SOCIO-ECONOMIC IMPACTS OF COMMUNITY FOREST MANAGEMENT IN RURAL INDIA

By

FREDERICK JOHN ROSSI

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I dedicate this to my parents, Joseph and Irene Rossi, for the unconditional love and enduring support they have always given me. I also wish to dedicate this work to my uncle and godfather, David Rossi. His words once challenged me to action, which ultimately lead to this dissertation. He will be missed always.

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By

Frederick John Rossi

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Chair: Sherry L. Larkin
Cochair: Janaki Alavalapati
Major Department: Food and Resource Economics Department

This work provides an economic and institutional analysis of Joint Forest Management (JFM) as applied in Andhra Pradesh, India. JFM is a natural resource management paradigm that actively involves local stakeholders in the protection and management of local forest resources. In essence, JFM is an institutional framework in which state forest departments work in partnership with local communities to restore degraded forests to a productive and sustainable capacity. Concomitant goals of this program are to increase the incomes of rural participants, and provide an equitable distribution of program benefits throughout local communities. In 1992, Andhra Pradesh enacted legislative orders adopting JFM; these orders were subsequently revised in 2002 to authorize Community Forest Management (CFM), a more devolved version that further involves local communities in the decision-making process of forest management.

Primary data collected from three regions of Andhra Pradesh are used to analyze community-level impacts that this forest management program has on indicators of economic well-being, inequality, and poverty. Results suggest there is an appreciable opportunity cost of adopting the program when all 58 of the sampled villages are analyzed. When restricting the analytical focus to more forest-dependent villages, results indicate the JFM/CFM program has a

beneficial impact on economic well-being. This implies the program is successful in achieving one of its objectives: increasing economic benefits for the forest-dependent poor.

The CFM institutions of Andhra Pradesh are evaluated using design principles that Ostrom identified as key institutions common to successful, long enduring common-pool resource management regimes. Taken as a group, all of the design principles are found to exist in the state legislative orders and at the community-level (to varying degrees). However, some of the CFM institutions defined by the state only reflect these design principles in general terms, while the institutions implemented by communities are often incomplete or otherwise deficient.

Policy implications and recommendations drawn from this study are directly applicable to the CFM program of Andhra Pradesh. This study also provides useful information to those interested in the performance of CFM in Andhra Pradesh, or others interested in the general application and performance of JFM in India.

CHAPTER 1
INTRODUCTION: PARTICIPATORY FOREST MANAGEMENT

Challenges of Resource Management

Most natural resource systems are considered to be common-pool resources (CPRs). A CPR is typically defined by some type of natural resource stock (e.g., a forest or a fishery) from which individual units (e.g., trees or fish) are extracted. The resource units are rival goods, which means that use is mutually exclusive (i.e., use by one individual precludes use by another). This theoretically allows the possibility of excluding specific individuals or groups from benefiting from the CPR. The ownership of a given natural resource is often held by the government, although resource users themselves sometimes hold collective ownership. CPRs that lack an owner or clearly defined ownership (e.g., international fisheries) are often characterized as being an *open access resource*, which essentially means there are no regulations governing access, extraction, etc.

From the use of both renewable resource and game theoretic models of harvesting, economists are aware of the dynamics and incentives that drive people to over-exploit natural resources. These include, for example, the lack of regulation, a lack of enforcement, and zero user-costs borne by each individual. When a government cannot effectively exclude local people from accessing a natural resource, and if there are no communal rights and responsibilities governing use, a CPR effectively becomes an open access resource. The fundamental problem of open access resources will then follow: the benefits gained from resource extraction are realized individually, while the costs of extraction (in terms of decreased reserves, or environmental degradation) are shared by all who use the resource. As there is no guarantee that reserves will remain in the future, or that productivity will be sustained, extraction will proceed as fast as possible. Therefore, there is no incentive for any individual to practice conservation, because the

resource has no imputed value. The irony is that there is a collective social value to conservation: if the community of resource users can effectively organize and cooperate, they can establish stakeholder-devised institutions for the productive management of the shared resource.

The phrase 'tragedy of the commons' is often used to refer to open access over-exploitation resulting from the (perverse) incentives faced by each individual, which themselves are a function of misguided or non-existent institutions governing the resource (Hardin, 1968; Ostrom, 1990). In India, for example, government ownership of forest land, coupled with the historical policy of commercial timber extraction, allowed little consideration for the needs of forest-dependent people (Khare et al., 2000). As the government could not effectively exclude rural inhabitants from accessing public forestland (and with no communal rights and responsibilities for them to adhere to), the forests became a *de facto* open access resource. The resulting local pressures that a community exerts on a natural resource, such as a forest, are compounded over time by high population growth rates. In India, the impact of deforestation and forest degradation caused by local inhabitants is significant (Khare et al., 2000).

India is not the only nation facing threats to forest sustainability and the related poverty of forest-dependent people. Around the world, many developing countries are involved in forest conservation efforts due to concerns for both the long-term sustainability of forest resources and the wider socio-economic benefits that healthy forest provide to local communities. Beginning in the 1970s, the international development community has been aware of the important interdependence between forests and rural peoples (Odera, 2004). As traditional forest management policies became increasingly powerless to stem deforestation, different agencies and donors began trying more "holistic" approaches to forest management that included collaboration with local communities (Odera, 2004). As such, community-based forest

management eventually emerged as a paradigm for forest conservation and rural development in many developing nations; although what actually constitutes "community forest management" is in fact quite fluid and varies widely. Schmink (2004) stresses that the diversity in ecology, resource endowments, socio-cultural systems, and political and economic histories of each community (let alone nation) require approaches that are adapted to particular situations.

Interest in forest conservation in particular is now widespread around the world among both developed and developing countries. This is largely due to visually perceptible environmental degradation caused by deforestation, such as clear-cuts and their after effects (e.g., soil erosion, etc.). In addition, the controversial issue of anthropogenic global warming has recently sparked a renewed interest in forest conservation, including research addressing carbon-sequestration programs. Concurrent with the interest in forest conservation is the attention that the development community is giving to decentralized and participatory processes that embrace local human resources. Empowering local people to be at the forefront of their own development, in the context of forest conservation and management, has become a paradigm for sustainable socio-economic and environmental development (Schmink, 2004).

Forest degradation has also been a continuing problem for India, adversely impacting both the environmental and economic stability of rural communities that depend upon forests (World Bank, 2000; Balaji, 2002; Tewari, 2006). India is a country of approximately 1.1 billion people (2005 estimate) that is facing the challenge of forest resource sustainability for approximately 200 to 275 million people that depend wholly, or in part, on income derived from forests (Saxena, 1997; Khare et al., 2000). The future need for timber, fodder, non-timber forest products (NTFPs), and other environmental amenities and services will require a resource management paradigm that ensures productive and sustainable forests. Thus, the challenge of

reversing forest degradation, improving forest resource productivity and management, and improving rural communities is a daunting task, given that India has 678,333 square kilometers (km) of forest land, of which an estimated 42% is classified as "open forest", meaning that it is degraded (Ministry of Environment and Forests [MoEF], 2006).

The Role of Institutions

Institutions are the formal and informal rules and regulations that serve as humanly devised constraints. They shape human interaction and help structure the incentives of human exchange, thereby decreasing uncertainty in transactions (North, 1991); and their underlying social organizations are becoming increasingly relevant for the attainment of socio-economic development and natural resource sustainability goals. This is particularly so in rural areas where a lack of cooperation, cohesiveness, and coordination frequently hampers economic progress. For this reason, strong local organizations are often touted as a key determinant of successful rural economic development. They are especially important in mitigating the deleterious effects caused by the over-exploitation of CPRs such as public forests. Institutions often originate spontaneously in response to the particular needs of a group of individuals. Healthy institutions (e.g., those that are functioning and appropriate) also grow and evolve to fit the needs and demands of the society they serve (North, 1991).

Although population pressure has induced the unsustainable use of key natural resources such as forests in countries such as Nepal and India (Joshi, 1997; MoEF, 1999), the threats to natural resource sustainability are not limited to population growth alone. The absence of effective governmental and local institutions that manage natural resource use is just as detrimental to environmental sustainability, if not more so, than population pressures. Indeed, a viable and appropriate institutional framework that is responsible for natural resource

stewardship is a necessary condition for the achievement of socio-economic development and natural resource sustainability goals.

Hill and Shields (1998) and Rangachari and Mukherji (2000) provide empirical evidence for the reversal of severe land degradation and deforestation following the adoption of Joint Forest Management (JFM) in different states of India. Given the proper legal and institutional environment, communities have an incentive to organize and manage their resource base in a sustainable manner. The work of Elinor Ostrom has been instrumental in explaining how the strength and resiliency of community-level resource management organizations is derived from institutions that have evolved over time. In her book *Governing the Commons* (1990) she uses several case studies from around the world to analyze successful institutional arrangements that govern a diverse array of CPRs, including forests. Some of these case studies include CPR management regimes that have persisted for several hundred years.

Delineated from the case studies that Ostrom (1990) presents are a particular set of seven institutions referred to as "design principles" that she suggests all successful, long-enduring CPR management regimes are likely to exhibit.[1] Most of the design principles are self-reinforcing, and thus function as an integrated system for equitable governance of access to, and extraction from, CPRs. Presented below is a brief description of each design principle (DP) and how it provides an incentive to collective action, or otherwise affects the successful functioning of CPR management.

Clearly defined boundaries (DP 1) are basic to the problem and consist of two components: the spatial delineation of a given resource as common property, and the definition of rights of

[1] An eighth design principle (nested enterprises) is auxiliary and only relevant for larger and more complex CPR management systems that have an ordered hierarchy (Ostrom, 1990). For example, irrigation associations that must temporally co-ordinate allocation of water amongst several groups of users, and at several spatial scales in a region, often require the other seven design principles to be organized in multiple layers of nested enterprises. This design principle has no applicability to the scope of the present study and will not be discussed further.

access and use to a specific set of stakeholders. When taken together, these components lead to a marked reduction in uncertainty regarding who has legitimate access to the CPR, and clearly establishes the exclusion of non-stakeholders from access. These boundaries can be thought of as necessary conditions (though not sufficient) for conversion of an open-access resource to a CPR through the imposition of resource management institutions.

Congruence between appropriation and provision rules and local conditions is the second design principle (DP 2). The heterogeneity of resource endowments, even amongst separate user-groups (i.e., villages or communities) of the same geographic region emphasizes the importance of designing institutions that reflect the specific characteristics of a given CPR. For example, no two physical environments are exactly the same, even for the same type of CPR such as forests. Therefore, human interactions with CPRs will display considerable spatial and temporal variability, and will require institutions tailored to the specific parameters and nuances of a particular CPR.

Effective and equitable governing structures will give a voice to all stakeholders and requires that most members are given the opportunity to participate in the modification of the institutions. These collective-choice arrangements (DP 3) ensure that the institutions are responsive to the very individuals that they serve. In addition, this responsiveness also helps to ensure that DP 2 (congruence) is functioning well: by being responsive to its members, the institutions are able to respond and adapt to changing conditions. This is because the users of the CPR are in the best position to assess the local environment (political and physical) and any changes therein.

Monitoring of the CPR (DP 4) is necessary to keep all stakeholders in compliance with the appropriation rules, and to enforce the exclusion of non-stakeholders. This design principle

addresses the fundamental problem of open access by eliminating the free-rider and forcing each user to pay the cost of their resource usage. Monitors are accountable to the stakeholders, and are frequently the resource appropriators themselves. Effective CPR institutions do not rely on external enforcement. The community itself is responsible for the compliance of each individual through both formal and informal (i.e., cultural) institutions.

Circumstances will arise where temptations to cheat lead to infractions; thus, effective compliance is a function of graduated sanctions (DP 5). There is a certain amount of fairness that is implied with graduated sanctions. They are important so as not to discourage future compliance when minor infractions occur, or when first-time offenders are discovered cheating. However, sanctions should be heavy for repeat offenders in order to ensure increased future compliance by those who follow the rules.

Mechanisms for conflict resolution (DP 6) that are characterized by low transaction costs are required. To ensure both the fairness and the continuity of the institutions, each stakeholder must have recourse to a forum established for the purpose of dispute resolution. As any set of rules and regulations is subject to different interpretation by different individuals, and as the design principles are attempting to manage an open access resource, a forum is necessary for the dispensation of justice or punishment to those accused of non-compliance. Again, an external source of governance is not required for this function.

Minimal recognition of rights to organize (DP 7) is the seventh and last design principle discussed in this study. This design principle relates directly to an external presence. It refers to the need for an over-arching governmental policy framework that facilitates, or even encourages, community-level institutions that are capable of natural resource management. The most basic

requirement is for the government to recognize the rights of local people to devise their own institutions regarding CPRs.

These design principles provide a context within which participatory forestry programs, including those in India, can be evaluated. Although the particular aspects of JFM institutions in India do not allow perfect adherence to all of the design principles advanced by Ostrom, these principles nevertheless provide a framework for later discussion in this study.

A Case Study in India

Forest Management

The response to the problem of widespread forest degradation in India has been the development and implementation of Joint Forest Management (JFM). The Government of India introduced legislation in 1988 that was specifically designed to promote forest regeneration while addressing the needs of forest-dependent people living in rural areas. This change in forest policy subsequently led to the adoption of JFM in the individual states of India.

JFM attempts to provide for the sustainability of public forests by incorporating local stakeholders into the planning, management, and protection of public forests. Economic incentives provide a foundation for community involvement, and help to improve the socio-economic outlook of the participants. The cornerstone of the JFM paradigm is the participatory involvement of village stakeholders working (in collaboration with the state forest department) to reforest degraded local public forest lands. This was not always the case: forest departments historically followed a reactive approach to forest conservation and management that often alienated local communities. In contrast, JFM is a much more proactive approach.

In order to participate in the program, a community must establish a forest protection committee and register this organization with the forest department. Membership (by households) in this body is voluntary. Once approved and registered with the forest department,

the forest protection committee is given a tract of degraded forestland to rehabilitate, manage, and protect. Silvicultural techniques and other works (e.g., soil and water conservation) are employed to promote the natural regeneration of the area protected by the forest protection committee. Although ownership of the land is retained by the government, economic benefits conferred to the forest protection committee act as incentives for sustainable management and continued participation. As such, the forest protection committee is granted usufruct rights for most of the NTFPs that the designated forest area yields. Moreover, a critical aspect of JFM is their right to a portion of timber revenues (from future plantation harvesting), which serves as one of the main incentives for community participation in the program.

The basic objectives of JFM are to increase the livelihoods of local forest-dependent inhabitants by restoring degraded public forest lands, and to equitably distribute the related benefits throughout local communities. Since implementation of this forest management paradigm began in the early 1990s, adoption of JFM by local communities has been widespread. Recent data indicate more than 99,000 registered JFM committees are managing an estimated 214,300 square km of forest land (32% of total forest land) in all of the 28 states that comprise India (MoEF, 2006). The JFM program has changed throughout its tenure (MoEF, 2005), however, and continues to evolve over time.

On balance, the basic theory behind JFM is sound: addressing the restoration and sustainability of forests through incentive-driven community participation. The result is a move away from open access over-exploitation and toward collective conservation efforts that will realize future dividends to the community. Some empirical evidence exists to support this outcome, both in terms of forest resource restoration and income generation. For example, Khare et al. (2000) states that JFM is successful when measured in terms of the spatial spread of the

program, the number of hectares of forest managed under the program, and the regeneration of degraded forests that has occurred. Other researchers have documented increased village welfare derived from timber revenues, NTFPs, and environmental services (e.g., increased groundwater recharge) following implementation of JFM programs (Hill and Shields, 1998; Rangachari and Mukherji, 2000; Asia Forest Network [AFN], 2002). Rangachari and Mukherji recount clear, if preliminary, local success following the initial implementation of JFM in the state of Andhra Pradesh. Although they caution against premature claims of achieving sustainability after only a few years of JFM, their discussion specifically references improvements in forest protection and regeneration, NTFP yields, water table levels, agricultural production, and forest employment. In this lies the strength of JFM: demonstrating that community-level participatory involvement in resource management has the potential to reverse environmental degradation, even when the institutional arrangements are sub-optimal.

Nevertheless, some of the same research raises legitimate concerns of the distributional aspects of JFM by discussing how the most disadvantaged people appear to be those most adversely affected by restricted access to forests (Hill and Shields, 1998; Khare et al., 2000). Reddy et al. (2004) discuss how the livelihood impact of participatory forest (i.e., JFM programs) "falls short of expectations" in selected villages of Andhra Pradesh that were studied. Hildyard et al. (1998) raise concerns that "…the rhetoric of participation is not matched by realities on the ground." They are highly critical of projects that are participatory in name only. Overall it appears that the broad success of JFM has been mixed. Considering the multiple objectives that JFM is intended to address, it is perhaps not surprising that success has been variable; especially if management of the resource takes *de facto* priority over socio-economic concerns, as some authors have suggested (Saxena, 1997; Rangachari and Mukherji, 2000).

Despite these shortcomings, JFM is the preeminent forest management paradigm in India, and one of many participatory forest programs currently practiced around the world. As the generic label "community forest management" has become ubiquitous in describing most (if not all) of these programs, it is increasingly apparent that there is no universal specification of a "community forest management" model (Odera, 2004). This is largely because the programs and institutions being implemented in different countries around the world reflect the specific situations unique to a given country or region. This is as it should be, though; as each country (or greater/lesser region) will be defined by its own natural resource endowments (e.g., geology, climate, etc.), cultural practices, and socio-cultural and political history (Schmink, 2004). Hill and Shields (1998) provide an example from their case study of two villages, one each in two different states of India. They found that, in general, site-specific factors (e.g., tree species, locally important NTFPs, etc.) helped to determine the differential economic success they observed between the two cases.

Research Objectives

Even though its popular appeal is greater in some states than others, and may vary locally, there is little doubt that the JFM paradigm has spread throughout India in impressive fashion. This is advantageous for research, as continued efforts to study JFM in different locations can help to shed light on how spatial heterogeneities (whether environmental, institutional, and/or socio-cultural, etc.) affect the socio-economic objectives of the JFM program. Given that the main overarching goals of JFM are to restore degraded forest lands and to increase and equitably share benefits derived from forests, it is important that contemporary research analyze the impacts of JFM.

Although much has been written about community forestry in general, and JFM in particular, relatively few studies (e.g., Hill and Shields, 1998; Reddy et al., 2004) investigate the

economic efficiency and equity outcomes of JFM in India. It is generally believed that JFM has been successful in rehabilitating degraded forest lands (Khare et al., 2000; Rangachari and Mukherji, 2000); yet many questions still remain: Does JFM have an identifiable economic impact on the villages participating in the program in Andhra Pradesh? Is there any impact on inequality or poverty that can be measured? Are the design principles of Ostrom reflected in the institutions that currently define Community Forest Management (CFM)[2] in Andhra Pradesh; and, if so, are they being implemented and adhered to in the local communities?

In order to answer these questions, this dissertation has four specific research objectives:

1. To calculate estimates of several economic indicators in JFM/CFM villages of Andhra Pradesh; including the mean per-capita household consumption (μ), the Gini coefficient (γ), and the poverty-gap ratio (PGR);
2. To analyze the influence of demographic, economic, bio-physical, and institutional factors on the economic indicators in Objective 1;
3. To analyze the institutions of Community Forest Management (CFM) as implemented in Andhra Pradesh; and
4. To identify the structural strengths and weaknesses of the Community Forest Management (CFM) institutions based on the findings of Objectives 2 and 3.

Methods

Two separate questionnaires were utilized in the field survey of this research study. A village-level questionnaire was designed mainly to collect information about the key institutions of each JFM/CFM village selected for the survey, such as the way in which they monitor their protected forest area, for example. Other questions inquire about the basic functioning of their

[2] Note that in the state of Andhra Pradesh, JFM was modified in 2002 to further devolve the program to allow local stakeholders more control of forest management. As such, the JFM program there is currently referred to as Community Forest Management (CFM). The compound acronym JFM/CFM is used in the remainder of the text to denote when the continuity of the program is being referenced (e.g., for communities that began JFM in the early 1990s, and continue their activities under CFM in the present). Use of the acronym JFM will henceforth denote the program as applied throughout India, while use of the CFM acronym will generally represent the current set of institutions that define participatory forestry in Andhra Pradesh.

forest protection committee, the historical quality and uses of their protected forest area, and about the forest improvement works they have undertaken.

A household-level questionnaire was developed specifically to collect socio-economic information from the households that were sampled in each of the villages surveyed. It is based upon the modular format of the Living Standards Measurement Study (LSMS) questionnaire, which was initially designed and tested by the World Bank in the 1980s (Grosh and Glewwe, 2000). LSMS surveys have been administered around the world; and, in fact, the development of the module structure was mindful of the standardization of questionnaire formatting and the flexibility needed to accommodate surveys with different research goals. LSMS surveys are composed of numerous independent modules, each one corresponding to particular topics covered in surveys administered in developing countries that seek to gather information related to various development issues. One of the central objectives of LSMS surveys is to measure household consumption in order to document living standards and poverty. Deaton and Grosh (2000) explain that consumption directly generates a state of well-being (i.e., an actual condition), whereas income and wealth connote a power dimension (or potential). Thus, the most important concern of LSMS in estimating consumption is for measuring the distribution of living standards, including poverty (mainly) and inequality as well.

The compilation and analysis of the socio-economic data allows for the empirical examination of the interrelated relationship among CFM, its institutions, and the economic welfare and equity of the local communities that participate in the program. Dependent variables for regression analysis are economic indicators that represent components of social welfare and the level of poverty in the communities surveyed; they are analyzed because the JFM/CFM program is largely concerned with poverty alleviation and improving the livelihoods of rural,

forest dependent communities. In this study, social welfare is represented as $W = \mu (1 - \gamma)$, where μ is mean per-capita household consumption (for a given community), and γ is inequality (as measured by the Gini coefficient). Because both μ and γ are two separate components of social welfare, they are analyzed as distinct dependent variables in different regression equations. A third equation utilizes the poverty-gap ratio (PGR) as the dependent variable. PGR is a measure that quantifies the incidence of poverty in a given community; it is based on an objective consumption-based poverty line.

Demographic, socio-economic, bio-physical, and institutional variables represent the four types of explanatory variables drawn from a survey of individual households and a survey of the forest protection committee leaders. Examples of each variable type include: number of households (demographic); income from forest products (socio-economic); size of the protected forest area (bio-physical); and the presence or absence of a formal patrol (institutional). In particular, the JFM/CFM program is represented by a variable that controls for the length of time that a community has participated in the program; as such, any impact on the dependent variables can be discerned.

Summary and Preview

Chapter 2 begins with the history of forest management in India, including a discussion of the revolutionary experiment that JFM was later modeled on. The next section describes in detail the institutional framework of JFM (and later CFM) as it has been implemented in Andhra Pradesh. Then, a general overview of participatory forestry in other countries is offered to provide a basic comparison with JFM in India. The final section of Chapter 2 provides an introduction to the southern Indian state of Andhra Pradesh. A general description of the linguistic diversity, the social caste composition, and geographic regions of this state is presented

in order to supply the reader with some basic knowledge of the study location, as well as illustrate some of the challenges posed by the scope of this research study. Included is a brief overview of the role of the Andhra Pradesh Forest Department (APFD) in administering the CFM program throughout the state.

The third chapter describes both the development and implementation of the community-level and the household-level questionnaires, and the overall structure and administration of the survey. The first section describes the questionnaire used to interview the leader(s) of the forest protection committees in each village of the sample. The second section presents the composition and layout of the household-level questionnaire, discussing the design, structure, and formatting in detail. The final section of this chapter examines some important aspects of how the survey was implemented, including the spatial structure of the survey and field methods, etc.

Chapter 4 begins by presenting details of the specification of the empirical models. The second section discusses the hypotheses on the independent variables, while the final section presents and describes the data collected by the field survey. Chapter 5 presents the regression results and discusses the general implications. Chapter 6 returns to the design principles outlined by Ostrom, discussing them in the context of CFM in Andhra Pradesh and the empirical data that were collected and analyzed.

The final chapter summarizes the study results and offers overall conclusions and implications of the research. Policy recommendations and opportunities for future work in this area are also provided.

CHAPTER 2
BACKGROUND INFORMATION ON THE STUDY AREA

Overview

This chapter is divided into three main sections. The first section describes the historical management of natural resources and institutions in India, beginning with the pre-colonial era. Then, the immediate predecessor of JFM in India is discussed: the so-called "social forestry" programs of the mid 1970s to the late 1980s. Due in part to its lack of long-term success, social forestry in India was succeeded by JFM around 1990, although the origin of JFM can be traced back to a pilot program undertaken in the state of West Bengal in 1972 (which is also discussed). Thus, the initial foray into JFM actually predates social forestry in time, but eventually the success of this pilot program in regenerating degraded forest lands became widely publicized (Mitra, 1995). This led to JFM ultimately supplanting social forestry as it began being replicated, first in West Bengal, and later throughout the rest of India. This first section ends with a detailed description of the development of JFM in Andhra Pradesh, and its later transformation into the CFM program.

The second section of this chapter presents an overview of community-based forest management in other areas of the world. Nepal, China, and a few other countries in Asia are discussed; this is followed by a general description of participatory forestry in Africa. Community forest management in Mexico is also presented because, although there are some similarities to JFM in India, there are also some important institutional and production differences.

The third section provides an overview of Andhra Pradesh, which includes a general description of the state's linguistic diversity, social caste composition, and its three geo-political

regions. The role of the forest department in administering JFM/CFM throughout Andhra Pradesh is discussed as well. The final section summarizes the discussion of this chapter.

History of Participatory Forest Management in India

Pre-Colonial Era

The historical antecedents of JFM lie in the distant past of India itself. Two examples illustrate that community-level control of natural resources is not a foreign concept to the people of India. Indeed, it becomes clear that institutional structures can provide the incentives, or the disincentives, which govern the behavior of people.

Rangachari and Mukherji (2000) state that, like many other indigenous peoples around the world, the tribal peoples of India practiced shifting cultivation (also known as swidden or "slash and burn" agriculture). Forest land is typically cleared, burned, and planted with crops until soil productivity declines. The process then begins again on a new parcel, or an area left fallow is reutilized. Agricultural output is relatively low compared to high-input, intensive farming techniques used today. However, swidden cultivation requires no external inputs (other than labor) and, for that reason, is sustainable in the long-run (given relatively low population densities and an abundance of land). Besides raising crops under this system, the forest is utilized for other subsistence activities like hunting and gathering. Forests are an integral part of the cultural and economic life of such a community, and the institutions that govern access and use to the resource will reflect the values of the people who depend on it for survival. As land is held in common (i.e., there are no private property rights), resource sustainability and community welfare become the implicit objectives of resource management.

The southern kingdoms of India offer historical evidence of agricultural surplus and wealth in the post-Sangam era, according to Rangachari and Mukherji (2000), who discuss how village-level autonomy and community-level social organization was the norm for medieval southern

India. The institutional structure of this era (A.D. 300 to colonization) emphasized the de-centralized administration of planning, investment, and management of agriculture and natural resources. As an example of an appropriate and functioning institution, Rangachari and Mukherji (2000) discuss the structure of institutions that governed local water resources. Apart from tax collection, the King would preclude himself from any local administration, but would provide such public goods as large-scale irrigation infrastructure. The local organization and control of smaller-scale irrigation infrastructure was facilitated by the appropriate set of incentives and enforcement that bind together the stakeholders of common property resources.

The traditional institutions of forest management became incompatible with the centralized and bureaucratic governance structure of the British following the advent of their political and economic hegemony. The imposition of western ideas (such as the nationalization of forests) naturally supported and furthered their control, enabling them to consolidate their power and increase their wealth. For instance, the British promoted the distribution of private property rights for continuously cultivated land, and actively encouraged the clearing of forest land for agricultural production in order to generate farm incomes and subsequent tax revenues (Khare et al., 2000).

Another consequence of the changing institutional structure was the adoption of the prevailing forest management paradigm of the time, which viewed timber primarily as a factor of production. Before the introduction of steel and plastic, wood was utilized in the production of a wide variety of consumption goods. In particular, aside from use as a fuel source, large quantities of timber were used to produce railway ties, ships, and houses. Following Independence in 1947, the government of India essentially carried over this “industrial forestry” paradigm in the interest of its own national development objectives. They maintained exclusive control over the

production and management of forests, with concessions to industry providing a steady flow of income to the states.

Social Forestry Programs

After India gained independence, the forest policies of the government continued both the land tenure regime and the management practices of the British. In particular, the colonial-era paradigm of 'scientific' forest management proceeded well into the 1970's; there was little regard for the natural diversity of tree species as forests were converted to monoculture plantations (Khare et al., 2000). The needs of local people continued to be subordinate to national economic imperatives. However, burgeoning pressure on the state forests from rural people led to a policy change designed to stem forest degradation and ensure future productivity. Although official forest policy rhetoric had always paid only token respect to forest-dependent people, the 1976 National Commission on Agriculture (NCA) explicitly stated that management of government forests was to further the production of timber for industrial purposes (Khare et al., 2000). But in order to do so productively, the government realized the necessity of relieving the local pressures that were increasingly being placed on the public forest lands. What became known as "social forestry" was the resulting vehicle designed to accomplish this objective.

The idea behind social forestry was that the rural demand for small timber, fuelwood, and other forest resources would be met through production on village communal lands, private farms, and degraded or unproductive government land. Government subsidies and technical assistance were provided as incentives to mobilize the local population to adopt this paradigm. More importantly (from the government's perspective), the industrial demand for timber would be met by plantation forestry on government forests, which would now be free from rural predation. Thus, the continuation of a national forest policy that served industry still left the welfare of rural inhabitants as a secondary consideration. In fact, Khare et al. (2000) state that

"the major benefits [of social forestry] had been to the central and state governments in the form of cheap raw material and unbridled access to forests. Both types of benefits were at the expense of forest-dependent people" (p. 59).

Despite this reality, social forestry was important because it foreshadowed the concept of JFM by allowing tree cultivation on degraded government land, with at least some management responsibilities in the hands of local people. For example, the "community plantations" component of social forestry established government-sponsored plantations on community and/or government lands. Communal grazing areas, degraded government forests, and roadsides are examples of lands that were planted to meet the small timber and fuelwood needs of local inhabitants.

This program could not be sustained beyond the first harvest, however; due in part to a lack of institutions defining both the rights to the trees and the distribution of benefits (Khare et al., 2000). In addition, other factors that contributed to the demise of the program were that the forest departments exhibited a poor understanding *a priori* of the actual perceptions and practices of local people vis-à-vis trees, timber, and related forest issues. For example, the assumption that the community plantations would be utilized for fuelwood was proven false when it became clear that local authorities viewed these plantations as a source of communal income.

"Farm forestry" was the name applied to the other component of social forestry. The defining feature of farm forestry was tree production on private lands. Farmers were given free or subsidized seedlings, and no restrictions were placed on what to do with the output (e.g., use as fuelwood or timber). Initially this program was very successful, thriving beyond the original expectations of planners, who had anticipated social forestry as a scheme for locals to produce their own fuelwood (mainly) and small timber for their own use. In reality, however, participants

were cultivating commercially valuable species in response to the economic incentives provided by the program. As they did not regard the production of trees for fuel as a valuable use of the resource, they instead viewed trees as an investment. Thus, farmers preferred to focus on the production of poles, small timber, and/or pulpwood for commercial gain.

The subsequent initial success of farm forestry was so great that the government was unable to assist with the marketing of surplus timber. Thus, timber prices fell drastically in many states, which negatively impacted further program participation. Pulpwood subsidies to paper mills, and legal restrictions on the sale and transport of timber, also contributed to the low prices that eventually signaled the end of farm forestry in the late 1980s. Although "farm forestry neither significantly met local needs nor improved private wastelands", an important realization was that farmers responding to the right incentives and prices could meet most of the raw material needs of industries based on wood (Khare et al., 2000, p. 59).

The Arabari Experiment

The origin of JFM can be traced to what Saxena (1997) refers to as the Arabari experiment. In 1972, an enlightened Divisional Forest Officer in the state of West Bengal took control of 1,272 hectares of deforested land. This area had once been very productive as a good source of fuelwood, food, and livestock fodder. By 1972, however, it no longer produced commercial timber, and the soil erosion associated with the loss of tree cover was adversely affecting the local agriculture. In order to ensure successful forest regeneration, this officer realized the need for an integrated development plan to eliminate the cycle of degradation. Because the collection and selling of fuelwood in local markets would hinder any afforestation efforts, the officer banned such activity. Income lost from this source was replaced by the employment of local people for the forest restoration work.

The majority (55%) of this land was managed for the re-growth of coppiced sal (*Shorea robusta*), an important tree species that provides NTFPs in addition to timber. Most of the remaining land was cultivated as plantation of acacia (*Acacia spp.*), eucalyptus (*Eucalyptus spp.*), cashew nut, etc. In addition to the wages received for their labor, the participants were promised 25% of the final timber harvest (subject to the success of the project). Moreover, to ensure that the needs of the participants were met during the maturation of the forest, rice and fuelwood were grown on the land. Rice was subsequently sold at cost, while fuelwood was sold for a token price. Rotational grazing was also allowed.

By creating incentives to regenerate, manage, and protect this plot of land, the Arabari experiment placed local people at the center of efforts to rehabilitate a portion of the state's forest. The program incentives provided for their intermediate needs through wage income and low cost subsistence goods, while the share of timber revenues gave them a stake in the long-term health and productivity of the forest. Saxena states that "this arrangement made it clear to the people concerned that they had a right to enjoy the enhanced benefits of forests, but this right was accompanied by their duty to nurture and protect the forests" (1997, p. 99). In 1987, 618 families were awarded a share of the timber revenues following the harvest of 97 hectares of sal and eucalyptus. In addition, each family received wages paid for harvesting the timber. The success of this model is evident in that over 2,000 villages had adopted the program by 1993, and that approximately 60% of the forest area in the region is managed under this model (Saxena 1997).

Development of Joint Forest Management (JFM)

Recognizing the value of grassroots participation to successful afforestation projects, the Government of India (GOI) enacted the 1988 National Forest Policy that subsequently enabled the adoption of JFM programs throughout India (World Bank, 2000). This policy change shifted

the use of public forests away from commercial exploitation and towards the subsistence needs of forest-dependent people (Saxena, 1997; Khare et al., 2000). This was a radical departure from past forest policies and reflected a new understanding that the "tragedy of the commons" is not necessarily an inevitable outcome of resource use by locals, but rather a function of institutions which are either non-existent or ineffective. This new understanding came in part from demonstrated successes such as the Arabari Experiment.

Policy makers were also influenced by the changing political winds. Although "environmental activism is not a new phenomenon in India, but is rooted in the past," the plight of forest dwellers was not promoted by "intellectuals and activists" until the early 1970s (Saxena 1997, pp. 40-41). Widespread attention to the dissent and unrest of forest communities began with the non-violent Chipko movement in northern India in 1973, and continues to the present-day with the armed rebellion by so-called "Naxalite" groups in Andhra Pradesh and other states.

Although the 1988 National Forest Policy reoriented forest policy to the needs of the local stakeholders, the June 1, 1990 Circular actually specified the basic rights that people have in relation to forests under their protection (Khare et al., 2000). It explicitly enabled the state forest departments to engage locals in the management of forests. Thus, this resolution directly facilitated the implementation of JFM without ever mentioning the words "joint forest management". Clearly JFM is the reference point, as the text mentions how "Village Forest Protection" in West Bengal receives a 25% share of timber revenues. In addition, the text states that similar institutions may be adopted by the other states (Government of India [GOI], 1988), and also encourages the forest departments to work with non-governmental organizations (NGOs) as intermediaries between the government and the local communities (Saxena, 1997).

With this legal order, state governments now had the authority to draft their own legislation that specified the particular institutions that would define JFM in their respective states.

JFM in Andhra Pradesh was initiated under G.O. MS. No. 218 in August 1992. With reference to the 1990 Circular of the GOI, this order commands the Andhra Pradesh Forest Department (APFD) to introduce and implement the JFM concept to all districts of the state. It provides some general instructions for implementation, most notably calling for frequent reviews so that analysis can lead to beneficial amendments. The order also directs the local village community to be organized into a *Vana Samrakshana Samithi* (Sanskrit for "forest protection committee") if the community collectively desires to participate in JFM. VSS is the acronym for Vana Samrakshana Samithi, and it is commonly used in Andhra Pradesh to denote the forest protection committee general body. The Annexure to G.O. MS. 218 contains the specific institutions of JFM that spell out the composition, functions, responsibilities, and rights of the VSS and its managing committee; these details are summarized next.

Given a quorum of 50% of village households, a Forest Officer will explain the concept of JFM to the assembled community. A VSS will be formed if sufficient interest exists, and every household in the village has the opportunity to join. Any two members from a given household are allowed to join the VSS; however, one must be a woman. Each member of the VSS general body will, individually and collectively, protect the forest area against grazing, fire, and theft of forest products. In addition, members will assist the forest department in implementing a jointly-developed forest management plan (known as the "micro-plan"). The VSS general body will meet every six months to review the plan.

Every VSS shall have a Management Committee (MC) that is charged with the responsibility of carrying out the approved JFM micro-plan. The MC will convene monthly, and

the term of service is one year. It will be composed of six to ten members elected from the general body of the VSS, the president of the local government council, and two members of the forest department (who do not have voting privileges).

The micro-plan is to be developed by the APFD in consultation with the MC, and will apply to a specifically designated tract of degraded public forest land selected by the MC and the APFD. It will focus on supporting the demand for traditional forest products local to the area, and include measures designed to aid the regeneration of the forest—soil and water conservation measures, in particular, are to be an integral component. Planting of low-valued fruit trees such as tamarind is allowed, but horticultural species like mango and guava are not permitted. The conservation and development works of the micro-plan are to be coordinated by the MC, as are the paid and un-paid labor inputs. First preference for paid labor is to go to VSS members. The micro-plan will be in effect for 10 years and is subject to revision by the forest department.

Given adherence to its duties and responsibilities, the VSS is granted usufruct rights to the forest. The VSS, acting through the MC, is responsible for the equitable distribution of the usufruct benefits entitled to VSS members. Discretion is given to withhold or lessen the share of benefits according to the contributions, or lack thereof, of individual members. Each household is considered as one member for the dispensation of the usufruct benefits. Rights are divided into two classes. Non-reserved rights are granted to leaf and grass fodder, thatching and other grasses, thorny fencing material, and deadwood. Reserved rights apply to certain NTFPs under contract to a parastatal, and to timber and poles. After three years, access for timber and poles are afforded to the community subject to the JFM micro-plan: harvest is shared between the VSS and the APFD, with each receiving 50%. Usufruct rights shall only apply to VSS members, and

any disputes are to be adjudicated by the MC. The Conservator of Forests (a high-ranking APFD official) has the authority to relax these rules and regulations.

The first revision of the initial legal orders came in December 1996 with G.O. MS. No. 173. As well as changing some elements of the original order, it also provides more detail to the composition, functions, responsibilities, and rights of the VSS and its management committee. Important changes included:

- Ensuring participation of all tribal households and households from the lowest castes by making their membership automatic. Such households are also allotted a certain percentage of membership in the MC.
- Increasing the number of elected MC members to 10 – 15 (of which 30% are to be women), and increasing the term of the MC to two years.
- Allowing the VSS to apprehend offenders and turn them in to the concerned authorities.
- Devolving more power to the VSS to prepare the micro-plan, especially with the goal of including the input of women and more disadvantaged groups.
- Allowing the VSS to select the species for plantations, and relaxing other restrictions on what type of trees can be planted.
- Specifying that all labor contributions be paid.
- Relaxing the restriction on most NTFPs, and specifying that 50% of net income from collection of Beedi leaf (for locally produced cigarettes) be paid to VSS members.
- Increasing the share of timber and bamboo harvest received by the VSS to 100%.

Advent of Community Forest Management (CFM)

In February 2002, the legal orders for JFM were re-written to place greater emphasis on community participation and autonomy. As such, JFM was superseded by Community Forest Management (CFM) under G.O. MS. No. 13. According to the APFD, CFM "…aims at decentralizing the entire process of planning and implementation with APFD and Government of Andhra Pradesh (GOAP) acting more as facilitators and providers of technical and infrastructure support" to local stakeholders (APFD, undated, p. 4). This is in contrast to JFM, where the

VSS/government relationship is characterized as being more like a partnership. The main changes included revising the membership and functions of the MC, and creating other support councils for the VSS. Some minor revisions to NTFP, timber, and bamboo rights were made also. The important changes were:

- The VSS can now collect fines (less than 100 Rupees) for minor forest offences.
- VSS are entitled to all intermediate yields obtained from silvicultural operations.
- The MC is now comprised of 15 elected members from the VSS, and at least eight must be women. The MC tenure is increased to three years.
- The MC will elect a Vice-Chairperson. Either the Chairperson or Vice-Chairperson must be a woman. The Vice-Chairperson is to work closely and assist the Chairperson with the dispensation of his/her duties.
- The Chairperson will maintain VSS account books, micro-plans, minutes books, etc.
- The MC will account for and manage the VSS funds and other resources.
- There are two accounts. The 'Government Account' contains funds received from the government, and is jointly operated by the Chairperson, Vice-Chairperson, and APFD representative. The 'VSS Account' contains internally generated funds, and those derived from non-governmental sources. It is operated jointly by the Chairperson and Vice-Chairperson.
- APFD staff, NGO representatives, etc. are no longer part of the MC, but will form an Advisory Council to review micro-plans, and advise the VSS on strategies and resources.
- Other councils will be created to review the implementation of CFM and provide direction to the APFD regarding the rural development. Representatives from the APFD, other government agencies, NGOs, and selected VSS will be included. These councils will be created at the district, forest division, and state levels.

G.O. MS. No. 13 represents the current set of institutions authorizing and defining CFM in Andhra Pradesh. This document is a significant improvement over the original order authorizing JFM in 1992, both in terms of the actual institutions and the clarity of presentation. Although the general program parameters are specified by the government, as opposed to being organic institutions self-derived by locals, the clear intention of CFM is to recreate a similar institutional

environment. The continued involvement of the government has helped the program evolve towards a framework within which local stakeholders can fine-tune certain parameters to fit their specific situation. Thus, from initiation in 1992 to the advent of CFM in 2002, the various updates have ensured and/or strengthened, in principle, the institutions of JFM/CFM, which characterizes participatory forest management in Andhra Pradesh today.

Comparison to Participatory Forestry in Other Nations

Nepal

The causes of deforestation in Nepal, and subsequent adoption of community forestry, are similar to the experiences of its neighbor India. Population pressures had already begun to impact forest resources in Nepal by 1957, at which time the nationalization of the country's forests took place—ultimately leading to a degraded (*de facto*) open access resource (Joshi, 1997). The legal orders for participatory forest management in Nepal date to 1978. According to Joshi, however, orientation of the policy at this time was more towards management by local leaders or local political units (i.e., panchayats) than collective management. Later policy revisions ensured that local stakeholders were empowered to manage their forest resources through the formation of Forest User Groups (Joshi, 1997). These legally recognized groups are given rights to timber and NTFPs from the forest area under their management, and there is also an emphasis placed on the participation of women. Unlike JFM in many states of India, however, even well-established forests in Nepal are eligible for the program in addition to degraded lands.

China and Other Asian Nations

The 1981 Forest Policy enacted by China began to loosen the government monopoly over forest resources. Essentially, policy changes promoted afforestation by leasing forestland to individual households, and forest farmers were given greater flexibility and control of their management (MoEF, 2006). In general, the model became less strictly collective and more a

combination of collective and individual management. In 2002, new laws were passed to strengthen the security of collective forests, which account for approximately 60% of Chinese forests (MoEF, 2006). In addition, forestry income is shared with the farmer based on labor input and other factors.

Other Asian nations are also promoting various degrees of community forestry. In Bhutan, small groups of at least five people can obtain use rights to forestland if they agree to regenerate it according to a management plan. Changes to forest policy in Myanmar have enabled reforestation cooperatives at the village level, and community forest management. The program allows all benefits derived from the community-managed lands to remain with the stakeholders. Vietnam is decentralizing the management rights and responsibilities to provincial and local authorities (MoEF, 2006).

Africa

Odera states that community forest management in sub-Saharan Africa dates from the late 1980s and early 1990s, but that these early efforts were generally focused on "…a narrow band of linkages between people and trees" (2004, p. 16). Such linkages included exchanging forest access for labor, and joint management schemes that borrowed principles from wildlife management services. In the intervening years, community forest management has continued to develop and evolve as the "open-ended" definition of this paradigm has allowed different countries to devise and/or adapt institutions that are specific to their own experiences and circumstances. However, Odera also notes that different management regimes have emerged that vary from full-fledged participatory management to only token representation by local people. Nevertheless, experience has shown that community forest management has been successful in reducing deforestation and improving forest cover and benefits—but only when people have been empowered with responsibility and have been given secure tenure rights (Odera, 2004).

Most sub-Saharan countries have taken steps toward implementing community forest management, although most of these programs are clearly in the developing stages with many less than five years old. Like JFM in India, the general rule seems to be that the local stakeholders must register with a government agency. This allows them official recognition and formal use and management rights that, combined with a management plan, usually cover a period of five to fifteen years (Odera, 2004). Unlike India, however, some countries have granted permanent land rights or ownership titles to local communities; while others have granted permanent titles to forest resources. Management plans are often required for such tenure as well. However, most benefit flows in Africa have been confined to NTFPs because restrictions on tree felling have been imposed in order to rehabilitate the forest, even when rights have otherwise been transferred to the local people.

There appears to be wide variation in terms of the types of forest to which community forest management in Africa is applied. For example, only unclassified forests in Cameroon are eligible (under a 10-year agreement), with a maximum size of 5,000 hectares. Other countries allow community forest management in reserved forest areas, even those that are classified as "high-priority" in terms of conservation (Odera, 2004).

Despite the advent of community forest management in Africa, there are significant problems. Support for community forest management in many countries is lacking due to internal problems in national forest departments. A lack of funding and training are also key constraints. Thus, the role of non-governmental organizations (NGOs) is critical in helping to serve these needs, and to better implement this management paradigm in general.

Mexico

Agrarian land reforms in Mexico throughout the twentieth century created substantial amounts of common property in the rural sector, much of it forested (Bray et al., 2006). Despite

legal rights granting control over common property to local communities, the government maintained significant control over forest resources (and also retained ownership of the land until 1992). From 1940 to 1970, government control was exerted in the form of ineffective bans on logging and the granting of concessions to harvest timber from community lands (Bray et al., 2003). During this period, modest attempts to involve locals arose through government efforts that trained local communities to manage community forest enterprises (CFEs). However, these actions were undertaken mainly in support of industries dependent upon timber and do not constitute a serious attempt to empower locals stakeholders by involving them in the direction, planning, and management of forests for their own benefit.

In the 1970s, grassroots activism and legal reform stimulated interest in true participatory forest management at the community level, and led to the development of new CFEs. Subsequent legal reforms lent additional support by devolving more power to locals, and by funding various projects that directly focused on community forest management and development. Thus, in many respects the precursor conditions leading to community forestry in Mexico were similar to those in India.

The particular manifestation of community forestry in Mexico is quite different from that of JFM, however. The main difference is that many of the CFEs in Mexico are engaged in commercial production of timber and timber products. Bray et al. (2006) cite an unpublished study that reports over 2,400 communities in Mexico were engaged in commercial logging in 2002. Furthermore, in a previous paper Bray et al. (2003) state:

> What is unique about the Mexican case is the large number of communities that are managing common-property forests for the commercial production of timber, as well as finished timber products in some cases, in industrial processes that are thought to be beyond the reach of most poor, rural communities.

Moreover, Bray et al. (2003) discuss how communities are managing their forests for multiple benefits and with due consideration for the increasingly robust environmental laws. They also say that CFEs often voluntarily harvest timber at rates less than their management plans allow.

Why such a focus on timber production? Mexican forestry policies, rural activism, and the traditional system of rural organization have combined in such a way that allows some CFEs to respond competitively to market forces (Bray et al., 2003). In addition, a history of past experience with commercial logging (i.e., concessions), and a legacy of resource use, may have left a residual attitudinal imprint in rural areas. The size of communal forest areas in Mexico is also relatively large (at least by Indian standards), averaging 3,074 hectares, according to calculations from the unpublished data cited in Bray et al. (2006). Therefore, large tracts can better accommodate competitive commercial logging without being destructive of the environment, because a proportionately larger volume can be harvested.

Description of Andhra Pradesh

Location

Andhra Pradesh is situated along the Bay of Bengal in the southeastern part of the Indian subcontinent (Figure 2-1). The fifth largest state in terms of area (276,754 sq. km), Andhra Pradesh comprises 8.4% of the total territory of India; and, at 972 km, has the longest coastline of any Indian state (Tata, 2002). The 2001 population of Andhra Pradesh is 75.7 million, of which nearly 73% (55 million) are rural inhabitants (Tata, 2002). With such a large rural population, agriculture is a key sector. Not only is Andhra Pradesh a net producer of cereals, but it also leads all Indian states in the production of rice (Reddy et al., 1992). Cash crops important to Andhra Pradesh include sugarcane, tobacco, cotton, and groundnuts (peanuts). Commercial enterprise and industrial production can also be found in the two largest cities: Hyderabad and Visakhapatnam.

The capital city, Hyderabad, is located in the northwest part of the state and is a sprawling metropolis with a 2005 population of 6.1 million (UN, 2006). Hyderabad rivals Bangalore as a leading center of information technology in India, and is second in film production only to "Bollywood" (in Bombay). Hyderabad is also a major center for pharmaceuticals and bio-technology. The coastal city of Visakhapatnam (2005 population of 1.5 million) has such economic activities as steel production, petrochemicals, and shipping (Chagari, 2005; UN, 2006).

Figure 2-1. Map of India with Andhra Pradesh (shaded).

Languages and Castes

The principal language of Andhra Pradesh is Telugu, which is a Dravidian language that is very similar to the languages of the other states of southern India (e.g., Tamil). Urdu is widely spoken in Hyderabad, owing to the large Muslim population (nearly 50%) in this city. English is spoken by many as a second language, usually by people who have been educated in "English medium" schools where it is the focal language. In the rural countryside, however, English is likely to be known by very few individuals.

The social division of people into castes is a well known aspect of the Hindu religion. There are literally hundreds of castes, each defined by specific names and often indicative, at least historically, of an occupation. The GOI has delineated four main categories from the many castes and tribes: Scheduled Tribes (ST), Scheduled Castes (SC), Backward Castes (BC), and Other Castes (OC). This classification is for legal and bureaucratic purposes, as affirmative action-type programs in India are based on this division. These categories are commonly referred to by their initials.

Scheduled Tribes include the various tribal populations in India that have their own languages, which are essentially verbal only. They have their own cultural customs as well, although many elements of Hinduism have been absorbed. In addition to their own language, most tribal people in Andhra Pradesh speak Telugu. Near the border of an adjacent state, they may speak the official languages of that state instead of Telugu. Scheduled Tribes are generally poorly educated and engage in subsistence farming and/or casual labor activities. Most of the more remote villages in the mountainous regions of Andhra Pradesh are Scheduled Tribes villages, and their dependence upon NTFPs is usually higher than other social groups.

Scheduled Castes is the term given to the castes that were formerly identified as "Untouchables" by the rest of Indian society. Scheduled Castes typically occupy the most menial

jobs (which are often stigmatized), they usually own no land, and are generally poorly educated (as compared to the higher castes). In order to improve the long-term welfare of the Scheduled Tribes and Scheduled Castes, the Indian government has written into the constitution an "affirmative action"-type program that guarantees access to civil service jobs for members of these two social designations. Reddy et al. (1992) estimate that Scheduled Castes and Scheduled Tribes account for 5.9% and 14.9%, respectively, of the population of Andhra Pradesh. Thus, nearly 80% of the population of Andhra Pradesh is comprised of Backward Castes and Other Castes.

Backward Castes include the grouping of castes that socially lie between the lower level of Indian society (i.e., Scheduled Tribes and Scheduled Castes) and the upper castes. Backward Castes are largely analogous to "middle class" society in the United States; a typical occupation might be a merchant or a military officer.

Other Castes comprise the top level of Indian society. They are generally better off, economically and educationally, than the Backward Castes, and certainly more so than the Scheduled Tribes and the Scheduled Castes.

Geographic/Political Regions

Figure 2-2 is a map of Andhra Pradesh that is divided into 23 districts. The basic socio-political unit of a given Indian state is the district, which is roughly analogous to counties in the United States. More broadly, Andhra Pradesh is comprised of three different socio-political regions known as Telangana, Rayalaseema, and Coastal Andhra. Andhra Pradesh was formed as a state in 1956, along the linguistic bounds of Telugu, from these three regions.[3]

[3] As such, it is quite possible that one day Andhra Pradesh will split into three separate states: Jayashanker (2004) discusses how the recent demands for a separate state of Telangana predate the formation of Andhra Pradesh by a decade.

Most of Andhra Pradesh reminds one of the southwestern United States in terms of physical features and climate, although the coastal zone is much more humid and lush in terms of tropical vegetation. In general, Andhra Pradesh can be characterized as follows: forested mountains in the north, north-central, and northeast areas, dry upland plateau with smaller mountain ranges in the central-west and south, and humid plains along the coast.

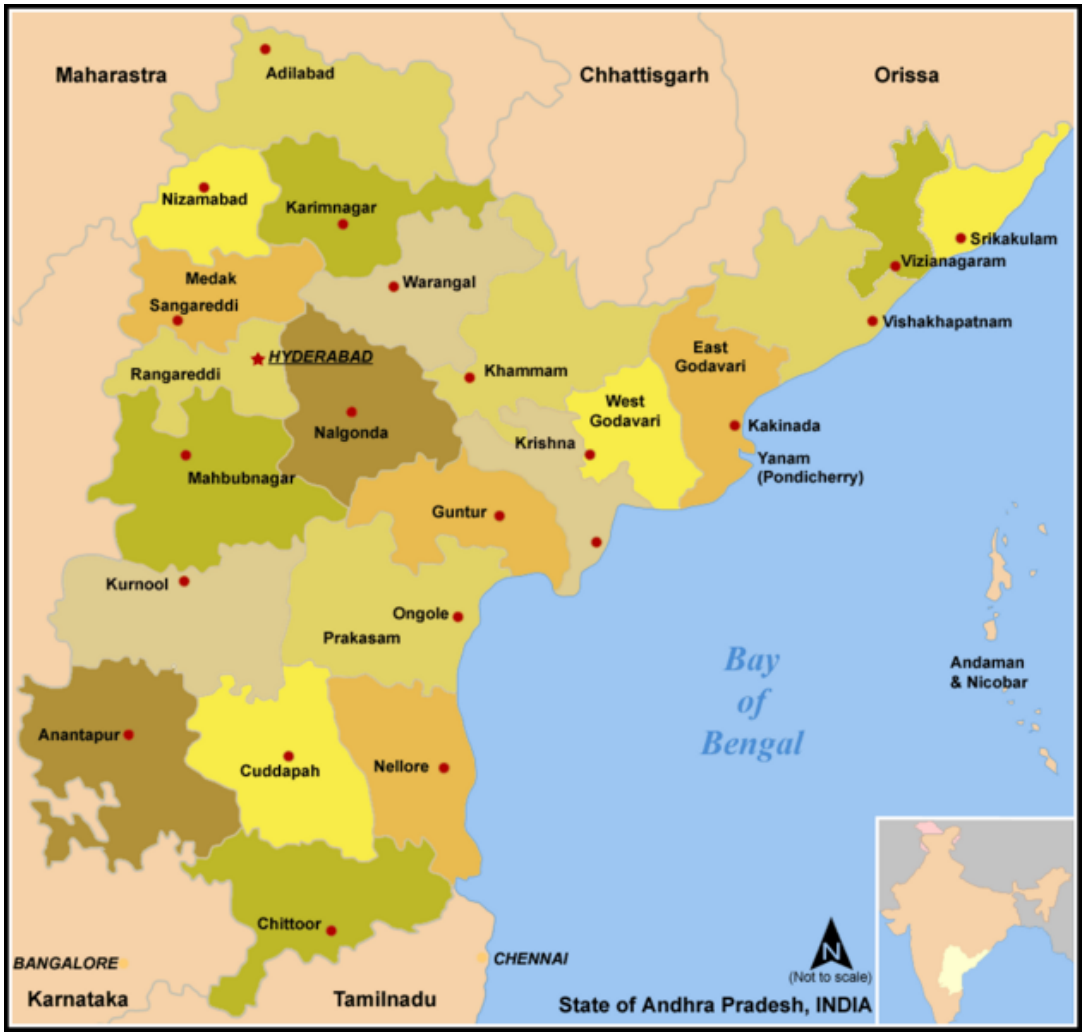

Figure 2-2. District map of Andhra Pradesh.

The physical-climatic description above broadly conforms to the Telangana, Rayalaseema, and Coastal Andhra regions. Telangana is comprised of nine districts in the north-northwest parts of the state (the triangular shaped area from Mahbubnagar–Khammam–Adilabad in Figure 2-2).

Of these, the four northernmost districts (Khammam to Adilabad) contain forested mountain slopes where teak (*Tectona grandis*) is the naturally predominating tree species, as well as the main tree species managed by most VSS villages in the region. Bamboo grows well locally and is also cultivated in such areas for its multiple uses. The other districts of Telangana are somewhat drier and steppe-like, having more exposed bedrock and less forest cover (as opposed to the more mountainous and forested terrain in the north). Overall, Telangana receives approximately 890 mm (35 in.) of rain annually, with most of this occurring in the summer monsoon of June to September (Reddy et al., 1992).

The four southern in-land districts of the state (Kurnool to Chittoor) comprise the Rayalaseema region, and are similar to the southern districts of Telangana in that rock outcrops are ubiquitous. Much of this region lies on a rocky plateau interspersed with higher mountainous areas and valleys; the climate on the plateau is somewhat more agreeable than surrounding lowlands due to the elevation. Nevertheless, Rayalaseema receives only 670 mm (26 in.) of precipitation per year and is prone to drought conditions, like much of Telangana (Reddy et al., 1992). The density of forest cover on the hillsides is generally quite low (extremely low where degradation is advanced), and these slopes mainly contain low quality tree species (which are often called "scrub" forest). Native tree species of great value, such as sandalwood (*Santalum album*) and Red Sanders (*Pterocarpus santalinus*), are largely gone except for individual villages that are attempting to cultivate Red Sanders. Although non-native to India, eucalyptus is widely cultivated there as part of the CFM program, largely because it is a fast growing species used for pulp, and because cows do not like to graze on it.

Coastal Andhra is comprised of the districts adjacent to the Bay of Bengal. The low mountain ranges in the western part of the southern districts (Nellore to Guntur), and the high

mountains in the northwestern parts of East Godavari, Visakhapatnam, Vizianagaram, and Srikakulam districts form the physical boundary to the west. In between these mountains and the ocean are humid, tropical plains (with some steep peaks locally) that receive ample moisture to ensure a lush and productive agriculture. Coastal Andhra receives approximately 1,000 mm (39 in.) of rain annually (Reddy et al., 1992), and this region is generally regarded as being more prosperous than Telangana and Rayalaseema. Much timber is grown commercially here owing to the beneficial growing conditions. Species include eucalyptus and casuarina (*Casuarina spp.*), and sal in the district of Srikakulam. Fruit plantations are ubiquitous as well, and bananas, coconuts, cashews, papaya, etc. are all cultivated there.

The Forest Department

As the agency commissioned with facilitating the VSS in their implementation of CFM, the APFD is the most important entity other than the local stakeholders themselves. As such, it is important to summarize their main role under CFM. The job of the field level staff is to work closely with the VSS, providing technical guidance when appropriate. For example, the forest department is tasked with preparing estimates for VSS project works until the VSS has the capacity to do so. However, the "VSS which are able to take up this responsibility are encouraged to do so at the earliest" (Government of Andhra Pradesh [GOAP], 2002). APFD field officers also ensure that VSS are in compliance with the CFM rules and regulations, and that they conform to all other pertinent GOI and GOAP laws.

In addition, the forest department is responsible for providing training for forest management and planning, including specialized technical training for aspects such as the grafting of high-yielding clonal varieties, raising and management of tree nurseries, etc. This is an important component of the program because extension work is crucial for creating a viable program that can endure in the long-run. The transfer of skills and knowledge, especially in

support of the development and enhancement of livelihood opportunities, is necessary for improving the incomes of the program participants. This will help to sustain participation in the CFM program when the external funding ends.

Concurrent with the transition to CFM is the development and implementation of the Andhra Pradesh Community Forest Management project (APCFM), supported by major funding provided by the World Bank. This project leaves no doubt that the focal objectives of CFM are to alleviate rural poverty through the improvement of livelihoods, by improving forest management and productivity. The APCFM Project Implementation Plan also acknowledges the need for developing alternate livelihoods, and the need for providing coordinated technical and financial inputs to the VSS (APFD, undated). Therefore it is important to note that this project is essentially a rural development scheme, set in the context of participatory forest management.

In many respects the APFD is put in an unenviable position by being the lead agency implementing the APCFM project. Outside of their tradition role, they are now charged with running a rural development program—something that is not the forte of this organization. It is worth noting that the APFD is aware of this fact, at least rhetorically, and is making efforts to adapt:

> One of the prerequisites for successful CFM is attitudinal change in forest department from one of 'command and control' to that of 'recognizing communities as equal partners'. …With the introduction of CFM they will be required to don the role of 'Facilitators and Extension workers'. Foresters will be mostly performing regulatory role and they will be facilitating community participation and providing technical and infrastructure support. This also warrants greater shift in mindset, which can be ensured only through massive trainings. (APFD, undated, p. 9)

These observations indicate that the APFD management structure is committed to CFM, and takes its implementation and facilitation responsibilities seriously. Indeed, others agree that the APFD has made substantial progress in adapting from the traditional 'command and control'

mode of operation, to the role of 'Facilitators and Extension workers' that participatory forestry requires (AFN, 2002).

Summary

The legacy of the institutional changes ushered in by the British is still being felt today. A near complete erosion of the traditional institutions of forest management, coupled with dramatic increases in population in the twentieth century, has resulted in the deforestation and degradation that has left millions in poverty. The poor and other marginalized people of rural communities dependent upon forests for their livelihoods have been the principal losers from government policies that traditionally favored timber production (Hill and Shields, 1998; Hildyard, et al., 1998; Khare et al., 2000). Often these people have no other choice but to illegally harvest firewood for both income generation and domestic consumption (Khare et al., 2000).

Since implementation of JFM in India officially began in the early 1990s, progress has been evident in terms of the adoption of the program by local communities. Citing data from MoEF and others, Khare et al. (2000) report that by the end of the decade there were nearly 35,000 registered forest protection committees in 16 states of India; the area under JFM was estimated to be over 7 million hectares, and perhaps as high as 9 million hectares. Some of the forest protection committees recorded are not due strictly to JFM, however; as many of these committees were established, in some states, under other participatory management regimes (e.g., van panchayats in Uttar Pradesh) or were self-organized as in Bihar and Orissa.

Recent data shows that the JFM program is still expanding, as over 99,000 registered JFM committees now manage an estimated 21.4 million hectares in all 28 states (MoEF, 2006). Several states in particular have shown growth of JFM in terms of numbers of forest protection committees and total area under joint management, including Andhra Pradesh, Madhya Pradesh, West Bengal, and Rajasthan. Andhra Pradesh not only possesses one of the largest JFM

programs in India, but the APFD has made "significant progress" in adapting to the changing priorities in forestry that JFM represents (AFN, 2002, p. 1). Recent figures indicate that there are 8,343 VSS in Andhra Pradesh; the coverage area is about 2.3 million hectares (APFD, 2006)[4].

Some of the initial JFM institutions implemented in Andhra Pradesh are robust. One strong point is that participation by communities is clearly voluntary. It is inclusive in that everyone in a participating community has an opportunity to join the forest protection committee. Another strength is that the benefits are clearly spelled out. In addition, several of Ostrom's design principles are represented to varying degrees: clearly defined boundaries [mainly in terms of who has resource access] (DP 1); congruence between rules and local conditions (DP 2); collective-choice arrangements (DP 3); monitoring (DP 4); and dispute resolution (DP 6).

A main weakness of the program, however, is that the JFM institutions are exogenous at the village level as they are originated with government legislative orders. Although the state governments provide for minimal rights to organize (DP 7), their influence on the whole process is much greater than Ostrom's DP has it in mind. This will be discussed in more detail later. There are several other important weaknesses, as well. For example, women are not accorded a significant role in VSS management; they are only mentioned in reference to household membership in the VSS general body. The government role has not devolved enough power to the local stakeholders: sufficient VSS autonomy is lacking, as evidenced by the fact that the APFD is represented on the MC. In addition, there are too many restrictions on the usufruct rights given the VSS as incentives for program participation.

That changes were made to the JFM program in Andhra Pradesh is important not only for the improvement of the institutions themselves, but because they demonstrate the responsive

[4] These data were obtained from the APFD website on Sept. 7, 2006.

involvement of the government in terms of its willingness to make amendments. As a result, equity concerns were promoted by attempting to better facilitate the participation of the disadvantaged (e.g., tribals and other poor) and women. More control over enforcement and planning was given to the VSS, and improvements to the economic incentives were made. For example, the share of timber revenues was increased to 100%. In addition, further revisions now allow the VSS to receive a percentage of fees collected (by the authorities) from smugglers apprehended by the VSS. The share of fees (or the forest produce in question) to be paid to the VSS was initially set at 25%; it was later increased to 50%. With the evolution of the policy, graduated sanctions (DP 5) are seen to be represented implicitly.

In conclusion, India is not alone in promoting community-based forest management programs in order to redress forest degradation and ensure future sustainability of forests. Many countries around the world, both developed and developing, are involved in various forms of participatory forest conservation efforts. Although the definition of "community forest management" can vary widely depending on the location, the international development community has looked to community-based forest management as a paradigm for forest conservation and rural development in many developing nations. Thus, it is important that different approaches under the umbrella of "community forest management" reflect the particular context within which they operate by considering the local ecology, resource endowments, socio-cultural systems, and political and economic history of an area (Schmink, 2004). As such, a brief examination of some of the different models of participatory forestry being implemented in different countries is useful for comparison with JFM.

CHAPTER 3
QUESTIONNAIRE DEVELOPMENT AND SURVEY ADMINISTRATION

Introduction

A significant element of this research study was the collection of primary data for empirical analyses. Given the lack of comprehensive data on the economic aspects of JFM/CFM in Andhra Pradesh, it was necessary to design questionnaires and administer a survey of VSS villages and households (HH) within them in rural areas. This chapter begins with brief description of the VSS-level questionnaire, and is followed by a detailed description of how the HH-level questionnaire was developed, structured, and formatted. The following section of this chapter examines some important aspects of the implementation of the survey, including the spatial structure of the survey and field methods. Finally, the chapter concludes with a brief description of how the data were compiled and reviewed for accuracy and completeness.

The VSS Questionnaire

Analysis of VSS institutions is one of the main points of this study. Therefore, development of this questionnaire was initially derived from the design principles identified by Ostrom (1990) as defining the institutional foundations of stable, well-functioning CPR management regimes. The comparative discussion of CPR management institutions, as presented by Agrawal (2001), was also helpful. Moreover, the APCFM Project Implementation Plan (APFD, undated) was important to the actual understanding of VSS functioning in Andhra Pradesh (i.e., in applied sense), and guided the overall construction of the questionnaire. Finally, field interviews with VSS Management Committee members in villages of Medak district in late February 2005 were invaluable in ensuring that the questionnaire was grounded in reality.

The VSS questionnaire was designed to elicit information about the institutions and functions of each VSS selected for the survey. For example, key institutional questions inquired

about monitoring of their VSS area and about sanctions imposed for rules violations, while an important question regarding the functioning of the VSS included queries about the forest improvement works undertaken. Other questions asked about the historical quality and uses of their VSS forest area, number and types of APFD training, any assistance from NGOs, etc. The VSS questionnaire is 7 pages in length and is written entirely in English (with a few Anglicized Telugu words); it is reprinted in Appendix A.

The Household (HH) Questionnaire

The LSMS Modules

The LSMS modular format was used as the foundation for constructing the HH questionnaire. Based upon actual experiences with the LSMS, Grosh and Glewwe (2000) and other researchers provide detailed advice on how to design multi-topic household surveys for developing country research; included are discussions by module (i.e., information category), examples, and even Microsoft Excel templates on an accompanying compact disc. Several independent modules comprise an LSMS survey, with each module corresponding to particular topics of interest that a given research study is either directly or indirectly addressing. For example, household consumption is one of their main modules; others include income, employment, education, health, etc.

The HH questionnaire contains eight modules and is 27 pages in length (24 pages of questions). Table 3-1 presents the contents of this questionnaire with a brief description of each section. The ordering of the modules reflects not only a logical sequence (e.g., household roster near the beginning), but also the relative importance of each module in the study. For example, the two most crucial modules of the survey, in terms of the research objectives, are the Consumption and Forest Resources modules. A copy of the HH questionnaire used in this research study is presented in Appendix B.

Table 3-1. Composition of the Household Questionnaire.

Module	Item/Module	Description	Pages
--	Cover Page		1
1	Metadata	Location identifiers, date; informed consent	1
2	Household Roster	Key demographic information	1
3	Consumption	Detailed collection of expenditure data	8
4	Forest Resources	Qualitative / quantitative forest-related data	6
5	Agriculture	Farm production, expenditure, & livestock data	3
6	Employment	Employment type, time employed, income	1
7	HH Enterprise	Enterprise management, income, & cost data	3
8	Remittance	Remittances to and from the household	1
--	Informed Consent (English)	Signature page	1
--	Informed Consent (Telugu)	Telugu copy given to respondent	1
		Total	**27**

Metadata (Module 1) are the key identifying information about how the survey was conducted. This module contains some crucial pieces of information, such as the unique household identification number, the VSS identification number, and the identification code of the interviewer. Certain qualitative aspects of the interview that are recorded include the name of respondent, the date of the interview, and the starting and ending time of the interview.

According to Grosh and Muñoz (2000), there are three main reasons why the collection of metadata is important. First, for substantive analysis: metadata is often crucial for certain purposes, such as the calculation of sample weights. Second, for survey management: metadata helps to assess the time needed to complete implementation, to anticipate replacement households, etc. Third, methodological research can be assisted with use of metadata, and this module can even incorporate research questions to help improve future surveys.

The Household Roster (Module 2) records the name and sex of each member of the household, as well as the relationship with the head of the household (e.g., wife, daughter, grandson, etc.). Key demographic data collected here for each individual include their age, education, and time spent living in the household. The latter information is important to determine if the person is counted as an official member of the household; the LSMS format guidelines requires nine months per year of residence to officially be considered a household member. Other associated details that are important are the VSS membership status of each individual, and their occupation or main daily activity (e.g., school, chores, etc.).

The Consumption Module (Module 3) is designed around items familiar to respondents: flows of goods and cash flows (e.g., taxes or remittances). Deaton and Zaidi (1999) define household consumption as all reported expenditures on individual goods and services, and all non-market consumption (e.g., own production and/or in-kind transfers). Consumption must be comprehensive for accuracy in measuring welfare; thus, reliance on one or a few items as a proxy is invalid.

The level of disaggregation of the consumption list will vary based on the requirements of a particular study. For instance, the comprehensive Indian National Sample Survey (NSS) has used long lists with good results (i.e., little respondent fatigue, good accuracy). On the other hand, LSMS survey lists are typically much shorter: examples include a Pakistani survey with 33 food items and 20 non-food items; and a Vietnamese survey with 45 food and 46 non-food items. The trade-offs in time efficiency versus accuracy are implied and will be site-specific; research from LSMS surveys have not settled the debate as to whether shorter lists provide sufficient accuracy, although some surveys have indicated this is so. The LSMS draft module, which is typical of past LSMS surveys, included 70 to 100 total items. This study incorporated

approximately 50 food items and 35 non-food items, which falls within the recommended guidelines (Deaton and Grosh, 2000).

Recall periods are one of the most difficult, yet important, design issues of the consumption module. The objective is to obtain a reasonably accurate estimate of the rate of household total consumption expenditure over the previous year. The proto-typical LSMS format asks about consumption expenditures for the past year, *in addition* to the recall period chosen. In general, however, there are different recall periods for different items. High-frequency non-food items such as tobacco, newspapers, etc. use recall periods of 1 to 2 weeks. Low-frequency items may have recall periods of 1, 3, 6, or 12 months; or different recall periods for individual items (e.g., soap in a month, vacations in a year). Deaton and Grosh (2000, pp. 112-13) discuss this in greater detail.

Basic options for a LSMS survey are single-visit or multiple-visit; and the choice will help determine the design of the recall period. Typical LSMS surveys are large undertakings that incorporate multiple visits; thus, the standard LSMS format is to use two recall periods—the time since the last visit (typically two weeks), and the "usual month" period. According to Deaton and Grosh, "…including multiple visits is probably not the highest priority for improving the typical LSMS survey." The following guidelines are given: if one is to compare results with other surveys, then use the previously established recall period; if not, use the general LSMS design format with modifications if necessary. If using a single visit, the "within the past two weeks" recall period can be substituted for "since last-visit" recall period of multiple-visit surveys. In general, a single-visit strategy is acceptable because consumption is smoothed throughout the year.

For logistical reasons, each household sampled in this study was only visited once. Therefore, the food purchases component utilized a recall format that allowed the respondent to self-identify the purchase frequency of each item, prior to the interviewer inquiring about the purchase quantity and units, and the total purchase price.

Imputing the values of non-market transactions is difficult in countries that are not highly monetized (Deaton and Grosh, pp. 116-17). For LSMS surveys, food is the most important imputed item in household budgets, and generally comes from home production or sometimes as gifts. The recall period can be a year or a "usual month". The main problem is with valuation because respondents are asked to hypothetically assign a value to items that are often rarely purchased or traded. The recommendation is to collect quantities of such goods, ask respondents about prices, and cross-check with other data. For the this survey, the HH questionnaire asked the respondent to recall if there was any home production during the previous year for the food goods listed. For positive responses, they were asked the total quantity and the units of measure; they were also asked to estimate the total value of this home production.

The Forest Resources Module (Module 4) consists of two parts. Part A contains 29 questions, loosely divided into four parts, which focus mainly on CFM awareness and participation. Because specific information related to VSS details were sought, Part A was only administered to VSS-member households; and only if the survey respondent(s) was an actual member of the VSS. The number of questions were about evenly split between questions requiring yes/no responses, Likert scale or other categorical responses, and magnitude responses (e.g., how many hectares of VSS forest area are there?). Part B quantifies the sales value and home consumption value of NTFPs, fuelwood, and small timber; the basic format is styled on the part of the LSMS agriculture module that quantifies crop production and sales. In addition to

fuelwood and small timber, Part B lists approximately 30 NTFP items that might be collected by respondent households, and (if any are sold) inquires about where and to whom these products were sold.

Farm size and income derived from agriculture are the two main pieces of information that the Agriculture Module (Module 5) collects. The Employment Module (Module 6) tabulates income from work performed outside the household. The Household Enterprise Module (Module 7) is included mainly to gather information on household income derived from home production activities. The Remittance Module (Module 8) concludes the HH questionnaire by inquiring about monetary flows into and out of the household that involve cash exchanges with household members, usually in the form of gifts to or from relatives (although pension income is occasionally listed here also).

Design and Structural Guidelines

The ordering of the modules within the questionnaire will depend upon the size and implementation of the survey. Respondents themselves may indicate the best ordering during field testing, especially if return visits are scheduled for later in the day or week. However, all of the interviews are completed in a single trip to a primary sample unit (i.e., VSS villages) in smaller, scaled-down LSMS surveys such as this study. In general though, different factors such as best recall period, the natural or logical location (e.g., end of survey for sensitive information), etc. will help determine where certain data are to be collected in the interview. The essential point is to ensure that data important to the study is collected in at least one of the modules.

All surveys begin, however, with the metadata and household roster modules. Following these modules, the primary respondents are usually determined; the other modules are collected as applicable. Education, housing, and migration are good topics to open with, once the metadata

and household roster are obtained. Employment and other sensitive topics (savings, credit, transfers) should be covered at the end of the interview (Grosh et al., 2000).

The issue of survey length is extremely important: a general goal is to keep actual survey interviews for any particular respondent to no more than an hour per day. This can vary given the tolerance of the people in a given country, and may depend on local conditions. LSMS experience shows that tolerance for a long interview is less in urban versus rural areas, lower for wealthy versus poor households and lower in wealthier countries. Grosh et al. (2000) offer guidelines that can be used to pare down a survey to the specific needs of a particular research study. For example, many LSMS prototype modules come in both a long and short version, and the particular needs and resources of a given research study will determine which version is preferred. Although choosing the shortest version of modules will allow the analysis of more objectives, depth should not be sacrificed for those objectives deemed most important to the particular study. For instance, the Consumption Module was the most extensive module in terms of length (in time required to complete) and depth (number of items/questions)—reflecting its central importance to this study. In addition, the Agriculture Module was based on the "short" version of the LSMS agriculture module, and it was modified even further to simplify and shorten it.

Draft modules for field testing are recommended to help determine and judge the trade-offs being made with respect to data collection. Their acceptability will either be confirmed, or will suggest that corrections are necessary, or that a suitable alternative must be found. Draft modules also allow for the review of the coding and nomenclature to ensure consistency throughout the questionnaire, especially with regard to similar questions (Grosh et al., 2000). A draft questionnaire is also important to recognize gaps and overlaps between modules, and testing

allows them to be modified or corrected as necessary. A draft questionnaire also helps to ensure that at least one of the modules is collecting data important to the study.

Formatting Guidelines

Below are some important issues pertaining to the formatting of selected questionnaire components as related by Grosh et al. (2000) per the LSMS format:

- Pre-coding and code boxes should be used extensively to increase efficiency and reduce data entry error.
- Response codes should be located next to the question. A code key can be placed somewhere on the page.
- Response codes corresponding to answers must be clear: simple, mutually exclusive, and exhaustive. They should be designed so they are not likely to provoke the same response.
- Lists of items (e.g., food goods in the consumption module) that respondents are asked questions about help the efficiency/accuracy of the survey. By first enumerating all items purchased before collecting details on each item, the temptation for the respondent to not list something is avoided when they realize there are several questions about each item.
- Use uppercase letters for instruction to the interviewers, while lowercase letters are for the actual questions asked of the respondents (Fowler, 2002).
- The questionnaire should be designed so that interviewers always ask verbatim questions to ensure uniformity among interviewers and between respondents.
- Two or three simple questions should be asked instead of one long, complicated question. Qualifiers are important (e.g., "What was the main reason…") to help obtain mutually exclusive answers where more than one answer could apply. When appropriate, the following convention is also used: other _____ (specify).
- Probe questions are common in consumption, agricultural, and similar modules that attempt to get at "how much" of something. Interviewers need to know what to probe for, and how to do it. This technique should reduce the number of "I don't know" responses, for which the "DK" abbreviation should be the proper response code.
- Code tables for different units of quantity allow the respondent to choose the unit for which they are most comfortable. This will also tend to reflect the unit in which the action/item discussed occurred—which may differ from household to household. Code tables are of key importance for use in "quantities produced" questions.

Survey Structure and Implementation

HH Questionnaire Testing and Revision

Grosh et al. (2000) emphasize the importance of field testing the survey instrument and list, by component, some of the key considerations that testing ought to cover. For the overall questionnaire, field tests should ensure that all the necessary information is being collected, and that there is internal consistency to the instrument without any needless double-counting. Testing will also reveal if individual modules collect the intended information, cover all major activities, and avoid any redundancy. For individual questions, field tests will help to know if the wording is clear, if the coding works well or not, and if there are any ambiguous responses due to either. In addition, Fowler (2002) states that questionnaire testing also helps to determine how long it takes to complete a survey instrument.

For the present study, the HH questionnaire was tested in the Medak district of Telangana region in late February 2005. The main finding of this test was that the questionnaire was too long, and redactions were necessary because respondents were showing signs of interview fatigue. Changes included shortening and simplifying the Consumption Module. For example, the extensive list of food items in Part B was reduced by eliminating less common items. In conjunction with this, more use was made of blank spaces for "other" items not specified. Further reductions were made by consolidating separate items into like categories in Part C (Non-Food Goods).

A more significant change was to revise Part B to allow the respondent to self-identify the purchase frequency of each item. The initial design of the Consumption Module relied on the LSMS frequency format: a 7-day recall period for daily expenditures (e.g., tobacco); both a 2-week and a typical-month recall period for food goods; and both a 30-day and a 1-year, recall period for non-food goods. Changing this avoided the time consuming (and potentially error-

prone) process of inquiring about purchases in the previous two weeks—followed by asking about the purchases in a typical month. For example, the question became: "How often does your family purchase […]?" with given responses pre-coded (e.g., weekly = 1, fortnightly = 2, etc.). Changing to this configuration for food items (Part B) also allowed greater flexibility for the respondent, by allowing them to better answer the query in a format closer to how they mentally relate their actual usage of a given item.

Further technical efficiency gained could only have come from extensive field trials that were not logistically possible at the time. Therefore, a second round of formal field testing was foregone, due to time constraints. This mainly had to do with the fact that the survey needed to be completed by June, when the monsoon season begins. Moreover, interviewers had yet to be hired and 1,200 questionnaires had to be printed. In addition, as several different individuals in India contributed to the development of the household questionnaire, it was decided to proceed with the instrument as revised.

Sample Selection

This research study was designed to obtain a sample of VSS villages from each of the three regions of Andhra Pradesh. Thus, the field survey is based on the random selection of 20 VSS villages from a district chosen to represent each one of these regions. Selection of villages was made using the random number generator in Microsoft Excel. The total number of 60 VSS was arrived at in order to ensure sufficient degrees of freedom when conducting the subsequent econometric analyses. For the household survey, each of the 60 VSS villages had 20 households randomly selected for interviews. Thus, the total possible number of observations is 1,186 households (which is less than 1,200 because three VSS villages had less than 20 households). Random selection of households was made using either Microsoft Excel or a random number sheet in the field.

The APFD apportions the state into administrative units (or so-called "Circles"); occasionally these circles conform to the districts observed in Figure 2-2, but in general they are aggregated somewhat into larger units. Each circle is comprised of smaller divisions: the Visakhapatnam Circle contains five divisions, for example. As such, the following APFD forest divisions were selected for sampling from within each of three circles: 1) Nirmal and Jannaram Divisions (Adilabad Circle); 2) Visakhapatnam Division (Visakhapatnam Circle); and 3) Chittoor West Division (Anantapur Circle). Random probability sampling was employed to select 20 VSS villages within each circle. The two divisions in Adilabad had their sample split based upon the relative number of VSS villages present in each division. Thus, 14 VSS were sampled in the Nirmal Division and 6 VSS were sampled in the Jannaram Division. Within each sampled VSS village, 20 households were also selected using random probability sampling techniques in order to ensure statistical validity when drawing inferences from the results.

It is important to point out, however, that the selection of the study areas (circles) within each region (i.e., Telangana, Rayalaseema, and Coastal Andhra) was not random. The Adilabad Circle was ostensibly chosen by the APFD on the basis of security concerns, and the Nirmal and Jannaram divisions of this circle were selected to represent two different forest regimes within the Telangana region. The forested area of the Nirmal Division is dominated by teak, while the Jannaram Division has more bamboo present for economic and consumptive activities. The Chittoor West Division of Anantapur Circle was also chosen by the APFD for inclusion in the survey—as was the Visakhapatnam Circle, although the principal investigator (PI) had originally selected this area to represent the Coastal Andhra region. (The representative division of this circle that was actually sampled [i.e., the Visakhapatnam Division] was randomly selected, however.) The implication of the selection process is that each regional part of the overall survey

is essentially representative only of that specific location within Andhra Pradesh, and aggregation of all three parts reduces the validity of inferring results to the state as a whole. Nevertheless, each village within a given region was still selected at random, and the evaluation of the specific hypotheses of the study takes precedence over the ability to apply the results on a wider scale.

For comparison, the Centre for Economic and Social Studies (CESS) in Hyderabad conducted a survey of Andhra Pradesh in 2004 to investigate the impact of JFM/CFM on livelihoods (Gopinath Reddy, personal communication). Much like the present research, the objectives of the CESS study included examination of the institutional and economic dynamics of CFM at the micro level (Reddy et al., 2004). Although much smaller, the CESS survey is also structurally very similar to the present study—selection of one district from each of the three regions of Andhra Pradesh (Adilabad, Visakhapatnam, Kadapa) with six villages from each district (3 VSS villages and 3 non-VSS villages). At the final sampling stage, 25 households were interviewed in the VSS villages (225 total), while 15 households were interviewed in the non-VSS villages (135 total).

Reddy and Chakravarty (1999) used a much smaller survey to investigate forest dependence and income distribution in villages of northern India. Their survey was based upon four "development blocks" (out of 15 total blocks in a single district) selected because they were contiguous to forest areas. Twelve villages were randomly selected from the four blocks, followed by individual households serving as the final sampling unit. Households were selected by simple random sampling with replacement, and the total number of usable household questionnaires equaled 233.

Interviewer Training and Implementation of the HH Survey

During the first week of March 2005, four enumerators were hired in Hyderabad to conduct the household interviews. Staff members of CESS were instrumental in identifying qualified interviewers. Three men that were hired each held masters degrees and had extensive experience with conducting rural household interviews, for both CESS and other rural welfare agencies. In particular, each had done similar work in the district of Adilabad, where the first leg of the survey was to commence. Although the fourth man had limited survey experience, he had served as an agricultural extension agent in his home district of Adilabad.

Training took place in the town of Nirmal, where the purpose of the survey and the format of the questionnaire were explained in more detail. In order to become familiar with the instrument and procedures, mock interviews were conducted where each member interviewed another—taking turns as both interviewer and respondent. This follows one recommendation of Fowler (2002), who also emphasizes that interviewer training should cover from two to five days. Following this practice session, Vishnu Reddy (the research associate of the PI) had an extensive discussion, in Telugu, with the interview team about their questions, problems, and other concerns. The PI was also there to answer questions and to comment about procedures. Subsequently the next phase of training consisted of actual data collection in the field—an extra village had previously been selected for this purpose, so each person interviewed a total of 20 households. In addition, the first two VSS villages surveyed are dropped from the analyses and effectively become additional training villages. Therefore, the total number of observations for analysis is 58 VSS villages.

The second round of sampling took place in the Visakhapatnam Division of the Visakhapatnam Circle in early April 2005. It was determined that two teams were required to reduce the amount of time needed to complete the research effort. Thus, prior to the beginning of

the second round of sampling, an additional four enumerators were hired. These men were also college graduates and most possessed previous survey experience as well. The pre-field training followed the procedures discussed above, with the original sample team assisting in the mock interviews and post-exercise discussion. For this leg of the survey, however, the field training of the new enumerators was increased and consisted of household interviews in two villages (for a total of 40 households per interviewer). When the actual sampling commenced, each new interviewer was paired with a member of the original sampling team.

The overall survey proper officially began on March 13, 2005; data collection was completed in the Adilabad Circle on April, 1 2005. Following the hiring and training of additional personnel, fieldwork resumed on April 10, 2005; data collection was completed in the Visakhapatnam Circle on April 19, 2005. Fieldwork for the final round of sampling commenced on May 4, 2005, in the Chittoor West Division of the Anantapur Circle. Like the previous round, the household surveys were again conducted by two interview teams. However, one team was now comprised of three enumerators, due to an unrelated injury sustained by one of the interviewers during the hiatus between the Visakhapatnam portion of the survey and the resumption of fieldwork in the Chittoor District. Data collection fieldwork for the study was completed on May 16, 2005.

Implementation of the VSS Survey

Prior to visiting villages selected for sampling, attempts were made to obtain secondary information from local APFD offices, local Velugu (a statewide rural poverty reduction project) offices or, on occasion, local magistrates. APFD division and field offices were visited to obtain VSS micro-plans for relevant information (e.g., VSS size or date of VSS inception), to observe topographic maps, and/or to gain useful anecdotal information. Local Velugu offices were often able to provide access to a list of households, and/or hand-drawn “social maps” of dwelling

units. This information was usually photocopied, or occasionally borrowed. If unable to do either of these, then this information was used to randomly select households at that moment in the Velugu office by recording the names of the household heads into a laptop or a notebook, for use in implementing the random selection techniques previously mentioned.

Obtaining secondary information from these sources (especially from Velugu) was often a time consuming and frustrating job, but proved extremely beneficial when successful. For instance, the household lists offered an objective estimate of the number of households for a given village, and meant that the random selection of households could be made prior to the field visit. This was the main benefit, as it allowed the interview team to avoid this process in the field, saving time and minimizing potential errors: they simply had to contact the pre-selected households.

Once the secondary information was in hand, the PI and his research associate would visit each village in order to conduct the VSS interview. The first task was to locate either the VSS Chairman and/or Vice-Chairman for introductions and to give an explanation of the research study. For cultural and practical reasons the PI and his research associate usually interviewed whichever person was male. If the VSS Chairman was a woman, she may not feel comfortable being interviewed: in such cases the interview would be conducted with the Vice-Chairman, with or without the presence of the Chairman.[5] In one village, the husband of the VSS Chairman was the former Chairman himself. Thus, this man was interviewed as he was obviously the *de facto* VSS Chairman of his village. Often during the interviews, a few other members of the

[5] When the women did participate in the interview, whether they were the Chairman or the Vice-Chairman, they almost always provided little input. Often it seemed that the women who were VSS Chairman or Vice-Chairman were mere figure-heads serving only to comply with the CFM institutions.

community (whether or not they were VSS Management Committee members) would usually be present and offer input to the discussion.

The interview was quite informal in terms of adhering to a rigid survey format of verbatim questions. The respondent(s) would be engaged in a quasi-structured conversation (in Telugu) based on the VSS questionnaire, which allowed for a certain amount of flexibility in terms of question order and overall flow of the interview.[6] Following the interview, the researchers would ask to take a walk through the VSS forest area (schedule permitting). Often the conversations would continue during the inspection of the protected VSS forest areas and/or plantation areas, as the villagers were usually enthusiastic to show off their forest area and the works they completed. Of the 62 VSS villages surveyed (including training villages), the researchers were able to inspect at least two-thirds of the VSS forests and/or plantations.

The visits to each village were intended to be unannounced in order to obtain an independent and unbiased assessment of each VSS—the goal being to conduct the interviews without any positive or negative bias that could potentially result from the outside influence of the APFD. Occasionally, field officers of the APFD would already be present upon arrival in a village; this was because they knew of the research effort when VSS micro-plans had been borrowed. In such cases, the PI would ask the forest officers to show him the VSS forest area in order to draw them away from the on-going interview: for this reason the PI was not present for approximately five or six of the interviews proper. In addition, for visits to the VSS villages of the sample, the PI declined transportation provided by the APFD so as to similarly avoid any direct or official association with the government. This is an important consideration for

[6] Although the PI could not understand the words, he could follow along with the general mood and tenor of the interview. Upon request, important passages were translated and the PI would pose additional questions to expand on the explanations.

obtaining unbiased interviews in the rural villages of Andhra Pradesh, according to CESS Research Fellow Gopinath Reddy (personal communication). Therefore, the PI generally rented a vehicle or an auto-rickshaw, rode the bus if the location was close enough.

Before leaving a village, the PI (through his research associate) would inform the people interviewed that a sample team would be coming within a few days to conduct the household interviews. The research associate would ask one of the villagers to assist the sample team in locating the households that were selected for interviews. Sometimes a sample team would accompany the PI to a village (usually in remote areas, or at the beginning or end of a sample leg) and administer the HH questionnaire while the VSS interview was being conducted; but most of the time the sample team(s) worked independently of the PI and his research associate. For this reason, the PI made every attempt to secure a list of households in advance, but in the event that they were unobtainable it was necessary to do the random selection of households in the field. The desire of the PI to avoid this situation by using pre-selecting households was based on two observable facts: 1) many villages lack an orderly layout, and 2) it is often difficult to distinguish distinct dwelling units amongst a collection of structures. Thus, the likelihood of deviating from a completely random sample increases in such a scenario, especially the larger the village and the less orderly its lay-out.

In the first few days of the survey, the PI was afforded the opportunity to demonstrate to the interview team how to randomly select households without a list. For example, in the VSS village of Rampur (Adilabad), the 340 households were divided by 20 (i.e., the intended sample) to calculate a selection interval of 17. For each interviewer, the PI selected a number ranging from 1 to 17 that was taken from the random number sheet. The village was divided into four sections and each enumerator was to interview every seventeenth household, beginning with

whichever household corresponded to the random number that was selected for them. This procedure was subsequently followed (to the best of the PI's knowledge) by the sample team leader when the PI was not present for the situations where households were randomly selected in the field.

Each household interview generally took between 45 and 60 minutes to complete, depending upon the size of the household, their level of consumption, and sources of income. Each team would usually complete one village per day (i.e., five households per interviewer), although at times it was feasible to finish two villages if they were located near each other. Non-cooperation (respondent refusal) was not a problem whatsoever, although occasionally a household would be unavailable (nobody home), said to have migrated, or non-existent for some reason. Such households were initially replaced by interviewing the next household, but later alternate random selections were made for this scenario.

Data Compilation

Following completion of the interviews, a template file was created using Microsoft Excel that essentially mirrored the HH questionnaire. This allowed data from each household to be easily transcribed into this format for later compilation into master files for each village, and eventually to an overall aggregate file. Each household file contains internal calculations that compute, for example, total household consumption expenditures and total household income. In addition, there is summary page where important data for the household are compiled into a single row of cells, in order that this line of data can easily be copied and transferred to a master file for the corresponding village.

For the job of transcribing the data, the PI retained two of the interviewers that were available and also hired a woman specifically to do this work. These three people did the majority of the transcription, although others (including the PI) occasionally assisted also.

Initially, the PI was able to supervise the transcriptions for quality assurance (QA) by instructing the data entry personnel on how to handle specific ambiguities in questionnaire responses and/or information as recoded in the field. By checking completed files to identify and correct entry errors, instructive feedback to the transcription crew was also provided. After the PI departed from India, the research associate continued the supervision activities. Prior to sending the completed files to the PI, the research associate conducted initial quality control (QC) checks of completed household files (approximately 5 per village).

The PI completed the final QC check for all household data files. When assembling the village master files, it was necessary to open each file to copy and transfer the summary line of data mentioned above. Thus, this opportunity was used to compare the HH questionnaire with its associated data file to ensure correct transcription and to rectify errors, which was a very time consuming process. However, it was necessary to perform this function because of persisting ambiguities with certain sections of the HH questionnaire with which the transcription team had problems. For example, NTFP consumption in Part B of the Forest Resources Module is prone to errors, in terms of the frequency and amounts collected, that need to be corrected. The confusion stems from the rigidity of the format: respondents were asked about their consumption on a monthly basis only. As most items collected from the forest are done so seasonally, or on an otherwise irregular basis, the self-identification of frequency (adopted for the Consumption Module following pre-testing) should have been the standard here also. Thus, it is often difficult to discern the total yearly consumption amounts from the recorded answers; interviewer heterogeneity could also compound the problem.

Other QC activities were also conducted by the PI. As they were basically transferring data verbatim, the transcription team was necessarily given little responsibility to interpret the data.

Thus, QC consisted of checking for the correct placement of information (e.g., income from a home enterprise in the HH Enterprise module instead of the Employment Module), and monitoring the internal consistency of calculations. The correction of all types of errors was made as objectively as possible in an effort to “clean” the data for subsequent analyses.

CHAPTER 4
MODELS, HYPOTHESES, AND DATA

Overview

The analytical focus of this study is concerned with factors influencing the economic impacts of participatory forest management in Andhra Pradesh, India (i.e., JFM/CFM). This study will capture such influences to the extent that the three measures representing different aspects of social welfare vary among the cross-section of VSS villages that comprise the sample. The three indicators include the mean per-capita household consumption value of a given village, the inequality in consumption among households in the village, and the level of poverty within the village. The first two are used to define social welfare within an economic context, while the third can be considered an alternative measure of social welfare since it focuses on the portion of a village (i.e., individuals in households) below a specified poverty level. Evaluating whether, and to what extent, various explanatory variables affect each individual economic indicator will help to empirically assess if there has been any economic impact of JFM/CFM.

To accomplish this task, each of the economic indicators will be used as dependent variables in separate models that will largely rely on a common set of explanatory variables. The explanatory variables used in the econometric models are summarized in Table 4-1. The variables are categorized into the following four groups: Demographic, Economic, Bio-physical, and Institutional. There are five to six variables in each group and 21 in total. The following section begins with a brief discussion of the selection of the basic welfare measure and its application. Social welfare is defined in an economic context and then each model is described in more detail, including the implicit assumptions behind each of the indicators chosen to represent these aspects of social welfare. Next, a section discussing the hypotheses of each variable shown in Table 4-1 is presented. Lastly, a detailed description of the data concludes this chapter.

Table 4-1. Explanatory variables utilized in the VSS-level regressions.

Variable	Variable Description	Unit	Type
Demographic:			
N	Number of households (HH) in a VSS village	Number	Integer
ST	VSS predominately comprised of Scheduled Tribes (1 if yes)	0, 1	Dummy
EDU	Mean HH Education level	Years	Continuous
NGO	Number of NGOs working in the community	Number	Integer
DGI	Index: number of DWCRA Groups divided by N	Percent	Ratio
Economic:			
YFP	Mean HH Income from Forest Products	Rupees	Continuous
YAL	Mean HH Income from Agriculture and Livestock	Rupees	Continuous
YOS	Mean HH Income, Other Sources (employment, enterprises, etc.)	Rupees	Continuous
IHW	External Investment per HH (avg. wages for VSS works/HH)	Rupees	Continuous
TRN	Number of Training events/field trips by VSS MC members	Events	Number
Bio-physical:			
LT	Length of Time under JFM/CFM	Years	Integer
LT2	Squared value of LT	Years	Integer
FA	VSS Forest Area size in hectares (ha)	Hectares	Integer
RRE	Relative Resource Endowment (VSS forest area per VSS member)	ha/mem.	Continuous
PFC	Percent Forest Product Consumption	Percent	Ratio
DTW	Depth to groundwater (proxy for spatial environ. heterogeneities)	Feet	Continuous
Institutional:			
VBA	Percent of VSS HHs with general Boundary Awareness	Percent	Ratio
GAI	Mean HH General Awareness of Institutions	0 to 7	Continuous
CCA	Mean HH proxy for Collective-Choice Arrangements	Percent	Ratio
FP	Presence of Formal Patrol of VSS forest area (1 if yes)	0, 1	Dummy
GS	Graduated Sanctions for rules violations (1 if yes)	0, 1	Dummy

Empirical Models

The empirical modeling of this study necessarily begins with the construction of the three economic indicator variables. First, a suitable measure to represent the living standards of individuals or households must be selected. The standard choices to measure economic well-being are either income or consumption. Deaton (1992, 1997) and Deaton and Grosh (2000) explain that while income is a superior welfare proxy for households in developed countries,

consumption serves as a better proxy for social welfare in less developed countries. Income data are generally inferior to consumption data for the measurement of living standards of rural people: data on consumption over a period shorter than a year gives a more accurate estimate than income. This is because consumption is affected less by seasonality than is income, which can be highly seasonal (especially in agriculture). Moreover, it is more cost-effective to gather consumption data and it is more reliable, as people are more likely to inaccurately report income and assets (for instance to lower tax liabilities). The Indian National Sample Survey (NSS) also focuses on consumption rather than income. For these reasons, consumption is used to measure social welfare in this study.

Household welfare is representative of utility as attained by the consumption expenditures of the household budget constraint. Therefore, the main purpose of the HH questionnaire described in Chapter 3 was to collect household-level consumption data so that the economic measures of social welfare could be constructed for each VSS village. Deaton (1997) emphasizes using individuals as the basis for a welfare measure because "it is hard to think of households as repositories for well-being" (p. 150). For example, he discusses how to transform household consumption data into individual welfare measures, including the complexities and practical constraints involved in assigning different consumption values to different members of the same household. In the end, however, Deaton (1997) recommends a simpler method which he deems to be the best practice: assigning the per-capita household consumption value to each individual in a given household. This is the procedure followed in this study, where the total consumption value of the household (*tcv*)[7] is divided by the total number of household members (*hhs*) to obtain *x*, the per-capita household consumption value.

[7] The household total consumption value equals all consumption expenditures, plus the imputed consumption of food items produced or collected, and the own consumption value of goods produced by a household enterprise.

Social Welfare Function

As explained by Deaton (1997), a measure of social welfare (W) transforms individual or household consumption data of a population into a single summary value that is useful for policy analysis. The general form of W that Deaton (1997) presents is decomposable into two parts (Equation 4-1), so that the social welfare of a given population is represented by the average level of consumption (μ) and its distribution (I):

$$W = \mu (1 - I) \tag{4-1}$$

Equation 4-1 implies that if each household in the population has the mean level of welfare (i.e., the case of perfect equality), then $I = 0$ and social welfare itself is equivalent to μ.[8] This expresses a societal preference that more equal distributions of social welfare, for a given level of μ, are superior to less equal distributions. Thus, any deviation from a totally equal distribution of welfare will necessarily result in social welfare (W) being less than the mean value (μ). In other words, μ is the highest level of welfare that is attainable, *ceteris paribus*. This identifies μ as a purely economic indicator of social welfare that remains uncorrected for distributional inequality.

An important aspect of Equation 4-1 is the explicit illustration that inequality is not synonymous with social welfare. Indeed, it is possible for W to increase while the inequality measure is also increasing, but only if average consumption (μ) increases enough to offset the decrease caused by I (i.e., the rich gain more than the poor, although everyone gained). Such a situation is still a Pareto improvement from the initial scenario. Nevertheless, given that social welfare consists of these two elements, it is necessary to decompose W into two separate

[8] Note that because perfect equality does not exist, empirically I will always be non-zero so that $W = \mu$ is merely a theoretical point of abstraction.

variables in order to analyze them individually. Thus, the present study utilizes each component of W as a dependent variable for regression analysis, where μ is measured as the mean per-capita household consumption value for a given VSS village; and *I* is measured by the Gini coefficient (γ), which is typically used to represent inequality.

Average Consumption Model

The first measure, which is the focus of this subsection, is μ. It is calculated for each VSS village as the mean per-capita value of household consumption. As data on consumption were collected at the household level, the per-capita household consumption value *x* was first applied to each individual in a household following Deaton (1997) as discussed previously. In order to derive μ as based on individual consumption, Equation 4-2 below was used:

$$\mu = \frac{\sum_{j}^{J}(x_i \cdot hhs_j)}{\sum_{j}^{J}(hhs_j)} \qquad (j = 1, \ldots, J) \tag{4-2}$$

where x_i denotes that the per-capita household consumption value *x* is applied to an individual *i*; *hhs* is the household size (i.e., number of household members) of the jth household sampled in the VSS village; and *J* is the total number of households sampled in the VSS village. By using random sampling techniques to select the households in each village, Equation 4-2 is used to calculate an *estimate* of μ for each of the 58 villages surveyed. The model used to estimate μ is specified as:

$$\mu = e^{(X'\beta + \varepsilon)} \tag{4-3}$$

and, by taking the natural log of μ, Equation 4-3 is transformed into a semi-log model:

$$\ln \mu = X'\beta + \varepsilon \tag{4-4}$$

that can be estimated using the ordinary least squares regression procedure. Equation 4-4 is comprised of the following components: X is a matrix of independent variables, β is a vector of coefficients associated with X, and ε is the disturbance term. The matrix X is composed of the following demographic, economic, bio-physical, and institutional variables listed in Table 4-1.

Demographic: N, ST, EDU, NGO, DGI

Economic: YFP, YAL, YOS, IHW, TRN

Bio-physical: LT, LT2, FA, PFC, DTW

Institutional: GAI, CCA

Two location dummies (ADIL and CHIT) are also included in the matrix X in order to control for the different spatial regions of Andhra Pradesh from which the data were collected.

Consumption Inequality Model

As described in the previous section, an important aspect of Equation 4-1 is that inequality I is a separate component of W, and is therefore not valid as an independent measure of social welfare. As a dependent variable, I evaluates the degree to which welfare is distributed in an inequitable manner throughout a given community. As mentioned, the typical measure used to represent inequality is the Gini coefficient (γ). This is a ratio measure most commonly associated with the Lorenz curve, which is a graphical depiction of percentage social welfare distribution (e.g., by income or consumption) in terms of population quintiles. Following Deaton (1997), the equation below is used to calculate an estimate of the Gini coefficient for each VSS village:

$$\gamma = \left[\left(\frac{M+1}{M-1}\right) - \frac{2}{M(M-1)\mu}\right]\sum_{i=1}(\rho_i \cdot x_i) \qquad (4\text{-}5)$$

where M is the total number of individuals i that belong to households sampled within a VSS village, and ρ is the relative rank of each individual, starting with $\rho = 1$ for the richest person

sampled, and ending with the poorest person ($\rho = M$) sampled.[9] As defined previously for Equation 4-2, x_i is the per-capita household consumption value (which is identical for all members of the same household) while μ is the mean of all x_i (i.e., mean per-capita household consumption value). The expression $\rho_i x_i$ is summed over all persons sampled in a given VSS village. The use of random sampling techniques to select the households in each village allowed the calculation of an *estimate* of γ for each of the 58 villages surveyed.

According to Vanhoudt (1998), a measure of distributional inequality can be econometrically modeled as a function of non-conventional factors (e.g., institutional parameters) in addition to typical neo-classical factors such as labor and both physical and human capital. Odedokun and Round (2001) discuss how recent studies of inequality have investigated "a broad range of factors" affecting inequality, specifically mentioning institutional factors. Regressing γ on a collection of explanatory variables is undertaken to evaluate the contribution of these variables to inequality; the model used to estimate inequality is specified as:

$$\gamma = e^{(Z'\alpha + u)} \tag{4-6}$$

which is transformed into a semi-log model specification:

$$\ln \gamma = Z'\alpha + u \tag{4-7}$$

where Z is a matrix of independent variables, α is the vector of coefficients associated with Z, and u is the disturbance term. The matrix Z is composed of the following demographic, economic, bio-physical, and institutional variables listed in Table 4-1; Z also contains the two location dummies introduced earlier:

[9] For instance, if the household with the highest per-capita consumption value x has four members, then those four individuals would have ρ values of 1, 2, 3, and 4. The Gini coefficient is an example of where it is *necessary* to use individual consumption values, following the procedure that Deaton (1997) recommends (as just described), in order to calculate a socio-economic indicator that is representative of inequality in a given community.

Demographic: N, ST, EDU, DGI

Economic: YFP, YAL, YOS, IHW, TRN

Bio-physical: LT, LT2, FA, PFC, DTW

Institutional: CCA, FP

Location dummy: ADIL, CHIT

Consumption-based Poverty Model

As mentioned previously, measures of poverty can be thought of as a special class of social welfare measures that specifically address the proportion of the population below some given poverty line. To the extent that there is a significant difference between poverty and social welfare in the villages sampled (i.e., poverty is not a uniform condition), then it would be useful to estimate a model that tries to explain any observed variations in poverty across villages.

Deaton (1997) discusses the derivation and characteristics of several different poverty measures. One of these measures is the headcount ratio, which is simply the number of people below a predetermined poverty line (e.g., a threshold level of consumption). The headcount ratio is a poor social welfare metric, however, because it has the disadvantage of violating the so-called "principle of transfers" (i.e., a transfer from a poor person to one who is less poor could conceivably lift the latter above the poverty line). The poverty-gap ratio (PGR) rectifies this deficiency by calculating the difference in an individual's welfare (which can be based upon either a measure of consumption or income) with the given poverty line, and normalizing to this line. Summing this over all individuals below the poverty line, and dividing by the total population, results in a ratio that (when multiplied by –1) makes a suitable measure of social welfare. The PGR is a poverty measure that is commonly used by development researchers (e.g., Reddy and Chakravarty, 1999) and is the measure that will be used in this study. Following Deaton (1997), the poverty-gap ratio is estimated for each VSS village by calculating:

$$\text{PGR} = \left(\frac{1}{M}\right)\sum_i\left(1-\frac{x_i}{z}\right) \qquad \text{for all } x_i \le z\text{; or} \tag{4-8a}$$

$$\text{PGR} = 0 \quad \text{if all } x_i \ge z \tag{4-8b}$$

where z is the predetermined poverty threshold. It should be noted that considerable debate surrounds the construction and use of poverty thresholds and researchers generally rely on existing estimates (Deaton, 1997); this study utilizes a consumption-based poverty line already established for rural Andhra Pradesh. *Ceteris paribus*, the PGR will increase the greater the difference between x_i and z, or if more individuals fall below z. Thus, as an economic measure of welfare for the population below the poverty line, higher PGR values indicate a greater level of inequality in the distribution of consumption within a VSS village.

Allanson and Hubbard (1998) discuss how to empirically estimate the *income-gap ratio* from a random sample of different income classes, and clearly this technique also applies to consumption data. Additionally, they relate the income-gap ratio to second-degree stochastic dominance, a concept whereby integration of cumulative distribution functions allows for the ranking of welfare distributions. Moreover, second-degree stochastic dominance is equivalent to generalized Lorenz dominance (Deaton, 1997), which itself permits the ranking of standard Lorenz curves by scaling them up using the mean of the distribution. Thus, randomly sampled household consumption data can be aggregated into a PGR value (estimated for each VSS village), which serves as the dependent variable in the equation below:

$$\text{PGR} = Y'\phi + \upsilon \tag{4-9}$$

where Y is a matrix of independent variables, ϕ is the vector of coefficients associated with Y, and υ is the disturbance term. The matrix Y is composed of the following variables:

Demographic: ST, EDU, NGO, DGI

Economic: YFP, YAL, YOS, IHW

Bio-physical: LT, LT2, RRE, PFC, DTW

Institutional: PBA, CCA, FP, GS

Location dummy: ADIL, CHIT

Hypotheses for the Explanatory Variables

Demographic Variables

For the empirical analysis, N is the total number of households belonging to the VSS village regardless of whether the household is a VSS member or a non-member. This variable is expected to be positive with respect to μ, meaning that economic well-being ought to be greater the larger the VSS. As such, an inverse relationship with PGR is expected, as small communities are more likely to be poor.[10] This is because small communities were generally observed to be more isolated and remote, and with employment opportunities that were generally more limited as compared to larger villages. The relationship with γ is also anticipated to be positive, which would reflect greater inequality due to a larger, and presumably more socially diverse, community.

ST is a binary dummy variable equal to 1 if a given VSS village consists entirely or predominately (as based on the sample mode) of households of the Scheduled Tribes caste-designation. As one of the main stakeholder groups identified in the JFM legislative orders, it is important to control for the Scheduled Tribes VSS villages in the sample. A negative relationship with μ may be predicted because Scheduled Tribes villages are often more remote than other villages and thus less-integrated with the larger local economy. (A positive relationship with PGR might be predicted for the same reason). The relationship between ST and γ ought to be

[10] For variables that are included in both the ln μ equation and the PGR equations, the relationships with the dependent variables will usually be opposite of each other as the prediction for N illustrates.

negative, as Scheduled Tribes communities are usually very homogeneous both ethnically and economically. However, as Scheduled Tribes have generally benefited from other tribal development projects sponsored by the government or external donors, it is possible that the opposite relationships (i.e., ST having a positive affect on μ and a negative effect on PGR and γ) will be observed (Janaki Alavalapati, personal communication).

EDU represents the educational level of a given VSS. It is computed by calculating the weighted mean[11] household education level for each VSS village; where the education level of a household is the sum of school years completed, divided by the total number of household members greater than three years of age. A positive relationship with μ is anticipated, and an inverse relationship with PGR is expected. The relationship with γ is likely to be positive, meaning that more education is associated with greater inequality.

NGO is a binary dummy that equals 1 if a non-governmental organization has provided forestry-related assistance to a given VSS. Misra and Kant (2004) point out that the particular focus of a given NGO must be taken into consideration; for example, the way in which an NGO affects a given village will depend upon whether their orientation is more towards conservation than economic development. The NGO variable as defined is, thus, more conservation oriented; therefore, one might expect a negative relationship with μ according to Misra and Kant (2004). However, it is possible that NGO could have a positive relationship on μ through improvements in human and social capital. For these reasons, a negative relationship with PGR is posited.

The recent CFM legislation specifically intends to empower women within the political economy of the VSS. In addition, the World Bank (2002) places much emphasis upon the critical

[11] VSS-level data derived from the household interviews is weighted to take into account the differential probability of selection of households for different VSS villages (i.e., large versus small villages in terms of N).

importance that women's representation has in the VSS. The extent to which women participate in (and influence) the collective action decision-making is extremely important because women likely know more about forest produce than men in many communities. The DWCRA group index variable (DGI) is the number of women's self-help groups (DWCRA) divided by N, the total number of households in the VSS. DGI represents the degree of self-reliance and self-organization of women, and proxies for the general empowerment of women in a given VSS. Empirical evidence from Misra and Kant (2004) indicate that there is a positive relationship between women's participation and the economic output of JFM. Thus, the present study anticipates a positive relationship between DGI and μ, meaning a greater amount of self-organized women have a beneficial influence on average consumption (i.e., mean per-capita household consumption). In addition, a larger DGI is likely to be inversely related to poverty (as measured by the PGR variable). A negative relationship with γ is anticipated, suggesting that a larger DGI results in lower levels of consumption inequality.

Economic Variables

Annual income is measured with three variables in this study. YFP is the weighted mean household income derived from all forest products, YAL is the weighted mean household income from agriculture and livestock, and YOS is the weighted mean household income derived from all other sources. YOS is mainly comprised of income from employment but it also includes (to a much lesser degree) income from household enterprises and remittances. Considering these measures independently differentiates low-income households from those that are relatively more affluent, and also categorizes income by its source; this is important because evidence suggests that the poorest households in rural communities are the most reliant upon forests for their livelihoods, and for supplementing their household consumption (Kumar, 2002).

As such, YFP is anticipated to be inversely related to μ, while YAL and YOS are predicted to be positively related to μ.

Financial support for the APCFM project is derived from the World Bank, and funds are distributed to the VSS by the APFD. IHW is an important variable because it proxies outside investment to the community in the form of the household average of total payments to individuals participating in VSS works projects, such as silvicultural treatments. IHW is calculated as the man-days of labor employed for VSS works in the three previous years as estimated by the VSS Chairman, divided by N (total number of households). This value is then multiplied by the wage rate paid by the VSS to the laborers. IHW is expected to have a positive effect on μ; a negative effect on both γ and PGR is anticipated because the VSS works are more likely conducted by the poorer households.

TRN is a count of the number of training events and field trips that VSS members (mainly Management Committee members) have participated in through the auspices of the APFD. It is a proxy for the amount of human capital investments made to a given VSS. This measure was also estimated by the VSS Chairman. Anticipated relationships for TRN are a positive sign for the average consumption and poverty-gap equations, and a negative sign for the consumption inequality equation.

Bio-physical Variables

The length of time (LT) that a community has participated in JFM as a registered VSS is extremely important because it is the key variable in terms of evaluating the success, or lack thereof, of the economic impact of JFM. This is because the NTFP benefits of JFM are expected to increase over time from an initial state of low returns characteristic of the degraded nature of the landscape being protected; high values of LT theoretically imply income is being derived

from timber harvests. Therefore, in relative terms among the cross-section of VSS sampled, a positive relationship between LT and μ (and/or a negative relationship between LT and PGR) would likely indicate that JFM has had a beneficial economic impact on the communities engaged in this program. Misra and Kant (2004) found empirical evidence to support such a relationship. However, a negative sign on LT (vis-à-vis μ) could be indicative of weakened social cohesion through time. Kumar (2002) relates that some foresters fear that interest in JFM may wane when outside support inevitably declines, affecting project sustainability—though this is unlikely to be important here, as funding under the APCFM project was still active at the time of the survey. Community malaise may have more to do with local factors, poor or inappropriate management plans, and/or poor engagement by the certain field officers of the forest department. A negative sign on LT for γ would support an interpretation that JFM has a beneficial impact on distributional equity, again relative to the cross-section of VSS villages sampled.

FA is the size of VSS forest area under CFM protection. Forests are potentially an important form of natural capital in rural areas, and Misra and Kant (2004) found that total forest area has a direct and positive effect on the economic output of JFM. As such, FA is expected to have a positive statistical influence on the economic measure of welfare in this study (i.e., average consumption, μ), and the anticipated relationship between FA and inequality is negative.

RRE represents the relative forest resource endowment managed under CFM, for the VSS sampled in the survey. RRE is calculated as the VSS forest area (in hectares) divided by the estimated total number of VSS members for the corresponding VSS village. This variable can be thought of as a population-normalized measure of the relative forest asset base of each of the villages selected for the survey. This variable is utilized in the poverty-gap equation because poorer VSS villages are more likely to have a greater dependence on their forest resources. Thus,

a negative relationship with PGR is expected, as larger proportionate areas under CFM protection should mean that more forest resources are available to help mitigate poverty in these communities. Damodaran and Engel (2003) state that "a minimum per capita land allotment of 1 to 2 hectares per VSS member can be considered a must for the success of JFM" (p. 30).

PFC is a proxy of the forest dependency of a community, as based on consumption at the household level. It is calculated as the consumption of forest products as a percent of total household consumption and is averaged (and weighted) over the households sampled in a given VSS village. Reddy and Chakravarty (1999) provide data indicating forest dependency is greater among poorer households. Thus, the following relationships are predicted for PFC: a negative relationship in the average consumption and consumption inequality models, and a positive relationship in the PGR model.

It is important to control for spatial differences in environmental and/or physical qualities and processes that may impact the components of social welfare that communities possess. One variable is included to represent a control of this type. DTW is the average depth to groundwater (in feet) for a given VSS, as estimated by the VSS Chairman or the Vice-Chairman. As agricultural production is a key component of local economies in rural India, this is an important variable. Depths of several hundred feet are common. Thus, smaller DTW should equate with higher μ and lower PGR. A positive relationship with γ is likely as greater depths would tend to preclude the poor from accessing the resource.

Institutional Variables

The institutional variables are based on the Design Principles established by Ostrom (1990) as described in Chapter 1. These variables represent a subset of the unconventional factors that may influence the welfare measures; Misra and Kant (2004) describe the use and

importance of such “non-neoclassical” factors, in addition to conventional economic factors, in equations defining a joint production model of JFM.

VBA is a variable that ranks the relative “boundary awareness” of the VSS villages. It is based on data gathered in the HH questionnaire; specifically, it is the percent of VSS households (within a given VSS) that were recorded as being aware of the spatial boundaries of their VSS forest area. This variable is used only in the poverty-gap equation, because the poorest households tend to utilize forests more than households that are economically better-off. A negative relationship is therefore anticipated, indicating that VSS villages with higher levels of boundary awareness are likely to have a lower PGR value because the households of these VSS theoretically have better control over their CPR.

The variable GAI measures the average general awareness (that households have) of four quantifiable VSS institutions and parameters; two each, respectively. It is based on an additive index (with a scale of 0 to 7) derived from scoring HH questionnaire data against objective data that describe the VSS (e.g., hectares of forest managed). GAI measures the average index score for each VSS village and, thus, has the same scale (i.e., 0 to 7). It is only included in the average consumption equation because of the possibility that it may have a statistical influence on μ. If so, a positive relationship is anticipated as higher levels of GAI are likely due to greater engagement of VSS-member households in CFM activities. As such, GAI would act as a proxy for level of participation, and theoretically would exert a positive influence on the average level of consumption in a village.

CCA is a proxy for collective-choice arrangements and is measured in terms of whether or not the micro-plan for each VSS is oriented towards the needs of forest-dependent households. This variable is also based on data collected in the HH questionnaire. CCA is a ratio that

measures the percent of households indicating that the VSS micro-plan for their VSS village reflects the interests of forest dependent households. Because conflicting interests are always present in a community, and the APFD has a large hand in developing the VSS micro-plan, this document may potentially favor rural elites, other interest groups, or perhaps even the APFD, instead of the poorer households that are the focus of CFM. To the extent that higher values of CCA signify greater adherence to the theoretical principle of responsive and representative institutions, a positive relationship with μ is expected; conversely, a negative relationship is anticipated with respect to both γ and PGR.

Monitoring of the resource is one of the key design principles identified by Ostrom (1990). The FP variable indicates whether or not the VSS has a formal patrol to monitor the VSS forest area. This variable is defined as a 0/1 dummy, where FP takes the value of 1 if the VSS has a regularly scheduled patrol, or employs a watchman to monitor the VSS forest area, and 0 if neither. Negative relationships for FP are expected with both γ and PGR.

GS represents graduated sanctions applied to locals who break the rules and regulations established by the VSS. This is captured as a dummy; GS equals 1 if the VSS has a two-tiered structure for punishing offenders, and 0 if not. The efficacy of GS as an explanatory variable is likely dependent upon the presence of graduated sanctions being widely known among members of the VSS. Although this is unlikely to be the case, the poorest households should be affected the most; thus a negative relationship with PGR is expected if GS is statistically significant.

Description of the Data

Table 4-2 displays the mean and standard deviation of the variables that will be used in the empirical analysis of the three economic measures examined in this study. These descriptive statistics are presented for each of the three regional samples collected and are intended to

Table 4-2. Mean and standard deviation for VSS-level data: comparison by the region sampled.

	Adilabad (n = 18)		Visakhapatnam (n = 20)		Chittoor (n = 20)	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Maximum**	**Minimum**
Dependent:						
μ	9,604	422	8,390	938	5,708	324
$\ln \mu$	9.032	0.036	8.864	0.111	8.538	0.051
γ	0.2396	0.0137	0.2704	0.0411	0.2320	0.0601
$\ln \gamma$	-1.457	0.059	-1.319	0.152	-1.495	0.273
PGR	0.0048	0.0023	0.0826	0.0702	0.0353	0.0319
Explanatory – Demographic:						
N	174	206	137	297	104	59
ST*	9	--	14	--	5	--
EDU	2.67	0.30	3.36	0.34	3.20	0.13
NGO†	0.333	0.485	1.0	0.0	0.800	0.410
DGI	5.1	2.5	5.4	2.4	4.6	2.5
Explanatory – Economic:						
YFP	300	119	1,869	366	764	373
YAL	8,290	2,750	2,621	544	9,044	1,487
YOS	20,848	2,568	19,690	3,828	12,714	745
IHW	8,662	7,618	6,024	6,397	3,922	5,657
TRN	4.9	1.7	4.5	1.9	5.8	2.6
Explanatory – Bio-physical:						
LT	8.0	1.7	7.2	2.1	7.4	2.1
FA	275	138	159	98	312	111
RRE	3.9	3.0	3.2	4.3	3.3	2.1
PFC	1.9	0.3	4.0	0.6	4.3	0.4
DTW	120	97	79	55	359	121
Explanatory – Institutional:						
VBA	0.176	0.125	0.279	0.169	0.234	0.105
GAI	2.12	0.72	2.53	0.83	2.24	0.45
CCA	0.663	0.131	0.658	0.140	0.640	0.164
FP†	0.444	0.511	0.400	0.501	0.300	0.470
GS†	0.722	0.461	0.700	0.470	0.450	0.510

* The value listed for the ST variable is the mode.
† Denotes a 0/1 dummy variable.

provide the reader with a broad comparison of the regions, which justify the inclusion of the regional dummy variables. Weighted means and cluster-adjusted standard deviations are calculated for those variables for which these measures are directly derived from the household-level data (i.e., μ, ln μ, EDU, YFP, YAL, YOS, PFC).[12] In addition, the mode of the ST variable is shown in place of a mean.

The remainder of this chapter presents and describes the data of some of these variables in further detail. An additional six variables of interest to the synoptic description of the data are also presented. These data are presented by region and variable type such that each of the three regions of Andhra Pradesh is represented by two tables, with each region discussed individually. The first table contains demographic and economic variables, while the second table contains bio-physical and institutional variables.

The Adilabad Sample

Table 4-3 summarizes the data for the demographic and economic variables collected from 18 VSS villages sampled in the Nirmal and Jannaram Divisions of the Adilabad Circle. The variables in this table are briefly described as follows. ID is the unique field identification number given to each VSS village sampled. N is the total number of households in each VSS village sampled. CST is the predominant caste group of a VSS village, as determined by the *mode* of the households sampled. EDU is the average household education level, which is measured in years and can range from 0 (no education) to 20 (a Ph.D.). ELC is the educational level of the VSS Chairman. DGI is the average number of women's self-help groups across households. MU is the weighted mean per-capita household consumption value of the VSS

[12] For the region-level descriptive statistics in Table 4-2 that are derived from household data, it is necessary to correct the standard deviations in order to account for the effects that the clustered sampling of households has on the variance of data collected in this manner.

village. YFP is the weighted mean household income derived from forest products. YAL is the weighted mean household income derived from agriculture and livestock. YOS is the weighted mean household income derived from other sources (e.g., employment, household enterprises).

Table 4-3. Selected demographic and economic variables for the Adilabad sample.

ID	VSS NAME	N	CST	EDU	ELC	DGI	MU	YFP	YAL	YOS
101	Dounelli Thanda	77	ST	1.34	12	2.6	6,435	731	4,327	15,405
103	Chincholi (B)	641	BC	3.93	10	4.7	9,133	0	3,368	31,539
104	Dongir Gama	80	BC	2.36	10	6.3	9,708	0	9,101	13,616
105	Kalva	643	BC	2.56	4	2.3	8,786	5	5,840	17,719
106	Rampur	340	BC	3.15	12	6.8	12,232	0	5,532	27,165
107	Arepalli	168	ST/BC	2.09	0	6.5	10,365	885	6,164	17,585
108	Mamada Thanda	34	ST	1.22	10	8.8	7,776	1,270	16,461	16,250
109	Rachchakota	80	ST	1.62	0	1.3	9,034	1,674	6,229	11,571
110	Ankena	80	ST	2.07	15	7.5	11,579	1,508	11,149	12,196
111	Badhankurthi	475	BC	2.19	10	3.4	10,506	100	23,669	20,326
113	Dildarnagar	150	SC	2.65	12	5.3	8,495	247	4,274	12,264
114	Kothagudem	78	BC	1.94	5	1.3	10,326	690	3,231	23,988
115	Danthanpalle East	80	BC/OC	3.48	12	7.5	10,800	325	11,753	10,706
116	Janguguda	41	ST	0.91	10	7.3	6,271	991	6,987	4,108
117	Gandi Gopalpur East	34	ST	0.63	5	2.9	6,843	1,397	798	10,602
118	Islampur (K)	22	ST	0.65	0	9.1	6,033	4,317	5,403	9,122
119	Puttiguda (Kotha)	35	ST	1.49	10	5.7	7,583	573	2,735	5,540
120	Kancherabai	72	ST	1.27	7	2.8	8,523	1,799	5,354	10,271
	Mean	174		2.67	8.0	5.1	9,604	300	8,290	20,848
	Standard Deviation	206		0.30	4.6	2.5	422	119	2,750	2,568
	Coeff. of Variation	1.18		0.11	0.58	0.50	0.04	0.40	0.33	0.12

The total number of households for each VSS village in the Adilabad sample (N) ranges from a low of 22 in Islampur (K) to a high of 643 in Kalva. In general, the sample can be characterized as being comprised mainly of very-small to small VSS villages: 75% of the sample (12 VSS) is comprised of fewer than 80 households. The other six VSS, however, all have more than 150 households.

The Adilabad sample can generally be described as being tribal as well. Fully half (nine VSS) of the VSS villages listed in Table 4-3 are comprised of a majority of Scheduled Tribes (ST) households. If a given VSS is listed as majority Scheduled Tribes, it will usually be the case

that 100% of the households are of the Scheduled Tribes designation. An exception is Arepalli VSS, where the number of Scheduled Tribes and Backward Castes households is equal. The other caste group that appears with some frequency (six VSS) as a majority is the Backward Castes; it also shares the majority in two other VSS. The majority-Backward Castes VSS villages appear to be associated with larger villages (i.e., greater values of N).

The educational variable EDU is a measure of the average number of school years completed in each household that is then averaged over all of the households sampled in a given VSS village. While the potential maximum for this variable is 20 years, the observed maximum in this sample was less than 4 years. The lower education levels appear to be correlated with Scheduled Tribes. In addition, the four lowest EDU values are among the five smallest VSS villages in terms of N, while the five highest EDU values are in the three largest VSS (i.e., Kalva, Chincholi (B), and Rampur). In general, the educational level of the VSS Chairman is high, with ELC equal to or greater than 10 years for eleven of the VSS. Three VSS have a Chairman with no education.

MU (average per-capita consumption) ranges from a low of 6,033 Rupees (Rs.) in Islampur (K), to a high of Rs. 12,232 in Rampur. This range is equivalent to roughly US$131 to US$266 based on the September 19, 2006 exchange rate. The weighted mean is Rs. 9,604, with a very low cluster-adjusted standard deviation (422) and coefficient of variation (4%). This means that the variation of the value of per-capita consumption among households in the Adilabad sample is low. The six lowest values of MU are all in VSS villages with a majority of Scheduled Tribes.

The income variables are derived by averaging at the household level, which is why they appear relatively large compared to the mean levels of consumption at the individual level (i.e.,

MU). As mentioned previously, income data in developing countries are subject to inaccuracy due to various factors. The use of YFP, YAL, and YOS (measures of income from forest products, agriculture, and other sources, respectively) must, therefore, be cautioned. The weighted mean YFP is greater than Rs. 500 in 11 of the 18 VSS and reached a maximum of Rs. 4,317 in Islampur (K). Only three VSS report zero income from forest products. Income from forest products (YFP) is associated with VSS villages that are generally both tribal and remote (similar to the VSS villages with the lowest values of MU); and those VSS villages with little or no YFP appear to be larger in size (i.e., larger N). The exception is Dongir Gama, a small VSS village with commercially worthless trees. They were given poor quality land in the 1980s when the government relocated their village due to the construction of a dam.

Comparison of the weighted income means also illustrates that agricultural income (YAL) and income from other sources (YOS), which is mainly derived from employment, are the main economic drivers of the VSS in the Adilabad sample. This actually applies to rural Andhra Pradesh as a whole. Mean YAL equals Rs. 8,290; only one VSS village averaged less than Rs. 1,000 from agriculture and livestock (Gandi Gopalpur). YOS appears to be very important in Adilabad: the mean is Rs. 20,848 and only three VSS have mean YOS values that are less than Rs. 10,000.

Table 4-4 summarizes data on the bio-physical and institutional variables obtained from the Adilabad sample. LT is the length of time that the VSS has been practicing JFM/CFM. LT was calculated by subtracting the year of VSS establishment from the year 2005; as such, the maximum possible age is 12 years, as field implementation of JFM in Andhra Pradesh began in 1993. FA is the total forest area (in hectares) that the VSS manages. Data on both LT and FA were obtained from the VSS micro-plans. DTF is the walking distance (in minutes) to the VSS

forest area, averaged over the households sampled (within a given VSS). PQF and PMU are the quality and main use, respectively, of the forest area before protection was established under the VSS. The data for these two variables were derived from subjective ratings made by the VSS Chairman or Vice-Chairman on Likerd scales. PFC is the percentage of household consumption that is derived from forest products, averaged over the households sampled. EP is an index that measures the equity in participation of the VSS; it is the percentage of VSS member households that believe the process of selecting the VSS Management Committee was free and fair, as opposed to being dominated by local elites or other groups. PG measures the perception of the government, as based on the relationship between the VSS Management Committee and the APFD, according to a Likerd scale measure made by the VSS Chairman or Vice-Chairman. The FP variable indicates whether or not the VSS has a formal patrol to monitor the VSS forest area.

Table 4-4. Selected bio-physical and institutional variables for the Adilabad sample.

ID	VSS NAME	LT	FA	DTF	PFC	PQF	PMU	EP	PG	FP
101	Dounelli Thanda	6	275	40	4.4	3	4	0.875	2	1
103	Chincholi (B)	5	180	40	0.6	2	3	1.000	2	0
104	Dongir Gama	7	40	33	1.4	4	0	0.583	2	0
105	Kalva	11	621	33	2.0	3	2	0.778	1	0
106	Rampur	9	164	36	1.2	3	2	0.813	2	1
107	Arepalli	9	280	30	1.8	2	4	1.000	2	1
108	Mamada Thanda	8	343	30	3.9	2	4	0.882	1	0
109	Rachchakota	7	227	54	2.7	3	4	0.941	1	0
110	Ankena	6	150	23	2.0	1	4	1.000	1	0
111	Badhankurthi	9	154	60	1.2	3	1	0.750	1	0
113	Dildarnagar	9	385	47	3.1	3	4	1.000	1	1
114	Kothagudem	7	150	20	2.9	3	3	0.625	2	0
115	Danthanpalle East	8	294	71	4.1	2	4	0.714	2	0
116	Janguguda	7	385	54	6.5	3	3	0.944	2	1
117	Gandi Gopalpur East	7	294	42	6.7	1	4	0.900	2	0
118	Islampur (K)	8	257	52	10.1	1	4	1.000	4	1
119	Puttiguda (Kotha)	9	380	39	4.5	3	4	0.900	4	1
120	Kancherabai	12	500	53	5.7	3	4	0.895	1	1
	Mean	8.0	275	40	1.9			0.867		0.44
	Standard Deviation	1.7	138	3.1	0.3			0.13		0.51
	Coeff. of Variation	0.22	0.50	0.08	0.17			0.15		1.15
	Mode					3	4	1.000	2	
	Median					3.0	4.0	0.898	2.0	

As shown in Table 4-4, LT (length of time under JFM/CFM) ranges from 5 to 12 years for the Adilabad sample; the mean is 8 years. The size of the VSS forest area (FA) ranges from 40 to 621 hectares, with a mean of 275 hectares. The minimum (40 hectares) is unusually low for the Adilabad sample, as the next largest FA value is nearly four times as large. In addition, three-quarters of the sample (12 VSS) is greater than 200 hectares.

The distance to the VSS forest area (DTF) ranges from 20 to 71 minutes, with a weighted mean of 40 minutes. PFC is a proxy of the forest dependency of a community, based on consumption at the household level. PFC indicates that the consumption of forest products as a percentage of total household consumption ranges from 0.6% to 10.1%; the weighted mean is 1.9%. Comparison with the CST variable in Table 4-3 indicates that each of the six highest values of PFC correspond to VSS that are wholly or predominately composed of Scheduled Tribes households.

PQF represents a subjective quality rating of the forest area prior to protection by the VSS, where 1 = good, 2 = slightly degraded, 3 = degraded, and 4 = very degraded. The mode and median both equal "3" (degraded). This result is not surprising since the legal basis for JFM rests upon rehabilitation of degraded land. However, some VSS clearly were given charge of non-degraded areas in order to avoid potential future degradation, and to support the development of communities such as Islampur (K), for example.

PMU identifies the main uses of the forest area prior to protection by the VSS, where 0 = no previous use, 1 = fuelwood, 2 = construction material, 3 = agricultural implements, and 4 = NTFPs. The majority of the Adilabad sample (11 of 18 total VSS) indicated that NTFP collection was the main use of their forest prior to JFM/CFM.

EP is an index created to proxy for the equity in participation within a given VSS. The potential range is 0 (no equity) to 1 (perfectly equitable participation), but the range for EP in the sample is 0.583 to 1.000; only five VSS villages have EP values below 0.800. The magnitude of the mean (0.867) reflects a high level of equity with regard to the internal political and institutional process.

The perception of government (PG) was measured with an ordinal subjective ranking where 1 = very good, 2 = good, 3 = fair, and 4 = bad. The vast majority of the sample (16 VSS) indicated that the relationship with the APFD officer was either "good" or "very good". The other two VSS, Islampur (K) and Puttiguda (Kotha), both indicated a "bad" relationship. The VSS Chairman of Puttiguda described in detail the corruption of the local APFD Beat Officer: this person took bribes from two other villages to allow them to cut wood in the VSS area. To underscore this point, the VSS Chairman and his associate also intercepted some timber thieves and confiscated their axe during the inspection of the VSS forest area by the principal investigator.

FP is a 0/1 dummy variable that takes the value of 1 if the VSS either undertakes a formal patrol of their VSS area, or employs a watchman to monitor it. Surprisingly, only eight VSS villages (44% of the sample) have a formal monitoring structure in place. Many claim that they informally monitor their VSS area because their farmland is adjacent to it, or the only access is through their farmland or village.

The Visakhapatnam Sample

Table 4-5 summarizes the data for the demographic and economic variables from the Visakhapatnam Division sample (20 VSS total). The total number of households for each VSS village in the Visakhapatnam sample ranges from a low of 12 in Ch. Konda Veedhi to a high of 1,362 in Darlapudi. In general, the sample can be characterized as being comprised mainly of

very-small to small VSS villages: 75% of the sample (15 VSS) is comprised of fewer than 80 households. Thus, from the standpoint of VSS size the Visakhapatnam and Adilabad samples are similar.

Table 4-5. Selected demographic and economic variables of the Visakhapatnam sample.

ID	VSS NAME	N	CST	EDU	ELC	DGI	MU	YFP	YAL	YOS
201	Appampalem	133	OC	1.530	10	3.8	5,115	0	2,561	13,564
202	Kunnempudi	33	ST	1.096	5	9.1	5,884	10,510	720	11,409
203	Poolabanda	42	ST	1.556	5	4.8	4,391	4,381	888	6,954
204	Kothavalasa	75	ST	1.941	7	6.7	6,021	4,102	3,863	9,644
205	Yerrabandalu	84	OC	1.647	10	4.8	6,523	0	5,567	10,141
206	K. Boddapadu	57	ST	2.464	0	3.5	7,117	3,969	3,265	4,440
207	Ch. Konda Veedhi	12	ST	2.053	1	8.3	4,834	9,821	501	3,672
208	Kandulapalem	70	ST	1.884	3	2.9	5,765	3,117	5,771	5,482
209	Vemagiri	344	BC	3.997	10	1.5	7,466	0	4,999	19,849
210	Somannapalem	117	BC	4.670	10	4.3	10,983	0	4,110	21,332
211	Chinauppalam	71	OC	3.206	5	5.6	7,004	0	3,588	12,129
212	Darlapudi	1,362	OC	3.913	5	6.6	10,161	1,699	1,906	26,874
213	Kondiba	70	ST	2.249	10	4.3	4,527	2,195	1,095	10,564
214	Medaparthi	54	ST	2.811	10	5.6	4,563	4,848	1,210	255
215	Punyagiri	60	ST	4.046	9	3.3	8,425	6,766	184	9,944
216	Latchannadorapalem	46	ST	2.442	10	6.5	5,491	4,385	2,310	12,073
217	Dellipadu	17	ST	0.321	3	11.8	3,474	3,191	970	2,385
218	Urumula	42	ST	1.477	0	4.8	3,968	6,818	1,133	3,077
219	Thodubanda	28	ST	0.985	0	3.6	4,173	1,692	95	1,703
220	Kandulaguddi	17	ST	2.326	3	5.9	3,689	1,468	763	3,024
	Mean	137		3.36	5.8	5.4	8,390	1,869	2,621	19,690
	Standard Deviation	297		0.34	3.9	2.4	938	366	544	3828
	Coeff. of Variation	2.17		0.10	0.67	0.44	0.11	0.20	0.21	0.19

The Visakhapatnam sample is predominantly tribal: nearly 75% (14 VSS) of the VSS villages listed in Table 4-5 are primarily comprised of Scheduled Tribes households. Of these, 10 VSS villages consist entirely of Scheduled Tribes households and the other four remaining villages range from 83.3% to 95% ST-designated households. Additional caste groups that form a majority in a given VSS include Other Castes (four VSS) and Backward Castes (two VSS). Three of these VSS are completely homogeneous (Appampalem, Yerrabandalu, and

Somannapalem), while the other three VSS have varying degrees of caste mixture. These six VSS tend to correlate with a larger village size.

EDU values (average years of education across households) are rather low across the Visakhapatnam sample, although the weighted mean (3.36) is greater than the weighted mean of the Adilabad sample (2.67). Four of the five highest EDU values correlate with VSS villages classified as either Other Castes or Backward Castes. In addition, the four lowest EDU values tend to be among the smallest VSS (in terms of size), while the five highest EDU values contain three of the four largest VSS villages (Darlapudi, Vemagiri, and Somannapalem). In general, the average educational level of the VSS Chairman is not very high, although ELC is greater than or equal to 10 years for seven of the VSS. Of the remainder, more than half (seven VSS) have Chairman that completed only three years of school or less.

MU, the average measure of the value of individual consumption, ranges from Rs. 3,474 (Dellipadu) to Rs. 10,983 (Somannapalem); or roughly $76 to $239, based on the September 19, 2006 exchange rate. The weighted mean is Rs. 8,390, with a relatively low cluster-adjusted standard deviation (938) and coefficient of variation (11%). The weighted mean of MU is approximately 1,200 Rupees less than in the Adilabad sample.

The weighted mean of income from other sources, YOS, (Rs. 19,690) is similar to the weighted mean YOS of the Adilabad sample (Rs. 20,848). In contrast, the average mean of income from both forest products and agricultural income (YFP and YAL, respectively) in the Visakhapatnam sample differ substantially from the Adilabad sample. For example, Table 4-5 illustrates that the weighted mean YFP equals Rs. 1,869, which is more than six times as much as mean YFP for Adilabad. Clearly, dependence of the VSS villages on forests resources is greater in Visakhapatnam. Like the Adilabad sample though, YFP is associated with the tribal VSS: five

of the six non-tribal VSS report zero income from forest products. Interestingly, the weighted mean of YAL (Rs. 2,621) is three times lower than in Adilabad. More than a third of the sample (seven VSS) has a weighted mean of YAL that is less than 1,000 Rupees, while the maximum YAL is only Rs. 5.771 (Kandulapalem).

Table 4-6 presents data on the bio-physical and institutional variables obtained from the Visakhapatnam sample. The length of time the village has been under JFM/CFM (LT) ranges from two to 11 years for the Visakhapatnam sample and averages 7.2 years. The size of the VSS forest area (FA) ranges from 41 to 363 hectares. Only seven VSS are greater than 200 hectares. The mean and median (159 ha and 131.5 ha, respectively) for FA indicate average VSS size in the Visakhapatnam sample is about half that seen in Adilabad (275 ha and 267 ha, respectively).

Table 4-6. Selected bio-physical and institutional variables for the Visakhapatnam sample.

ID	VSS NAME	LT	FA	DTF	PFC	PQF	PMU	EP	PG	FP
201	Appampalem	7	126	43	5.4	2	2	0.889	1	0
202	Kunnempudi	7	150	71	6.9	3	4	0.789	2	0
203	Poolabanda	9	225	51	7.1	3	3	0.765	2	1
204	Kothavalasa	9	100	106	5.1	1	4	1.000	1	0
205	Yerrabandalu	7	115	59	4.6	1	1	1.000	2	0
206	K. Boddapadu	11	75	81	9.0	1	4	0.889	2	1
207	Ch. Konda Veedhi	9	250	13	3.0	3	4	1.000	2	0
208	Kandulapalem	5	50	43	6.1	2	4	0.950	3	0
209	Vemagiri	6	60	26	0.3	2	1	0.667	1	0
210	Somannapalem	9	139	28	2.0	2	1	1.000	2	1
211	Chinauppalam	7	41	18	3.2	4	0	0.533	1	0
212	Darlapudi	2	70	29	3.9	2	1	0.400	2	1
213	Kondiba	7	124	27	8.3	3	4	0.688	2	0
214	Medaparthi	7	313	35	4.6	1	1	1.000	2	0
215	Punyagiri	9	200	21	3.7	2	4	0.944	2	1
216	Latchannadorapalem	9	137	52	3.8	2	4	0.944	2	0
217	Dellipadu	5	363	18	11.0	2	4	0.824	3	0
218	Urumula	9	352	14	7.6	2	4	0.882	2	1
219	Thodubanda	5	200	20	6.1	3	4	0.750	2	1
220	Kandulaguddi	5	92	19	9.4	3	1	0.875	2	1
	Mean	7.2	159	39	4.0			0.839		0.40
	Standard Deviation	2.1	98	5.5	0.6			0.17		0.50
	Coeff. of Variation	0.29	0.62	0.14	0.14			0.20		1.26
	Mode					2	4	1.000	2	
	Median					2.0	4.0	0.886	2.0	

DTF, the distance to the VSS forest area, ranges from 13 to 106 minutes, with a weighted mean of 39 minutes (which is nearly identical to the Adilabad sample). PFC (a proxy for forest dependency) indicates that the consumption of forest products from 0.3% to 11.0% of total consumption. The weighted mean is 4.0%, which is twice that of the Adilabad sample. The tiny VSS village of Dellipadu, which only has 17 households, has the maximum PFC value; this VSS also has the lowest MU value (mean per-capita consumption). Interestingly, the same scenario is observed in the Adilabad sample.

The mode and median of the measure of prior forest quality (PQF) both equal "2" (i.e., slightly degraded). The mode is representative of nine VSS villages, while another seven VSS rated PQF as either "3" or "4" (i.e., degraded or very degraded). A majority of the villages of the Visakhapatnam sample (11 VSS) indicated that NTFP collection was the main use of their forest prior to JFM/CFM; six VSS indicated fuelwood collection was the previous main use.

EP is the equity in participation index, which averaged 0.839 but ranges from 0.4 to 1.0 in the sample. Seven VSS have an EP value below 0.8. The magnitude of the mean is similar, though less, than the mean EP for Adilabad (0.867). PG proxies the perception of government; almost the entire sample (18 VSS) indicated that the relationship with the APFD field officer was either "good" or "very good". The other two VSS villages, Kandulapalem and Dellipadu, both indicated a "fair" relationship with their APFD officer. FP is a dummy indicating a formal patrol of the VSS area. Similar to the Adilabad data, only eight VSS villages (40% of the sample) have a formal monitoring structure in place.

The Chittoor West Sample

The Chittoor West sample is comprised mainly of small and medium sized VSS villages: 75% of the sample (15 VSS) consists of VSS villages with 70 or more households. The sample

ranges from a low of 26 in Kondakindaindlu to a high of 224 in Muddanapalli. The coefficient of variation (0.57) indicates a much tighter distribution of N for this sample than for either the Visakhapatnam and Adilabad samples (CV = 2.17 and 1.20, respectively).

Table 4-7. Selected demographic and economic variables for the Chittoor West sample.

ID	VSS NAME	N	CST	EDU	ELC	DGI	MU	YFP	YAL	YOS
301	Krishnapuram	200	SC	4.165	10	4.0	7,853	664	21,103	13,614
302	Nadimuru	99	OC	3.093	12	2.0	4,435	0	10,954	11,710
303	Jowkupalli	58	OC	3.249	5	5.2	5,973	0	10,203	17,060
304	Kudavagadda	157	SC/BC	3.616	12	4.5	4,141	346	11,132	10,580
305	Muddanapalli	224	BC	3.052	5	4.5	4,223	79	11,433	14,138
306	Urinayanipalle	84	BC	1.961	5	4.8	4,423	330	575	12,373
307	Diguvathanda	70	ST	2.510	5	5.7	7,919	0	4,482	7,021
308	Kondakindaindlu	26	ST	1.830	0	7.7	5,674	278	8,170	9,268
309	Mudiveducross	87	SC	4.175	7	2.3	6,428	0	4,362	13,331
310	Papepalli	190	BC	3.163	0	9.5	6,319	0	1,978	13,258
311	Rajugaripalli	85	OC	2.998	7	4.7	5,978	0	7,724	8,458
312	Siddhartha Colony	48	ST	3.046	0	8.3	5,389	15,408	1,994	8,396
313	Atukurallapalle	70	OC	3.672	5	1.4	8,800	0	15,691	21,633
314	Chappidipalle	137	SC	3.046	7	2.9	5,016	140	5,646	11,985
315	Motlapalle	38	SC	3.107	10	5.3	5,417	0	10,159	11,154
317	Pengaragunta	190	BC	3.206	4	2.1	6,417	240	5,459	17,817
318	Adivilopalle	70	ST	2.746	5	0.0	7,252	395	10,056	9,511
319	Gowthumakulapalle	105	OC	3.591	5	6.7	6,225	50	10,037	9,654
320	Singiriguntapalle	103	BC	2.643	10	2.9	5,446	2,606	15,671	12,188
321	Irlapalli (81)	42	ST	2.466	10	7.1	3,962	5,936	1,555	8,597
	Mean	104		3.20	6.2	4.6	5,708	764	9,044	12,714
	Standard Deviation	59		0.13	3.7	2.5	324	373	1487	745
	Coeff. of Variation	0.57		0.04	0.59	0.54	0.06	0.49	0.16	0.06

Unlike the other two samples, Table 4-7 shows that the Chittoor West sample can only be characterized as a poly-caste sample. There is an almost equal division of the CST variable: 25% (five VSS) of the VSS listed are majority Scheduled Tribes (ST) households, 25% are majority Backward Castes (BC) households, and 25% are majority Other Castes (OC) households. Another four VSS are majority Scheduled Castes (SC) households. The remaining VSS is a bimodal BC/SC village. Three of the four smallest communities in the sample are Scheduled Tribes-designated VSS villages (Kondakindaindlu, Irlapalli (81), and Siddhartha Colony).

EDU values, measuring the average level of education by household, are again rather low across the VSS; the weighted mean (3.20) falls between the Visakhapatnam mean and (3.36) and the Adilabad mean (2.67). The distribution (CV = 0.04) is also somewhat tighter than the other two samples (CV = 0.10 and 0.11, respectively). In general, the average educational level of the VSS Chairman (6.2 years) is similar to the Visakhapatnam sample (5.8), with six of the VSS having an ELC value greater than or equal to 10 years. Of the remainder, more than 70% (10 VSS) have a VSS Chairman that completed five years of school or more.

MU, which measures the average level of consumption at the individual level, ranges from a low of Rs. 3,962 Rupees in Irlapalli (81) to a high of Rs. 8,800 in Atukurallapalle. The dollar equivalent for the range is US$86 to US$191 based on the 19 September 2006 exchange rate. The weighted mean is Rs. 5,708, which is 32% and 41% less than the Visakhapatnam and Adilabad samples, respectively. MU also exhibits a low cluster-adjusted standard deviation (324) as indicated by the coefficient of variation (6%).

The weighted mean of average forest income (YFP) is Rs. 764. This is more than twice as large as the weighted mean for YFP in the Adilabad sample, but less than half of the weighted mean for YFP in Visakhapatnam. YFP is concentrated in three VSS villages (Siddhartha Colony, Irlapalli (81), and Singiriguntapalle). These three VSS contain 41 of the 58 households (out of 396 total households in the Chittoor West sample) that report non-zero YFP. Moreover, of the 16 VSS villages that record weighted mean YFP values less than Rs. 500, half of these (eight VSS) derive no income at all from forest products. In contrast, Adilabad has only seven VSS with mean YFP less than Rs. 500, with only three having zero YFP. In Visakhapatnam, there are five VSS villages with zero mean YFP—but the rest all have a mean for YFP greater than Rs. 1,400.

Table 4-7 shows that the weighted mean of agricultural income (YAL) is Rs. 9,044, which is similar to the weighted mean YAL of the Adilabad sample (Rs. 8,290). Both are substantially greater than the Visakhapatnam weighted mean YAL (Rs. 2,621). Only one VSS village has a weighted mean for YAL that is less than Rs. 1,500 (Urinayanipalle); fully half the sample (10 VSS) records a weighted mean for YAL greater than Rs. 10,000. In contrast to both the Visakhapatnam and Adilabad samples, the weighted mean of other income (YOS) in the Chittoor West sample is substantially less (approximately 35% to 40%), although the distribution is tighter. The weighted mean of YOS equals Rs. 12,714, with a cluster-adjusted standard deviation of 745 (CV = 6%). Thus, the minimum YOS (Rs. 7,021) for Chittoor West is higher than the minimum for the other samples.

In Table 4-8, the length of time under VSS management averages 7.4 years, with a range of 3 to 12 years. The size of the VSS forest area (FA) ranges from 150 ha to 521 ha. There are no small VSS areas in the Chittoor West sample: the minimum of 150 ha (Jowkupalli) exceeds the median FA for Visakhapatnam by almost 20 ha. The mean and median (312 and 300, respectively) indicate that the average VSS forest size in the Chittoor West sample is roughly twice that of the Visakhapatnam sample (159 and 131.5, respectively). FA size in the Chittoor West sample is also greater than the Adilabad sample, although the difference in mean and median is less than 12%.

DTF (average distance from household to forest) ranges from 18 to 56 minutes, with a weighted mean of 37 minutes (which is slightly less than the other two samples). The forest dependency proxy, PFC, indicates that the consumption of forest products as a percentage of total household consumption ranges from 1.4% to 9.6%. The weighted mean is 4.3%, which is twice that of the Adilabad sample and slightly higher than the Visakhapatnam sample. Irlapalli

(81) is the VSS with the maximum PFC value; this VSS also has the lowest MU value (mean per-capita household consumption). Interestingly, the same was observed in both of the other samples.

The mode and median of PQF both equal "3", indicating that eight villages rated the forest quality before VSS protection as "degraded". Another four VSS rated PQF as "4" (i.e., very degraded). The data for the PMU variable indicate that a large majority of the Chittoor West sample (14 VSS) report that fuelwood collection was the main use of their forest area prior to JFM/CFM, while NTFP collection was listed by five VSS as the previous main use.

Table 4-8. Selected bio-physical and institutional variables for the Chittoor West sample.

ID	VSS NAME	LT	FA	DTF	PFC	PQF	PMU	EP	PG	FP
301	Krishnapuram	8	345	34	3.1	3	4	1.000	2	1
302	Nadimuru	8	200	29	5.2	3	3	0.857	1	0
303	Jowkupalli	7	150	48	5.9	4	4	0.900	3	0
304	Kudavagadda	7	200	31	6.4	2	1	0.917	2	0
305	Muddanapalli	10	500	28	4.6	2	1	0.846	2	1
306	Urinayanipalle	3	200	41	6.2	2	4	0.824	4	0
307	Diguvathanda	5	200	23	2.8	3	1	0.750	2	0
308	Kondakindaindlu	7	402	18	7.8	3	1	0.706	2	0
309	Mudiveducross	7	265	24	1.4	4	1	1.000	2	1
310	Papepalli	3	199	54	3.9	2	1	0.800	2	0
311	Rajugaripalli	8	457	52	2.5	4	1	0.867	2	0
312	Siddhartha Colony	7	287	56	3.9	3	4	0.938	2	1
313	Atukurallapalle	7	390	32	2.3	3	1	0.889	2	0
314	Chappidipalle	7	300	37	3.1	3	1	0.571	2	0
315	Motlapalle	9	300	32	2.7	2	1	0.412	2	0
317	Pengaragunta	9	521	46	2.8	3	1	0.667	3	1
318	Adivilopalle	9	350	41	3.8	4	1	0.667	3	0
319	Gowthumakulapalle	3	200	42	3.4	2	1	0.571	3	0
320	Singiriguntapalle	7	380	35	8.7	2	1	0.444	1	1
321	Irlapalli (81)	12	390	41	9.6	2	4	1.000	1	0
	Mean	7.4	312	37	4.3			0.781		0.30
	Standard Deviation	2.1	111	2.1	0.4			0.18		0.47
	Coeff. of Variation	0.28	0.35	0.06	0.09			0.23		1.57
	Mode					3	1	1.000		
	Median					3.0	1.0	0.835		

The range of the equity in participation (EP) proxy is 0.412 to 1.0, with a mean of 0.781. EP values less than or equal to 0.75 are recorded for eight VSS villages. The magnitude of the

mean is less than the mean EP for both Adilabad (0.867) and Visakhapatnam (0.839). Table 4-8 indicates that 75% (15 VSS) report PG values of either "1" or "2", indicating that the relationship of the EC with the APFD officer was either very good or good. Four VSS record a PG value of "3" (i.e., "fair" relationship). The only VSS to report a "bad" relationship is Urinayanipalle—during our interview they accused the Forest Beat Officer of serious bribery and corruption charges.

The FP dummy indicates that a formal patrol or a watchman is employed in only six VSS (30%) of the sample from Chittoor West. This percentage is lower than in both the Adilabad (44%) and Visakhapatnam (40%) samples.

Summary

Direct examination of the economic and distributional impacts of JFM/CFM over time would ideally be made using a panel of data. As this was not possible, analytical focus is placed upon factors influencing the relative success of JFM/CFM that can be captured with cross-sectional data. Models representing different dimensions of social welfare are analyzed using economic indicators as dependent variables. The overarching purpose of such regressions is to evaluate selected explanatory variables for their contribution, or lack thereof, to the ability of JFM/CFM to reduce poverty and inequality. Highlighting key relationships that drive or hinder this ability is important for providing empirical evidence to researchers seeking to refine the facilitating institutions of JFM/CFM, or similar forest management programs. Results derived from the regression models specified in the first section of this chapter are presented and discussed in the following chapter.

CHAPTER 5
RESULTS AND DISCUSSION

Introduction

This chapter presents, discusses, and summarizes the estimation results of the study. Table 5-1 contains the mean, standard deviation, maximum, and minimum for all of the variables used in the regressions. The total number of observations for the data set is 58 VSS villages. The logged average consumption model (ln μ) model and the poverty-gap ratio (PGR) model both provide good results. For the ln μ regression, the joint test for all parameter coefficients equal to zero is $F_{(19, 38)} = 10.83$, with a p-value[13] of 0.0000. For the PGR regression, the LR $Chi^2(19) = 110.99$ with a p-value of 0.0000. These results indicate that the null hypothesis (H_0: all coefficients = 0) for each regression is rejected. In contrast to these two models, the null hypothesis that all coefficients equal zero cannot be rejected for the consumption inequality (ln γ) regression: $F_{(18, 39)} = 1.11$ ($p = 0.382$); indicating the overall results of this regression are very poor. The estimation results for each variable of the three regressions are displayed below in Table 5-2; the statistically significant coefficients (and their p-values) are highlighted in bold type for $p \leq 0.050$.

The regression results will only be discussed briefly for the inequality equation, while the results for the consumption and poverty regressions will be examined in further detail in the sections that follow; included are brief interpretations of the results and supporting analyses (e.g., correlations and joint significance tests) for selected variables. After a discussion of the results of the economic models, the results of an auxiliary model are presented which explain changes in forest quality under JFM/CFM in Andhra Pradesh. Unlike the previous models, the unit of

[13] The probability value (or p-value) is defined by Gujarati to be "the lowest significance level at which a null hypothesis can be rejected" (1995, p. 132). It can also be thought of as the exact probability of committing a Type-I error (i.e., the probability of rejecting a true hypothesis).

analysis is the household and the dependent variable proxies for the effects of forest restoration. The chapter concludes with a detailed discussion of the length of time (LT) variable and its impact on average consumption and forest quality.

Table 5-1. Basic statistics for VSS-level regression analyses (58 observations).

Variable	Variable Description	Mean	Std. Dev.	Maximum	Minimum
Dependent:					
μ	Mean per-capita household consumption	6,850	2,236	12,232	3,474
$\ln \mu$	Natural log of μ	8.7804	0.3242	9.4118	8.1531
γ	Gini coefficient	0.2476	0.0553	0.3777	0.1097
$\ln \gamma$	Natural log of γ	-1.4224	0.2389	-0.9737	-2.2100
PGR	Poverty-gap ratio	0.0421	0.0551	0.2648	0
Explanatory – Demographic:					
N	Number of households	137	210	1,362	12
ST	Scheduled Tribes village (dummy)	0.483	0.504	1	0
EDU	Mean HH education level	2.474	1.018	4.670	0.321
NGO	NGO assistance for forestry (dummy)	0.724	0.451	1	0
DGI	DWCRA group index	0.050	0.024	0.118	0
Explanatory – Economic:					
YFP	Income from forest products	1,930	3,033	15,408	0
YAL	Income from agriculture and livestock	5,970	5,215	23,669	95
YOS	Income from other sources	12,073	6,442	31,539	255
IHW	Investment per HH for VSS works	6,118	6,735	27,388	411
TRN	Number of training events	5.05	2.15	12	1
Explanatory – Bio-physical:					
LT	Length of time under JFM or CFM	7.50	1.99	12	2
FA	VSS forest area size	248	132	621	40
RRE	VSS forest area per member	3.44	3.22	15.25	0.15
PFC	Percent forest product consumption	4.59	2.55	11	0.3
DTW	Depth to groundwater	188	157	500	0
Explanatory – Institutional:					
VBA	VSS boundary awareness ratio	0.232	0.140	0.579	0
GAI	General awareness of institutions	2.303	0.692	4.5	0.700
CCA	Collective-choice arrangements proxy	0.653	0.144	1	0.273
FP	Formal patrol dummy	0.379	0.489	1	0
GS	Graduated sanctions dummy	0.621	0.489	1	0

Table 5-2. Estimated regression coefficients and associated p-values.

	ln μ model		ln γ model		PGR model	
Variable	**Coefficent**	**P-value**	**Coefficent**	**P-value**	**Coefficent**	**P-value**
N	-0.000267	0.218	0.000077	0.803	--	--
ST	**0.197503**	**0.018**	0.133558	0.271	**-0.053690**	**0.001**
EDU	**0.101853**	**0.019**	-0.054342	0.378	-0.002280	0.750
NGO	0.101585	0.188	--	--	**-0.045400**	**0.012**
DGI	1.01758	0.410	0.782015	0.646	-0.504483	0.052
YFP	-0.000004	0.708	-0.000024	0.161	0.000001	0.456
YAL	0.000007	0.297	-0.000001	0.952	0.000001	0.592
YOS	**0.000015**	**0.021**	0.000009	0.307	**-0.000004**	**0.000**
IHW	**-0.000009**	**0.026**	-0.000008	0.166	**0.000002**	**0.022**
TRN	0.010360	0.398	**-0.039771**	**0.036**	--	--
LT	**-0.204649**	**0.016**	0.097490	0.418	0.012810	0.259
LT2	**0.013876**	**0.010**	-0.005351	0.478	-0.001013	0.175
FA	-0.0001683	0.504	-0.000013	0.972	--	--
RRE	--	--	--	--	**0.005740**	**0.000**
PFC	**-0.050075**	**0.001**	-0.015716	0.435	**0.012500**	**0.000**
DTW	0.000174	0.481	-0.000030	0.934	**-0.000097**	**0.026**
VBA	--	--	--	--	-0.056620	0.152
GAI	0.049750	0.179	--	--	--	--
CCA	**-0.471046**	**0.020**	0.011689	0.968	**0.135157**	**0.000**
FP	--	--	0.121990	0.117	-0.010741	0.239
GS	--	--	--	--	-0.012444	0.198
ADIL	**0.431535**	**0.000**	**-0.257758**	**0.042**	**-0.130066**	**0.000**
CHIT	-0.146724	0.177	-0.104503	0.513	**-0.034326**	**0.031**
_CONS	**9.18943**	**0.000**	**-1.47981**	**0.009**	0.044168	0.443

Economic Models

Average Consumption Model

Including a constant, twenty explanatory variables are regressed on the natural log of μ, which measures mean per-capita household consumption and is hereafter referred to as "average consumption" (recall that average consumption is used in this study to measure the economic

component of social welfare, per Equation 4-4). The regression was tested for omitted variable bias using the Ramsey RESET test; the null hypothesis (H_0: no omitted variables) could not be statistically rejected ($p = 0.668$). As the presence of heteroskedasticity is possible, most likely due to the income variables, the Breusch-Pagan/Cook-Weisberg test was applied. However, the null hypothesis of constant variance could not be statistically rejected ($p = 0.657$) either. The adjusted R-squared value of 0.766 indicates that the model is successful in explaining a large portion of the variation observed in the logged values of μ. Ten of the twenty variables analyzed were statistically significant at p-values ≤ 0.050. These variables are discussed individually in the paragraphs that follow.

The Scheduled Tribes dummy (ST) is statistically significant ($p = 0.018$) with a positive sign on the coefficient. This indicates that ST-designated VSS villages are associated with higher values of mean per-capita household consumption, which supports the *a priori* expectation that ST-designated VSS are likely to have benefited economically from other tribal welfare programs.

The coefficient on EDU (educational index) is statistically significant ($p = 0.019$), with the anticipated positive sign. Thus, higher mean education levels are correlated with economically higher levels of average consumption. This is consistent with the expectation that an increase in human capital through education will translate into economic benefits to a community.

As expected, income from other sources (YOS) is statistically significant ($p = 0.021$) with a positive sign on the coefficient. Thus, an increase in YOS will result in higher levels of average consumption for the VSS in the sample. Although YOS includes income from household enterprises and remittances, this variable is mainly comprised of employment income derived outside the household. Therefore, this estimation result indicates that local employment

opportunities are an economically significant component of the welfare and development of the VSS sampled. Of the three income variables, only YOS is statistically significant. However, a positive Pearson correlation coefficient ($r = 0.279$) between YOS and YAL (income from agriculture) indicates a complementary relationship between these two variables. Indeed, employment income for many households is derived from providing agricultural labor to other farms; YAL is jointly significant with YOS: $F_{(2, 38)} = 3.34$ ($p = 0.046$).[14]

The IHW variable proxies for external investment in VSS villages in the form of average wages paid (per household) for VSS works projects. This variable is statistically significant ($p = 0.026$) in the regression; however, the negative sign contradicts the *a priori* expectation that external investments will increase average consumption. This result may signify that poorer VSS villages have been targeted to receive greater amounts of assistance money. (The same argument can also be applied to Scheduled Tribes villages). The rationale for this might be that other economic opportunities are relatively limited. This interpretation is supported by negative correlations of IHW with both YAL ($r = -0.247$) and YOS ($r = -0.229$), and the joint statistical significance ($p = 0.023$) of these three variables.

The length of time (LT) variable and its squared term (LT2) are significant with p-values of 0.016 and 0.010, respectively. These variables are jointly significant: $F_{(2, 38)} = 4.06$, with a p-value of 0.025. LT has a negative coefficient, while LT2 has a positive coefficient. The observed signs of the coefficients were opposite of what was expected. Instead, the estimation results indicate a convex (i.e., U-shaped) relationship between and the length of time under the JFM/CFM program; average consumption initially declines before increasing as the cross-section

[14] The degrees of freedom available precluded the testing of interaction terms. Joint significance tests using linear restrictions on the models were used to determine whether or not selected groups of variables had collective explanatory power.

of the VSS sample increases in "age". This relationship is explored in further detail at the end of this chapter.

The variable PFC is negative and highly statistically significant (p = 0.001), meaning that as forest consumption (as a percentage of total consumption) decreases, average consumption also increases. This is expected because PFC is used as a proxy for forest dependency. As the collection of forest products (particularly NTFPs) has a high opportunity cost in terms of time, greater dependency on forest resources likely signifies a lack of other remunerative opportunities. Empirical data presented by Reddy and Chakravarty (1999) show that forestry income is important for poor households, especially those that own less land. However, Heltberg (2001) used a measure of forest dependency as a dependent variable in a study of forest conservation and management, instead of as an explanatory variable. As this raises the possibility of PFC being an endogenous variable, a Wu test was performed. The endogeneity of PFC was statistically rejected.[15]

The collective-choice institutional proxy (CCA) is statistically significant (p = 0.020) and has a negative sign, which is opposite of the *a priori* expectation that VSS villages that actually place an emphasis on forest-dependent households would have a positive influence on average consumption. However, the negative sign of this variable might reflect that the CFM institution being proxied has more relevance in the poorer VSS villages for which CFM is designed and oriented towards.

The location dummy ADIL is highly statistically significant (p = 0.000) with a positive coefficient, while CHIT (p = 0.177) is statistically insignificant. This means that the Chittoor

[15] A Wu test was performed by regressing PFC on some of the exogenous variables of the equation and some other available variables. The predicted values of PFC were then placed in the original equation. The coefficient of PFC-hat was statistically insignificant (p = 0.828), indicating there is no correlation of PFC with the error term.

sample cannot be statistically distinguished from the Visakhapatnam sample in terms of average consumption, while the Adilabad sample is statistically distinct. Specifically, the VSS villages of the Adilabad sample are economically better off (as measured by average consumption levels) than those of the Visakhapatnam and Chittoor samples: for example, the data show that 60% (24 of 40) of the VSS villages of the combined Visakhapatnam and Chittoor samples have average consumption levels that are less than those in the Adilabad sample ($\ln \mu = 8.705$). This regional effect could be one reason why the coefficient of the ST variable is positive and significant. In terms of average consumption, the nine ST-designated VSS of the Adilabad sample rank above all but four or the nineteen ST-designated VSS of the other two regional samples. This seems to exert a positive influence on the direction of the relationship, even though the correlation coefficient between ST and $\ln \mu$ is negative ($r = -0.294$).

Several variables that display no statistical significance are somewhat surprising. The size of the VSS village (N) was predicted to have a positive relationship with average consumption. In general, the economic activity of a given village should be more robust the greater number of households. Income from forest products (YFP) was expected to have a negative association with average consumption, because poorer VSS villages are more likely to be dependent on forestry related income than other VSS villages. Such an association was observed by Reddy and Chakravarty (1999) in their study of poverty and inequality in Uttar Pradesh, India. Except for the VSS villages of the Visakhapatnam sample, however, income from forest products was found to play a relatively small economic role in most of the VSS sampled; perhaps the statistical insignificance of YFP should have been expected for this reason.

It is interesting to note that YAL (income from agriculture) shows no statistical significance in this regression because agriculture generally plays an important role in the local

economies of rural Andhra Pradesh. A possible explanation for this result is that home consumption of agricultural products is predominant in many households (i.e., many households are subsistence-oriented). As such, many of the households that were sampled only produced small surpluses (if any) available to be marketed. Thus, many agricultural households often showed little or no income. This effect may be enough to effectively blunt any statistical relationship between YAL and average consumption.

Consumption Inequality Model

The inequality model regresses nineteen explanatory variables on the natural log of the Gini coefficient (γ), which is an economic measure of inequality (in this study, consumption is the basis for measuring the Gini coefficient). Tests for omitted variable bias and heteroskedasticity were statistically rejected; however, the results displayed in Table 5-2 show that this model is almost completely devoid of any explanatory power. The statistical insignificance of most of the variables is unlikely due to multicollinearity, as this property was only detected for the LT and LT2 variables, which (as expected). The only variables found to be statistically significant, in addition to the constant term, are TRN (training events) and ADIL (Adilabad dummy). Although the overall F-test rejects the model, these two variables are briefly discussed.

TRN ($p = 0.036$) is significant and negative, indicating lower values of inequality are associated with VSS villages that reported relatively more training for their VSS members. This may be indicative of CFM having a beneficial effect on VSS equity, but the statistical insignificance of LT and LT2 cast some doubt on such an interpretation. Furthermore, joint significance tests for TRN and LT ($p = 0.101$) and for TRN, LT, and LT2 ($p = 0.199$) do not indicate any collective explanatory power for these groupings. The negative sign on ADIL (p =

0.042) means that the VSS villages of the Adilabad sample have less inequality than the VSS sampled in either Visakhapatnam or Chittoor. Due to the non-significance of the CHIT variable, the latter two samples cannot be distinguished statistically in terms of inequality.

The results of this model are surprising because almost every explanatory variable was statistically insignificant. That some variables would display no impact on inequality was not unexpected due to the complex nature and interaction of distributional issues; however, it was expected that at least some of the demographic variables and perhaps one of the income variable would register an appreciable impact on inequality. In particular, the variables ST, EDU, and YOS were predicted to have a significant negative relationship with inequality.

Poverty-gap Ratio Model

The third regression model includes twenty explanatory variables regressed on PGR, the poverty-gap ratio. As shown in Equation 4-8a, PGR is based on per-capita household consumption, and essentially measures the degree of poverty for those VSS villages having at least one individual below the poverty line. Thus, the measured poverty-gap ratio will be larger for greater levels of poverty and zero for those VSS villages that had no sampled households below the poverty line. Because nearly a third (18 of 58 observations) of the VSS villages sampled have no households below the poverty line, their PGR values are equal to zero.[16] This means that these 18 observations are censored at zero, which necessitates the use of Tobit estimation to overcome the bias that censoring creates. The estimation results are shown in Table 5-2; ten of the independent variables have statistically significant coefficients

The Scheduled Tribes dummy (ST) is statistically significant ($p = 0.001$) with a negative sign on the coefficient. This means that ST-designated VSS are more likely to be less poor than

[16] The observed maximum PGR value in the sample is 0.2648 (Table 5-1). The theoretically potential maximum value of PGR is 1, which is essentially equivalent to all individuals in a village having zero consumption.

other VSS with households below the poverty line. As with the ST variable in the average consumption equation, this result is likely due to the presence of other tribal welfare programs. For example, several remote tribal communities that were surveyed in the Visakhapatnam district were being served by an European Union-supported project implemented by the Indian branch of CARE, which is an international non-governmental organization (NGO).

The NGO variable is also statistically significant ($p = 0.012$) and negative. This sign was anticipated and suggests that the involvement of NGOs that provide forestry assistance to VSS communities contributes to lower levels of poverty. This is somewhat difficult to explain given the non-significance of some of the other forestry-related variables (e.g., LT, YFP, etc.), but may instead reflect an influence that is indirect and not readily observed.

YOS is highly statistically significant ($p = 0.000$) with a negative coefficient. This sign was anticipated, and means that income derived from sources (mainly employment) other than forestry or agriculture are more important among the less poor VSS that have households below the poverty line.

The external funding proxy (IHW) is positive and statistically significant ($p = 0.022$). The sign on IHW does not agree with the *a priori* expectation that external money for VSS works has a positive effect on poverty alleviation. As with the average consumption model, however, this result may simply mean that poorer VSS villages have received greater amounts of assistance money (via wages for VSS works) per household.

The coefficient on RRE (relative resource endowment) is positive and statistically significant ($p = 0.000$), which is contrary to *a priori* expectations. Thus, higher levels of poverty are associated with higher values of per-member VSS forest area. This suggests that larger VSS forest areas are being allotted to the poorer VSS villages, per the development objectives of the

CFM program. Support for this proposition is found by observing the correlation coefficients between average consumption (μ) and the VSS forest area size (FA). Although the correlation for the pooled sample (r = -0.137) is weak, both of the correlations of FA with the Adilabad sample (r = -0.429) and the Visakhapatnam sample (r = -0.493) are much stronger.

Percent forest consumption (PFC) is highly significant (p = 0.000) and positive, as predicted. This signifies the poverty level of a given VSS village is higher the greater is the forest dependency. In conjunction with the strong statistical significance of PFC in the average consumption equation, this result reinforces the contention that forest dependency is a good proxy for socio-economic status.

DTW (depth to water) is significant (p = 0.026) and negative, which is also contrary to the predicted result. This result suggests that higher depths to groundwater are associated with less poverty among the VSS having at least some households below the poverty line. This could be the case if, for a given VSS village, irrigation from deep bore-wells is only possible for households that are economically better off. In general, VSS villages with high DTW values are likely to be relatively more reliant on other sources of income than income from agriculture; recall that YOS is also statistically significant in this regression, also.

The CCA (collective-choice proxy) variable is statistically significant (p = 0.000) and has a positive sign, which is opposite of the *a priori* expectation that VSS villages placing an emphasis on forest-dependent households would have a beneficial influence on poverty. Like CCA in the average consumption equation, the "wrong" sign of this variable may only mean that the proxied institution is associated with the poorer VSS villages for which CFM is designed and oriented towards.

Both location dummies in the PGR regression model are statistically significant. The negative signs on ADIL (p = 0.000) and CHIT (p = 0.031) signify that the poorest VSS in the Adilabad and Chittoor samples are notably less poor than the poorest VSS villages of the Visakhapatnam sample (e.g., these four VSS villages are located in the mountainous Araku valley area of northern Visakhapatnam district, near the border with the state of Orissa).

Forest Quality Change Model

With the exception of the inequality equation, the above models provide a reasonable amount of statistically significant variables that explain the variation in observed measures of average consumption and the poverty-gap ratio. Most of these variables are of the demographic, economic, or bio-physical type. Only one is an institutional variable (CCA). Despite the statistical significance of CCA (with an unexpected coefficient sign), the other institutional variables included in the three regressions had no explanatory power. As these variables either directly describe, or act as a proxy for, various institutional factors directly related to CFM in Andhra Pradesh, one may conclude that they exert no influence on average consumption, inequality, or poverty in the sample.

It is important to note, however, that the three economic indicators serving as dependent variables are not direct outcome variables in terms of measuring the success of the JFM/CFM program. Such a variable would need to quantify forest productivity changes, or perhaps income derived from forests over time. Therefore, it seems entirely plausible that the institutional variables would be statistically insignificant in the models that explain economic outcomes.[17]

[17] This may also be why some of the statistically significant program-related explanatory variables (e.g., IHW, CCA, RRE) show coefficient signs that contradict the *a priori* predictions. The average consumption and PGR regressions may be capturing relationships with these variables that are *descriptive* in nature, as opposed to relationships that might otherwise be hypothesized (and inferred) as causal—especially if the data were time-series or panel data, instead of cross-section data. For example, it was suggested earlier that poorer VSS villages may have received more external monetary assistance (IHW) in an effort to compensate their relatively lower economic status. This is

Thus, an alternative model with a different dependent variable is required in order to better analyze the suite of institutional variables listed in Table 5-1.

The household survey provides data on forest quality that can be used as an outcome, or performance, variable for the JFM/CFM program. Forest quality change (FQC) is likely to be more directly influenced by the program institutions described in Chapter 2 than were the previous dependent variables that measured economic outcomes. Thus, a fourth model was analyzed using many of the same explanatory variables; this equation is based on household-level data from which a measure of forest quality change under JFM/CFM can be calculated.

The dependent variable, FQC, is derived from two subjective questions in the household questionnaire that separately inquired about: (1) the level of forest quality prior to JFM or CFM in their village, and (2) the current level of forest quality in the forest area being protected by the VSS. Respondents were presented with responses representing the subjective quality rating of the VSS forest area, which were coded as follows: 1 = good, 2 = slightly degraded, 3 = degraded, and 4 = very degraded. As the same scale was used for both the prior and current forest quality levels, an FQC value was obtained for each household by subtracting the current quality rating from the prior quality rating. The highest possible level of positive forest quality change (i.e., FQC = 3) is recorded if the respondent indicated a "very degraded" prior quality and a "good" current level of forest quality. The potential range for FQC is -3 to 3, although the survey data actually yield a six-category scale that ranges from -2 to 3.

An ordered probit model was used for this auxiliary regression because the discrete values of the dependent variable render ordinary least squares as a poor choice to model the subjective forest quality change. The ordinal nature of the dependent variable requires a model structure

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perhaps why the relationship between IHW and average consumption is negative, when economic theory would suggest a positive impact.

that allows the data to be analyzed by utilizing the cumulative normal function to represent the probabilities that each discrete category (e.g., forest quality change) is observed.

There are a total of 815 usable observations (only VSS-member households were asked questions regarding CFM), with all 58 VSS villages represented as primary sampling units from which the households were randomly selected. The standard errors of the parameter coefficients were corrected for the effects of clustering at the village-level; this cluster correction simultaneously corrects for any heteroskedasticity that may be present as well (StataCorp, 2005). Thus, the design degrees of freedom for the model is 57, and the effective degrees of freedom for the regression equation is 39 (58 clusters less 19 explanatory variables) instead of 796. The joint test for all coefficients equaling zero is $F_{(19, 39)} = 13.12$, which has a p-value of 0.000. This indicates that the regression has statistical validity, despite the fact that only 8 of the 19 explanatory variables (42%) are statistically significant at $p \leq 0.050$.

The model only predicted slightly more than half of the values correctly. This can be observed in Table 5-3, which shows the joint frequency of the actual FQC data versus the predicted values. The 409 correct predictions are highlighted in bold type.

Table 5-3. Actual versus predicted Forest Quality Change (FQC) values.

Actual FQC	**Predicted FQC values**					
	-1	**0**	**1**	**2**	**3**	Total
3	0	0	16	8	**1**	25
2	0	3	155	**28**	2	188
1	0	39	**338**	40	0	417
0	1	**40**	87	2	0	130
-1	**2**	35	16	0	0	53
-2	0	0	2	0	0	2
Total	3	117	614	78	3	815

Comparison of the row and column totals indicate that the predicted values are more concentrated in the FQC = 1 category than are the actual values, and less so in the other

categories. In terms of the prediction bias, a net of 66 observations moved from higher categories (i.e., FQC = 2 or 3) into "Predicted FQC = 1" than from the lower categories. The percentage of correctly predicted FQC = 1 values is relatively high (81%) while the correctly predicted FQC = 0 values is relatively low (31%), although the total predicted (117) is similar to the number of actual FQC = 0 values (130).

There are eight (42%) statistically significant variables in this regression, including the length of time variable and its square (i.e., LT and LT2). The other variables are relative resource endowment (RRE), prior-use value (PUV), micro-plan reflects forest users (MRFU) dummy, access regulations clearly understood (ARCU) dummy, graduated sanctions (GS) dummy, and the Adilabad (ADIL) dummy. Unlike the previous regressions, the estimated parameter coefficients of the ordered probit model cannot directly be used to evaluate the impact of the explanatory variables on the dependent variable.[18] Instead, one has to calculate the marginal effects of each independent variable on the probability of being selected into each of the response categories (e.g., FQC = 2). Table 5-4 presents the marginal effects and p-values for the statistically significant variables listed above (except LT and LT2, which are discussed later), and for five of the six FQC response categories.

RRE is negative and statistically significant ($p \leq 0.025$) for two of the positive FQC categories. This indicates that an increase in the relative size of the VSS forest area (measured in ha per member) will decrease the probability that a VSS village will be selected into the FQC = 1 category or be selected into the FQC = 2 category (i.e., a one to two category impact to forest quality under JFM/CFM). RRE is also positive and statistically significant ($p \leq 0.012$) in both of the non-positive FQC categories displayed in Table 5-4, which means that an increase in the size

[18] For this reason, the parameter coefficients are not presented as before. The more meaningful results to present are the marginal effects; these are calculated and presented for the statistically significant variables of the regression.

of the VSS forest area per member will increase the probability that a VSS village will be selected into either the FQC = 0 or FQC = -1 category (i.e., forest quality did not change or got worse under JFM/CFM). Taken together, the marginal effects coefficients for RRE support the inference that smaller-sized VSS forest areas per member are more likely to have positive changes in forest quality. This interpretation is plausible considering the monitoring required for successful management, as well as the restorative works projects undertaken. Smaller resource endowments allow for relatively more intensive monitoring and physical improvements.

Table 5-4. Estimated marginal effects and p-values on categorical probabilities.

Variable	Prob. [FQC = 3]	Prob. [FQC = 2]	Prob. [FQC = 1]	Prob. [FQC = 0]	Prob. [FQC = -1]
RRE	-0.000879 p = 0.081	-0.012120 p = 0.008	-0.004428 p = 0.025	0.011269 p = 0.011	0.006133 p = 0.012
PUV	0.000002 p = 0.034	0.000034 p = 0.009	0.000012 p = 0.050	-0.000031 p = 0.018	-0.000017 p = 0.009
MRFU	0.009628 p = 0.067	0.137789 p = 0.002	0.078048 p = 0.073	-0.135794 p = 0.010	-0.089142 p = 0.035
ARCU	0.005342 p = 0.058	0.078045 p = 0.002	0.038670 p = 0.007	-0.076127 p = 0.002	-0.045707 p = 0.008
GS	-0.006964 p = 0.116	-0.086305 p = 0.004	-0.022402 p = 0.012	0.076009 p = 0.003	0.039506 p = 0.005
ADIL	-0.023280 p = 0.048	-0.246004 p = 0.000	-0.085030 p = 0.003	0.214743 p = 0.000	0.138633 p = 0.000

Note: The Probability of FQC = -2 category is not shown because all of the marginal effects were statistically insignificant ($p \geq 0.349$).

PUV is the prior-use value (ex-ante JFM/CFM) of the forest area currently under VSS protection, as reported by each VSS-member household interviewed in the survey. It is an estimate of the total value of products collected, consumed, and/or sold (by the household) from the VSS forest area in the year prior to its protection under JFM or CFM. This variable controls for the baseline quality and productivity level of the forests area being protected and

rehabilitated. PUV is positive and statistically significant ($p \leq 0.050$) for the three positive FQC categories, significant and negative ($p \leq 0.018$) for the two negative FQC categories. As one would expect, this indicates that the more productive the forest area was prior to VSS protection, the greater is the probability of a positive forest quality change.

MRFU is the household-level equivalent of the CCA variable that was analyzed in the VSS-level regressions. MRFU is a dummy that equals one if respondents indicate that forest-dependent households are being served by the VSS micro-plan. Previously it was shown that CCA has explanatory power in both the average consumption and poverty-gap ratio models, although the signs of the coefficients were different than predicted. In the FQC model, the marginal effects coefficient MRFU is positive and statistically significant ($p \leq 0.002$) only for the FQC = 2 category. The positive marginal effects for the other positive categories (i.e., FQC = 3 and FQC = 1) are significant only at $p \leq 0.073$. Both of the negative FQC categories have marginal effects coefficients that are negative and significant at $p \leq 0.035$. Thus, there is some evidence to suggest that VSS with management plans oriented towards households that are more forest-dependent are more likely to have positive changes in forest quality.

The ARCU variable is also a dummy. ARCU is equal to one if the access regulations regarding entry to the VSS area are clear and easy to understand, as indicated by household respondents, and zero otherwise. Thus, this is a proxy for one aspect of the "clearly defined boundaries" design principle. The marginal effects coefficients for ARCU are positive and statistically significant ($p \leq 0.007$) for the FQC =2 and FQC = 1 categories, and negative and statistically significant ($p \leq 0.008$) for the negative FQC categories. This signifies that "access awareness" in a VSS village increases the probability of a positive change in forest quality from JFM/CFM.

The graduated sanctions (GS) variable is negative and statistically significant ($p \leq 0.012$) for the FQC = 2 and FQC = 1 categories, and positive and significant ($p \leq 0.005$) for the negative categories in Table 5-4. In theory, the presence of graduated sanctions ought to have a positive impact on the success of JFM/CFM. In practice, however, the graduated sanctions mechanism is largely unobserved by most VSS members—as there have been very few (if any) rules violations by community members in most of the VSS that were surveyed. Repeat offenders seem to be rare, as well. Thus, it is difficult to know exactly what GS represents at the field level; it could perhaps serve as a proxy for the relative level of complexity or "sophistication" of the local VSS institutions.

The regional dummy ADIL is negative and statistically significant ($p \leq 0.048$) for all three of the positive FQC categories, and positive and significant ($p \leq 0.000$) for both of the negative FQC categories shown. This indicates that VSS villages of the Adilabad sample are more likely to be selected into the negative FQC categories. The CHIT dummy was not statistically significant; thus, the Visakhapatnam and Chittoor samples are statistically indistinguishable from each other with respect to change in forest quality.

Discussion of the Effect of Time under JFM/CFM

Aside from the institutional variables, which are discussed in further detail in the next chapter (which examines CFM adherence to the Ostrom design principles), the most important variable analyzed by this study is LT. This variable represents the length of time that a given VSS has officially practiced JFM or CFM (as registered with the APFD). Paired with its square term (LT2), this variable appears in all four of the regressions presented above—and is statistically significant in two of the four. In the average consumption ($\ln \mu$) equation, the statistically significant signs on the coefficients for LT (–) and LT2 (+) signify a convex (or U-

shaped) relationship with average consumption; such a relationship is indicative of an initial decline in the economic welfare of VSS age-cohorts, followed by an eventual increase as the length of time under JFM/CFM increases.

The suggestion, however, that this quadratic representation of LT—and by inference JFM/CFM—has a definitive economic influence on VSS villages in the sample is, by itself, rather weak. This is because the inference of any causal relationship between average consumption and LT must be made with caution, for at least two reasons. First, regression results alone give no assurance that a particular relationship is causal. Thus, there must be some underlying basis to assert that a statistical association implies a causal relationship. Second, unlike time-series or panel data, the data at hand are not tracking VSS villages dynamically through time. If they were, there would be a solid basis on which to infer causality. Given these concerns, the statistical link identifying a consumption–duration (i.e., ln μ–LT) relationship is either valid or an artifact of the data in which the association of the variables is more descriptive in its essence. In either case, additional evidence is required to establish a more robust interpretation of the relationship between LT and either average consumption or forest quality change. Each will be explained further in turn.

Average Consumption Model

The imposition of JFM/CFM institutions theoretically places severe restrictions on access and/or use of the VSS forest area that has been designated for restoration. If forest resource benefits are still able to be derived from the VSS forest area at the inception of the JFM/CFM program in a given village (i.e., LT = 0), then it is plausible that the flow of such benefits will be reduced in the near-term (e.g., LT = 2 to 5) as forest resources are conserved through access restrictions, etc. Once forest productivity has increased to a level that permits some sustainable

extraction (e.g., LT > 7), economic benefits ought to increase as forest products are once again collected. Establishment of additional VSS institutions might also directly impact economic activity in the VSS villages if restrictions on grazing are imposed (which is almost always the case), and/or if forest lands encroached under shifting cultivation are re-established as forest under the protection of the VSS. Both of these examples are important locally.

The introduction to this discussion raised the question of whether or not the inferred economic impact of JFM/CFM (through LT and LT2) on the households of the VSS villages sampled was a valid interpretation. By itself, the statistical significance of these two variables in the average consumption model merely provides evidence for such a link, while the signs indicate the general shape of the relationship (e.g., convex). In order to observe the true nature of the link between LT and mean per-capita household consumption, Figure 5-1 plots the predicted values of μ as a function of LT and while holding the other variables constant.

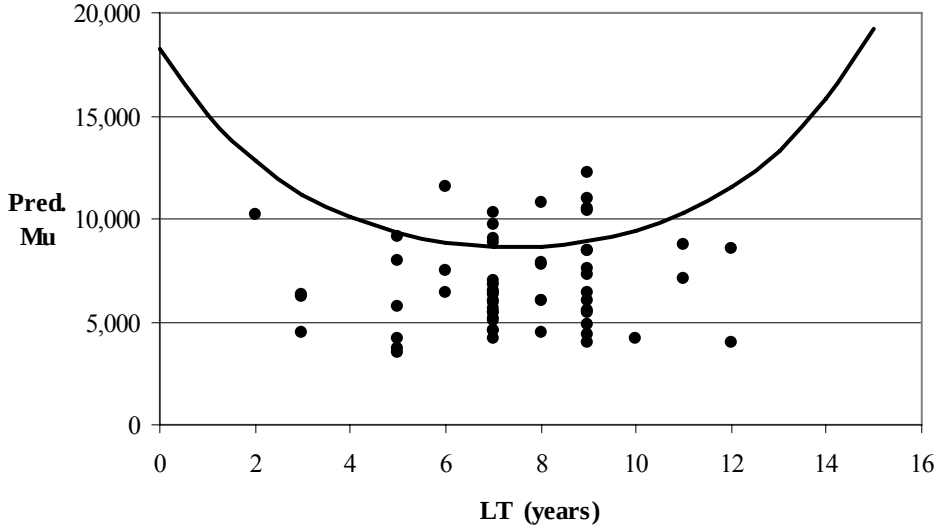

Figure 5-1. Actual μ (dots) and predicted μ (line) in Rupees, versus LT.

This graph confirms the convex relationship implied by the coefficient signs, but also indicates an overall negative impact of JFM/CFM on the mean per-capita household

consumption value of the VSS villages in the sample. The initial steep decline in μ observed for LT = 0 to 4 suggests that the program has an extremely adverse impact on local households in the early years as predicted μ drops nearly 50% by year 4. The marginal impact of the program is zero at 7.35 years and, although there are positive marginal impacts beginning thereafter, the values of predicted μ do not surpass the initial value (at LT = 0) until after year 14. Thus, there seems to be a large opportunity cost of participating in this program.[19]

Although these results are compelling, there are a few caveats to note. First, many of the VSS communities have yet to harvest any timber, while others indicated they do not wish to harvest any. Depending on the species grown, timber harvesting would likely occur after ten or more years of forest protection (or plantation management), which would help to offset the negative impacts of the early years. Second, any positive externalities associated with the program, such as increased groundwater recharge and soil conservation, are unlikely to be captured in this study since the duration under JFM/CFM is too short in the VSS villages sampled. Therefore, it may be that predicted μ at higher values of LT are biased downward.

Another important factor that potentially affects the results can be tested. The consumption of forest products is generally a small fraction of the value of household consumption, usually less than 5%. As μ is ultimately based on consumption values as reported by individual households, the impact of JFM/CFM (through LT) on mean per-capita household consumption might be obscured if a significant number of households do not consume many forest products. Therefore, it is necessary to examine a subset of the data that only includes those VSS villages that are most dependent on forest products. This was accomplished by running a regression on a

[19] Note, however, that the predicted values of μ outside the range of the actual values are likely to have a high level of uncertainty. Moreover, a large majority of the sample data (86%) lies between LT = 5 and LT = 9, which will diminish the confidence in the predicted values of μ for both the low and high values of LT depicted in Figure 5-1.

restricted set of variables for a subset of VSS villages based upon PFC (percent forest consumption) values greater than 4.5 (which is slightly below the full-sample mean of 4.59). LT was statistically significant and positive with a p-value of 0.010 in this regression. The implicit regression equation is: ln μ = f (N, ST, EDU, Y, IHW, LT, FA, PFC, CCA, ADIL), where Y is an aggregation of the three income variables (YFP, YAL, YOS). The adjusted-R^2 is 0.711 for this specification. In Figure 5-2, the predicted values of μ from this subset regression are plotted against LT.

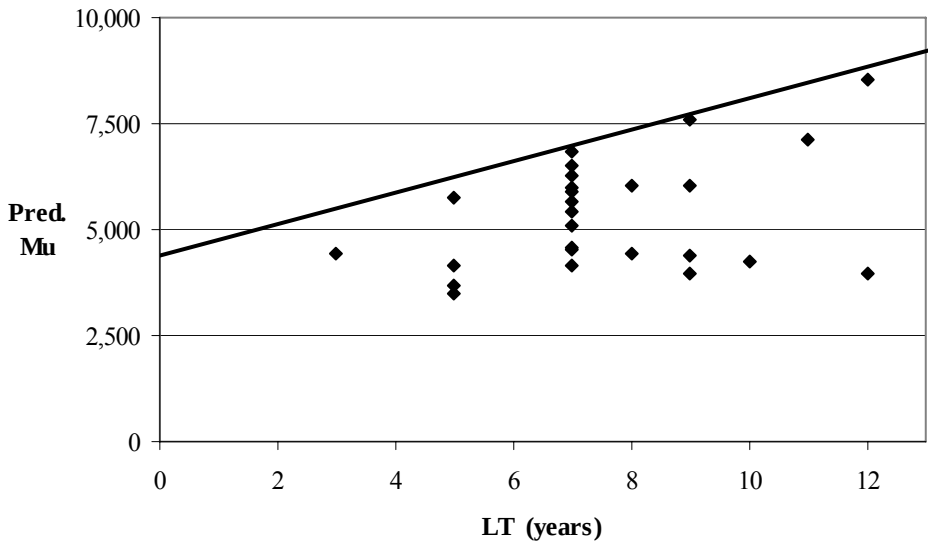

Figure 5-2. Actual μ (dots) and predicted μ (line) in Rupees, versus LT: using a subset of VSS where PFC > 4.5 (n = 26).

The linear prediction in Figure 5-2 controls for the other variables, and a positive relationship between μ and the JFM/CFM program can be inferred. Note that this subset comprised the most forest-dependent VSS villages, and also tends to represent the poorest VSS villages. In addition, the subset sample is comprised of 18 VSS (69%) that are identified as ST-designated VSS villages. Because a key objective of this program is to increase the opportunities and economic well being of the rural poor, the institutional structure of CFM in Andhra Pradesh

has explicitly focused attention on the incorporation of Scheduled Tribes. Thus, the results from this subset provide evidence that the most economically disadvantaged VSS are benefiting from JFM/CFM.

In contrast to the convex pattern observed in Figure 5-1, the positive relationship between μ and the JFM/CFM program observed in Figure 5-2 is more akin to a direct relationship between FQC and LT (discussed in the next section). As such, improved forest quality ought to affect local economic well being in the following manner: as degraded forests with little productive capacity are put under protection through JFM/CFM arrangements, restoration proceeds to the point where the forest resources once again become productive enough to have discernable beneficial effects on the level of household consumption.

Nevertheless, this analysis still calls for some caution. The implementation of JFM/CFM often results in the collection of forest products being shifted away from newly protected areas to nearby forest areas that are unprotected. Some evidence of this was encountered in the household survey, as well as in field observations made by the principal investigator. The result is that while the output of forest products from the VSS forest area is diminished, the observed consumption of forest products may not change much. (The same would be true of income derived from forest products.) This may prevent an accurate assessment of the overall average consumption–LT relationship if significant amounts of forest products are in fact derived from non-protected areas.

Forest Quality Change Model

How might JFM/CFM be positively linked to improved economic well being in the VSS villages sampled in this study? The simple answer, of course, is through improvements in forest quality and productivity that the CFM program is designed to achieve. Consider Table 5-5,

which presents the probability of selection for each FQC category and the compound marginal effects of LT and LT2 on the observed probabilities displayed.

Table 5-5. Probabilities of selection and marginal effects of LT.

FQC	Probability of Selection	Compound Marginal Effects	Standard Error	p-value
3	0.0057	0.57339	0.257	0.029
2	0.1518	1.81799	0.564	0.002
1	0.5849	-0.79101	0.409	0.058
0	0.2008	-1.57306	0.626	0.015
-1	0.0567	2.02957	0.580	0.001
-2	0.0001	-2.05689	0.604	0.001
Total	1.0	0.0	--	--

The desire to link the institutional variables more directly to an outcome variable prompted the inclusion of the FQC regression in the study, but it also provides an opportunity to assess forest quality as a function of the JFM/CFM program. As Table 5-5 illustrates, there is a high probability (74%) that a positive category of FQC will be selected. Moreover, LT and LT2 are also key variables analyzed by the forest quality change regression, and the calculation of their compound marginal effects offers some evidence to support that the length of time of JFM/CFM has a positive impact on the change in forest quality in VSS forest areas. However, the marginal effects of LT on the probability of FQC = 1 are statistically insignificant, despite the fact that this category (i.e., the one indicating a one-category improvement in forest quality) has the highest number of responses and the highest probability of selection. Conversely, the marginal effects of LT for both of the adjacent categories (i.e., FQC = 2 and FQC = 0) are statistically significant at $p \leq 0.015$. Together, these three FQC response categories (i.e., FQC = 2, FQC = 1, and FQC = 0) contain 90% of the total FQC responses (cf. Table 5-3).

Figure 5-3 displays predicted probability as a function of LT for these three FQC categories. This graph illustrates why the marginal effects of LT on the probability of FQC = 1 are statistically insignificant. Following an initial increase in probability in years 0 to 3, the probability declines slightly, from the maximum (36%) at year 4, for several years before rising slightly in the final years of the time period depicted. From the maximum (year 4) to the secondary rise (years 10 to 12), the probability remains in a narrow 5% band; this means that LT has little overall impact on the probability of a one-category improvement in forest quality. The reason for this is unclear, although it may be due to the large number of the FQC values that are predicted as "1" despite the actual distribution of FQC values (cf. Table 5-3). Another likely contributing factor is that nearly three-quarters of the actual FQC values (586 of 815 total observations) correspond to LT values of 7 to 9 years.

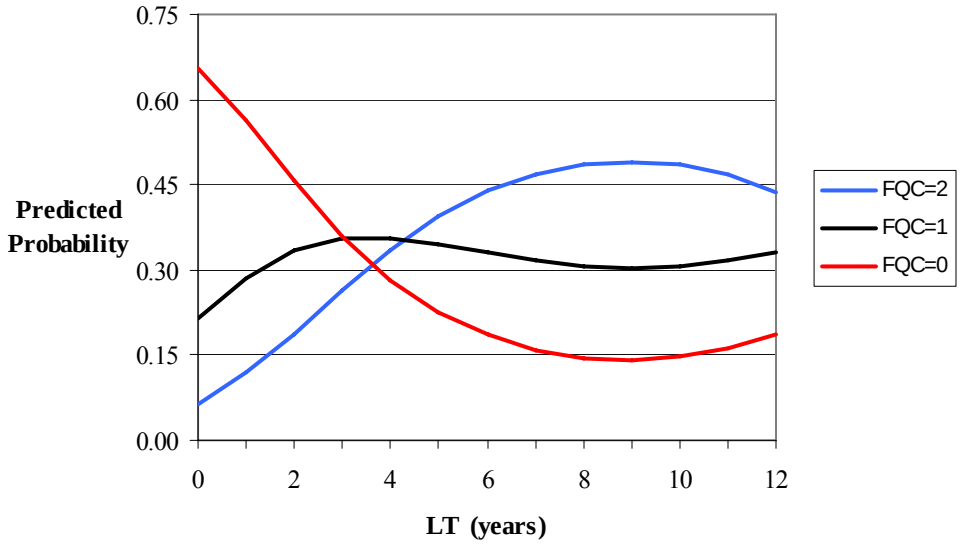

Figure 5-3. Predicted probabilities of FQC values as a function of LT.

In contrast, both of the predicted probabilities for FQC = 2 and FQC = 0 display a salient relationship with LT. The predicted probability of FQC = 2 increases steadily with LT and reaches a maximum (49%) in year 9 before declining somewhat thereafter. The opposite is

observed for the predicted probability of FQC = 0. The initial probability of zero forest change being reported is well over 60%; this value falls steadily until year 9 when it reaches a minimum of 14%, and begins to increase beyond this point. Note that each of the curves flatten and change direction in the same time period (years 8 to 9), and the point at which the derivative equals zero is the same (i.e., year 9). This might indicate that the concentration of the data around this time period is affecting all of the probabilities, and not just the predicted probability of FQC = 1.

Nevertheless, there is a robust and unequivocal relationship between LT and the predicted probability of FQC = 2 and the predicted probability of FQC = 0 that lends some credence to the hypothesis that positive forest quality change results from the adoption of JFM/CFM. The former relationship (i.e., for predicted probability of FQC = 2 vs. LT) is suggestive of positive forest quality changes initially occurring in response to VSS protection, but then the change in quality subsequently declines somewhat for the VSS villages that have practiced JFM/CFM for a longer length of time. This is mirrored by the latter relationship (i.e., predicted probability of FQC = 0 vs. LT): as time progresses it is more likely that forest quality will change, presumably for the better as the frequency data and the probabilities in Table 5-4 indicate.

As mentioned previously, the data being modeled do not directly represent a dynamic association through time as time-series or panel data would; however, the relationship between LT and the predicted probabilities of selection (into the positive FQC categories) can be thought of as approximating a direct temporal association because forest growth (essentially being proxied by FQC) is itself an increasing function of time.[20]

[20] At least for the time periods considered in the sample (max. LT = 12 years). Generally, tree growth is represented as a cubic function of time: initial growth (from planting) is slow but followed by rapid growth during maturation, with the eventual decline in the rate of growth as a plateau is reached. The period of slow early growth may not be as prominent if tree growth is regenerated from coppicing, where stem growth proceeds directly from cut stumps. This is largely the case in the VSS forest areas surveyed.

Why does the predicted probability of FQC = 2 appear to decline somewhat for higher values of LT (years 10 to 12)? It may be that forest quality change reaches a plateau, with resource use once again increasing; or there may be some downward bias of FQC values in the upper ranges of LT. Recall that the FQC variable is an ordinal and relative measure of forest quality change based on the subjective perceptions of respondents to the HH questionnaire, with memory recall of the forest quality prior to protection a critical component. As such, one can intuitively understand that FQC values—as assessed by individuals of a specific VSS—will increase with LT (for VSS age-cohorts) in the early to middle years of the VSS age scale, as CFM institutions and VSS works are initiated to protect and restore the VSS forest area. In addition, early in the program initial small improvements will likely be perceived as a great success.

Respondents are more likely to have good recall in the short run, when they are not far removed in time from when the VSS forest area was unprotected and degraded. The recall period for respondents is much longer at the highest values of LT than it is for those members of VSS villages that have recently adopted CFM. This may cause an upward bias in what the perceived forest quality prior to VSS protection was, especially if forest regeneration has been successful. For "older" VSS, the initial rapid growth of some species (e.g., eucalyptus[21]) will have likely slowed somewhat; and if the forest has already "grown in" in terms of spatial and canopy density, then respondents may unconsciously skew the ex-ante JFM/CFM forest quality perception towards forest quality values more indicative of the cumulative change that they currently observe.

[21] The principal investigator observed cloned varieties of eucalyptus in the field that ranged anywhere from 12 to 20 feet in height; these trees were 2 years old or less.

What drives the FQC–LT relationship? The change in forest quality through time is derived from the participation of VSS members in the protection of the VSS forest area, and in the forest restoration works undertaken by the VSS. Although the participation proxy (PRT) is statistically insignificant in the FQC model, a Wald Test indicates that the joint significance of PRT with LT is robust: $F_{(2, 56)} = 13.04$ ($p = 0.000$). The joint significance of PRT with both LT and LT2 is also strong: $F_{(3, 55)} = 10.91$ ($p = 0.000$). Likewise, the monitoring proxy (FP) is statistically insignificant in the FQC model, but a Wald Test indicates that the joint significance of FP with LT is robust: $F_{(2, 56)} = 14.06$ ($p = 0.000$). The same is also true of FP with both LT and LT2 as well: $F_{(3, 55)} = 10.11$ ($p = 0.000$).

Despite the statistical insignificance of FP in the FQC equation, there are two other institutional variables that are statistically significant with positive coefficient signs that are indicative of an effective impact on forest rehabilitation. ARCU represents one aspect of the first design principle (clearly defined boundaries), which are fundamentally characteristic of successful CPR management schemes (Ostrom, 1990). MRFU proxies another important design principle: collective-choice arrangements (i.e., effective representation and input of stakeholders). Together, the joint statistical significance of these two institutional variables with LT and LT2 is strong: $F_{(4, 54)} = 9.02$ ($p = 0.000$). This offers some additional support for the causal relationship between LT and FQC.

Summary

In general, the analyses presented above offer evidence that JFM/CFM has had a positive impact on the forest resource of the VSS sampled, in terms of improving the quality of the VSS forest areas that have been under local protection and management. The range of time under management for the VSS sampled is 2 to 12 years. In terms of economic impacts, VSS protection has an adverse impact on the average consumption of the VSS villages sampled, at least for the

full sample of 58 VSS that were pooled for analysis. Specifically, it appears that the opportunity cost of the program is high as it relates to both the short run economic impact on consumption, and the long run impact on the sustainability of the CFM program in Andhra Pradesh in terms of the participation and involvement of the stakeholders.

However, the analysis of a subset of the data that represents more forest-dependent households provides evidence to the contrary by showing a positive relationship between the length of time of VSS protection (i.e., the LT variable) and average consumption. As the main target populations of the JFM/CFM program are the poorer, more forest-dependent VSS villages and households (especially Scheduled Tribes), this result implies that the program is at least having some success in benefiting the people for whom it was designed. Caution is advocated when extrapolating the results, however, due to the limited number of observations in this subset. Further investigation is required to confirm these results and test for additional hypotheses. Finally, there also is evidence that some of the CFM institutional variables analyzed in the FQC regression have a positive impact on rehabilitation of VSS forest lands protected by the VSS sampled. A more detailed investigation of the institutional variables is addressed in the next chapter, with additional data collected in the survey augmenting the regression results described in the previous sections.

CHAPTER 6
ANALYSIS OF CFM INSTITUTIONS

Introduction

The long-term efficacy of CFM as a resource management paradigm is dependent upon several factors. Such factors include the active interest and continued engagement of the VSS, their adherence to Ostrom's critical design principles, outside assistance from NGOs, and the effective facilitation of the program by the Andhra Pradesh Forest Department (APFD). The degree to which these factors are realized will largely determine the spatial and temporal sustainability of the program, and the effective realization of the program goals: improved forest cover and productivity, improved livelihoods and equity, and reduced rural poverty.

As a unified program for forest restoration and community development, JFM/CFM is still in a nascent stage of development: in Andhra Pradesh (and most of India) the program is still only in its first generation. This is exemplified by the fact that official legislation has evolved, in the first decade of JFM in Andhra Pradesh, to the extent where more direct control has been given to local stakeholders under the new moniker CFM. In addition, the first rush of demand for the implementation and registration of VSS has been impressive, but it seems likely that the growth rate of VSS formation has peaked and annual additions will be relatively modest. The challenge moving into the future is to retain the VSS that are currently practicing CFM by making sure that their efforts are successful. This is because the long-term viability of the CFM program is dependent upon the ability of the VSS to sustain their efforts in the absence of external financial support. For example, Khare et al. (2000) state that support for JFM in West Bengal waned following the completion of the World Bank project that was providing support.

One of the salient elements of this research is to address the degree to which the institutions of CFM (having succeeded JFM) follow the design principles that Ostrom (1990)

devised in her seminal work. The reason for this is that these principles were specifically distilled from case studies of different CPR management schemes that have endured through time—in some cases for hundreds of years. Thus, they represent successful institutions common to a diverse array of resource situations and are meant to serve as guiding principles in the development of new CPR management programs. By incorporating the design principles into the institutional set of CFM, the long-term success of this endeavor—while not assured—is at least more likely.

On the other hand, non-adherence to these design principles will likely limit the efficacy of any CPR management scheme (not just JFM/CFM) because of their demonstrated theoretical and empirical strength (Ostrom, 1990). Some of the key features of JFM as originally devised, however, violate these design principles. For instance, self-initiated institutions for the sustainable management of a CPR are the ideal circumstance for a group of local stakeholders who actually own the resource. This is not the case in India, which is an important distinction that may also limit the efficacy of CFM in the future. Unlike the self-initiated ideal, the Government of India (GOI) is responsible for introducing an overarching institutional set that defines the forest resource management paradigm while retaining ownership of locally managed forest lands. As such, the long-term security of rights may perhaps be considered questionable and this may eventually impact participation rates, whatever amount of trust there is in the government, and ultimately the viability of collective action through the CFM program. In addition, although the original legislation for JFM spelled out the conditional benefits that VSS are entitled to, it did not guarantee rights to the forest produce or the forest land. While subsequent revisions by the Government of Andhra Pradesh (GOAP) seem to strengthen the rights of the VSS to access forest produce (and expand the range of forest products), it is still

clear that such rights are conditional on the discharge of the VSS duties and responsibilities. This is one of the main limitations of this paradigm, which is underscored by the fact that forestland tenure remains with the government.

Under the proper legal and institutional environment, community-level organization directed at sustainable resource management can be realized. Ostrom (1990) defined eight critical institutional elements that are required (at a minimum) for transforming an open access resource into a CPR. As CFM is undertaken to check deforestation and rehabilitate forest lands through a similar process, it is necessary to revisit each element and evaluate the institutions of CFM against them using the empirical results from the regression analysis in Chapter 5 and the data described in Chapter 4.

DP 1: Clearly Defined Boundaries

According to Ostrom (1990), the CPR being managed must be clearly defined in terms of the spatial boundaries. In addition, the definition of rights of access and use by a specific set of stakeholders must be clearly defined. Together these components reduce uncertainties regarding who has legitimate access to the CPR, and clearly establishes the exclusion of non-stakeholders from accessing the defined area. Although these institutions would ideally be self-initiated by the local stakeholders, the APFD and GOAP are responsible for proscribing the overarching institutional set that includes these components. For example, the GOAP orders on CFM define the conditions under which a VSS is formed and, to some extent, membership eligibility (e.g., all Scheduled Tribes households are automatically granted membership in the VSS). To fully analyze this design principle, the spatial boundary awareness, awareness of access regulations, and the general awareness of institutions are examined in turn.

Spatial Boundary Awareness

In actual practice, clearly defined spatial boundaries are not a simple issue for JFM/CFM. As forest areas allotted for protection are ultimately public land, the APFD has the greatest amount of knowledge concerning the spatial boundaries of the VSS forest area in terms of descriptions of the north, east, west, and south (NEWS) boundaries. They have descriptions of these boundaries in both documents and maps that define the location of boundaries in reference to physical landmarks and administrative territory. In some cases, a physical characteristic makes one or more of the boundaries obvious (e.g., the crest of a ridge or a paved road). However, a typical boundary might be listed as "Reserve Forest Compartment 502", which may be important for the APFD but likely has little meaning to a VSS member.

Thus, the main problem with respect to this aspect of DP 1 is that the VSS members need to be well informed of the boundaries of their VSS forest area because they are the primary stakeholders responsible for resource management. Although the NEWS boundaries are normally identified in the VSS micro-plan, most VSS members are unlikely to have read it (notwithstanding the fact that many rural people are illiterate). Sometimes a map is provided to the VSS, either in the micro-plan or displayed on a wall in the village. In practice, however, the VSS members often seem to have little or no knowledge of some or all of the boundaries, especially the administrative-type boundaries that do not correspond to easily recognizable physical landmarks.

Data from the household questionnaire (Appendix B) support the anecdotal evidence described above: respondents were asked, "Do you know the exact boundaries of the VSS forest area?" (Question 15, Forest Resources Module, Part A). This question was scored "yes" if the respondent was judged credible in the identification of two or more of the VSS boundaries, and

"no" otherwise.[22] Despite a high level of uncertainty involved with the reporting of the data, only 24% (202 of 839 respondents) of VSS-member households were determined to have "boundary awareness" (BA). The BA variable was statistically insignificant in the FQC regression, which attempts to explain variation in the change in forest quality under VSS.

The variable VBA ranks the relative boundary awareness of the VSS villages. It is calculated, for a given VSS, as the percent of VSS households that indicated a general level of boundary awareness in the household-level questionnaire. Table 6.1 shows the frequency distributions of this variable.

Table 6-1. VSS boundary awareness.

VBA	Frequency	Relative Frequency	Cumulative Frequency
0 to 0.10	11	18.97	18.97
0.101 to 0.20	16	27.59	46.55
0.201 to 0.30	15	25.86	72.41
0.301 to 0.40	7	12.07	84.48
0.401 to 0.50	8	13.79	98.28
0.501 to 0.60	1	1.72	100.0
Total	58	100.0	--

Most of the VSS villages (42 of 58) had a VBA value of less than or equal to 0.30 (i.e., 30%); only one VSS village, K. Boddapadu (# 206), had a majority of households that were deemed "boundary aware" (VBA = 0.579). This is perhaps due to the fact that a reservoir borders their VSS forest area, and a boat is required to access their site. Overall, VBA was not found to explain poverty, as it was statistically insignificant in the poverty-gap ratio (PGR) regression.

[22] Note, however, that the response to this question is potentially biased towards the "no" answer for two reasons. First, the presence of the administrative-type boundaries made it impossible to evaluate the respondent's knowledge of all NEWS boundaries. Second, the principal investigator and the interview teams often lacked NEWS data themselves; therefore the interviewer had to subjectively determine if the respondent knew at least some the VSS forest area boundaries.

Awareness of Access Regulations

The rights of access and use by a specific set of stakeholders are meant to define the group of individuals that are active as forest protectors or resource users. Definition and knowledge of these rights, and who they pertain to, strengthen the control and monitoring of the CPR. This is one institution with which the VSS has some degree of latitude to establish. While all of the VSS that were sampled have banned the felling of trees in their VSS forest areas (and most have bans against the grazing of animals), other types of access restrictions or prohibitions vary according to the local institutions devised. For example, a frequent rule observed is a prohibition against carrying cutting tools in the forest area; two VSS have banned smoking in the forest, etc.

This aspect of DP 1 is perhaps the most important based on the relative length of discussion by Ostrom (1990) on this topic. Access restrictions that reserve benefits for members only are an important institutional incentive that helps to strengthen participation by explicitly discouraging the free-riding of non-members. To understand this aspect of the first design principle, Question 25 in Part A of the Forest Resources Module inquired about this "access awareness" by asking: "Regulations concerning entry to [the] VSS forest area, are they clear and easy to understand?" (HH questionnaire, Appendix B) An overwhelming majority (82%) answered affirmatively, suggesting that at least one of the first steps toward effective collective action is being followed. This question also forms the basis for the dummy variable ARCU that was analyzed in the forest quality change (FQC) regression. The marginal effects of this variable are positive and statistically significant ($p \leq 0.007$) for the FQC = 2 or FQC =1 categories. This indicates that access awareness in a VSS village increases the probability of positive forest quality changes resulting from protection and restoration.

As with boundary awareness, observations in the field must be considered when evaluating this data. Three factors must be addressed: Scheduled Tribes (ST) membership, access of non-members, and paid wages for VSS works. Access and use rights for a specific set of stakeholders are not as critical in smaller-sized VSS villages where every household in the village belongs to the VSS. This situation is most likely to occur in ST-designated VSS, not only because the small VSS villages tend to be tribal villages, but because CFM legislation automatically grants VSS membership to ST households. Thus, all ST households have permission to access the forest and use forest products that the VSS allows collection of, and everyone is likely to know this fact. A breakdown of the ARCU variable by caste is presented in Table 6-2.

Table 6-2. Access awareness of VSS-member households by caste.

Caste Designation	ARCU	Frequency	Relative Frequency
ST Households	No	93	18.83
	Yes	401	81.17
	Total	494	100.0
SC Households	No	17	19.54
	Yes	70	80.46
	Total	87	100.0
BC Households	No	28	19.18
	Yes	118	80.82
	Total	146	100.0
OC Households	No	11	9.48
	Yes	105	90.52
	Total	116	100.0

The relative frequency of "access awareness" by the Scheduled Tribes (ST), Scheduled Castes (SC), and Backward Castes (BC) households (80% to 81%) are almost identical to those

observed in the pooled sample (82%). The only notable difference is with the Other Castes (OC) households, which indicate a higher awareness of the access restrictions (91%). Thus, the ARCU variable is not unduly influenced by the automatic VSS membership of ST households.

The rights of access and use by a specific set of stakeholders are more critical in larger VSS villages that have a fair amount of non-VSS members. It was observed that, while all of the VSS villages in the survey exclude village outsiders from accessing their VSS forest area, most seem to allow non-members to access their protected forest area—which may undermine the commitment of the participating VSS members and erode their future efforts toward CFM. Only one VSS sampled, Kancherabai (# 120), explicitly reported the prohibition of non-members in the VSS forest area. Moreover, their rules stated that only VSS members were allowed to collect deadwood for fuelwood, and/or coppiced wood for construction. In terms of this design principle, Kancherabai VSS seems to be approaching the ideal—indeed, the principal investigator observed that this VSS had good leadership, was well-endowed with forest resources (especially bamboo), and functioned very well in terms of forest protection, management, and remunerative production (e.g., selling bamboo).

Undoubtedly there are social reasons for allowing access to VSS non-members of the village, but in practice this likely weakens the VSS in the long-run for the reasons presented above. Such adverse impacts might not be manifested immediately, however, because the benefits and costs of protection are not always apparent, especially in the early years of JFM/CFM programs. The benefits of forest protection and regeneration will often take several years to be realized, while the labor costs are being subsidized in the initial stages of the APCFM project.

Since the wages paid for VSS works are derived from external funding[23] from the government and/or the World Bank, there is a clear disconnect between the cost-benefit incentive structure of the institutions and the rights of access of individuals. It is possible that problems will arise when the external funding for these works is no longer available. In most of the CPR management systems documented by Ostrom (1990), individuals or households contribute unpaid labor to maintain the CPR—either through works and/or monitoring, which entitles them to the benefits of the resource. For the VSS of Andhra Pradesh, future maintenance works will probably involve mostly the coppicing and pruning of trees and the maintenance of fire-breaks. Although such work is not as physically grueling as the soil-moisture conservation (SMC) works (e.g., digging of contour trenches), it will most likely have to come from the unpaid labor of VSS members, which will reinforce the need to clearly define the rights of access to the forest and its produce. This is especially so since most VSS currently have provisions that allow non-members to be employed for their works projects, although many VSS do give first preference to members.

General Awareness of Institutions

A variable that examines the first DP in terms of the general awareness of VSS institutions and parameters is labeled HGAI. This variable is an additive index having a theoretical scale of 0 to 7, and is used as a proxy for access awareness in order to augment the previous variables that proxy for DP 1. HGAI measures the level of awareness that VSS-member households have vis-à-vis two institutions and two quantitative parameters of the VSS. The evaluation criteria include: the type of process used to select the VSS Management Committee (ballot or consensus), the

[23] The impending termination of the funds for these works has necessitated an emphasis on the economic sustainability of the VSS through livelihood augmentation and development of alternate livelihood opportunities. This topic will be discussed in more detail in the next chapter.

length of the Management Committee's term (in years), the size of the allotted VSS forest area (in hectares), and the year of VSS establishment. Household responses are compared against objective data for these four criteria, and scored according to the accuracy of the responses.

The distribution of HGAI scores for each VSS-member household is shown in Table 6-3. In general, the respondents have a rather low level of general awareness of the VSS, in terms of the criteria evaluated. More than half scored a value of 2 or less, meaning that these households have little or no knowledge of the VSS beyond how the VSS Management Committee is elected (because 92% of respondents knew the MC election process). Less than 3% of respondents scored a high level of knowledge about their VSS (GAI ≥ 5); of these, approximately 65% are current or former members of the Management Committee.

Table 6-3. HGAI for VSS-member households.

HGAI Scale	Frequency	Relative Frequency	Cumulative Frequency
0	29	3.24	3.24
1	357	39.84	43.08
2	100	11.16	54.24
3	220	24.55	78.79
4	80	8.93	87.72
5	85	9.49	97.21
6	10	1.12	98.33
7	15	1.67	100.0
Total	853	100.0	--

The HGAI index was included in the FQC regression, and the parameter coefficient was found to be statistically insignificant. Mean HGAI values for each VSS village were also calculated in order to create the variable GAI. This variable was included in the average consumption model but was statistically insignificant as well.

DP 2: Congruence between Rules and Local Conditions

This design principle recognizes the importance that local institutions must accommodate the specific characteristics of a given CPR, which include (but are not limited to) the heterogeneity of resource endowments and social circumstances. Ostom stresses that the implementation of "well-tailored appropriation and provision rules" will help enable CPR management systems to flourish and endure (1990). Even amongst separate user-groups of the same geographic region, variability must be accounted for by adapting the local institutions as necessary.

This DP is difficult to observe without an extended amount of time to study each VSS; as such, isolating the factors that reflect this DP is more conducive to a case study format. Because of the limited time spent in each VSS, only anecdotal evidence is presented. In general, and to the extent that this DP could be assessed in a short interview, it appears that the VSS sampled conform fairly well to this DP. Explicit examples are very limited, but a few are notable.

For example, K. Boddapadu VSS (# 204) has prohibited grazing in part because a reservoir borders their VSS forest area. Other VSS villages such as Kunnempudi VSS (#202) have restricted or prohibited the traditional practice of shifting cultivation known locally as "podu". As mentioned previously, two VSS have explicit bans against smoking in the forest. In addition, while not pertaining directly to a rule or regulation, Puttiguda VSS (# 119) maintains a tree inventory that includes 760 gum-producing trees in their VSS forest area. This reflects a site-specific organizational response pertaining to the management of an important local NTFP resource.

DP 3: Collective-choice Arrangements

Functionally effective institutions must be responsive to the individuals they serve by giving a voice to all stakeholders, and by giving them the opportunity to participate in the

modification of the institutions. Much like the first design principle (i.e., clearly defined boundaries), collective-choice arrangements are fundamentally important for the long-term viability and success of CPR management schemes. This is because the success of collective action is based on the active and effective participation of the stakeholders. Their interests and views must not only be heard, but actively incorporated into the process in order to ensure institutional flexibility, and (ideally) promote equitable representation and the equitable distribution of benefits derived from collective action.

For the VSS of Andhra Pradesh, this design principle is particularly relevant given that local stakeholders can set some of the local-level CFM institutions (e.g., rules like access restrictions). It not only allows the VSS some flexibility to tailor their local rules to their CPR (as much as possible, at least theoretically), but also provides the opportunity for all members to participate in the direction of resource management. The latter of these is extremely important and was examined by focusing on the extent to which the VSS Management Committee adequately represents the members of the VSS General Body, if the VSS micro-plan addresses the interests of the poorest households, and if participation in the VSS is equitable.

The respondent in each VSS-member household was asked: "Do you think [the] VSS Managing Committee considers views, needs of majority of its VSS members?" (Question 8, Forest Resources Module, Part A). The response was strong: 88.9% (746 of 839 households) answered "yes" to the query. This is a positive finding, of course, because it indicates that the group of stakeholders entrusted with the day-to-day management responsibilities of the VSS act in accordance with the spirit and ideals of CFM. These data also offer support that the theoretical design principle is being adhered to, as well.

In addition, each VSS-member household was asked the following question: "In practice, [the] VSS micro-plan reflects interests of which section of society?" (Question 9, Forest Resources Module, Part A). Respondents were given four possible answers to choose from; both the response choices and the frequency distribution of responses are shown below in Table 6-4. More than two-thirds of the respondents believe that forest dependent households are being served by the VSS micro-plan, although nearly 20% of the respondents believe that local elites are favored. The overall responses to this question and the previous question seem to support the presence of collective-choice arrangements, which means that the VSS Management Committees are responsive to the stakeholders and the micro-plan reflects the interests of forest dependent households.

Table 6-4. Response frequency indicating that the VSS Micro-plan reflects the interests of:

Code	Response Categories	Frequency	Relative Frequency	Cumulative Frequency
1	Forest Dependent Households	582	68.23	68.23
2	Other Households	63	7.39	75.62
3	Local Elites	167	19.58	95.19
4	Forest Department	41	4.81	100.0
	Total	853	100.0	--

In order to represent collective-choice arrangements in the econometric equations, the frequency data of Table 6-4 was used to develop a dummy variable. The variable MRFU = 1 if the VSS micro-plan represents the interests of forest-dependent households, and MRFU = 0 otherwise. Analyzed in the FQC equation, the marginal effects of MRFU are statistically significant ($p = 0.002$) with a positive sign for the FQC = 2 category. This signifies that the VSS that are oriented towards forest-dependent households have a higher probability of positive forest quality change. This is an important finding, as it offers some statistical evidence that the third

design principle is effectively represented in the CFM institutions of the VSS sampled by this study.

The variable CCA proxies for collective-choice arrangements in all three of the VSS-level equations; it is a ratio measuring the percent of households in a given VSS that indicate the VSS micro-plan reflects the interests of forest dependent households. CCA was statistically significant in two of the three regressions that attempted to capture variation in economic indicators of social welfare (i.e., average consumption and the poverty gap), but the coefficient signs were opposite of the *a priori* expectation in both cases. The interpretation of such results seems to indicate that VSS villages that place an emphasis on forest-dependent households have a deleterious influence on local economic well-being and poverty, but that could be an incorrect conclusion. For example, the causality implied could be a result of the fact that CCA is measuring the degree to which the VSS micro-plan is oriented towards the poorest communities, which are typically the most forest dependent. In addition, both the average consumption and poverty-gap variables are not outcome variables in terms of directly measuring JFM/CFM success.

Conflicting interests are always present in a community and, as such, the potential exists for rural elites (or other interest groups) to co-opt development schemes such as JFM/CFM for their own benefit. To further examine whether DP 3 is well represented by the VSS of the sample, data was also collected as to the equitable representation of stakeholders in terms of electing the VSS Managing Committee. The respondent in each VSS-member household was asked: "In general, what do you think about the way [the] VSS Management Committee elections are held?" (Question 13, Forest Resources Module, Part A). In Table 6-5, the five response categories provided to respondents are shown, along with the frequency distribution of

responses. The household data suggest that conscientious representation in the community is the norm: 82% of VSS-member households reported that elections for the VSS Managing Committee are free and fair.

Table 6-5. Response frequency regarding elections for the VSS Managing Committee.

Code	Response Categories	Frequency	Relative Frequency	Cumulative Frequency
1	Free and Fair	698	81.92	81.92
2	Dominated by Local Elites	86	10.09	92.02
3	Dominated by Interest Group	48	5.63	97.65
4	Other (specify)	0	0	97.65
99	Don't Know	20	2.35	100.0
	Total	852	100.0	--

DP 4: Monitoring

Stakeholder compliance with the appropriation rules is necessary to achieve effective and sustainable CPR management, and this can only be guaranteed through effective monitoring. Monitoring not only ensures stakeholder compliance, but also helps to enforce the exclusion of non-stakeholders. Ostrom (1990) discusses how the CPR management systems profiled in her book are not dependent upon external authorities for the monitoring and enforcement of the CPR institutions. Monitors are accountable to the stakeholders, and are frequently the resource appropriators themselves. This design principle is a vital component of the CPR management system, and this study tried to determine if regular monitoring is undertaken by the VSS. Note that the CFM institutions as legislated by the state do not mandate formal patrols by VSS members; these institutions transfer the monitoring responsibilities to the VSS and, as such, only implicitly refer to monitoring of the forest for access violations.

The FP variable is a dummy variable that identifies the presence of a formal patrol and/or a watchman, and was included in two of the VSS-level regressions (the consumption inequality and poverty-gap ratio models). It was also included in the FQC regression, by assuming the same value for all households of a given VSS. FP was not statistically significant in any of the regressions, which implies that this variable has no explanatory power on consumption inequality, poverty, or a change in forest quality.

The data for this variable indicate that only 38% of the sample (22 VSS) organized formal patrols or employed a watchman. Five of these VSS had at least one watchman, and some VSS employed a watchman in addition to patrols by members. The rest engaged in informal monitoring by either casually watching the VSS forest area (often it is near their agricultural land), or by incidentally monitoring while they are in the forest for other reasons. Some VSS reported that they monitor informally because there is only one (or a few) access points into their VSS forest area and these can be readily observed. While these efforts represent a low-cost method of monitoring, they may not be effective.

Of all the information collected, the data on FP is perhaps the most surprising. It cannot be overemphasized how important monitoring is to effective CPR management. A formal patrol and/or a watchman should be a mainstay in each VSS village according to the fourth design principle, regardless of the proximity to agricultural lands. Most VSS forest areas are too big for that approach, and effective deterrence means increasing the odds of detecting violations. In fact, the PI uncovered at least two serious violations on impromptu field visits to VSS forest areas: timber theft from the Puttiguda VSS forest, and illegal goat grazing in the Rampur VSS forest. In both cases, the offenders were outsiders from other communities. In addition, the VSS in both cases reported that they engage in monitoring activities. Puttiguda VSS (# 119) has organized

formal patrols that are comprised of VSS members split into four groups of five members each. Data from the VSS interview shows that Rampur VSS (# 106) reported having a watchman, although the PI did not observe a watchman during the impromptu tour of their VSS area.

In general, approximately 50% of the VSS reported some type of violation had been committed, usually the smuggling of timber or deadwood. Most offenders appear to be people from outside the community; in other words, the general compliance rate within the population of the VSS village seems to be very high. This anecdotal evidence is supported by the fact that 85.5% of VSS-member households thought that the majority of VSS members follow the rules and regulations.

DP 5: Graduated Sanctions

The fifth design principle has important implications for the sustainability of a CPR management regime, because circumstances will eventually arise where stakeholders themselves are tempted to cheat. The consequences of rules violations should be designed to act as effective deterrents without being so draconian as to encourage non-compliance. For example, the first rule violation could result in a modest penalty to remind the offender of the importance that compliance serves to the greater public good. Repeat offenders, however, must face increasingly severe penalties to discourage wanton free-riding according to Ostrom (1990). The CFM institutions as legislated by the state do not explicitly call for graduated sanctions but, similar to monitoring (DP 4), this design principle can perhaps be observed as implicit within the institutional framework.

The presence of graduated sanctions in a given VSS was measured by the GS dummy variable. Of the VSS sampled, 62% (38 VSS) reported having this penalty structure. When analyzed in both the poverty-gap ratio (PGR) and forest quality change (FQC) models, this variable was statistically significant in only the FQC regression. However, the marginal effects

of this variable are negative ($p \leq 0.012$) for two of the *positive* forest quality change categories (FQC = 2 and FQC = 1). This contradicts the *a priori* expectation that graduated sanction should have a beneficial influence on forest quality. As stated above, compliance within the VSS seems to be very high with most violations appearing to occur from offenders outside the community. This means that there have been few opportunities for the graduated sanctions mechanism to be observed by most members of the VSS that were surveyed and is, therefore, difficult to know what kind of influence this design principle has on the stakeholders themselves. In practical and statistical terms, this would mean that no causative effect is expected.

It is possible that a purely descriptive association is being mistaken for a casual relationship. If so, it is not readily apparent since there is no obvious descriptive reason why this variable should be associated negatively with a change in forest quality. Given the likelihood that the presence of graduated sanctions is not widely known by the members of the VSS, it seems plausible that GS might be more representative of some other property or process that is related. In such a case GS would be indirectly acting as a proxy for something else. The application of the graduated sanctions mechanism in many of the VSS sampled is also disconnected from theory somewhat. Roughly half of the VSS reporting graduated sanctions indicated that, for second offences, offenders would be handed over to the APFD instead of facing locally-based sanctions.

DP 6: Conflict-resolution Mechanisms

According to Ostrom (1990), conflict resolution mechanisms that are characterized by low transactions costs are a necessary aspect of an effective CPR management scheme. To ensure both the fairness and the continuity of the institutions, each stakeholder must have recourse to a forum established for the purpose of dispute resolution. As any set of rules and regulations is

subject to different interpretation by different individuals, and because all organizations are bound to have some free-riders, it is important that a forum exist for the dispensation of justice and punishment to those accused of non-compliance. As with monitoring and graduated sanctions, an external source of governance is not required for this function.

Again, the fact that most of the rule violations were not from the VSS villages sampled means that this design principle was difficult to assess. As compliance with the VSS institutions appears to be rather high amongst community members, there is ostensibly little need for a dispute resolution forum. Indeed, preliminary field interviews with VSS Management Committee and General Body members indicated that such matters would generally be referred to the Forest Department. Because of the socio-cultural cohesiveness of rural India, especially in the Scheduled Tribes communities, the absence of a VSS-organized dispute resolution forum may not be a critical loss in terms of VSS effectiveness in many of the smaller VSS.

DP 7: Minimal Recognition of Rights to Organize

Effective CPR management regimes need an over-arching governmental policy framework that facilitates, or even encourages, community-level institutions capable of natural resource management. As discussed previously, the legislation enabling CFM provides the broad framework for local forest protection institutions. The most basic requirement is for the government to recognize the rights of local people to devise their own institutions regarding CPRs; to this narrow extent, CFM in Andhra Pradesh adheres to this design principle.

However, the distinction between this applied case and the theoretical case described by Ostrom is that CFM goes beyond enabling: it actually defines many of the key institutions. Moreover, a huge distinction between theory and reality is that land tenure remains with the government—although this does not necessarily render CFM ineffectual. Nevertheless, the spirit of this design principle as applied to CFM is in the recognition of VSS autonomy to manage their

allotted forest area. Thus, VSS autonomy was used as a proxy for this design principle. In addition, the general tenor of the relationship between the VSS and the APFD officer with whom they normally interact was also used to gauge the overall influence of the government in this study.

The VSS questionnaire asked the VSS Chairman or the Vice-Chairman the following question: "Does the Forest Department give the Executive Committee[24] enough autonomy to manage the VSS forest area in a way that best serves the community?" Ninety-three percent answered affirmatively. A similar question was included in the HH questionnaire; 765 of 853 VSS-member households (89.7%) indicated that the VSS receives enough autonomy from the APFD.

The variable PG (perception of the government) was used in the FQC regression to control for this design principle. This variable serves to proxy for the interference by external government agencies (i.e., the APFD). Thus, PG measures government interaction with the VSS by qualitatively rating the relationship that the VSS Management Committee has with the APFD field officer with whom they work most closely. PG is an ordinal subjective ranking made by the VSS Chairman or the Vice-Chairman when asked to describe this relationship. The rating scale is presented in Table 6-6, along with the distribution of the responses.

An overwhelming majority of VSS (84%) indicate that they have a "good" or "very good" relationship with their APFD field officer. The regression results were statistically insignificant, however, indicating that PG has no explanatory power on forest quality change. Nevertheless, the data describing the perception of autonomy suggests that the spirit of this design principle is

[24] The VSS Management Committee is often referred to as the VSS Executive Committee, which was the term used in the questionnaires.

adhered to rather well, even though it does not directly affect the measures of economic welfare and forest quality change as defined in this study.

Table 6-6. Relationship between the VSS Management Committee and their APFD field officer.

Scale	Response Categories	Frequency	Relative Frequency	Cumulative Frequency
1	Very Good (Officer really supports VSS efforts)	14	24.14	24.14
2	Good (Officer is helpful)	35	60.34	84.48
3	Fair (or indifferent)	6	10.34	94.83
4	Bad (There are problems with this officer)	3	5.17	100.0
	Total	58	100.0	--

Summary

The design principles (DPs) for successful common-pool resource management regimes (Ostrom, 1990) offer a benchmark against which the CFM institutions of Andhra Pradesh can be examined. Quantitative data were used to assess the following five design principles:

- DP 1: Clearly defined boundaries.
- DP 3: Collective-choice arrangements.
- DP 4: Monitoring.
- DP 5: Graduated sanctions.
- DP 7: Minimal rights to organize.

Overall, this set of design principles is represented throughout the sample of VSS villages surveyed as a whole, but the presence of each individual design principle varies among the VSS sample. Moreover, the degree to which a given CFM institution (as implemented at the community-level) adheres to its counterpart design principle is also variable, and in some cases clearly deficient (e.g., monitoring). The implications of the specific findings will be discussed in the following chapter, and recommendations will be offered in terms of how to address these deficiencies.

CHAPTER 7
CONCLUSIONS, POLICY IMPLICATIONS, AND FUTURE WORK

Overview

This last chapter contains four sections. The first section presents conclusions drawn from the analytical results of the regression analysis, as well as the results derived from the institutional analysis discussed in the previous chapter. In particular, the impact of the JFM/CFM program is assessed using the length of time (LT) variable and the degree to which the Ostrom design principles are incorporated into the institutions of the CFM program being implemented in Andhra Pradesh. The second section discusses the broader policy implications of this study, especially as it relates to the ability of this program to alleviate poverty and remain sustainable in the long run in Andhra Pradesh and elsewhere. Some recommendations are also provided that are designed to strengthen the program and its institutions. The third section describes some of the limitations of this study. The fourth and final section discusses some planned future work, and other areas of focus that are worth investigating further.

Summarized Conclusions

Regression Analysis

The first of the models to examine any improvements in the economic indicators of social welfare due to JFM/CFM attempted to explain variations in mean per-capita consumption values ("average consumption") at the VSS-level. Estimation results indicate that this regression performed fairly well in terms of explanatory power. Especially noteworthy are the statistical significance of LT (–) and LT2 (+) and the direction of their signs: the coefficients signs signify a U-shaped predicted relationship with average consumption. The graph of this predicted relationship shows that the overall impact of JFM/CFM (as proxied by the duration under this relatively new forest management regime) on average consumption is adverse because of the

steep decline in predicted average consumption in the initial years following adoption of JFM/CFM. Only after 14 years does the predicted level of average consumption increase to the original value at year zero. This suggests that VSS villages face a significant opportunity cost when implementing the program, both in terms of the short run economic impact and the long run sustainability of stakeholder participation and involvement in VSS collective action.

This average consumption analysis was conducted on the full sample of 58 VSS villages, which include VSS villages that have a relatively low dependency on the forest as measured by the percentage of total consumption that forest products comprises. Positive socio-economic impacts of JFM/CFM should, however, be derived from improvements in forest productivity and because average consumption served as the dependent variable, the relationship described in the previous paragraph is likely to be absent in many of the low-dependency VSS villages. Therefore, an additional regression was performed on a subset of the sample data and these results indicated a positive predicted relationship between average consumption and the length of time under JFM/CFM. This suggests that JFM/CFM is having a beneficial socio-economic impact on the VSS villages of the sample subset that is comprised mainly of poorer households, many of which are Schedule Tribes. These are the principal stakeholders of CFM in Andhra Pradesh, as identified by the legislative orders and targeted by the implementing agencies. As such, this evidence implies the program is successful in at least this dimension of its objectives.

The second model to examine any improvements in the economic indicators of social welfare due to JFM/CFM attempted to explain variations in consumption inequality using the Gini coefficient. This model performed poorly such that no results are summarized here. The third model to examine any improvements in the economic indicators of social welfare due to JFM/CFM attempted to explain variations in poverty as measured by the poverty-gap ratio.

Estimation of this model revealed that poverty levels are distinctly less in the Adilabad and Chittoor samples than they are for the Visakhapatnam sample. The results also suggest, in particular, that NGOs providing forestry-related assistance contribute to lower levels of poverty. However, the results also show there is no relationship between the poverty-gap ration and the length of time under JFM/CFM.

The regression to analyze forest quality changes (FQC) as a function of the length of time that a given village has participated in the JFM/CFM program (i.e., the LT values) found that the compound marginal effects were statistically significant for a two category improvement (i.e., FQC = 2). This result suggests that a relationship between the JFM/CFM program and improved forest quality can be asserted.

To summarize, if the length of time since JFM/CFM was (1) positively related to the average level of consumption and (2) positively related to a change in forest quality, the interpretation is intuitive; forest quality improvements increase forest productivity through time, which eventually leads to increased benefits to households (as measured by average consumption). This was the finding for households dependent on forest products for livelihoods or subsistence needs in this study.

As CFM institutions should have a direct effect on the physical resource, seven institutional variables were analyzed in the FQC regression. These variables represented five of Ostrom's design principles. Three variables represented the first design principle; one of which was statistically significant and positive (ARCU). This indicates that awareness of access restrictions (ARCU) had a positive impact on forest quality change. In addition, the statistical significance of MRFU indicated that the orientation of the local forest management plan towards forest-dependent households also had a positive impact on forest quality change. Thus, there is

evidence that some of the CFM institutional variables analyzed have a beneficial impact on the regeneration of forest lands protected under CFM in Andhra Pradesh.

Institutional Analysis

One of the main objectives of this study was to examine how well the CFM institutions conform to the design principles delineated by Ostrom (1990), both as they are defined in the legal orders that enable the program and in the actual field implementation by local stakeholders. All of the design principles for successful common property resource (CPR) management regimes are present—more or less—in the CFM institutions enacted and being promoted by the Government of Andhra Pradesh. This is notable because they are meant to function together to reinforce the participation, commitment, and monitoring of stakeholders, without which success cannot be sustainable in the long run. However, most of the design principles are either only partially or implicitly represented and this needs to be addressed in future policy revisions. Moreover, two of the Ostrom design principles are not directly applicable to the CFM institutions examined by this study and can only be evaluated in terms of the degree to which they are approximated by analogous CFM institutions or participant behavior and perceptions.

These two design principles (minimal recognition of rights to organize and collective-choice arrangements) are important because they represent where the JFM paradigm deviates from the CPR management theory as expounded by Ostrom, due to the intrinsic governmental oversight of the program. First, unlike the case studies from which Ostrom's design principles are synthesized, the vast majority of forest protection taking place under CFM in Andhra Pradesh (and indeed JFM throughout India) is not self-originating because the basic institutions enabling the program are derived from legislative orders. Thus, the extent of government involvement is far greater than Ostrom (1990) suggests it should be, which means that the seventh design

principle (minimal recognition of rights to organize) is effectively moot within the institutional set of JFM/CFM. For this reason it was difficult to assess in its original context.

Nevertheless, it is necessary to account for the "spirit" of this design principle and, as such, some proxy indicators were used to approximate it in terms of measuring VSS autonomy and government interference. An overwhelming percentage of respondents reported that the APFD (i.e., the government) allowed the VSS sufficient autonomy to manage their VSS forest area. In addition, a large majority of the VSS sampled indicated that the relationship with their local Forest Officer was either good or very good; this measure intended to capture the degree of inference. Thus, it appears that the spirit of the seventh design principle is adhered to as much as can be expected given the circumstances that prevent its full realization as Ostrom had intended.

Secondly, collective-choice arrangements (the third design principle) are ostensibly guaranteed in the national forest policy and the state legislation defining CFM in Andhra Pradesh. This is because the CFM program preferentially targets the most forest-dependent people, as seen by the automatic membership that tribal households are granted in the VSS General Body and the VSS Management Committee. However, despite this, and although the local communities have some latitude to devise their own VSS-specific rules and regulations, they have no direct input into the creation and modification of the basic CFM institutions. This is, of course, a violation of collective-choice arrangements that is a consequence of the government origins of the program.

Note the interrelation between these two design principles as a result of their weak representation (or relative absence). Because the basic institutions that define JFM are exogenous to the local communities for which the program is designed, individual stakeholders do not have the opportunity to *directly* devise and revise the key institutions that define the program and

govern forest resource management. This is a structural design weakness that may eventually affect the functioning of the other design principles and, thus, may have a long-term impact on the success of the program. For example, the ability to revise the institutions to adapt to changing local conditions may be hampered due to the violation of collective-choice arrangements mentioned above.

Notwithstanding this problem, though, it appears that the program is responsive to the needs of those for which it is designed; implying that collective-choice arrangements are conformed to well, if not totally in theory then at least in practice. For example, a majority of VSS households indicated that forest-dependent households are indeed being represented in the local management plan. In addition, the election of the Management Committee by the VSS general body was deemed to be free and fair by a wide margin, and the Management Committee was reported to be accurately representing the rest of the VSS members well.

The fact that many of the design principles are present, to a greater or lesser degree, in the institutions of CFM is encouraging. This signifies, theoretically, that the foundation for successful long-term forest management is in place. But clearly weaknesses remain at the state-level that affect the implementation and effectiveness at the local level. To its credit, the Government of Andhra Pradesh has been responsive to institutional change by modifying their original JFM institutions to better facilitate their functioning, and to improve the incentives for participation by local stakeholders. Despite the relatively new CFM institutions in Andhra Pradesh that are more devolved, however, this updated program will never qualify as a fully self-originated system of CPR management for which Ostrom's design principles apply as an ideal. But the design principles that are directly applicable to JFM/CFM (e.g., monitoring) must be re-addressed in order to strengthen them.

The question at present is how effective are the relevant design principle-associated institutions being implemented in the field (i.e., at the local level). This was examined in detail in the previous chapter and the answer is similar to the evaluation at the state-level: overall, the entire set of the five design principles that were targeted for analysis are represented throughout the sample of VSS surveyed as a whole, but not in each individual VSS. Furthermore, the degree of adherence to each design principle as implemented as a CFM institution was variable, and was found to be deficient entirely lacking in some cases. Again, however, most of the basic foundations of successful CPR management (as per Ostrom) are there, albeit in varying degrees, both in the legislative orders and implemented at the field level.

The key is to begin making progress towards the full realization of the design principles, as represented by the specific institutions of CFM—to the extent possible given the governmental origin of the program. This is a difficult task because the standardization of certain institutions, in order for them to be more congruent with the design principles, must also preserve the ability of individual VSS villages to adapt the local-level institutions to their own local circumstances. Indeed, field observations underscore the need for flexibility and creativity of each individual VSS. The sheer variability in resource endowments—whether in terms of human capital, natural capital, physical capital, and/or financial capital—require that cookie-cutter approaches to rural development be eschewed. Thus, the CFM program will be constrained in its ability to evolve if it cannot reconcile the need for flexibility at the local level with uniformity at the state level, which is inherently needed for the wider implementation of the program. It is interesting to observe, then, that the fundamental nature of the JFM paradigm is somewhat paradoxical: a decentralized system of forest management is designed to empower local people, but is guided by mostly centralized institutions devised and promoted by the government.

Policy Implications

Recommendations from the Economic Analysis

The main conclusions from the economic analysis are that the JFM/CFM program seems to have had a beneficial influence on the most forest-dependent VSS villages, but it also appears to have had a significant opportunity cost for those VSS villages that are better off economically. As the alleviation of poverty is a key objective of the program, it is encouraging to find some evidence that the poorer forest-dependent VSS are being reached. However, more needs to be done if the individuals in such villages are to be lifted out of poverty. Alternative and/or improved livelihood opportunities are needed to increase the low incomes and consumption of the households in the poorer VSS villages. This is a rural development issue as much as it is a forestry issue.

In terms of the CFM program overall, the high opportunity cost of the program also indicates the need for development or improvement of alternate or existing livelihood opportunities. Without a concerted focus on this topic, the long run sustainability of the program, in terms of stakeholder participation and commitment, will be in jeopardy. Currently, the main pecuniary incentives for many VSS villages are derived from an external source (e.g., World Banks funds distributed by the APFD). In fact, Reddy et al. (2004) state that the major benefit from participatory forestry in Andhra Pradesh appears to be from externally supported wage employment, which is not sustainable in the long run. As such, participation is likely to wane when external funding is removed (Kumar, 2002), and Khare et al. (2000) point out that this situation was indeed observed in West Bengal when a World Bank supported project ended.

To underscore the emphasis on livelihoods, a conference was held in March 2005 at the APFD's demonstration center in Jannaram (Adilabd district), where representatives of the World Bank addressed field officers of the APFD. They advised these forest officers that funding from

the World Bank would only last a few more years and they should relay this information to the VSS members. The development and enhancement of livelihood opportunities was a central theme of this conference; many different ideas, techniques, and opportunities were discussed. It was clear that promotion of this agenda was important to the APFD and the World Bank, because they wanted the local stakeholders to sustain their forest management efforts in the absence of external funds. The only way to ensure this outcome is by increasing the incomes of stakeholders through the development of their skills and opportunities.

Despite the World Bank presentation and their concern for livelihoods, the subsequent field visits during data collection for this study found that most VSS members are unaware of the impending termination of funds. Worse still, many VSS villages are currently without viable alternatives (i.e., in terms of livelihood opportunities and/or marketable timber) to the external money that has so far supported the forest rehabilitation efforts. It is obvious that a crucial deficiency on the part of the VSS members is an inability to plan more than one or two years in the future. Thus, it is extremely important that the APFD and various NGOs effectively assist in the planning of management schemes that:

- Enhance existing livelihood opportunities through value-addition.
- Develop new livelihood opportunities through value-addition and marketing linkages.
- Procure and distribute physical capital that allows value-addition in the above.
- Assist VSS villages and VSS members with the marketing and distribution of output.
- Devise management plans that stagger timber production to ensure a steady source of income through time.

A good example is the valued use of bamboo, which is being promoted by the APFD. This forest product is a great source of income for rural people in the different areas where it grows well. Some value-added items produced using bamboo include: baskets, floor and wall mats, sericulture mats for cultivating silkworms, and small slivers used for making incense sticks. The enhancement of bamboo production is not only tied to better propagation and silvicultural

techniques, but also requires the allocation of physical capital in the form of a small machine used to cut bamboo in different sized strips depending on the ultimate use. By western standards these machines are relatively cheap and save a lot of time in the manufacturing of the different end products. Training on these machines and for learning how to produce different bamboo-derived products is an important focus that needs to be continually emphasized.

As mentioned previously, the site-specific nature of resource endowments precludes a cookie-cutter approach to both forestry management and related livelihood options. Other options for VSS villages in Andhra Pradesh include the production of lac, which is a natural resin used as a dye and as the base component of shellac. It is derived from the secretions of the tiny insect, *Laccifer lacca*, as they colonize host trees and deposit their resinous pigment (a deep scarlet color). A local NGO employee has trained various rural people in how to produce lac by preparing certain tress such as Moduga (*Butea frondosa*) in order to better cultivate the insect. Moduga is locally abundant and produces other important NTFPs (e.g., leaves, flowers and seeds) besides lac, but the development of this particular livelihood option could benefit certain VSS villages that lack other options (due to its relatively high remunerative potential).

Two other livelihood options being promoted by the APFD are important because they have a wider range of availability in terms of the raw material (i.e., tree species) and the lower cost of the physical capital. The first is based on a common activity in India that involves stitching leaves together by hand to make small disposable plates for eating (both at home and in local food stalls or restaurants). Several tree species commonly found throughout Andhra Pradesh, such as Moduga and Adda (Bauhinia vahlii), are used for these leaf plates and offer an alternative source of income for VSS villages with few other opportunities. Another small machine promoted by the APFD can produce these plates by using pressure and heat to fuse the

leaves into the shape of a plate. Like the bamboo-cutting machine, this is another example of how a small machine can increase the production efficiency of VSS members.

Another livelihood option being promoted by the APFD is a tamarind-cake machine. It is common for rural Indians to collect tamarind fruits for cooking purposes and to sell in local markets. Use of a very simple mechanical press can quickly convert a large bulky bag of tamarind fruits into small bricks (i.e., "cakes") that are easily transportable. When selling these tamarind cakes at market, the local people can obtain up to twice the price per kilogram of tamarind than for the bulk product. Thus, this livelihood option is important, especially since the cost of the tamarind-cake machine (approximately US$300) is much less than the other machines mentioned.

These options are strategies that are known and available, but what is lacking is sufficient funding at the field level to provide each VSS village with the opportunity to obtain at least one of the above machines or skills (e.g., lac production). Also lacking are personnel that can assess the site-specific needs and opportunities faced by each VSS village, which is necessary to match these communities with the proper capital (be it human capital, physical capital, etc.) that they require for economic improvement. While it is not feasible to simply give a machine to every village, those that can afford one can be put on an extended, interest-free repayment plan to cover the basic cost of the machine. Those VSS villages that are especially poor ought to have only a token repayment schedule.

Recommendations for Training and Extension

Although the APFD is aware of the necessity of promoting some of these activities, their efforts need to be redoubled. In addition, such efforts need to be placed in a more integrated framework of development that involves effective partnerships with other government agencies and local NGOs. Obviously, training and extension are at the root of any efforts towards

developing skills and livelihood options. In general, the APFD does a good job of promoting CFM and developing the knowledge and skills of VSS members through training programs and local demonstration centers. The APFD is to be commended because, although CFM is forestry-based, it is actually more of a rural development scheme. This means that there are limits to what they are able to accomplish because the implementation of such a program is obviously not the specialty of the APFD.

The formal training provided by the APFD is conducted at the Andhra Pradesh Forest Academy near Hyderabad. Courses taught are grouped into five subject areas: Forest Management, Financial Management, Business Management, Social Development and Information Technology. This academy instructs a large number of people (a few thousand) throughout a given year, including VSS Chairpersons and other VSS members, Forest Section Officer trainees, members of other government agencies, members of various NGOs, and representatives from other state forest departments and forestry institutes in India.

Training of new Forest Section Officers at the academy needs to be geared more towards CFM and the field techniques that support it. Given all the attention paid to CFM by the APFD (especially in the upper levels of management), it appeared as if the personnel in training were not given enough instruction in this area. This fact was acknowledged by the then-Director of the Academy who indicated he was pushing for such changes in the curriculum to address this situation.

As with any large organization, there are spatial heterogeneities in terms of personnel and their commitment to CFM and the local stakeholders. The challenge is to make sure that the commitment and adaptation (from traditional forest management to CFM) required are actually being registered throughout the lower levels of the APFD—both administratively, with

committed Divisional Forest Officers, and at the field level. Field officers working directly with the VSS must not only be committed to CFM, but they must have proper training to be effective facilitators and extension workers. Most of the APFD personnel appear to doing a good job, but resources at the field-level seem to be stretched thin and more training is necessary.

A particular aspect of concern in this area is the long-term commitment to the forest department of new recruits. Unlike the United States or other countries, forestry programs are generally limited at the university level and so personal preferences for a career in forestry are unlikely to be an especially significant influence on new APFD recruits. For example, during this study, many of the officers undergoing training at the Academy were also taking government placement exams in order to obtain a different (non-forestry) job within the government. Either there is little inherent desire for a career working in forestry, or the remuneration in the forest department is lacking in relation to other governmental jobs. Whichever is the case, this is likely to affect the necessary commitment to the ideals of the CFM program in terms of its rural development focus. Thus, the APFD may want to consider a modified selection process for new employees; perhaps by developing a special internship or recruitment program with the forestry department at the college in Nizamabad or the Indian Institute of Forest Management in Bhopal, for example. In addition, an internship or recruitment program should also be set up with rural development related programs at other universities in Andhra Pradesh or other states.

The training of VSS Chairpersons and other VSS members at the Andhra Pradesh Forest Academy appears to be very good. Not only are important management skills taught to these individuals, but they also have an opportunity to interact with a diverse array of people from all parts of the state. This networking aspect is perhaps underappreciated by the APFD, although they do promote study tours for VSS members to visit other VSS villages in the state and

occasionally other parts of India (e.g., Maharashtra, West Bengal). This is a critical element of training and extension because it can help VSS Chairpersons to foment ideas and strategies based on the successes of other VSS, especially if they have similar site-specific resource endowments and/or other bio-physical or social characteristics. Thus, more study tours should be promoted given available funding; but more importantly, additional networking strategies need to be developed to provide links for VSS villages to alternative livelihood opportunities that other VSS villages and/or NGOs know about. This job could be accomplished by several small extension teams of two or three people that travel around and coordinate the linkage of opportunities and recipients, and assess the various financial, human, and physical capital needs to support the alternative livelihood options. The need for such teams was previously outlined above.

Another key element of the APFD's knowledge-dissemination strategy is the regional demonstration center just outside the town of Jannaram, in Adilabad district. This center has a well developed nursery for raising different tree species (including cloned varieties of eucalyptus), a small demonstration garden of locally important medicinal plants, and a small demonstration plot filled with examples of the various technical works (e.g., soil-moisture trenches) that VSS members undertake in their forest areas. Most importantly, however, this demonstration center hosts different training events and fora for the dissemination of skills and knowledge to VSS members, especially in the area of livelihood opportunities. A high priority ought to be placed on funding and developing more of these demonstration centers; at the very least there should be a similar type of demonstration forum in every forest department circle.

Recommendations from the Institutional Analysis

Theory, empirical evidence, and field observations were all used to identify institutional and structural strengths and weaknesses of the JFM/CFM program in order to increase the potential of this paradigm as a development tool that can alleviate poverty and inequity. In

particular, the institutional analysis was undertaken specifically to highlight certain key institutions that needed attention in terms of being augmented where deficient or incorporated where absent. The following paragraphs offer some recommendations.

A large majority of VSS members in the sample indicated that the access regulations concerning their protected forest area are clear and understandable. Of concern, however, is that non-members of the VSS are allowed access and use in the protected forest area of many VSS villages. While wider social considerations likely inform this practice, in the long run the violation of the basic economic incentive structure for participation can potentially undermine the future commitment of VSS members if free-riding becomes widespread. This issue must be addressed by each VSS where it is common practice to have loose access requirements. At the very least non-members of the VSS should be charged a user fee to offset the cost of their forest use. Such a fee would distinguish them from VSS members, who would then know that others were not free-riding on their efforts. Only four VSS sampled indicated that any type of user fee was collected; however, it appears as if these fees apply to both members and non-members alike—which is acceptable, theoretically, as long as the fee structure is two-tiered.

Awareness of the physical boundaries of the protected forest area is low, as is the general awareness of local institutions and parameters. The overall awareness on the part of VSS members (particularly boundary awareness) must be increased through improvements in the dissemination of information in VSS meetings. Additional maps that are better suited to local knowledge, and which display boundaries that are more understandable to local stakeholders, would be helpful as well. This will help create a greater sense of resource ownership and perhaps lessen conflicts with other VSS that are related to boundaries. Saxena (1997) recounts instances of inter-village disputes resulting from confusion over boundaries between communities.

The state-level institutions grant VSS members the power to apprehend violators, so the theoretical element of monitoring is present. As local protection of the forest is the cornerstone of CFM, it cannot be said that monitoring is being complied with fully: less than half of the VSS sampled had either formal patrols or a watchman. Vigilant monitoring is especially important since most rule violations seem to have occurred from people outside of the village. Long-term sustainability of VSS-member participation in forest protection requires effective monitoring so that members know their efforts are not in vain. The choices involve contracting a third party to discharge the monitoring, which requires all households to share the costs; or to have the villagers themselves perform the duties, which is the usual practice because most households prefer to provide the labor themselves. A community self-patrol has the added benefit that it likely decreases inequality because the richer households may opt to hire the poor to fill their shift. At the very least, VSS Management Committees need to be encouraged to set up daily patrols to ensure that there is a deterring presence in the forest everyday. An active monitoring program can reinforce the sense of community responsibility for forest management, as well as help instill this value into the next generation of VSS members.

Although the government orders on CFM allow fines to be collected for minor offences, the particular legislative clause is wordy and seems unlikely to be followed in practice. For example, many VSS have set their own fine structure. In any event, the state-level institutions cannot truly be considered graduated sanctions. In contrast, many of the VSS villages sampled report that they have a two-tiered structure of punishment; usually for the second offense, however, the violator is handed over to the APFD. This can perhaps be considered quasi-graduated sanctions, and ought to be the *minimum* level of acceptable sanctions as encoded in the legislative orders. Although the current need for graduated sanctions appears to be relatively low,

it may be of importance in the near future when external funding for CFM is removed. As such, this issue needs to be addressed in the form of legislative orders that mandate the graduated sanctions *structure*, but leave the particular details to each individual VSS.

Conflict-resolution mechanisms were not able to be formally analyzed as part of this study, but it is important to briefly address them because a low-cost forum for resolving conflicts seems to be necessary for CPR institutions to flourish, especially over long periods of time (Ostrom, 1990). Most VSS villages in the sample reported that disputes are adjudicated by the APFD; indeed, the government orders on CFM provide for a higher level (i.e., Forest Division-level) coordination committee to "resolve inter VSS conflicts and conflicts between the VSS and non VSS conflicts [sic]" (GOAP, 2004). Nevertheless, the establishment of a local forum to deal with disputes internal to a VSS ought to be encouraged so that such matters can be dealt with promptly and transparently, as conflicts naturally arise when a community enforces the exclusion of access. This is especially so given the recommendation above that access and use requirements need to be restricted to VSS members only. In addition, an effective local mechanism for dispute resolution reinforces the other institutions that collectively work together to ensure effective commitment and monitoring. This is because complex institutions are never unambiguous in their interpretation and/or implementation (Ostrom, 1990).

A forum for conflict resolution would also add some gravitas to the overall institutional structure of the VSS and, as such, could help act as a deterrent to local elites who may be tempted to high-jack the VSS for their own interests. Finally, a forum of this type is probably more important for larger VSS villages that are likely to have more internal disputes among VSS members, and that are also likely to have a higher percentage of non-members.

Caveats of the Study

Survey

The most limiting factor in terms of the survey was that preliminary fieldwork was insufficient prior to the initiation of this phase of the study. Budget considerations had precluded this activity; however, given a similar opportunity in the future, all efforts would be made to ensure that some preliminary field visit could be arranged. Certainly the survey instruments (in particular the VSS questionnaire) would have been strengthened by advance work, and important contacts could also have been established *a priori*.

As mentioned in Chapter 3, the field-testing of the questionnaires and training of the interviewers were cut short due to time considerations. The incomplete field-testing and training were limiting factors in terms of data accuracy for certain questions. For example, the household questionnaire is a good instrument in terms of the information it is designed to collect but the wording, response codes, and/or recall periods of some questions are sub-optimal and needed to be refined. In particular, the module for data on the collection, consumption, and sales of timber and NTFPs required modifications to improve how these data could be reported and recorded more effectively. Additional testing would have uncovered these and other problematic questions, and been beneficial in how best to revise them and better deal with contingencies as they arose.

Additional time could perhaps have allowed for more in-depth visits and interviews. This would have been informative in terms of collecting more detailed information on the forest resources available in each VSS village, the VSS works conducted (and when), and the associated livelihood options and potential opportunities available. Specifically, these data improvements would have allowed for a better profile of each VSS village vis-à-vis the number and types of forest resources available, and the number and types of forest products consumed or

sold at the household level. As it stands, existing household data on fuelwood collection could be hampered by measurement errors due to a lack of uniform and precise measures used in the instrument (i.e., how much does a “bundle” or “bunch” weigh and cost in Adilabad versus Visakapatnam?).

Data

The lack of baseline economic and forestry-related data for the VSS participating in the JFM/CFM program precluded this study from tracking direct temporal changes within individually specified VSS villages. In this study, a cross section of VSS villages was chosen in which the relative differences within this sample were used to evaluate the economic impacts of the JFM/CFM program. This is obviously a second-best method for conducting economic analyses having a temporal element, but at least offers one way to investigate this forest management paradigm in the absence of an appropriate comparative baseline.

VSS-level data were also problematic in terms of availability from the APFD. The field officers of the APFD routinely collect data in order to monitor the compliance and progress of the participating VSS. Examples of data collected include the finances of each VSS (e.g., expenditures for labor employed for VSS works), size of treatment areas, other measures of VSS works (e.g., length of contour trenched dug), general measures of inputs and outputs of forest management, and demographic information such as literacy rates and the number of VSS members.

Data compilation and management by the APFD is generally poor. Crucial measures used in this study that were obtained from the APFD (i.e., size of the VSS area and year of VSS establishment) are basic measures found in the micro-plan of each VSS; these data were not always readily accessible from electronic databases at the division level—they should be easily available there and at all higher levels. Important input and output data regarding VSS finances

or VSS works could not be obtained from the APFD due to the lack of cogent and timely compilation. Such data had to be estimated from information collected by the survey questionnaires, which subsequently impacted its accuracy and reliability. The general unavailability of data that ostensibly exists limited some of the models in terms of incorporating certain factors as explanatory variables.

The compilation, management, and availability of data are critical aspects that the APFD cannot overlook and must upgrade statewide at the division level. This means more and better equipment where needed but, more importantly, guidelines and training are primarily what is required. Note that the computer services and data management section of the Visakhapatnam Circle office did an excellent job providing data for this study, and could be used as an example of how to compile and manage data and information correctly. The computer personnel in the Chittoor West and Jannaram division offices were very helpful also, but their resources (especially office space) seemed to be limited and that appeared to hamper their efficiency.

Future Work

Many opportunities for future work abound regarding the topic of CFM in Andhra Pradesh, as well as for the broader subject of JFM in India. Additional work can be undertaken to examine different subsets of the average consumption model, especially in the context of interaction terms and slope differences among the three regional samples. The forest quality change model can be reformulated in two different ways by rescaling the dependent variable, FQC. The first way would be to simply collapse the ordinal dependent variable into a simple binary variable without any qualitative scale, where 1 = positive change and 0 = no change/negative change. An alternative model would be to examine forest quality change separately as a positive change (with FQC range of 0 to 3) and a negative change (with FQC measured as 0 or 1, where 1 = negative change).

A number denoting the specific VSS village, the individual household number, and the actual person who conducted the interview uniquely identifies each observation in the household dataset. During the data compilation phase, the quality assurance and control checks uncovered two interviewers with sub-par performance. As such, it would be informative to explore the potential effects that interviewer bias may have on the estimation results. Either the proposed analysis of household participation in JFM/CFM or the modified FQC equation described above could incorporate such a tangential component, as both of these models are based on household-level data.

Because the consumption inequality regression essentially had no explanatory power, it might be informative to remodel this equation using a binary dependent variable to see if that has any effect on the statistical significance of the explanatory variables. For example, the twenty VSS villages with the lowest Gini coefficients could be assigned a value of zero (i.e., no inequality) while the twenty VSS villages with the highest Gini values would be given a value of one (i.e., inequality). Alternative choices for explanatory variables could also be sought as well.

The mixed results of the poverty-gap regression suggest an opportunity for additional work. Deaton (1997) discusses some limitations of using Tobit models for the regression analysis of data pertaining to development research, and offers *median regression* as one alternative. Using the median of the PGR for the regressand, instead of the mean value, would effectively blunt the effect of the 18 observations in the sample that are censored at zero (because they have no households below the poverty line). This may perhaps improve the estimation results as compared with the Tobit model. An alternative approach would be to use a selection model if a suitable specification of explanatory variables could be found for the selection equation, because the selection and outcome equations must differ by at least one independent variable.

Another focus could be to use the existing data to examine the determinants of household participation in JFM/CFM as members of a VSS. A selection model framework could be used to: (1) isolate the *decision to participate* as a binary choice dependent variable (i.e., the selection equation), and (2) analyze the *level of participation* in the VSS (i.e., the outcome equation) as a continuous dependent variable measured by the per-capita number of days of labor that a household was employed for VSS works projects in the previous year.

The preceding paragraphs detail additional work that the data collected in this study can support. However, there are other important areas of investigation beyond the immediate focus of this study and for which additional data would be required. For example, the ideal manner in which to model the economic impact of JFM/CFM would be to undertake a longitudinal analysis based on panel data. Thus, a future study could revisit the VSS villages (if not households) that were sampled by this study and collect new data that would then be incorporated into a panel design with the data collected previously.

Another approach would be a cohort analysis where additional survey data on selected VSS villages are periodically collected and analyzed. As the data of this study is a cross-section of cohorts, as defined by the establishment year of the VSS (i.e., LT), additional data would simply expand the number of VSS villages of each "age" cohort and expand the total number of cohorts as new villages adopt the program each year. The addition of randomly selected non-VSS villages as a control group would perhaps provide a better evaluation strategy, especially for a single cross-section. This would allow the two groups to be tested for a treatment effect that the adoption of the JFM/CFM program would represent.

Additional focus should also be made towards better measurement and analysis of the institutional variables that reflect the Ostrom design principles, especially for those that are

proxy measures. In general, a larger study with more observations is needed to better investigate the institutional aspect of JFM—in India as a whole, and not just Andhra Pradesh. A particularly worthy area of focus would be a comprehensive analysis of the different JFM institutions across the states of India, both theoretically and empirically, in terms of the design principles of Ostrom as well as the response of each state with regard to revisions and evolution of the program. Part of such a study would also include a deeper examination of the paradoxical institutional dichotomy of JFM, as was described previously, which is that local participatory forest management is enabled and directed by state-level institutions.

APPENDIX A
THE VSS QUESTIONNAIRE

UNIVERSITY OF FLORIDA

COMMUNITY FOREST MANAGEMENT RESEARCH STUDY

ANDHRA PRADESH, INDIA SPRING 2005

VSS-Level Questionnaire

DISTRICT ID	VSS ID	VSS VILLAGE NAME		
INTERVIEW DATE:				
START TIME:		END TIME:		
NAME OF EC CHAIRMAN:				
CHAIRMAN'S AGE:		CHAIRMAN'S LEVEL OF EDUCATION:		
NAME OF EC VICE-CHAIRMAN:				

Part A: Historical Background Questions

1) Thinking back to before the CFM program began here, how would you rate the quality of the forest area at that time?

GOOD (manchiga).....1
SL. DEGRADED (palsaga undedi).....2
DEGRADED (podaluga undedi).....3
VERY DEGRADED (banjaruga undedi).....4

2) Regarding the forestland now protected by the VSS, what were the main uses of this area by members of the community before CFM began in this village? (Circle the most important.)

3) Did this village have any prior experience with community management of any forest areas? (e.g., sacred forest, temple lands, irrigation networks, etc.)

YES NO If yes, specify:

Part B: Essential Questions for Econometric Analyses

1) Are there access restrictions to the VSS forest area? **YES** **NO** If no, go to 4.

2) What are the restrictions imposed?

3) How are these restrictions implemented? (e.g., by activity, household, user fee, etc.)

4) How does the community monitor the VSS forest area?

5) What sanctions does a violator of the rules encounter? **GRADUATED SANCTIONS?**

1st Violation: _____ Check if YES: ☐

_____

2nd Violation: _____

_____

6) Have there been any violations, either within the VSS or from non-members and/or other communities?

YES **NO** If yes, prompt for details.

7) Have there been any other types of conflicts or disputes with non-VSS members and/or other communities?

YES **NO** If yes, specify:

8) Does any NGO work specifically with the VSS on forest related issues? **YES** **NO**

9) How many NGOs in total work with this community? **NUMBER** ☐
(e.g., with respect to health care, education, etc.)

10) What is the total number of training events (e.g., Dullapalli, Vallur) and/or field visits (e.g., West Bengal, other VSS areas) that members of the Executive Committee have participated in, since the inception of the VSS?

11) Did these experiences help improve the VSS? **YES** **NO**

12) VSS Work Project Details: Please describe the types of works taken up by the VSS and the expenditures incurred.

2004-2005 **2003-2004** **2002-2003**

13) How many man-days of employment did the VSS provide in the past 3 years for all works projects?

2002 – 2003 VSS works: _____ persons _____ days

2003 – 2004 VSS works: _____ persons _____ days

2004 – 2005 VSS works: _____ persons _____ days

14) What are the criteria for selecting workers for VSS projects?

15) What is the daily wage rate offered to workers employed in VSS project work?

RUPEES [ ]

16) How many DWCRA groups are in this VSS village?

NUMBER [ ]

17) Has this village received assistance in the past from the ITDA? If yes, was it helpful?

YES NO

18) Has this village received assistance in the past from any other Gov't agency?

YES NO

Part C: Participation/Equity Questions

1) Is the selection of the VSS Executive Committee made by consensus, or is an election held?

```
CONSENSUS..................0
ELECTION...................1
```

2) What is the length of term of the Executive Committee? **YEARS**

3) Describe the relationship between the Executive Committee and the FD officer with whom you normally interact?

```
VERY GOOD (OFFICER REALLY SUPPORTS VSS EFFORTS).....................1
GOOD (OFFICER IS HELPFUL)...........................................2
FAIR (OR INDIFFERENT)...............................................3
BAD (THERE ARE PROBLEMS WITH THIS OFFICER)..........................4
```

4) Does the FD give the Executive Committee enough autonomy to manage the VSS forest area in a way that best serves the community?

YES NO

5) **VSS Future Livelihood Plans/Investments:** Please describe how the VSS plans to sustain itself in the future, given the decline and elimination of external funding in a few years. What investments are being made and/or requested?

6) Does the VSS micro-plan adopted by the VSS contain any items that the FD insisted upon, even though the community does not want or need? (e.g., particular tree species or NTFP, etc.)

YES **NO** If yes, specify item(s):

7) Does this village have any Social Forestry? If so, what types of tree species are grown.

8) Is any of the VSS area under plantation? If so, please specify the tree species.

9) What is the frequency of meetings for the Executive Committee, and for the General Body?

10) Typically, what is the attendance for a meeting of the VSS General Body?

11) What is the current balance of the VSS Account, approximately? **RUPEES**

12) How would you describe the overall participation of VSS members in VSS meetings, projects, and works?

VERY INVOLVED.....1
INVOLVED.....2
SOMEWHAT INVOLVED..3
NOT INVOLVED.....4
DON'T KNOW.....99

Part D: Final Questions

1) Have there been any problems employing people for the VSS project works?

   YES **NO** If yes, specify problem(s):

2) Have there been any conflicts within the VSS?

   YES **NO** If yes, specify:

3) Have there been any encroachment problems from other communities or other VSS ?
   If so, how have they been solved?

   YES **NO**

4) What is the extent of the encroachment area? **ACRES** [ ]

5) What are the main crops grown here, and the main market(s) for them?

6) Approximately how many functioning bore-wells are there in this village? **NUMBER** [ ]

7) What is the average depth of water in these bore-wells? **FEET** [ ]

8) Do people from this village migrate to other places for work?

   YES **NO** If yes, specify:

APPENDIX B
THE HOUSEHOLD QUESTIONNAIRE

UNIVERSITY OF FLORIDA

COMMUNITY FOREST MANAGEMENT RESEARCH STUDY

RURAL HOUSEHOLD SURVEY, SPRING 2005

ANDHRA PRADESH, INDIA

Principal Investigator:

Frederick Rossi

Food and Resource Economics Department
University of Florida

Research Associate:

R. Vishnu Vardhan Reddy
M.Sc. (Agricultural Economics)

With assistance from:

Andhra Pradesh Forest Department

UNIVERSITY OF FLORIDA ANDHRA PRADESH COMMUNITY FOREST MANAGEMENT RESEARCH STUDY

Rural Household Survey: Informed Consent Protocol (Verbal)

I (Name of Investigator) am working for Frederick Rossi, Research Scholar of University of Florida. Dr. Janaki Ram Reddy Associate Professor at School of Forest Resource and Conservation, University Florida is the guide for Frederick Rossi. Fred Rossi is doing research on participation of rural communities in Community Forest Management and benefits accruing to rural families in Andhra Pradesh. The data that will be collected from you will be available only to Fred Rossi. There are no risks / benefits for participating in this research. You will not receive any compensation / payment for participating in this research.

The questions will be in detail on your knowledge of CFM, on projects, your participation, and your family's economic activities. For example: In last 2 weeks, is your family purchased Red gram? What is the price paid? How much quantity you have purchased? Other questions may be like this one: Have you voted in Vss Management Committee elections? How many Women members are there in Vss Management committee?

If you don't feel like answering any of the questions you can do so. It may take approximately one hour to answer the questions. If you want the interview to be scheduled at other time I will do so.

I will be giving you a copy having summary of the details given to you now. If you need any details regarding this research, your rights, if you have questions or any other doubts. You can call the phone number given in the copy. We will answer you. If you don't like to sign the copy, you can give oral consent. May I start the interview?

DISTRICT ID	VILLAGE ID	INTERVIEWER	HOUSEHOLD ID
DATE:			
START TIME:		END TIME:	
RESPONDENT NAME:			
CASTE:			

HOUESEHOLD ROSTER

1. Before beginning this survey, I request you to enumerate your family details. LIST ALL HOUSEHOLD MEMBERS BEFORE GOING TO QUESTIONS 4 – 9. **RELATIONSHIP CODES:** **HEAD.....1** **SPOUSE OF HEAD.....2** **SON/DAUGHTER.....3** **SON/DAUGHTER-IN-LAW.....4** **GRANDCHILD.....5** **FATHER/MOTHER.....6** **SISTER/BROTHER.....7** **NIECE/NEPHEW.....8** **FATHER/MOTHER-IN-LAW.....9** **BROTHER/SISTER-IN-LAW...10** **SERVANT/EMPLOYEE.....11** **OTHER.....12**		2. Sex (gender) of the member? **MALE..1** **FEMALE. 2**	3. Their relation-ship with the Head of the Family?	4. Age of the member?	5. What is the educational qualification of the member? (Highest educational qualification). **IF < 3 YEARS: (»6)**	6. Past year, how many months did the member live here?	7. BASED ON THE CRITERIA IN Q. #6, IS THIS PERSON A MEMBER OF THE HOUSE-HOLD?	8. To know the member's contribution to the family, give two important occupational details of the member. **OWN FARM PRODUCTION (AGRI).....1** **HOUSEHOLD ENTERPRISE.....2** **LONG-TERM AGRI. EMPLOYEE.....3** **SALARIED EMPLOYEE.....4** **CASUAL LABOR.....5** **COLLECTION/FORAGING.....6** **HOUSEHOLD CHORES.....7** **ATTENDS SCHOOL.....8** **DOES NOT WORK.....9** **OTHER 10**			9. Who among the family, two members belong to the VSS? **INDICATE WITH A CHECK MARK, THEN GO TO NEXT PAGE**
	NAME OF HOUSEHOLD MEMBER		**CODE**		**CODE**	**MONTHS**		**#1**	**#2**	**IF 10,SPECIFY**	
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											

HOUSEHOLD SURVEY: CONSUMPTION MODULE PART A: DAILY EXPENSES

1. Following questions will be on purchases made for your family. Purchaser can be any member of the family. In the past 7 days did any member in the house spend money to purchase any of the items given below? IF YES, PUT A CHECK MARK IN THE 'YES' BOX FOR EACH ITEM, THEN ASK Q. 2 FOR THOSE ITEMS.			2. How much did the member spend on (…)?	3. In the past 7 days, How many times did household members eat out (Tiffin or snacks / lunch or dinner)?		4. In the past 7 days, what is the amount spent on eating out?
	ITEM	**YES**	**RUPEES**	**ITEM**	**NUMBER**	**RUPEES**
1	Chutta (local kind of cigar), Beedi, Cigarettes.			Tiffin/Coffee and Tea		
2	Gutka, Khaini, Panmasala, Tambaku (tobacco products).			Madhyana Bhojana (lunch)		
3	Tamalapakalu (betel leaves).			Rathri Bhojana (dinner)		
4	Newspapers or Magazines (e.g., Swathi)			Thinu Bandaralu (food items)		
5	Lottery Tickets			Mandu (e.g., Kallu, beer, wine, whiskey)		
6	Prayana Kharchulu (e.g., bus, autorickshaw)					
7	Devudiki Kanukalu (donation to god)					
8	Toddy/Kallu					

Following questions will be on purchases made for your family. Purchaser can be any member of the family.

PART B: FOOD AND FUEL			PURCHASE FREQUENCY			HOME PRODUCTION		
1. In the last 12 months, give details of purchases/ usage of food items by your family. Exclude the items that are purchased for business purpose. **IF YES, PUT A CHECK MARK IN THE "YES" BOX BELOW FOR EACH FOOD ITEM, THEN ASK Q. 2 – 6 FOR THOSE ITEMS.**			2. How often do your family members purchase (...)? **WEEKLY.....1** **FORT-NIGHTLY....2** **MONTHLY....3** **QUARTERLY..4** **BI-ANNUALLY...5** **YEARLY.....6**	3. How much did they purchase?	4. Total amount spent on the purchase?	5. In the last 12 months, how much quantity of your own production of (...) did you consume?		6. What is the value of own production of (...) you have consumed?
ITEM	**YES**	**CODE**	**FREQUENCY**	**QUANTITY**	**RUPEES**	**QUANTITY**	**UNIT**	**RUPEES**
Biyyam (Rice) – PDS		**1**						
Biyyam (Rice) – Market		**2**						
Jonnalu (Sorghum)		**3**						
Mokkajonnalu (Maize)		**4**						
Wheat		**5**						
Kandi (Red Gram – i.e., Red Lentils)		**6**						
Sanaga (Bengal Gram)		**7**						
Minumulu (Black Gram)		**8**						
Pesalu (Green Gram)		**9**						
Pillipesearea		**10**						
Verusanaga (Groundnut)		**11**						
Other Grains		**12**						
		13						
		14						
		15						

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
PACKET...4
BUNDLE...5
GRAM.....6
BOTTLES..7
BUNCH....8
OTHER....9

PART B: FOOD AND FUEL			PURCHASE FREQUENCY			HOME PRODUCTION		
1. In the last 12 months, give details of purchases/ usage of food items by your family. Exclude the items that are purchased for business purpose. **IF YES, PUT A CHECK MARK IN THE "YES" BOX BELOW FOR EACH FOOD ITEM, THEN ASK Q. 2 – 6 FOR THOSE ITEMS.**			2. How often do your family members purchase (...)? **WEEKLY.....1** **FORT-NIGHTLY....2** **MONTHLY....3** **QUARTERLY..4** **BI-ANNUALLY...5** **YEARLY.....6**	3. How much did they purchase?	4. Total amount spent on the purchase?	5. In the last 12 months, how much quantity of your own production of (...) did you consume?		6. What is the value of own production of (...) you have consumed?
ITEM	**YES**	**CODE**	**FREQUENCY**	**QUANTITY**	**RUPEES**	**QUANTITY**	**UNIT**	**RUPEES**
Palm Oil		**16**						
Other Cooking Oils		**17**						
Palu (Milk)		**18**						
Curd		**19**						
Chakkera/Panchadara (Sugar)		**20**						
Eggs		**21**						
Mutton		**22**						
Chicken		**23**						
Chepalu (Fish)		**24**						
Vankaya (Brinjal – i.e., Eggplant)		**25**						
Tomato		**26**						
Ullipaya (Onion)		**27**						
Karivepaku (Curry Leaves)		**28**						
Chinthapandu (Tamarind)		**29**						
Benda (Lady Fingers – i.e., Okra)		**30**						

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
PACKET...4
BUNDLE...5
GRAM.....6
BOTTLES..7
BUNCH....8
OTHER....9

PART B: FOOD AND FUEL			PURCHASE FREQUENCY			HOME PRODUCTION		
1. In the last 12 months, give details of purchases/ usage of food items by your family. Exclude the items that are purchased for business purpose. **IF YES, PUT A CHECK MARK IN THE "YES" BOX BELOW FOR EACH FOOD ITEM, THEN ASK Q. 2 – 6 FOR THOSE ITEMS.**			2. How often do your family members purchase (...)? **WEEKLY.....1** **FORT-NIGHTLY....2** **MONTHLY....3** **QUARTERLY..4** **BI-ANNUALLY...5** **YEARLY.....6**	3. How much did they purchase?	4. Total amount spent on the purchase?	5. In the last 12 months, how much quantity of your own production of (...) did you consume?		6. What is the value of own production of (...) you have consumed?
ITEM	**YES**	**CODE**	**FREQUENCY**	**QUANTITY**	**RUPEES**	**QUANTITY**	**UNIT**	**RUPEES**
Pachimirapa (Green Chillies)		**31**						
Ithara Kuragayalu (other vegetables)		**32**						
(Specify)		**33**						
		34						
		35						
Aratipandu (Banana)		**36**						
Jamakaya (Guava)		**37**						
Seethaphal (Custard Apple)		**38**						
Mamidi (Mango)		**39**						
Ithara Pallu (other fruits)		**40**						
(Specify)		**41**						
		42						
		43						
Jeelakarra/Avalu (Mustard)		**44**						
Gasagasalu (Poppy Seeds)		**45**						

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
PACKET...4
BUNDLE...5
GRAM.....6
BOTTLES..7
BUNCH....8
OTHER....9

PART B: FOOD AND FUEL			PURCHASE FREQUENCY			HOME PRODUCTION		
1. In the last 12 months, give details of purchases/ usage of food items by your family. Exclude the items that are purchased for business purpose. **IF YES, PUT A CHECK MARK IN THE "YES" BOX BELOW FOR EACH FOOD ITEM, THEN ASK Q. 2 – 6 FOR THOSE ITEMS.**			2. How often do your family members purchase (...)? **WEEKLY.....1** **FORT-NIGHTLY....2** **MONTHLY....3** **QUARTERLY..4** **BI-ANNUALLY...5** **YEARLY.....6**	3. How much did they purchase?	4. Total amount spent on the purchase?	5. In the last 12 months, how much quantity of your own production of (...) did you consume?		6. What is the value of own production of (...) you have consumed?
ITEM	**YES**	**CODE**	**FREQUENCY**	**QUANTITY**	**RUPEES**	**QUANTITY**	**UNIT**	**RUPEES**
Allam/Vellulli (Ginger/Garlic)		**46**						
Endumirapa (Dried Red Chillies)		**47**						
Tea		**48**						
Coffee		**49**						
Bottled drinks (Pepsi, etc.)		**50**						
Beer		**51**						
Ithara Madyapanalu (other Alcohol)		**52**						
Snacks (Samosa/Biscuits/etc)		**53**						
Pillalaki Palapodi (Baby Foods)		**54**						
Canned Foods		**55**						
Kerosene		**56**						
Cooking Gas		**57**						
		58						
		59						
		60						

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
PACKET...4
BUNDLE...5
GRAM.....6
BOTTLES..7
BUNCH....8
OTHER....9

PART C: NON-FOOD GOODS			PURCHASES LAST 30 DAYS		LAST 12 MONTHS
1. Following questions will be on purchases made for your family. Purchaser can be any member of the family. Exclude the items that are purchased for business purpose. In the last 12 months, have you purchased or amount spent on or received as gift any of the following (. Item.) **IF YES, PUT A CHECK MARK IN THE "YES" BOX FOR EACH ITEM, THEN ASK Q. 2 – 4.**			2. Did any member of the family purchase (...) In the last 30 days? **YES…1** **NO..2** **» 4**	3. How much did you spend on (...)?	4. In the last 12 months, How much did your family spend on (...)?
ID	**ITEM**	**YES**		**RUPEES**	**RUPEES**
1	Ladies clothing + tailoring charges				
2	Gents clothing + tailoring charges				
3	Childrens clothing + tailoring charges				
4	Aadavalla Cheppullaki (Ladies footwear)				
5	Magavalla Cheppullaki (Mens footwear)				
6	Pillala Cheppullaki (childrens footwear)				
7	Personal Services (e.g., hair-cuts, shaving, etc.)				
8	Sabbulu (soap), Shampoolaki (shampoo), Toothpaste				
9	Make-up, Other Products for Women				
10	Kitchen Utensils, Dishes, Pots/Pans, etc.				
11	Small Kitchen Appliances/Other Small Electrical Items				
12	Electrical Supplies (light bulbs, batteries, etc.)				
13	Household Linen (towels, bed sheets & others)				
14	Repair and Maintenance of Appliances				
15	Repairs, Maintenance, and Improvements to House				
16	Vehicle Repairs and Maintenance, Parts and Licenses				

PART C: NON-FOOD GOODS			PURCHASES LAST 30 DAYS		LAST 12 MONTHS
1. In the last 12 months, have you purchased or amount spent on or received as gift any of the following (. Item.) **IF YES, PUT A CHECK MARK IN THE "YES" BOX FOR EACH ITEM, THEN ASK Q. 2 – 4.**			2. Did any member of the family purchased (...) In the last 30 days? **YES…1** **NO..2** **» 4**	3. How much did you spend on (...)?	4. In the last 12 months, How much did your family spend on (...)?
ID	**ITEM**	**YES**		**RUPEES**	**RUPEES**
17	Pustakala Kharchulu (expenditure on books)				
18	Post-officeki/Cell phone/Telephone Kharchulu (expenses)				
19	Cinema Kharchulu (expenses)				
20	Toys, Sports Equipment, Small Games				
21	Travel Expenses (marriage, pilgrimage, jatara)				
22	Ceremonies (child birth, marriages)				
23	Dowry				
24	Doctor, Hospital, Traditional Medicines				
25	Insurance (auto, property, LIC)				
26	Taxes (housing, property and others)				
27	Legal Services, Registrations, etc.				
28	Contributions (temples/mosques/churches/charities)				
29	Funeral Expenses				
30	Savings Account Deposits				
31	Gambling Losses				
32					

CONSUMPTION MODULE PART D: DURABLE GOODS

1. Do you own any of the following articles / Goods? IF YES, PUT A CHECK MARK IN THE 'YES' BOX FOR EACH ITEM. THEN ASK Q. 2 – 4.			2. How many (...) do you own?	3. How many years back did you purchase the (...)?	4. Have you purchased the article brand new or used one?		5. How much did you spend to purchase the article? If you have received it as gift what is the value?
	ITEM	**YES**	**NUMBER**	**YEARS**	**NEW**	**USED**	**RUPEES**
1	Stove						
2	Fridge (refrigerator)						
3	Grinder						
4	Sewing machine						
5	Fan						
6	T.V.						
7	VCD						
8	Tape Recorder/Radio						
9	CD Player						
10	Camera						
11	Video Camera						
12	Cell Phone						
13	Cycle						
14	Motorcycle/Scooter						
15	Car						
16	Lorry (truck)						
17	Computer						
18	Washing Machine						

FOREST RESOURCES MODULE PART A: CFM AWARENESS AND PARTICIPATION

IS THE RESPONDENT ONE OF THE HOUSEHOLD'S VSS MEMBERS? YES.1 NO..2 [ ] **IF YES, GO TO QUESTION 1.**

IF THE ANSWER TO THE ABOVE QUESTION IS NO, ASK TO SPEAK TO A VSS MEMBER. RESCHEDULE FOR LATER IF NECESSARY TO INTERVIEW A VSS MEMBER.

This module consists of questions to know about your family's involvement and opinion with regard to Community Forest Management (CFM) of your village. First few questions are to know about your family's usage of forest (currently the forest area under VSS) prior to the introduction of CFM.

1	What is the quality of forest prior to the introduction of CFM. GOOD (manchiga).....1 SL. DEGRADED (palsaga undedi).....2 DEGRADED (podaluga undedi).....3 VERY DEGRADED (banjaruga undedi).....4	CODE
2	Prior to the introduction of CFM did your family use forest produce, currently they are under VSS protection. IF YES, SPECIFY USES; THEN » 3 IF NO, ASK WHY NOT; THEN » 5	YES1 NO.2
3	ASK THEM TO IDENTIFY WHICH USE WAS MOST IMPORTANT:	
4	Prior to the introduction of CFM, what is the average value of the forest produce used in a year for different needs of your family.	RUPEES

Following few questions are to know your opinion about family's participation in CFM and VSS micro-plan.

5	Is election to VSS Management Committee by agreement / consensus or is it election by secret ballot method? CONSENSUS (ekagrivamuga)...0 » 7 ELECTION (ennikalu).....1	CODE
6	In the last VSS Management Committee elections, did both members from your family cast their votes?	YES.1 NO..2
7	Do you or any one of your family is a member of the VSS Managing Committee?	YES.1 NO..2
8	Do you think VSS Managing Committee considers views, needs of majority of its VSS members?	YES.1 NO..2
9	In practice, VSS Micro-plan reflects interests of which section of the society? FOREST DEPENDENT HHs (adavi pi adarapadina).....1 OTHER HOUSEHOLDS (ethara kutambalu).....2 LOCAL ELITES (grama peddalu).....3 FOREST DEPARTMENT (atavi shaka).....4	CODE

10	How do you describe VSS member's participation in CFM micro-plan preparation? **VERY INVOLVED (andaru sabyulu palgontara).....1** **INVOLVED (ekkuva sabyulu palgontara).....2** **SOMEWHAT INVOLVED (thakkuva sabyulu palgontara)....3** **NOT INVOLVED (sabyulu palgonara).....4** **DON'T KNOW (thelavadu).....99**	**CODE** **IF 3 OR 4, » 12**
11	In your opinion, what are the reasons for non-participation of VSS members in micro-plan preparation? **THE PROCESS WAS DOMINATED BY LOCAL ELITES….....1** **THE PROCESS WAS DOMINATED BY INTEREST GROUP.....2** **THE PROCESS WAS DOMINATED BY THE FOREST DEPT.....3** **THE MEMBERS WERE INDIFFERENT (sabyulu pattichukoru)...4** **OTHER (Specify).....5** **DON'T KNOW.....99**	**CODE**
12	Do you think Forest Department is giving sufficient autonomy to VSS, to manage forest area and to provide best services to community?	**YES.1** **NO..2**
13	In general, what do you think about the way VSS Management Committee elections are held? **FREE and FAIR (vattidi lekunda swatantramuga)...1** **DOMINATED BY LOCAL ELITES.....2** **DOMINATED BY INTEREST GROUP (VARGAMU).....3** **OTHER (Specify).....4** **DON'T KNOW.....99**	**CODE**

Now I would ask few questions on VSS, current usage of VSS forest area.

14	How much time it takes to walk to forest area managed by CFM from your home?	**MINUTES**
15	Do you know exact boundaries of VSS forest area? **PROBE RESPONDENT ABOUT THE BOUNDARIES OF THE VSS FOREST: NEWS**	**YES.1** **NO..2**
16	What is the improvement in quality of VSS forest area since formation of CFM? **GOOD.(manchiga).....1** **SL. DEGRADED.(palsaga).....2** **DEGRADED.(podaluga).....3** **VERY DEGRADED.(banjaruga).....4**	**CODE**
17	Do You pay any membership fee to VSS? **IF NO: » 19**	**YES.1** **NO..2**
18	How much do you pay for a year?	**RUPEES**
19	For which important use do you pay this fee (say grazing, and so on).	

20	Currently what is the approximate balance amount in the VSS account?	RUPEES
21	What is the extent of area in hectares under CFM managed by VSS?	HECTARES
22	What is the tenure of VSS Management Committee?	YEARS
23	In which year VSS was established?	YEAR

Before going to next section, I will ask few questions on community participation in CFM.

24	Approximately, what is the level of participation of your family in VSS (like participation in General Body meeting, VSS works, Projects and so on)?	CODE

VERY ACTIVE (CHURUKUGA ANNI SABHALU/PANULU PALGONTAMU)..1
SOMEWHAT ACTIVE (THARACHUGA PALGONTAMU).....2
OCCAISIONALLY ACTIVE (APPUDAPPUDU PALGONTAMU) 3
NOT ACTIVE AT ALL (PALGONAMU).....4

25	Regulations concerning entry into VSS forest area, are they clear and easy to understand?	YES.1 NO..2
26	Do you think majority of VSS members follow rules and regulations? IF NO, » 28	YES.1 NO..2
27	According to you, what is the main reason for majority of people to follow rules and regulations?	CODE

THEY RESPECT THE LAW.....1
THEY RESPECT THE FOREST AND NATURE...2
THE THREAT OF SOCIAL DISAPPROVAL.....3
THE THREAT OF THE MONETARY FINES.....4
THEY KNOW THERE ARE BENEFITS
FOR COMMUNITY AND INDIVIDUAL HH.....5

28	In your opinion, what is the main reason for people not following rules and regulations?	
29	If all the members of VSS contribute some amount for the development of community, what amount is your family ready to contribute for the same?	RUPEES

FOREST RESOURCES MODULE PART B: INCOME FROM FOREST PRODUCTS

In this section, I will be asking about your family's collection of Forest Produce.

1. In the last 12 months, did any one of your family members collected any of the following (NTFP Item) from the nearby forests? **LIST EACH ITEM, THEN ASK Q. 2 – 7.**			2. In one-year period, for how many months your family members collect (….)?	3. Generally in a month how much quantity of (….) do your family collect?		4. How much quantity of (….) collected in a month do you sell?		5. Last time when you sold (…) what price did your family received?		6. Who purchases (….) from your family? **GOV'T (GCC)....1 A CONTRACTOR...2 MKT VENDOR.....3 LOCAL PEOPLE...4 OTHER(specify..5**	7. From which region / forest area do you collect (…)? **VSS FOREST.....1 OTHER FOREST...2 OWN LAND.....3 OTHER(specify).4**
ID	**NTFP NAME**	**YES**	**MONTHS**	**QUANTITY**	**UNIT CODE**	**QUANTITY**	**UNIT CODE**	**RUPEES**	**UNIT CODE**	**CODE**	**CODE**
1	Tapsi Gum										
2	Kondagogu Gum										
3	Chirumanu Gum										
4	Gumpena Gum										
5	Honey										
6	Karakkaya										
7	Shikakai										
8	Kunkudukaylu										
9	Kanuge Ginjalu										
10	Mahua (Ippa) Ginjalu										
11	Mahua (Ippa) Puvvu										
12	Nallajeedi										
13	Sarapappu										
14	Vepa Ginjalu										
15	Jeddipikkalu										

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
CARTS....4
BUNDLE...5
GRAMS....6
POLES....7
BUNCH....8
PACKS....9
OTHER...10

1. In the last 12 months, did any one of your family members collected any of the following (NTFP Item) from the nearby forests?			2. In one-year period, for how many months your family members collect (….)?	3. Generally in a month how much quantity of (….) do your family collect?		4. How much quantity of (….) collected in a month do you sell?		5. Last time when you sold (…) what price did your family received?		6. Who purchases (….) from your family? GOV'T (GCC)....1 A CONTRACTOR...2 MKT VENDOR.....3 LOCAL PEOPLE...4 OTHER(specify..5	7. From which region / forest area do you collect (…)? VSS FOREST.....1 OTHER FOREST...2 OWN LAND.....3 OTHER(specify).4
ID	**NTFP NAME**	**YES**	**MONTHS**	**QUANTITY**	**UNIT CODE**	**QUANTITY**	**UNIT CODE**	**RUPEES**	**UNIT CODE**	**CODE**	**CODE**
16	Thuniki (Beedi Leaf)										
17	Adda Akulu										
18	Isthara Aaku (Mothuka)										
19	Rayla										
20	Lakka										
21	Cheepurlu										
22	Eetha Chapalu										
23	Usiri										
24	Seethaphalalu										
25	Chinthapandu										
26	Maredu Gaddalu										
27	Nelavemu										
28	Sathavari Gaddalu										
29	Ithara NTFPs										
30											
31											
32											
33											

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
CARTS....4
BUNDLE...5
GRAMS....6
POLES....7
BUNCH....8
PACKS....9
OTHER...10

1. In the last 12 months, did any one of your family members collected any of the following (NTFP Item) from the nearby forests?			2. In one-year period, for how many months your family members collect (….)?	3. Generally in a month how much quantity of (….) do your family collect?		4. How much quantity of (….) collected in a month do you sell?		5. Last time when you sold (…) what price did your family received?		6. Who purchases (….) from your family? GOV'T (GCC)....1 A CONTRACTOR...2 MKT VENDOR.....3 LOCAL PEOPLE...4 OTHER(specify..5	7. From which region / forest area do you collect (…)? VSS FOREST.....1 OTHER FOREST...2 OWN LAND.....3 OTHER(specify).4
ID	**ITEM NAME**	**YES**	**MONTHS**	**QUANTITY**	**UNIT CODE**	**QUANTITY**	**UNIT CODE**	**RUPEES**	**UNIT CODE**	**CODE**	**CODE**
34	Small timber and poles										
35	Fuelwood										
36	Ithara wood products										
37											
38											
39											
40											
41											
42	Wild Game										
43											
44											
45											
46											
47											
48											
49	Grasses/Fodder										
50	Do you graze animals?										

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
CARTS....4
BUNDLE...5
GRAMS....6
POLES....7
BUNCH....8
PACKS....9
OTHER...10

AGRICULTURE MODULE PART A: LANDHOLDINGS

1. Currently, do any one in your family own agriculture land, or forestland, or crops, or wells, lakes and so on? YES..1 NO...2 [ ] IF NO, GO TO PART B BELOW

2. How many acres of land do your family own?	3. Do your family has any land without proper legal documents?	4. What is the extent of such land?	5. What is the extent of leased land?	6. What is the extent of leased out land?	7. What is the extent of irrigated land?	8. Previous year, what is the extent of cultivated land?	9. What is the market value of land owned by your family?
ACRES	YES.1 NO.2	ACRES	ACRES	ACRES	ACRES	ACRES	RUPEES

AGRICULTURE MODULE PART B: FARM CAPITAL INVENTORY

1. Do your family own (….)? IF YES, PUT A CHECK MARK IN THE "YES" BOX FOR EACH ITEM, THEN ASK Q. 2 – 4.			2. How many do your family own (….)?	3. Do your family have any (….) joint ownership?	4. How many do your family have (….) joint ownership?	5. What is your family's share in joint ownership of (….)?	6. If you sell it (….) now, what price you will receive?	7. Previous year, has your family derived any income by renting it (….)?	8. What is the income?
CODE	TYPE OF FARM EQUIPMENT	YES	NUMBER	YES.1 NO..2 (»6)	NUMBER	PERCENT	RUPEES	YES.1 (»8) NO..2	RUPEES
1	Tractor (include implements)								
2	Animal pulled plow (Nagali)								
3	Pump-set/Submersible								
4	Sprinkler/Drip irrigation								
5	Thresher/Harvester								
6	Rice/Flour Mill								
7	Chopper (to process feed)								
8	Power sprayer								
9	Hand sprayer								
10	Ox cart								

AGRICULTURE MODULE PART C: DISPOSITION OF CROPS

1. What are the crops cultivated previous year? **PROMPT RESPONDENT FOR RECALL AND/OR CROPS NOT LISTED**			2. What is the yield of (….) in the last 12 months?		3. What quantity of (…) produced in last 12 months, you have sold? **IF 0, » NEXT CROP**		4. What is the price received for the (…) sold by you?	
ID	**CROP NAME**	**YES**	**QUANTITY**	**UNIT CODE**	**QUANTITY**	**UNIT CODE**	**RUPEES**	**UNIT CODE**
1	Vari (paddy)							
2	Jonnalu (sorghum)							
3	Mokkajonnalu (maize)							
4	Kandi (redgram)							
5	Chanaga (Bengal gram)							
6	Pesalu (Green gram)							
7	Palli (Verushanaga) (groundnut)							
8	Minumulu (Blackgram)							
9	Sunflower							
10	Sugarcane (Cheraku)							
11	Cotton (Patti)							
12	Ithara Pantalu (other crops, specify)							
13								
14								
15								
16								
17								
18								
19								
20								
21								

UNIT CODES:

KILO.....1
LITER....2
DOZEN....3
CARTS....4
BUNDLE...5
GRAMS....6
POLES....7
BUNCH....8
PACKS....9
QUINTAL.10
BALES...11
OTHER...12

AGRICULTURE MODULE PARTS D and E: INPUT PURCHASES AND LIVESTOCK

	1. Did your family purchased (input) in the last 12 months? **IF YES, MARK ALL INPUT PURCHASES BEFORE ASKING QUESTION 2.**			2. In last 12 months, how much did you purchase (…)? (what is the total cost)
ID	**INPUT**	**DESCRIPTION**	**YES**	**RUPEES**
1	Fertilizer #1	Urea		
2	Fertilizer #2	D.A.P.		
3	Fertilizer #3	M.O.P.		
4	Fertilizer #4	S.S.P.		
5	Fertilizer #5	20:20:0:15		
6	Manure	FYM		
7	Pesticide #1	Monocrotophos		
8	Pesticide #2	Quinolphos		
9	Pesticide #3	Chloropyriphos		
10	Pesticide #4	Endosulfon		
11	Herbicide #1	Butachlor		
12	Herbicide #2	2,4-D		
13	Fungicide #1	Bavistin		
14	Fungicide #2	Thiram/Captan		
15	Bio-fertilizers	Rhizobium/PSB		

1. Any member of your family owns (…)? **LIST ALL ANIMALS BEFORE ASKING Q. 2 - 5 FOR EACH ANIMAL**			2. How many does your family own (…)?	3. If you sell this one (…) what price does it fetch you?	4. Are you deriving any income from this (…) (like milk, eggs and so on).	5. What is the income derived from (…) in the last two weeks?
ID	**ANIMAL**	**YES**	**NUMBER**	**RUPEES**	**YES.1 (» 5) NO..2**	**RUPEES**
1	Gedelu (Buffaloes)					
2	Aavulu (cows)					
3	Yeddulu (oxen)					
4	Pandulu (Pigs)					
5	Gorrelu (Sheep)					
6	Mekalu (Goat)					
7	Kollu (Chicken)					
8	Bathulu (Ducks)					
Ithara Jantuvulu (other animals)						
UNIT CODES: **KILOGRAM.....1** **LITER.....2** **CARTLOAD.....3** **OTHER (Specify)..4**						

EMPLOYMENT MODULE [REFER TO HOUSEHOLD ROSTER]

In this module, few questions to the family head on the various works and the family members engaged in it.

If any member were employed outside, I would like to talk to the member now. If it is not possible for the member to talk to me. I would like to talk to any other member of the family who can provide details of employment of such member.

WRITE THE HOUSEHOLD MEMBER ID CODE IN THE FIRST COLUMN, IF THE PERSON'S OCCUPATION CODE (FROM Q.10 OF THE HOUSEHOLD ROSTER) EQUALS 3, 4, 5, OR 6. THEN WRITE THE PERSON'S JOB DESCRIPTION NEXT TO THEIR ID CODE.

IF A PROXY RESPONDENT IS ANSWERING THIS SECTION, INDICATE THEIR PERSONAL ID CODE HERE: ☐

1. **IF THE PERSON HAS MORE THAN ONE TYPE OF JOB, INDICATE THIS BY MARKING THEIR ID CODE IN COLUMN 1 FOR EACH JOB DESCRIPTION LISTED.** **THEN PROCEED TO ASK QUESTIONS 3 – 9 FOR EACH JOB LISTED.**		2. IS THIS PERSON ANSWER-ING FOR HIMSELF OR HERSELF?	3. Last year for how many months you have worked in this job?	4. What is the salary per month you received for this job? **IF NO MONEY WAGE IS COLLECTED: » 7**	5. How many days in a month do you work?	6. Normally what is your earning per day?	7. Last year have you received any payment not in cash form **IF NO: » 9**	8. What is the value of payment received in non- cash mode?	9. IF THE RESPONDENT RECEIVES NO TYPE OF PAYMENT FOR WORK, THEN ASK THIS QUESTION: What is the reason for not receiving any kind of payment for your work? **NON-PAYMENT CODES:** **APPRENTICESHIP OR UNPAID TRAINEESHIP....1** **LABOR EXCHANGE.....2** **PAYING OFF A DEBT.....3** **WORKING FOR A RELATIVE...4** **OTHER (Specify).....5**		
ID CODE	**JOB DESCRIPTION**	**YES..1 NO...2**	**MONTHS**	**RUPEES**	**DAYS PER MONTH**	**RUPEES PER DAY**	**YES..1 NO...2**	**RUPEES**	**CODE**	**(Specify if CODE = 5)**

HOUSEHOLD ENTERPRISES MODULE PART A: GENERAL INFORMATION

In last one year any one in your family owned a shop or ran/ managed business enterprise? **YES.1 NO..2** ☐

Previous year any one in your family operated business enterprise (such as sculpting, tailoring, mechanic) not related to Manufacturing, service sector, or agriculture **YES.1 NO..2** ☐

IF THE ANSWER TO EITHER QUESTION ABOVE IS YES, PROCEED TO QUESTION 1 BELOW.

IF BOTH ANSWERS ARE NO, INFORM THE RESPONDENT THAT YOU WILL NOW PROCEED TO THE FINAL SECTION. PROCEED TO THE REMITTANCES MODULE.

1. I will be asking some important questions related to the business operated by your family. If it is convenient, I would like to talk to the person who is familiar with day to day operations of the enterprises. Please tell what kind of enterprise is run by the family. **BRIEFLY INDICATE THE TYPE OF ENETRPRISE OWNED BY THE HOUSEHOLD (E.G., "METALWORKING")**		2. Are you the sole owner of this enterprise? **IF YES: » 4**	3. What is your family's share in this enterprise?	4. Who manages this enterprise? **IF THE MANAGER BELONGS TO ANOTHER HOUSEHOLD: WRITE "99" » 7**	5. IS THE RES-PONDENT THE MANAGER? **IF NO: » 7**	6. How many days in month do you work to manage this enterprise?	7. In normal month, how many days in a month does your enterprise work?	8. In normal month how many members of your family are employed in the enterprise?	9. In a normal month, how many persons are employed who are not members of your family?	10. Since how many years this enterprise is in operation?	11. Is this enterprise started with loan component?
ENT. CODE	**ENTERPRISE DESCRIPTION**	**YES..1 NO...2**	**PERCENT**	**NAME**	**YES..1 NO...2**	**DAYS**	**DAYS**	**NUMBER**	**NUMBER**	**YEARS**	**YES..1 NO...2**
1											
2											
3											
4											
5											
6											

HOUSEHOLD ENTERPRISES MODULE PART B: REVENUES

The following questions are related to income from your occupational business enterprise. Please furnish gross income (i.e., inclusive of product price or service cost received in cash and or in kind form). Do not exclude expenses on operating business, or expenses for family.

	1. In a year, how many months do your business has higher sales?	2. What is the monthly income in months of higher sales?	3. In a year, how many months do your business has normal sales?	4. What is the monthly income in months of normal sales?	5. In a year, how many months do your business has no sales?	6. Previous year, in business have you received any payments in kind or in the form of service? IF NO: » 8	7. In months with normal sales, what is the value of payments received not in cash (i.e., in kind form or service form)?	8. Whether your family consumed products or services of your enterprise in previous year?	9. In a month with normal sales, what is the monthly consumption of your family of product / service of this enterprise?
ENT. CODE	**NUMBER OF MONTHS**	**RUPEES**	**NUMBER OF MONTHS**	**RUPEES**	**NUMBER OF MONTHS**	**YES..1 NO...2**	**RUPEES**	**YES..1 NO...2**	**RUPEES**
1									
2									
3									
4									
5									
6									

PART C: INPUT COSTS

In this section, questions will be on investments made on enterprise.

ENT. CODE	1. Last year, how much you have invested on all inputs (include all such as labor costs, raw materials, transport, electricity, water, fuel, rent, tax, registration fee, insurance, loans, operation costs and so on). RUPEES	2. In a month with normal sales what is the total expenses on all inputs? RUPEES
1		
2		
3		
4		
5		
6		

PART D: BUSINESS ASSETS

Lastly, few questions in brief to know details of assets used for operating household enterprise.

ASSET	1. Have you acquired any of following assets for household enterprise. Please answer yes / no. Please take care not to include assets already mentioned in consumption or agriculture module. NOTE: PROMPT THE RESPONDENT TO MAKE SURE THAT NO ITEMS ARE DOUBLE-COUNTED IF YOU SUSPECT THIS PROBLEM. **FOR EXAMPLE, A TRACTOR ALREADY LISTED AS AN AGRICULTURAL ASSET SHOULD NOT BE INCLUDED HERE. THE SAME APPLIES TO A BICYCLE LISTED IN PART E OF THE CONSUMPTION MODULE.** YES	2. What is the market value of this asset? RUPEES	3. Is your family sole owner of this asset or having joint ownership with other family? **SOLE OWNER..1** **SHARED ITEM...2**	4. Have you acquired any of the following assets in the past one-year? YES.1 NO..2	5. What is the total amount spent to purchase Household enterprise assets? RUPEES	6. Have you sold any of these assets in the past one-year? YES.1 NO..2	7. What is the amount received for selling enterprise asset? RUPEES
Building/Shop							
Small vehicles (bicycle, cart, etc.)							
Large vehicles (truck/car/boat/etc.)							
Equipment and machinery							
Tools							
Other (Specify)							

REMITTANCES MODULE

PART A: EXPENDITURES ON INTER-HOUSEHOLD TRANSFERS

1.

In last 12 months, any one in your family has given some amount to other member of the family. For ex: to relatives living at other places, or for children's education or friends.

YES…1
NO..2 ☐ **IF NO (» PART B)**

2. In the last 12 months, give name and details of person whom your family members helped.		3. What is the relationship of this person with head of the family?	4. In the last 12 months, what is the amount given to this person by family members?
ID	**NAME**	**RELATIONSHIP**	**RUPEES**
1			
2			
3			
4			
5			
6			
7			
8			
9			

PART B: INCOME FROM INTER-HOUSEHOLD TRANSFERS

1.

Last year, give names of persons who have helped your family?

YES…1
NO..2 ☐ **IF NO:**

END THE INTERVIEW BY THANKING THEM (ENTHUSIASTICALLY) FOR THEIR TIME AND CO-OPERATION.

2. Last year, give names of persons who have helped your family?		3. What is the relationship of this person with head of the family?	4. Last year, what is the amount received by your family from this person?
ID	**NAME**	**RELATIONSHIP**	**RUPEES**
1			
2			
3			
4			
5			
6			
7			
8			
9			

Informed Consent
Protocol Title: "Economic Analysis of Joint Forest Management (JFM) in India: Impacts on Poverty and Inequality in Andhra Pradesh."

Please read this consent document carefully before you decide to participate in this study.

Purpose of the research study: This research will study the participation of rural communities in Joint Forest Management (JFM), and how JFM provides benefits to households within villages of Andhra Pradesh.

What you will be asked to do in this study: I would like to ask you some questions regarding your household welfare and livelihood, and your participation in the forest management program in your community. You do not have to answer any question if you do not want to. If you would prefer, I can schedule the interview for another time.

Time required: Approximately one hour.

Risks and Benefits: There are no direct risks or benefits to you for participating in this study.

Compensation: There is no compensation for participating in this study.

Confidentiality: Your identity will be kept confidential to the extent provided by law in any report produced. Only the principal investigator and interviewer will know your identity.

Voluntary participation: Your participation in this study is completely. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence.

Whom to contact if you have questions about the study:

Supervisor:
Dr. Janaki Alavalapati, Associate Professor
School of Forest Resource & Conservation
P.O. Box 110410
Gainesville, FL USA 32611-0410
Ph: 352-846-0899; Fax: 352-392-1707
e-mail: janaki@ufl.edu

Principal Investigator:
Frederick Rossi, PhD student
Food and Resources Economics Department
PO Box 110240
Gainesville, FL USA 32611-0240
Ph: 352-392-1826 ext. 428
e-mail: frossi@ufl.edu

Whom to contact about your rights as a participant in this study:

UFIRB Office
Po Box 112250
University of Florida
Gainesville, FL USA 32611-2250
Phone: 352-392-0433

Agreement:

I have read the procedure described above. I voluntarily agree to participate in the procedure and I have received a copy of this description.

Participant signature: _____ Date:

Interviewer signature: _____ Date:

Principal Investigator signature: _____ Date:

Approved By
University of Florida
Institutional Review Board 02
Protocol # 2004-U-890
For Use Through 11/17/2005

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BIOGRAPHICAL SKETCH

A native of Michigan, Frederick Rossi grew up with a keen interest in maps and the natural world. Educated in geological sciences at Michigan State University, he soon moved to the western United States in search of mountains. After working for the man for several years, he enrolled in the graduate program at Colorado State University in order to pursue interests in economics and foreign countries. After obtaining a masters degree in agricultural and resource economics, he moved to Florida to continue the study of both development economics and natural resource economics. Despite the limited snowboarding opportunities in Florida, benefits of the move to this state have included home ownership, finding a wife, and a passage to India.