

Women, Nutrition and Water Resource Development in the Kolli Hills

Final Report – January 31, 2005

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Calendar of Activities

This Final Report is the result of fieldwork over 9 months. The fieldwork was undertaken in two phases, from September 2003 to February 2004, and from September 2004 to December 2004. The first phase has previously been discussed in an Interim Report submitted to IDRC on March 31, 2004. The goals of my second fieldwork phase (see Questionnaire, Appendix II) were designed to clarify and expand upon themes that emerged during preliminary analysis of the results of the first fieldwork phase. The Final Report may be somewhat repetitive in places for individuals who have read the Interim Report. However, it is more useful to integrate aspects of that report here, rather than repeatedly referring the reader to the Interim Report for further details. The overlap applies to both procedural and methodological details, as well as some of the analysis of the data. The Calendar of Activities that follows includes the Calendar of both fieldwork phases.

Calendar of Activities

September 11, 2003 – September 25, 2003

I arrived in Chennai on September 11, 2003. Until September 25, I was based in Chennai renewing relationships with Dr. T. Vasantha Kumaran and Dr. Madha Suresh, Department of Geography at the University of Madras, and with Dr. Rani Senthamarai, Department of Geography at Presidency College. Since Dr. Kumaran is my local research guide, he offered suggestions on my methodology and my interview questionnaire. He also provided me with some of his own reports on the Kolli Hills. He introduced me to faculty in the Department of Anthropology. I was subsequently able to use their library resources on gender, tribal issues and the Kolli Hills.

Dr. Rani Senthamarai provided me with reasonably-priced accommodations in Chennai during this stay. She also introduced me to the Chief Examiner for all state-run

schools. Making this contact allowed me to make contact with the government school in the Kolli Hills.

Finally, I renewed contact with my research assistant, Ms. N. Annammadevi (Annamma), a graduate student at the University of Madras. Together we created a rough plan for the research process. Annamma also translated my informed consent form into Tamil, ensuring that concepts and the research process were clearly explained. The original, English version of this informed consent form was approved by McMaster University's ethical review board. It was translated in its entirety, and approved by Dr. Kumaran.

September 26, 2003-October 4, 2003

I arrived in the town Semmedu in the Kolli Hills on September 26, 2003. For the first week I stayed by myself, since my research assistant could not arrive until October 4. During the first week I made contact with local government and NGO offices. These included the staff at the government secondary school, and the officers at the local LAMP Society, an organization that provides subsidized food and no-interest loans to tribal peoples. This was a period of gathering background information about the demographic composition of Hills, as well as basic information about health and health care access. I attended an NGO-run millet-selection group meeting, where women chose millet varieties for cultivation based on self-created criteria such as taste, yield and ease of processing.

I also made acquaintance with an Ayurvedic doctor, Dr. Joy Emmanuel. It was through this friendship that I later met a number of nuns who run women's self-help groups in the Hills.

October 4, 2003 – October 11, 2003

My research assistant arrived in the Kolli Hills. We continued to gather background information and make inquiries about accommodations in my research community.

Although I had planned to work in Mel Poosanikullipatti, we learned we would have a hard time find a place to live. After a preliminary site visit on October 9, 2003,

we found a place to stay in Nariyankadu, a village within walking distance of Poosanikullipatti. I had visited Nariyankadu in 2002, and had contacts there.

October 12, 2003 – November 12, 2003

We moved to Nariyankadu. Nariyankadu is an extremely isolated part of the Kolli Hills, with limited bus service and no telephones or running water. We hired one village woman, Gomathi, to cook food for us. We also hired two local girls to collect water for us.

Due to the small and interconnected nature of the villages, I decided to undertake research in three communities: Nariyankadu, Mel Poosanikullipatti and Sundakadu. The process included semi-structured interviews with women and men, life history interviews, focus group activities on labour and food diversity and participant observation. The Deepavalli festival took place in late October.

November 13, 2003 – November 30, 2003

I decided to expand research to include a more central village, Perugaraipatti, near Semmedu, to see similarities/differences between central and peripheral communities. During this period I alternated between staying in Semmedu and Nariyankadu.

November 24, 2003

Annamma returned to Chennai due to family difficulties. I hired a new research assistant, Ms. A. Chitra. A B.Sc graduate, Chitra is native to Nariyankadu.

November 30, 2003

I left the Kolli Hills a week earlier than anticipated due to illness.

December 1, 2003 – Arrive in Chennai

December 2, 2003 – December 28, 2003

Stay in Chennai. I consulted a doctor and began medication for a chest infection. During this period I also attended and presented at the Third International Conference on

Environment and Health at the University of Madras on December 15-17. After the conference I continued with a preliminary analysis of my data, and planned the next steps of the research to fill in questions that arose.

December 29, 2003 – Return to Kolli Hills

December 29, 2003 – January 20, 2004

I continued work in Nariyankadu and Semmedu areas, conducting interviews, having informal conversations, and participating in everyday life. The Pongal harvest festival took place from January 15-17. During this period I stayed near Nariyankadu with Chitra's relations for the festival.

January 22, 2004 – Return to Chennai

January 23, 2004 – February 11, 2004

I conducted library research in Chennai, gathering background information on nutrition, food security, women in India, agriculture and the Kolli Hills. This helped to flesh out some of the questions I had about things such as millet production needs. I finished interview translations with the assistance of Ms. N. Annammadevi. I also discussed my research data and my future research plans with Dr. Kumaran. I attended and presented at the 76th Annual Indian Geographical Society Meeting in Chennai.

February 11, 2004 – I left India.

February 12, 2004 – August 31, 2004

During this period, I undertook preliminary analysis of my data. This was followed by a number of activities. I presented the following papers:

- Richard Salisbury Award Paper Presentation. "We feel like we are dry husks": Food Security, Cash Crops and the Environment in the Kolli Hills, South India/Water Resource Management/Development and Food Security in the Kolli

Hills, India: A Gendered Approach. Canadian Anthropology Society (CASCA) Annual Meeting, May5-9 2004, University of Western Ontario, London, Ontario (See Appendix V for the paper).

- Anthropology 3C03 Guest Lecture: “We feel like we are dry husks”: Food Security, Cash Crops and the Environment in the Kolli Hills, South India. March 15, McMaster University, Hamilton, Ontario.

I also undertook activities to aid in the analysis of my data, including:

- Undertaking a review of literature addressing Tribal peoples in India, food security issues, and human agency.
- Reviewing my initial questionnaire, and creating a secondary questionnaire based on the themes emerging from the preliminary analysis.
- Meeting with my research supervisory committee to discuss the direction of my research.
- Communicating with academics based in India with regards to my data and plans for potential collaborative writing efforts.
- Writing a draft of a research report to be submitted for publication consideration in *American Anthropologist*. This report is to be submitted in February, 2004.
- Writing drafts of the literature review, methodology and ethnographic background sections of my Doctoral Dissertation.

August 31, 2004 – September 7, 2004

Arrival in Chennai. I met with Indian academics at the University of Madras, obtained assistance with some final methodological and fieldwork details, and generally renewed acquaintance with the academics and non-academics who have assisted me with this work. I had discussions with Dr. T. Vasantha Kumaran with regards to collaborative future writing and research projects that we hope to undertake.

September 8, 2004 – December 12, 2004

I traveled to Namakkal District, met with a former research assistant (Ms. A. Chitra) and with representatives of the DTMC Trust, an NGO operating in the Kolli Hills. They were able to find suitable research assistants (Ms. Vimala Matthew, Ms. Gracy Savariammal and Mr. K. Vikram) for me. Due to other responsibilities, these research assistants did not all work with me at the same time.

During this period, I worked in the Kolli Hills, staying in Nariyankadu (Chittor Nadu) in a rented house. I occasionally spent a few nights outside of the village, when meeting with DTMC trust workers.

September to November was a period of research in three villages, Nariyankadu, Sundakadu and Mel Poosanikullipatti. However, the body of my work took place in Nariyankadu. During this time I conducted 57 interviews with 61 people, and 24 follow-up interviews based on issues that arose in the initial interviews. I participated in a large number of daily life activities, from household chores to work in the fields. Conceptual land-use maps were created with the assistance of key individuals who were identified based on their experiences. Community timelines were constructed to gain a better understanding of key dates for the area, including the construction of a road, the arrival of electricity, and the building of the Primary Health Centre.

From November 24-December 2, I conducted 24-hour dietary recalls with 21 people in 20 different households. These took place every second day, so that a total of 4 days were covered, over one week, for each participant. Although I had attempted to do

something similar earlier in the field term, it was not possible. After staying in the area for some time, villagers were more receptive to me using this methodology.

From December 4-12, I stayed in Semmedu in order to be able to meet with government officers in various agricultural, environmental and social offices, and with NGO workers and teachers. During this time I gathered data on environmental changes and social issues. I also visited with villagers from Perugaraipatti, although research did not take place in this community.

December 13-16, 2004

I returned to Chennai and met with Dr. T. Vasantha Kumaran and others prior to leaving for Canada on the 16th.

December 17-January 31, 2004

I worked on my Final Report, as well as drafts of two scholarly publications. I typed up interviews and other data, and continued to analyze my data. I worked on two thesis chapters to be submitted in February. I gave a guest talk to grade 11 social studies students about working as an anthropologist and about my fieldwork experiences. I spoke with members of the North Bay Rotary Association about my research.

Technical and Narrative Account of the Research Process and Research Results

Introduction

This Final Report is the result of 9 months of fieldwork. The fieldwork was undertaken in two phases, the first from September 2003 to February 2004, and the second from September 2004 to December 2004. The first phase has previously been discussed in an Interim Report submitted to IDRC on March 31, 2004. The goals of my second fieldwork phase (see Questionnaire, Appendix II) were designed to clarify and expand upon themes that emerged during preliminary analysis of the results of the first fieldwork phase. The Final Report may be somewhat repetitive in places for the individual who has read the Interim Report. However, it is more useful to integrate aspects of that report here, rather than repeatedly referring the reader to the Interim Report for further details. The overlap applies to both procedural and methodological details, as well as some of the analysis of the data.

I originally traveled to the Kolli Hills intending to examine the ways in which small and larger dam projects, for irrigation and hydroelectricity generation, affected food security and nutritional status. I planned to base my work in Chittor Nadu, a political district that contains 7 villages. A preliminary visit to three of these villages, Nariyankadu, Kel Poosanikullipatti and Mel Poosanikullipatti in September 2002 indicated that the issue of damming was relevant to people's lives, and that villagers were interested in addressing such development issues. However, in the process of the research, particularly during September and October 2003, it became clear that dam developments were not as central to food issues as it originally appeared. In the process, my research focus has shifted somewhat, reflecting more immediate development and food concerns for villagers. My initial intention was to gauge responses to and outcomes

of small dam construction projects and proposals, but this focus lost relevance in the context of ongoing drought in Tamil Nadu and the Kolli Hills.

While there are small, irrigation dams in Chittor Nadu, these dams have become next to useless over approximately 10 years. The general consensus among villagers is that dams are useful and good, in that they have enabled villagers to extend rice paddy fields. From the installation of these dams, beginning approximately 30 years ago, conceptual land use maps show how one river was used to create a networked system of paddy fields. However, as drought has reduced rainfall, the use of these dams as water reservoirs and dispensers has fallen. The level of water does not reach the dam openings. Where dams were still somewhat useful, they have fallen into disrepair, and governments have been non-responsive to requests for assistance. Paddy fields are currently less successful, with outlying fields particularly prone to crop failures.

More relevant to local development and food security are the ways in which villagers respond to drought. Responses take place within a context of possible options, which are shaped by infrastructure and community/individual priorities. In the case of Chittor Nadu, the relatively new possibility of cash cropping has been one response to rainfall pattern changes that hamper food cultivation.

The cash crop tapioca has been widely adopted and expanded in the area over the past 15 years. The reasons for this are multiple, but the drought is one factor. Unreliable rainfall during the May-June rains has made it difficult to grow food crops including vegetables and the traditional subsistence millets. These crops have gradually been supplanted by tapioca. As the rainfall has been particularly problematic in the last 3-4 years, many families have stopped trying to grow subsistence crops altogether. In contrast to millets and most vegetables, villagers state that tapioca will grow with only a little rain, or even no rain at all. This affects the quality of the tapioca, and consequently annual profits, but people argue that this is better than an almost total failure of their food crops. Although some vegetables can be found, occasionally intercropped with tapioca, the quantities are limited, and beyond tomatoes, curry leaves, onions and garlic, most households rely on purchased vegetables.

Tapioca cultivation is therefore a response to changes in environmental conditions. However, before it became a viable crop in the area, other changes had to

take place, including the construction of a reliable road into the area. Tapioca is not merely a responsive crop. It is a crop of opportunity, and the ways that people take advantage of this opportunity may be affecting their environmental changes. Additionally, tapioca and drought has contributed to dietary changes. These issues will be elaborated on in this report. Prior to this, I discuss community background, method and ethical issues.

Ethnographic and Community Background

Geography, Services and Politics

The Kolli Hills lie in Tamil Nadu's Talaghat Plains (Bohle 1992:140), one of a series of hills of the Eastern Ghats. The Hills lie in the Namakkal political district. Covering approximately 282 square kilometers (Kumaran et al 1998:11), the Hills rise between 1100 and 1400 metres above sea level, although most of the inhabited area falls at approximately 1000 metres above sea level (Kumar-Range 2001:15). The elevation makes the climate more temperate than in the surrounding plains. Bohle (1992:140) notes that the average annual temperatures of 23-25 degrees Celsius, as well as the mean annual rainfall of 1200 mm¹ make the Kolli Hills better for cultivation than the surrounding lowlands, particularly given the rich soils in the Hills.

According to the Government of Tamil Nadu's (GoTN) Directorate of Tourism (2001), the Kolli Hills are one of only two mountainous regions in the area that still contain remnants of rainforests. These are predominately evergreen mountain forests, including a number of native and introduced species such as jackfruit, mango, guava and orange trees, eucalyptus and silver oak. The eucalyptus and silver oak appear to have been introduced into the area as part of an attempt at reforestation. Silver oak is also used in the cultivation of climbing pepper plants. The Kolli Hills, although surrounded by forest on the exterior, have progressively been cleared for agricultural purposes on the

¹ The surrounding plains receive approximately 700 mm of rain over a year (Bohle 1992:140).

interior. Presently, the area is approximately 51% agricultural land, and 44% forest land. This compares with an estimated 84% forest land in 1882 (Kumar-Range 2001:18-19).

The Hills are accessible by road, although some of the interior is limited to dirt roads or walking paths only. There are regular buses from the plains to Semmedu, the central town in the Hills. This is where the hospital, bank and government offices are located. The bus ride, taking approximately 1.5 hours from the base of the Hills, consists of 70 hairpin turns before reaching Solakkadu, the first community on the road. As the buses are always overcrowded, this can be a particularly difficult and uncomfortable ride. It is also not unheard of for trucks and other vehicles to miss the tight turns, leaving the roadway periodically blocked. In both 2003 and 2004, while I was in the Hills, rain-induced landslides closed the road for a number of days.

Bus services, both private and government, are available from Solakkadu and Semmedu to other areas of the Hills. These bus services can be frequent to relatively central areas, or once or twice a day in the case of the more isolated areas of the Hills. Only government buses go to the most isolated areas. Aside from buses, people rely on motorcycles, bicycles, hitched rides on the backs of trucks, the occasional jeep or car, and walking for transportation.

Politically, the Kolli Hills are divided into 14 *nadus*. A *nadu* refers to local political divisions. Each *nadu* is represented by an elected Panchayat officer, and depending on the population size, by three to five elected Ward officers. Elections take place every five years (Kumar-Range 2001:17).

In the 2001 census, the Kolli Hills contained 274 hamlets and a population of 37 293, 18 864 being males and 18 429 being females. The majority of this population is classified as Scheduled Tribe (32 130 in 1991), with the rest belonging to Scheduled Castes. The Scheduled Tribe and Scheduled Caste designations are an institution of the Government of India.

The Kolli Hills contain a number of amenities and services, including a hospital and several primary health care centres, two residential higher secondary schools as well as a number of primary schools and *balwaadis* (child care centres), a branch of the Indian Bank, a library, a police station, a telephone exchange station, a central post office and 22 sub-post offices, ration shops, and two Large-Area Multipurpose Society (LAMP

Society) offices, tarmac roads, electricity, three small hotels, shopping areas and several weekly markets. However, the distribution of these services is skewed towards the more central areas.

Road access began in the 1960s, extending first to Solakkadu, where a weekly market was developed in the early 1980s (Kumar-Range 2001:20, 45). The development of a passable road as well as a central market meant that local farmers no longer had to carry their produce to markets in the plains via footpaths. Rather, wholesale buyers began to bring trucks to the Hills for produce. Roads have been extended since the 1960s, although the pace has been inconsistent and the work is ongoing. More markets have been created, but they continue to be located in the more central areas, leaving those in peripheral locales with additional costs and concerns when getting their products to markets and buyers. Some *nadus* in the Hills continue to be without road access.

The hospital, bank, BDO, higher secondary schools, police office, main post office, telephone exchange office, electricity board offices and library are all located in or around Semmedu. Most central areas have electricity although the infrastructure is far from reliable. However, proximity to Semmedu or Solakkadu does not necessarily ensure access to electricity. In one community approximately 15 minutes walk from Semmedu electricity has not yet been extended to all households.

Semmedu also houses one of the LAMP Society offices. The Large-Area Multipurpose Society is a Government of India institution responsible for agricultural extension services, ration shops and for providing a variety of interest-free loans to villagers. They attempt to institute economic-development schemes. LAMP Society ration shops and services are well-distributed throughout the Hills.

Thus, the Kolli Hills has a number of services, but distribution of many of these is variable. Although primary schools and *balwaadis* are well-distributed, further education is often a considerable travel for students. Residential schools are not necessarily a welcome option for all households, as this removes the student from participating in family labour. Additionally, in the more isolated regions, including Chittor Nadu, teachers are not necessarily adequate in numbers. They may not consistently appear each work day, particularly if they do not live in the communities or *nadus* in which they work.

People and Culture

The Kolli Hills are primarily inhabited by the Malaiyali (Malayali) people, a Scheduled Tribe according to the Government of India. The Malaiyali are scattered throughout the Hill regions in Tamil Nadu, and they are the largest single Scheduled Tribe in the state, with a population of 201 242 in the 1991 census. This compares to a total Scheduled Tribe population in Tamil Nadu of 574 194 in the same year (Parimurugan 2001:7). Although the history of the Malaiyali is somewhat unclear, they state that they were once part of the agricultural Kongu Vellala caste, originating in the Kanchipuram coastal area. In the 16th century, they moved, or were driven from the land, and went to the Kolli, Panchamalai and Kalrayan Hills (Kumaran et al 1998:12). The Malaiyali are not considered to be tribal people in the sense of being the initial inhabitants of India. Rather "In the centuries after their occupation of the hills, they acquired tribal characteristics" (Kumaran et al 1998:12).

The Malaiyali are a Hinduised people, but as Kumar-Range (2001) notes, they have their own customs and practices when compared with plains cultures. They do not, for example, recognize Brahmins as their priests, and consequently have a less "layered and hierarchical caste system" (Kumar-Range 2001:17) than in the surrounding lowland communities. Typically bride price, not dowry, is practiced, but this appears to be slowly changing with increased regular contact with lowland communities (Kumar-Range 2001:39-41, 82).

Boys and girls attend school at similar rates, although it appears that boys may be more likely to be sent to English-medium private schools located within and outside the Hills. Statistics from the Block Development Office show that enrollment in primary and secondary schools is about 53% boys and 47% girls, with 15% of the boys and 13% of the girls reaching Grade 12 (also called plus two or 12th standard) (Kumar-Range 2001:73). The sharp drop in school attendance at higher levels may be attributed to a number of factors. Plus two, or 12th standard is generally geared towards students who wish to pursue a post-secondary university or college education. Those who do not wish to do so, or who cannot afford it, may see little value in continuing education past 10th

standard. As well, factors such as the need for additional labour, marriage of girls, and the limited number of secondary schools in the Hills may affect education decisions. The higher secondary schools are located in the central part of the Hills, or outside of the Hills, and losing a child's labour when he or she enters a residential school may not be an option for some households.

The adult literacy rate in the Kolli Hills is 58% for males, and 36% for females. This is compared to the national literacy rate of 68.28% for males and 46.58% for females (personal communication, Education for All Office, Kolli Hills). It is likely that for most parts of the Hills, these literacy rates will be highly skewed among the younger generations. People under approximately 35 years will be more likely to have had some education; people in their early 20s or younger will be the most likely to be literate.

The local economy is primarily linked to farming. Although some inhabitants have other, or secondary jobs such as machine repair, provision shop ownership, government and NGO jobs, teaching and security, the majority of the Malaiyali own agricultural land. Crops across the Hills include a mix of subsistence and cash crops, although sometimes products serve both functions. Rice, millets, tomatoes, onions, brinjal, okra, oranges, guava, citrus, bananas, mangoes, pineapple, papaya, jackfruit, coconut, groundnut, tamarind, curry leaves, cardamom, nutmeg, cloves, pepper, coffee, tapioca and medicinal plants are the primary crops. The division of crops varies throughout the Hills. Kumaran (no date), through a survey of the Hills, has found that tapioca is the primary crop in six of the *nadus*, five of them located in the north-west section of the Hills. This includes Chittor Nadu. Paddy rice is the primary crop of one *nadu* located close the central area of the Hills. Banana, pineapple and coffee are the principle crops in the rest of the *nadus*.

As previously stated, approximately 51% of the Hills are used as agricultural land. 42.44% is sown land (Kumaran et al 1998:16). Tapioca is the largest single cultivated crop, a figure estimated at 4453 hectares in the 1990s (Kumaran et al 1998:16). This has likely increased in the intervening years. Millets, rice paddy, ragi (a millet) and pineapple are the subsequent most cultivated crops, at 1727, 1502, 1337 and 1000 hectares respectively (Kumaran et al 1998:13).

Finally, the agricultural land is primarily rainfed. Only 13.3% of the land is irrigated and Kumar-Range notes that this is primarily via natural seepage from streams, and some gravity irrigation (2001:19). Pumped irrigation is rare, likely for a number of reasons including limited private wells and limited access to water pumps. The dependence on rainfall for agriculture lands means that regular rainfall patterns are key for agricultural success and in making agricultural decisions.

As the Kollimalai are primarily farmers, most own some lands, generally less than 5 acres.² These are not necessarily premium lands capable of growing subsistence paddy rice. Land may be lowlands, uplands or rocky terrain.

Research Communities

My research is based on the experiences of people living in four communities. One of these is located within walking distance of Semmedu. The remaining three, the villages that my work centres around, are located in Chittor Nadu, one of the most isolated and least populated areas in the Hills. Although these four villages have differential access to a number of services, the experiences and perceptions of environment, food and agriculture are remarkably similar. For clarity, I divide this section into two subsections, in order to deal with the different areas separately.

Chittor Nadu

I originally began my work in Chittor Nadu, a *nadu* located in the North-western part of the Hills. The comments about the entire *nadu* are based on work in three communities, Sundakadu, Nariyankadu and Mel Poosanikullipatti. However, the 7 villages in the *nadu* are closely linked and interrelated, and although I did not undertake formal research in all 7 villages, I have visited and spoken with people on a casual basis in each community. For the purposes of this section, data from the three research communities are aggregated.

² Technically, land is not supposed to be sold in most of the Kolli Hills, as it has been allotted to tribal people. However, in practice, land becomes available for sale periodically. In 2003, in Valavanthi Nadu, land was sold for approximately Rs.20 000/

Accessible via a 3 hour, twice-daily bus trip, Chittor Nadu has a population of less than 2000 people. It is relatively isolated from the rest of the Hills, although there are footpaths that lead to the plains. These paths, taking approximately 3.5 hours to traverse, are regularly used by people to access markets. These markets are not used primarily to sell crops, as these tend to be transported on hired trucks. Rather, the markets are frequented weekly by most households to purchase food.

Chittor Nadu received good paved roads between villages in the year 2000. Until then, a paved road led to (and beyond) the area, but dirt pathways connected the individual villages. Road works are currently ongoing to better connect the area with the rest of the Hills.

Electricity became available between 1998 and 2000. Some villagers attributed this to the ongoing campaigning of one local man. The arrival of electricity means that regular contact with India as a whole is possible, through the use of radios and rarely, televisions. However, the service is sporadic. Wind, rain and circuit problems routinely interrupt services. Repairs can be slow.

Currently there are no telephone lines in the area. One villager has made enquiries about the possibility of telephone lines being extended to the area, and has offered to pay the connection fee. However, he has received communication from the government telephone company stating that the distance is too far to extend lines, and is beyond the current budget. There is a cellular phone tower in the vicinity, but getting a connection signal is often difficult. In any case, paying for a cellular phone, the airtime and one of the scarce cellular telephone numbers is beyond the means of most households in the area. The signal tower appears to be of more use to visitors and government or other officials who might have a cellular phone. There is, however, one cellular phone in Nariyankadu. The household, which hires the phone out for use, received it in August, 2004.

Chittor Nadu covers approximately 78.3 square kilometers, has five open wells, five bore wells, 5 public drinking taps, and 28 (government-paid) tube lights to light public spaces. There is a Primary Health Centre (PHC) staffed by a nurse who makes

weekly visits.³ The PHC also contained the only latrines in the *nadu* in 2003 (one in the clinic, one in the staff quarters). These were not accessible to the public. However, in August 2004, construction began on public toilets in Nariyankadu. Construction was ongoing in December, 2004, with most households stating they would be reluctant to use the toilets when they are completed, as they are situated less than 10 metres from the drinking water well. Additionally in mid-2004, some households in each village in the *nadu* began to build private toilets. Many of these toilets are incomplete or unused.

The *nadu* supports two schools, one primary and primary-lower secondary school. During my time in the area, I was aware of three functioning *balwaadis*. The schools and *balwaadis* offer noon-meals to the children, part of a government noon-meal program. There are two LAMP Society-run ration shops that provide foodstuffs and kerosene as part of India's Public Distribution System. Rice, sugar, cooking oil and kerosene are offered at rationed prices, and each household is allotted a certain amount of each product, depending on family size. There is one sub-post office in the *nadu*, several private, small-scale provision shops⁴, and two rice-mills, both privately owned, but which villagers can use without paying a fee. The owner-operators of these electric mills keep the chaff from the rice and sell it to traders. This provides enough of a profit that user-fees for the mills are unnecessary.

As with the rest of the Kolli Hills, the majority of the inhabitants of Chittor Nadu are farmers and/or agricultural labourers. Farmers tend to work for themselves, on their own lands, while agricultural labourers (both adults and children) hire themselves out to the landowners. However, this is not a clear distinction, as many farmer/landowners will also hire themselves to their neighbours, or to other farms in the Kolli Hills. Work hours

cent (1/100th of an acre) for land without road access and Rs.40 000/cent for land with road access.

³ Although there are new, very good staff quarters attached to the Primary Health Centre, there are no permanent staff. This can be attributed to the relative isolation of the area, along with health care staff shortages.

⁴ These shops have limited supplies. Fresh fruits, vegetables and eggs are rare, while dry supplies such as small bags of lentils, dried chilies, sugar, and beans are common. However, snack foods (biscuits, papads, mixed spicy snacks, sweets), cigarettes and bidis, and school supplies such as pencils, paper and notebooks are more common. The stores also tend to stock small supplies of medicines, generally a few of a variety of pills (painkillers, antibiotics). Shampoo, soap and toothpaste are also available.

are generally between 9 am to 5 pm, or 10 am to 6 pm, with one hour for lunch. There is also some migrant agricultural labour out of the Hills, with people traveling to rice fields in and around Salem (the nearest city with a train station, located in the plains), Erode and Chennai.

Other jobs include teaching and child care, cooking for the children's noon-meal program, insurance salesman, shop owner, postman, ration shop employee, rice-mill operator, tailor, and road and house construction. These jobs are gendered to some degree. Cooks for the noon-meal program are women, while the postman, salesman and ration-shop employees are men. The rice-mills are owned by men, but their wives run the mill in their absence. The same goes for the provision shops, where women do most of the work. There are male and female tailors. Road and house construction are done by both women and men, but men are more common and are paid more. Women and men both hire themselves out as agricultural labourers, and although women are more common here, men get paid more. The standard daily wage for women is Rs.25-35/day, while for men it is Rs.40-60/day.⁵

Most people take these jobs in addition to their agricultural work on family farmland. The economy of the area is therefore strongly tied to agricultural work, and it becomes clear after spending even a short time in the area, that without farming people would be unable to survive. For example, without funds from produce, there would be no money to buy machines that would then support a machine repair shop. The dependence on agriculture and the possible vagaries in prices received for crops is one of the complaints that some people voice, particularly in relation to changes in the environment. The fact that there are not more economic options is considered to be a problem by inhabitants.

The primary crop in Chittor Nadu is the cash crop tapioca. Other crops include other cash crops such as coffee, oranges, bananas, pineapple, mangoes, papaya and coconuts. Household-use crops include rice paddy, *samai*, *thenai* and *ragi* (millet varieties), vegetables, tamarind and curry leaves. Occasional jackfruit trees provide fruit for households and markets.

⁵ During my field terms, the exchange rate varied between Rs.28-35/Canadian dollar.

Table 1 shows the major characteristics of the three villages in Chittor Nadu that were part of this study. Mel Poosanikullipatti has the fewest amenities of the three villages, and also has the greatest water problems. The wells in Mel Poosanikullipatti are very poor, and households gather approximately 2 pots of water per day (about 50 litres). This compares to the 10-14 pots per day that households in the other two villages are able to draw. The wells in Mel Poosanikullipatti take a long time to recharge, and the water tends to be muddy. Additionally, the check (irrigation) dam in the village broke several years ago, which means that the reservoir no longer adequately stores water for agricultural and livestock use.

Table 1: Selected Characteristics for 3 Villages in Chittor Nadu

Village	Population (from census taken during the research periods)	Males	Females	Wells (public)	School?	Shops (ration, private)	Other amenities
Nariyankadu	225 (unknown sex: 1)	123	101	1 bore well, two open wells, a periodically functioning community tap system (5 taps distributed throughout village)	Elementary (up to 8 th standard)	Ration shop, private provision shop	Rice mill, noon meal centre, Village Officer quarters (unused), Primary Health Care centre and staff quarters (unused), post office, marriage hall, Panchayat Office, village temple, <i>balwaadi</i>
Mel Poosanikullipatti	195 ⁶	105	90	Two open wells, non-functioning community tap	Elementary (up to 5 th standard)	No	Noon meal centre, <i>balwaadi</i> , village temple
Sundakadu	252	132	120	3 bore wells, 2 open wells, community taps (non-functioning)	No	Ration shop, private provision shop	Rice mill, village temple, home of Panchayat officer, meeting hall (unused, built by missionaries)

⁶ Mel Poosanikullipatti statistics are official 2003 statistics. It was not possible to undertake my own survey.

Table 2 shows the literacy rates in Sundakadu and Nariyankadu, compared to the Kolli Hills in general, and the national literacy rates. In all cases, literacy in these two villages is below average. Women in Nariyankadu have particularly low literacy rates. It should be noted that these statistics may be slightly skewed, since it is unclear if the Kolli Hills and national rates refer to adult and subadult literacy rates. Additionally, I considered literacy rates in terms of education. The national and Kolli Hills rates may have been compiled using a different standard. Nevertheless, this provides some indication of the generally poor level of education for adults in Chittor Nadu.

Table 2: Literacy Rates

	Sundakadu	Nariyankadu	Kolli Hills	National
Women	30.3% (adult women)	16.2% (adult women)	36%	46.58%
Men	41.8% (adult men)	45.5% (adult men)	58%	68.28%

Perugaraipatti

My purpose for working in Perugaraipatti was to compare service availability, labour and dietary practices in a more central Kolli Hills community with the peripheral Chittor Nadu. Perugaraipatti is located approximately 15 minutes walk from Semmedu. It is thus close to the amenities discussed above. There are also telephones a two or three minutes away. Containing about 40 households, Perugaraipatti is a village of primarily farmers and agricultural workers. Unlike Chittor Nadu, Perugaraipatti is within one hour's walking distance of a large, 70-acre plantation owned by a non-Malaiyali who lives in Salem. This plantation, a stunning example of intercropping⁷, provides work to agricultural labourers. It is not the only employer, but as there are different crops and jobs throughout the year, I was told that if people need work or money, they can always

⁷ The sheer number of crops in one space is almost overwhelming, particularly after spending time in Chittor Nadu, where fields and fields of monocrops are only occasionally interspersed with more traditional examples of calculated intercropping. The plantation grows cash crops only, but rather than concentrating on one or two species, bananas, coconuts, nutmeg, cloves, coffee, pepper, oranges, guava, and citrus, among other crops, are cultivated. Local weeds and plants are allowed to grow between trees.

go to the plantation. Additionally, Perugaraipatti contains a medicinal plant farm (owned by people from outside the Hills), a small plot of land where medicinal plants are grown in makeshift tarpaulin greenhouses. This offers another source of employment for agricultural workers (primarily women). This work is comparatively easy, in the sense that women are able to sit in a small group and talk while preparing and planting seedlings in small plastic covers. This is less physically demanding than field labour, which may include weeding, planting, harvesting and ploughing fields. Both of these plantations pay Rs.35/hour for women. Thus, people in Perugaraipatti can work as agricultural labourers on small farms owned by themselves and their neighbours, and they also have the option of almost constantly available work on plantations owned by outsiders.

Other jobs held include watchman for the LAMP society, truck driver, non-governmental organization (NGO) employee and provision/tea shop owner. Some of these jobs are in addition to agricultural labour. However, the more time a non-agricultural job takes, the more likely it is for a household to hire outside help for field work. Some extended families are large enough to make up the labour shortfall from within their own households.

Perugaraipatti in some ways is more cosmopolitan than Chittor Nadu. Aside from the proximity to services such as the hospital, secondary school and markets, it is well connected to other parts of the Hills and to the plains via bus. Villagers have regular contact with a local NGO, and one of the households has donated land to this NGO for agricultural meetings and experiments. A wider variety of goods are available, particularly in terms of brands of biscuits, as well as bread and buns (which tend to only be available in Chittor Nadu during festivals), and medical supplies. It is much easier to obtain household and dry goods such as folding cots, shoes, pots and pans, blankets, cassette tapes, camera film, shawls and woolen hats, hair accessories and bracelets and a wider variety of sweets. Many of these items are not readily available in Chittor Nadu. Others, such as blankets, pots and pans, glass jewelry, minor electronics, and shawls are brought to Chittor Nadu by salesmen or women who generally travel by foot.

Methodology – Process and Issues

I have used a number of methods for this research. Some were based on participatory research techniques, others were more traditional in nature. Some methods were more successful than others, and some were suited only to specific situations. Research took place with individuals and groups, and also was dependent on participant observation.

Methods included individual and group semi-structured interviews, interviews with key community figures, household surveys, follow-up interviews with selected key informants, dietary diversity ranking with focus groups, the creation of labour/health/food/water calendars with groups, the construction of area timelines, the creation of conceptual land-use maps, daily labour tracking, dietary recalls, and participant observation.

During my first fieldwork term, I used three main methods for gathering data: semi-structured interviews (see Appendix I), focus groups, and participant observation. These methods were used in the villages; in order to gather background data on the Kolli Hills, I met with government officials in the Hills, as well as with academics and NGO personnel who have worked in the area. I also undertook a considerable amount of library research, both at the University of Madras, and in smaller, independent libraries.

During my first field term, I undertook 45 semi-structured interviews with 78 people, both men and women. Interviews took place generally in the early mornings when women had some free time. In some cases, individual interviews became group interviews. Some women acted as key informants, being particularly knowledgeable about agriculture and other issues. These women were interviewed more than once, and I often had informal discussions with them as well.

Focus groups were also very dynamic and social. My research assistant and I organized, with the assistance of local women volunteers, one focus group in each community. These were held on Saturday or Sunday, when women had more free time. The focus groups addressed household food diversity and women's daily labour. We asked women to list the foods in their household stores and rank them according to how often they are consumed on a monthly basis. We also asked women to list and rank their daily labour tasks according to the amount of time/work each task required. As

mentioned in my Interim Report, two methodological issues arose during the process of focus groups:

- 1) Participatory rural appraisal techniques suggest that women be given beans, stones or beads to count out to use for ranking. This means that women do not have to be literate to participate. However, research participants did not generally enjoy the bean-ranking process. Instead, they wanted to write a number. Since many women, particularly the older women were illiterate, in two focus groups, they enlisted their children or other schoolchildren to write for them. Since many women had childcare responsibilities, and brought their children with them, this helped the children from being bored. It made the process more fun for all of us because the children were particularly eager to use their abilities.

- 2) Women decided that rather than ranking food consumption in terms of 1 to 10, they would work from 1 to 30. This happened in all cases. Some women would rank very common foods such as rice higher than 30. This is particularly interesting and corresponds well with the repeated comments made during interviews that rice is consumed up to three times a day.

It was not possible to undertake some of my proposed methodologies. I was able to observe mealtimes and make notes about types of foods consumed as well as household distribution of foods. However, it was not possible to obtain standardized measurements of foods consumed. Generally, women, children and men eat as much as they want, something which varies from meal-to-meal and day-to-day. The important factor is to eat until you no longer feel hungry. This, coupled with inconsistent spoon and dish sizes, and the fact that recipes for vegetable curries, rasam (onion, garlic and chili broth) and sambar (vegetable/lentil curry) are not set but rather reflect what is available in the home on any given day, made an analysis of nutrient intakes impractical. Additionally, 24-hour dietary recalls were not practical, given that most women could not

read and write, and could not rely on their children being home to record intakes for them.

During my second field term, I relied on participant observation, key informants, and semi-structured interviews. The interviews were based on a revised questionnaire (see Appendix II) designed to reflect themes and questions I encountered during preliminary analysis. In total, I conducted 57 interviews with 61 different people, and 24 short, follow-up interviews (see Appendix III) addressing spending and political changes in the area. Additionally, I was able to conduct modified 24-hour dietary recalls with 21 individuals from 20 households over an 8 day period. Due to the above mentioned problems with conducting recalls, they are not intended to be an indicator of nutritional status. Rather, they are intended to examine dietary diversity in households with different economic statuses. Villagers were asked what they had eaten throughout the day before. Beyond daily meals, villagers were also asked about the consumption of snacks, fruits and drinks.

Community timelines were constructed with selected individuals whose experiences led them to remember key dates and events. These included former and current political figures and villagers active in self-help groups.

Conceptual land-use maps were created in order to understand perceptions of land-use change. In the absence of land survey data, these kinds of maps, drawing on memories, provide some sense of land-use change. This can then be correlated with information drawn from timelines and interviews. Four maps were created, one for the main 4 villages in Chittor Nadu (Mel Poosanikullipatti, Nariyankadu, Sundakadu and Averikadu⁸). Although the participatory research approach for such activities is to allow people to draw their own maps on paper or on sand, this was not particularly successful. People were uninterested in drawing with pencil on paper. As the main participants of these exercises were older and illiterate, pencil and paper were not commonly used, and men and women were not comfortable using them, even though people were eager to share their local knowledge. A compromise was reached for this methodology where I or a research assistant would draw the map to their specifications, checking and rechecking

⁸ Averikadu was not formally included in the research. However, a select number of key individuals from the village were interviewed.

that the representations were as the participants desired. Corrections were made when necessary. Although in each case one individual was central to this process, other villagers came and offered suggestions, making the map collaborative.

The maps are interesting because they detail more than land-use change. Maps of 40-50 years ago were made, followed by maps of the current village. Changes that were included were increased population size, the creation of roads, the installation of electricity, the change from all thatch rooftops to predominantly tiled rooftops on houses, the diverting of a river to paddy fields, the cleaning of land and creation of tapioca fields, and in one notable case, the beginnings of villager-initiated reforestation on one hill.

Finally, during both field terms, participant observation played a key role in understanding the contexts of people's daily lives and cooking habits. I was able to observe and participate in harvesting, drying and preparation of foodstuffs and cash crops like coffee; watch over drying grains and foodstuffs; help in the local shop; help in preparing meals; draw and carry water from the public well and the water tap; cut tapioca sticks harvest; and do various household chores such as grinding ragi flour and pounding rice. I participated in village festivals, funerals and wedding celebrations. I learned simple but important activities such as putting out numerous buckets in the rain, catching the clean water, since heavy rain would leave the well water muddy and undrinkable for days. These kinds of activities helped me to better understand village networks, the labour requirements of woman, the availability of different crops, and the difficulties in processing different foodstuffs. I attended meals and was able to observe food consumption behaviour.

In Perugaraipatti, a village located close to the administrative sector of the Kolli Hills, 10 interviews were conducted with 10 households to gauge potential food, finance and service differences with communities in the more isolated Chittor Nadu. However, the circumstances in this community were not followed up during the second field term. The complexities of the situation in Chittor Nadu led the area to remain my focus.

Ethics

It quickly became clear that people had little use for written informed consent forms. Many of the women and men who participated in this project could not read or write, and did not see any benefit to the papers. Additionally, there was extreme reluctance to sign a piece of paper. People did not want the consent form because they felt it bound them into some kind of contract. Although I explained that this was not the case, no one wanted a copy. Instead, verbal ethical consent was obtained for each participant. The written consent form was thoroughly verbally explained prior to obtaining consent.

In subsequent writings, including my thesis but excluding funding-related reports, I plan on creating a pseudonym for Chittor Nadu and the various villages. This is to offer some protection to the villagers who were willing to participate in this research. This decision comes as a result of some of the concerns that some villagers expressed. If I refer to specific people, I will also do so with pseudonyms. Village pseudonyms are not used in this report since IDRC is already aware of the location of my research.

Summary of Findings – Analysis

As indicated in the introduction, infrastructural developments such as road construction, and environmental changes such as variability in rainfall, have contributed to economic activity changes in Chittor Nadu. Tapioca as a cash crop is central to the daily lives of villagers in the area. This is having effects on diet, household income, spending, political activity and the aspirations of people.

Until 1985, Chittor Nadu was accessible only by a walking path. During the pre-1985 period, cash crops were small scale, limited to items that could be relatively easily carried to market on the head, such as ground nuts and guava. With the introduction of a dirt road between 1985 and 1989, followed by a tarred road in 1989-90, the area became accessible to large trucks. Only at that point did tapioca become a viable crop.

Although people's stories of how tapioca came to Chittor Nadu are vague, generally stated in 'friend of a friend tried it and made money' manner, the earliest it appears to have been cultivated was approximately 15 years ago. As the crop was extended, new households adopted it, with a few only beginning to grow it 3 or 4 years ago.

The reasons for the extensive cultivation of this crop are numerous, and interact with each other. The two main reasons are the limited rainfall and the cash income. Direct quotes more eloquently articulate this, as illustrated below:

Over 4 years ago, we grew ragi and maize, which was not enough for our food. Since we did not get any profit, we started planting tapioca. (33-year-old woman)

We grow it [tapioca] because of the rain. When there is no rain, we grow other crops. If there is enough rain, we can grow other crops. If there is good rain, the tapioca will grow well. If there is not enough rain, we still get some sacks. It makes a difference, but at least we get some sacks. If there is nice rain, we will get 150 sacks an acre, if not, 50-75 sacks. With other crops it is not like that. (46-year-old woman)

It should be noted that when people discuss poor rainfall, they are not generally referring to the rainfall during the October-December rainy season. Although people do feel that the rain during this period is less, it is still sufficient for crops at the time. The primary problems seem to be the seasonal rains in February, and the rains that should come in May-June. During these times, a lack of rain is causing difficulties. If planting should be done in April for millet and other crops, it is no longer possible. Rice that is planted in November and December may grow well until February, when inadequate rains can leave the fields dry and the paddy useless. Tapioca, however, can be planted in August-October and requires less rain.

People generally agree that while there are other cash crops that could be cultivated, tapioca is notable for its ease of cultivation. Aside from harvesting and planting, there are only two weeding seasons (October-November; February-March),

leaving people with a lighter labour load. One 30-year-old woman stated the cash and labour benefits succinctly,

We grow tapioca because it is a cash crop [*moneyparar*]. We also can get money from other crops, but it is not as easy as tapioca. Millets need more care – more work and fertilizers, and more water.

Tapioca makes household work easier, and also plays a role in daily wage and exchange labour. Exchange labour is common, but daily wage work during the harvesting, planting and weeding seasons is more popular. However, there can be reluctance for daily wage and exchange labourers to work in non-tapioca fields.

For millets, we need a lot of people for work, to cut it and all. So many we have to call. Because everybody is growing tapioca, they will only go for that work. If we only grow millets, we don't get enough workers. (70-year-old man)

In any case, the market for millets is limited, while the tapioca market is thriving. A tuber crop, tapioca supplies the sago-starch sector of the Indian food industry. Tapioca may also be consumed directly in products such as tapioca chips or as a starch component in meals. The sago-starch industry is concentrated in the Salem district⁹ of Tamil Nadu, and the tapioca growing industry in the state is largely found in the adjoining Salem, Dharmapuri and Namakkal areas (Revathy 2001). In 2001, this amounted to over 85 000 hectares of tapioca cultivation in the state alone (Revathy 2001), supporting over 100 000 growers, mainly small farmers (1999). Although tapioca is grown more extensively in Kerala state (Revathy 2001), in 1999, Tamil Nadu met almost 80% of India's tapioca-product related needs (1999), suggesting that tapioca in Kerala is more likely to be directly consumed by producers, while in Tamil Nadu, the crop tends to be directed

⁹ Salem district adjoins Namakkal district, and until political restructuring of the area, encompassed Namakkal district. Most tapioca manufacturing facilities are located in Salem, with some even at the bottom of the Kolli Hills. It should be noted that the industry has various associated environmental impacts, including aquifer contamination from waste-water discharges (Simhan 1998).

towards sago-starch and other products. Export of tapioca is considered to have high potential, although the export market tends to be dominated by Thailand and Indonesia (1999).

Harvested once a year, tapioca can survive on limited water and thus grows in fields that are rainfed only. However, high-yield varieties of the tuber require good irrigation, and rainfed crops tend to be lower in yield and quality. The crop can yield between 15-40 tones per hectare, depending on variety and irrigation (Simhan 1998). In Chittor Nadu, people grow the 10-month variety of the crop, and sell it in 75 kilogram bags.

It is not unusual for villagers to state that, beyond the cash and rainfall benefits of tapioca, they grow it because everyone is growing it. This pressure to also grow the crop reflects two main issues: First, a desire to have the tapioca income and be able to afford what one's neighbours are purchasing; and second, a concern that if some fields are not planted with tapioca, mice and other vermin will be attracted to those fields, destroying the food crops.

Tapioca is a key development in these communities, and in the surrounding area, and has been spurred by environmental and infrastructural changes. In turn, the income from the crop is contributing to other changes, also environmental and infrastructural. I will detail these changes shortly, addressing the positive and negative outcomes of the crop, for dietary, cultural, environmental and infrastructural/political factors. However, first I address the differences in profits and inputs for households.

Inputs, Profits

Tapioca has a highly variable selling price. Rates for one year may be half, or even double the previous year, falling between a range of Rs.120-300 per one gunny sack (75 kilograms). Rate fluctuations depend on the success of the crop that year in Tamil Nadu, the individual quality of the crop (the bigger the tubers, the fewer needed per bag), and the time when people harvest their fields. A late or early harvest can change the price the brokers are willing to offer. Additionally, some people may find that selling directly to tapioca mills, rather than to brokers, can influence the price they get. Mill owners may

try to cheat villagers; on the other hand, selling through a broker means having to pay a commission of Rs.2-4 per bag. A good relationship with a broker, who may be from the area, or from outside, or who might even be a relative, may mean a better selling price.

The thickness and hence the quality of the root is dependent on inputs such as rainfall and fertilizers. Poor rainfall makes for a poor crop. Many households are finding that each year they must increase the number of bags of fertilizer used per acre of land. Since crops are routinely planted year after year in the same fields, immediately after harvesting, this need for fertilizer is hardly surprising. At between Rs.250-450 per 75 kilograms, fertilizers can represent a considerable expense. Poorer families are not able to afford such expenses and either do without fertilizers, or take loans from neighbours or from tapioca brokers to pay for this and for other production costs such as labour and crop transportation. This can lead to a cycle of debt, particularly when families have small amounts of land. Such a situation is articulated by one 40-year-old woman, a mother of 5 children:

We get money May-July through the tapioca. After the tapioca is finished, there is no money for us. We borrow money from others to buy the rice and all. Once we have sold the tapioca, we give back the money.

Her situation is exacerbated by the recent death of all her chickens from disease. This alternative income generator is now no longer possible. Another woman, 49-years-old, stated,

We are borrowing money for planting tapioca and for buying food. It is not sufficient the income that we get from the land. If we go to work everyday we can buy and eat. If we don't go to the daily work we are not able to buy food. Then we have to borrow money.

Additionally, since tapioca is an annual crop, people may take loans throughout the year for household and other expenses, hoping that the profit for the year will enable them to

pay the loan and interesting, and have money remaining. Interest on loans is generally Rs.3 per Rs.100.

It is useful to offer examples of tapioca variability throughout the communities. One villager from Poosanikullipatti with 2 acres of land sold his tapioca in 2003 for Rs.225 per bag. In 2004, it sold for Rs.160 per bag. For labour, the limited fertilizer, the broker's commission and transportation to the plains, he needs approximately Rs.10 000. However, this year he received just over Rs.5000. As a result, he had borrowed the rest of the money from the tapioca broker who bought his crop.

Even for people with more land and more money to use for fertilizers, annual losses can be heavy. One family with 12 acres of land made Rs.70 000 in 2003, and Rs.27 000 in 2004, even though they planted the same amount of land. Rainfall plays a role in this, since even large amounts of fertilizers will have little effect without sufficient rain. If there is no rain, too much chemical fertilizer will cause the tapioca to rot.

Nevertheless, tapioca is widely discussed as a good crop, even by people with limited profits. Although there are disadvantages, the monetary income that the crop brings is useful for many families. The opportunity to take loans, with their future crops as insurance, is seen by people as useful, despite cycles of debt that might be created. As one 30-year-old woman stated,

If we keep planting tapioca, I can borrow money, and they know we will pay it back.

Another woman, 31-years-old, stated,

After selling tapioca, the amount we get is enough for us. If the amount is not enough for us, we usually borrow money from people we know. For 2.5-3.5% interest. After selling the tapioca, we always repay the money, so people are willing to lend us money.

Outcomes: Positive and Negative

As with most economic and livelihood decisions, tapioca cultivation has had negative and more positive outcomes. The positive outcomes include infrastructural changes such as the introduction of electricity to the area; improved education; and increased political agency and activity on the part of villagers. Finally, villagers state that they are now more “cultured” or “civilized” (*nagarikam*) in the sense that they feel they are increasingly living in ways similar to people in the plains. Such a feeling is problematic, in the sense that it appears people are internalizing externally-imposed views that tribal people are more primitive and less cultured. However, the aspirations of people cannot be discounted, even if these aspirations are linked with perceptions of social inequality.

Tapioca income and loans have made it possible for people to afford the Rs.2000-5000 required for the installation of electricity in the homes. Beginning in 1998, but not widespread until 2000, electricity was extended to many households in Chittor Nadu, although some villages such as Nariyankadu and Sundakadu are more serviced than others such as Mel Poosanikullipatti and Averikadu. These differences are linked to householders’ abilities to pay for installation and electricity metres.

Electricity was brought to the community as a result of a petition delivered at a time when many households were able to contemplate such a cost. Most households now have electric radios, and several families have televisions, often also watched by members of nearby households. These appliances connect the village with outside world in a consistent manner, previously unprecedented for children and others who were not regularly traveling to the lowlands. Ideas of what are “cultured” behaviours, as well as information about political and other struggles in the country are thus filtering more rapidly into the area. Even if some households have not been able to afford installation of electricity to their homes, they still benefit from the government-provided fluorescent lighting throughout the village, something that only came with the request for private electricity. Additionally, electricity led to the introduction of a private rice mill. This precludes handpounding and/or onerous trips to the plains to process locally grown rice.

Several inhabitants from all six villages in the district have come together to open a library in the memory of a well-respected man from Nariyankadu who died in late

2003. Such a move is unprecedented in the area, and initially relied entirely on donations, in the form of books, furniture and money, from local people. A library was chosen as a suitable memorial since the individual had been known for constantly trying to improve the situation of tribal people. The fact that households were able to afford such donations illustrates another way tapioca income can be used in a positive way for the community.

Feelings about Money

Monetary income has contributed to people's beliefs that they are becoming more developed, and gaining better access to some of the services and goods available in the lowlands. As indicated in the Interim Report, there has been a shift in the cultural environment such that money is the current agricultural priority. Whereas food was the primary reason for farming in the past, people are increasingly interested in gaining a cash income. Although each household may have different reasons for wanting money, the following two quotes illustrate some common reasons:

[In the past] when we were getting married, we brought clothes [saris] only. But now ladies are asking for gold bangles, chains, and jewels. So the people only like money. (60-year-old woman)

A 29-year-old mother of two said,

Sticks [tapioca] are cash crops, that's why people grow them, not only no rain. The people want jewels, the cash...we can't sell and make money from *samai*, *thenai*. We can only eat it.

People want access to goods and services that they see other Indian citizens having. Gold jewelry, motorbikes, televisions, motorized water pumps, new clothing, household goods and education for children were listed as priorities

for households. Moneys for festivals and for traveling to temples during certain religious times are also important for people.

Additionally, there is some indication, which was also noted by Kumar-Range (2001), that wedding costs are increasingly. The shift from the traditional bride-price practice to that of the (technically illegal) dowry practice means that girls are increasingly required to bring a variety of jewels, goods and sometimes money to their marriage. It is difficult to assess the extent of this trend, but talk of girls and wedding expenses did occur. This is in contrast to the traditional wedding practices of brides bringing some small household things, and her family receiving a monetary gift from the groom's family (Kumar-Range 2001). Weddings themselves are increasingly lavish and include expensive engagement ceremonies.

The trend towards buying gold jewelry reflects two main factors. First, gold is a symbol of status and wealth. Second, and more important, gold provides a form of financial security for women and households. It can be easily sold in times of economic difficulty. It can also be used as collateral against bank loans. A 33-year-old father of two succinctly put the relationship between tapioca, jewels and money this way:

Before 10 years ago, we planted ragi, maize and millets. Since these do not give profit for us, we started planting tapioca. It gives nice profit for us. If we planted ragi, maize and millets, the amount is not enough to buy dresses, eating and for studying. So if I keep tapioca, I get some profits. Sometimes, though, I get a loss. So if I have tapioca, I can borrow some money to buy jewels and keep the jewels in the bank for whenever I need them [to sell].

Money is a household priority because it is linked with other aspirations. Many villagers feel that their lifestyles are changing in ways that bring them closer to the behaviours and practices of people living in the plains. It is common for people to state that since the introduction of tapioca to the area, they have been able to become more

"cultured", "civilized" and developed. Ideas of cultured and civilized behaviours appear to correspond with people's perceptions of what it means to be a non-tribal lowlander. Examples included the introduction of the sari blouse, rather than simply wrapping cloth around their bodies, increased numbers of clothes, a tendency to dress more neatly, particularly among children when they go to school, a change in the language so that it is more polite and respectful, and increasing attention to personal hygiene. Comments included:

From the income from tapioca, there were a lot of changes in the lifestyle in this village. People are able to save money and buy gold jewels. Some are keeping 4-5 sovereigns of gold in their house. The dressing has changed, it is more cultured. (46-year-old woman)

There are a lot of change in this village due to tapioca income. People are more cultured and better dressed than before. They can get things for the home: TV, radio, grinder, tape recorder, two-wheeler, jewelry. Also chairs, stools, furniture. This is all from tapioca income. (31-year-old woman)

People in the villages have developed [uses English word] quite a lot more than before. We couldn't get money from millets, but we are able to make money with tapioca. They are more decent [uses English word] than before. (23-year-old woman with post-secondary diploma)

There are a lot of changes in the village from the income from the tapioca. All the houses had grass roofs before, even my own house. Now they have started to make them tiled, and make new houses. And we are getting things for our homes, what we need for cooking, radios, TVs, grinders, two-wheelers. We have got electricity. Life has changed. (46-year-old man, village political figure)

Because of this income, there have been a lot of changes in the village. The life has become more cultured in this village. Because we get money from tapioca, and

some are able to buy TVs, radios, two-wheelers. The way of dressing and eating has changed. (30-year-old woman)

Dressing has changed quite a lot. Elderly people were not using blouses...I started to wear blouses, but before I did not. Still there are people who don't wear blouses. Now it is not like that. It is more cultured. (60-year-old woman)

Now, for 10 years, after the road, the style of dressing is changed, it is nice. Because of the road, and seeing different kinds of people in the towns. Through the transport we can go to many places and see different ways of dressing. Before, we had only one or two sets of dress only, now we have money. So that is a change. (40-year-old man)

The difference between the people living here and down is that they are educated, and they know what to do and what not to do. But people here don't know. If they go out to work, they will come and prepare the food without washing their hands. They won't take baths. They won't dress nicely. And the way of speaking is also different, here it is indecent. (27-year-old woman)

As stated above, the issue of becoming more "cultured" [*nagarikam*] is problematic, as villagers are comparing themselves to an external standard and an external set of beliefs. Popular beliefs that tribal people are less cultured and more primitive appear to be internalized by villagers. Trappings associated with culture include commercial goods and practices, such as jewels, clothes, styles of dress. It is likely that views of what is cultured have been shaped partially by exposure to television series and commercials. There is a discounting to tribal knowledge and practices. In other cases, people conflate basic services such as education and electricity, and knowledge about health issues, with a more civilized lifestyle. While these are important community development aspects, it is problematic when they are associated with judgmental and value-laden terms like 'cultured' and 'civilized'. However, people's personal aspirations towards a certain

lifestyle cannot be ignored, even if it these aspirations are embedded in a system of social inequality.

Part of what people consider to be a "civilized" lifestyle includes having alternative means of income generation. The annual tapioca income, coupled with the limited profits that some households receive, is to many people a sign of their social and political disadvantage *vis-à-vis* lowland farmers and city dwellers. It was very common for people to contrast their lifestyle with the lifestyle of people who live in the lowlands. More economic chances, better access to food, better educational chances, and more household income were all highlighted. These included statements such as:

I feel that we don't have the same lifestyle as in Salem and Namakkal. We are always in the field from morning to evening. Social behaviour and dressing and eating becomes somewhat the same, but the standard of living is different. I feel we need a lot of development [uses English word] to become like people down. Because they are living in towns and nearby towns, so they have more chances to make a living. (30-year-old woman)

They are not the same as us. Their work is different, their lifestyles are different, and they have facilities we don't have. We are always working in the field. They have so many ways to earn income, like business. They are keeping shops and they are able to buy whatever they want. We need to wait for the yearly tapioca income. (49-year-old woman)

The differences between the Kollimalai and the people living down, the main difference is the knowledge. People living in Kollimalai have less knowledge, because the people living down will send their children to an English-medium school. If we go and ask for a place in an English-medium school in the down, they say there is no place in the school. Because already the people living in down have paid more to get that place. (33-year-old man)

The lifestyle of down people is much better than us. Because they get a lot of profit. We only get Rs.2000 or Rs.4000 after all the expenses. But for the people down it is not like that. They grow tapioca, paddy, they have a lot of coconut trees. So their lifestyle is totally different. (57-year-old male)

While people's perceptions of their economic and educational chances are valid, and need to be understood when examining agriculture and food decision-making practices, it is interesting to note that villagers tend to have a somewhat skewed vision of lowland farmers. Farming is a difficult task in the lowlands. There may be better irrigation infrastructure, but the advantages of this can be partially offset by higher lowland temperatures and less average rainfall (Bohle 1992). Lowland farmers have also been affected by the Tamil Nadu-wide droughts. It is not uncommon, for example, to read newspaper articles detailing farmers' struggles due to drought and/or flooding in lowland villages in surrounding districts. At the same time, it is possible that some lowland farmers do have better access to things such as markets and agricultural extension services. They do not have to pay higher prices for the transportation of goods to and from the Hills. Thus, perceptions of Hill versus lowland agriculture and lifestyle may be skewed somewhat, but this does not mean that people's aspirations to be more like the "down" people are invalid. Indeed, some villagers still tell stories of discrimination in lowland places. This might include being denied use of village wells because others view them as socially inferior and/or polluted tribal people. It is therefore not surprising that some people might want to have the same advantages, education and trappings (behaviours, ways of dressing) as lowlanders. Cash crop money helps make these things possible, and therefore is a high priority.

Community-Based Development: Coming Together for the Road

Villagers also link tapioca to an ongoing struggle for the construction of a more direct route to the lowlands. Rather than a winding, 30 kilometre route to the central Hills district, and another 30 kilometre journey down to the plains, the proposed 10 kilometre road will extend from Nariyankadu to Mullukurichi, the presently walked-to market town

in the plains. A bus trip would take less than an hour, versus the current 6 or more hour trip. It would mean lower transportation cost for tapioca crops, substantially decreasing the cost of renting trucks. This economic benefit has provided an additional incentive to make a concerted, group struggle for this road, a project that has been blocked by bureaucratic red tape and conflicting requirements by state and central government departments. Actions on the part of the community include multiple strikes, confrontations with government officials, the construction of parts of the road itself, and letter-writing campaigns.

Beyond incentive, the relative ease of cultivating tapioca has provided some time for villagers to devote to such struggles. Even more, the income generated from tapioca plays a role in the fight. Strikes, transportation, flier and letter printing, mail, construction and other costs can be paid for with money collected from households for this project. Requests for the road extend as far back at 1973, but these were primarily undertaken by a few political or influential community members who had the time and motivation. More recently, the struggle for the road has no longer linked with wealthier families and political figures. Rather, it is a more community-based effort. This was articulated by one 30-year-old woman,

Because of the money we get from tapioca, we are able to strive for the common good. We are able to make a fight for the road to Mullukurichi. Each family maybe can give only a little, but as a community it makes an amount, a common fund we can use for this kind of thing. This is only through the tapioca income.

Another woman, 20 years old, stated,

Tapioca brought money to every home. Now we have money, we are able to go for strikes and struggle for the road. Before, we were not even able to afford the bus fare. We had no money, and we had to go walking, walking, and no one was interested. Now we have money, we can go by bus and come back, and we are able to go and fight for this road to Mullukurichi.

Such themes were articulated by many villagers, although some do not view things in a similar manner. Some households are not able to make a profit from tapioca, leading to a cycle of debt that shapes their view of the crop, and that limits aspects of their participation in the struggle for the road.

However, most the villagers interviewed in Nariyankadu anticipate that, beyond reducing tapioca output costs, the road will increase their move towards becoming more "cultured". Children will have better access to higher levels of education and possibly the quality of education in local schools will improve. Villagers anticipate gaining some of the economic chances found in the plains, such as diversified moneymaking opportunities that yield a monthly, rather than annual, income. This is part of what villagers consider to be civilized living. Vegetables and other foodstuffs may become more readily available if it is easier and faster to get to market.

Less Positive Consequences of Tapioca

I have discussed some of the more positive perspectives on the crop, and at this point I want to address some of the noticeable and developing problems. Some of these problems are explicitly discussed by all villagers, while others are emerging.

The most remarked upon outcome has been a change in dietary practices. Villagers stated that rather than having a varied staple diet of a handful of different kinds of minor millets, they now rely almost solely on rice, and most frequently this rice will be purchased from government ration shops, or from private market shops. The loss of local millets is much lamented except by villagers in their early 20s who generally do not remember these foods. Millet loss is often articulated through complaints of loss of strength, general weakness, and an inability to work as hard or as long as in the past. Although this can be attributed at least partially to age among older villagers, women and men in the early thirties make similar complaints. People also feel frustration at the lack of vegetable availability. They state that their vegetable consumption is less, and consists of fewer varieties of vegetables as side dishes to the staple rice dish.

There are three basic dimensions to the dietary changes. The first is that of nutritional quality. The second is preference, which includes aspects of preparation. The

third is that people are buying more of their food, rather than growing it. Each of these have implications for dietary diversity.

Although it was not possible to conduct a quantitative nutritional analysis of research participants, the move from largely eating minor millets to rice does have dietary implications. In general, minor millets are considered to be more nutritious than rice, both in terms of macro and some micronutrients. For example, samai is a minor millet consumed occasionally by villagers, and it was once one of their staple foods and crops. One hundred grams of the edible portion of the millet contains 7.7 grams of protein, 4.7 grams of fat, 7.6 grams of fibre, and 67 grams of carbohydrates. It also has 17 milligrams of calcium, 220 milligrams of phosphorus, and 9.3 milligrams of iron. In contrast, 100 grams of milled, cooked rice contains 6.4 grams of protein, 0.4 grams of fat, 0.2 grams of fibre, 9 milligrams of calcium, 143 milligrams of phosphorus, and 1 milligram of iron. The following table shows the different basic nutritional values of rice compared with some of the minor millets villagers listed as former staples. Bajra and Italian millets are known in the Kolli Hills and Tamil Nadu as *cambu* and *thenai*.

Table 3: Some Nutritional Characteristics of Millets and Rice

Food (100 grams)	Energy (Kcal)	Protein (g)	Fat (g)	Fibre (g)	Carbohydrates (g)	Phosphorus (mg) ¹⁰	Calcium (mg)	Iron (mg)
Rice (milled, cooked) ¹¹	346	6.4	0.4	0.2	79.0	143	9.0	1.0
Bajra (cambu)	361	11.6	5.0	1.2	67.5	296	42.0	8.0
Italian millet (thenai)	331	12.3	4.3	8.0	60.9	290	31.0	2.8
Ragi	328	7.3	1.3	3.6	72.0	283	344.0	3.9
Samai	341	7.7	4.7	7.6	67.0	220	17.0	9.3
Varagu	309	8.3	1.4	9	65.9	188	17.0	0.5

Source: Gopalan et al 2004

In terms of energy and carbohydrates, there is little difference between millets and rice. However, protein is higher, in most cases considerably higher, the fibre content is higher,

¹⁰ Phosphorus works with calcium in that most calcium in the body is deposited as calcium phosphate (Gopalan et al 2004:19).

¹¹ Although handpounding was the method of processing rice in the past, most people now mill their rice in the village electric mill, or purchase pre-milled rice. Handpounding is rare, although it does improve the nutritional content of the rice.

there is more fat, and micronutrients are also almost always higher. Thus, while rice is nutritionally useful, and does have essential amino acids, as a sole staple food, it is less useful than a combination of a variety of millets and rice. This is particularly problematic when vegetable, meat and milk product consumption is minimal, as is the case in the research communities.

The second major aspect of a shift towards rice as a dietary staple is food preference. It was not unusual for women to complain about having monotonous, rice-based diets, lamenting the loss of millets. It is not that rice is new to the area, but it was eaten with considerably less frequency. In the past, each meal would consist of a different kind of millet accompanied by vegetable or bean/lentil curries. Now, curries and rasam (an onion, chili and garlic broth) are the accompaniment to rice, with some people feeling that curries do not taste as good with rice. A typical comment, made by one elderly woman, was, "I don't like rice, but there is no other choice, so I am eating it. Here, nobody sells *samai*, *thenai*. We would like to buy them." Millets would also frequently be described as more healthy. As one 31-year-old woman put it,

With *thenai*, we used to make *thenai* rice. With that we made a kind of beans curry. If we ate that, we didn't feel hungry very soon, and it tasted so good. Now we are eating a plateful of rice. It doesn't give us any strength as compared to one tumblerful of *thenai*.

Feelings about millets as a staple food are nicely encompassed by the feelings of one 57-year-old man, who said, "When cultivating millets, we got nice food and felt wealthy because of it." A wealth of flavour, variety and strength were available from millet cultivation.

At the same time, it should be noted that all millets are difficult to process. They must be ground in a grinding stone, or pounded by hand. There are no machines to process the grains. Women would talk of having to get up at 4 am to pound the morning millets. Older women felt that it was too hard, and that the younger girls are now uninterested in preparing millets, at least on a frequent basis. Rice, purchased pre-processed or easily milled in a machine, represents an easier work load for women. Few

women handpound their cultivated rice, and when they do, it is infrequently, for example, if the rice mill was especially busy. Villagers may call millets a preferred food, but many women also find it easier to not have to process it. This cannot be discounted when attempting to understand dietary changes. Women are responsible for gathering wood and water, laundry and all housework, child and animal care, processing and cooking of foods, weeding, planting and harvesting tapioca and other crops. They also go out to work in fields for a daily wage. Considering such a workload, it is understandable that finding ways to limit food processing would be appealing.

Nevertheless, the rarity of millets means that they tend to have achieved a status as a desirable, high-quality food. In the past, rice almost exclusively had to be purchased, as it was grown in small amounts, or not at all. Thus, rice was associated with wealthier people, and was considered to have a "richly look" too it. Millets were common. Now, however, people speak of millets in terms of desirability and high quality. For example, a 34-year-old woman who plants some of these grains stated,

The people who had money before bought rice. Rice was considered as high quality food. *Thenai* and *samai* are now considered a high quality food because they give us more strength than rice.

This belief is not shared by everyone, or it is not unconditionally shared. In one case man in his thirties stated that millet consumption was a sign of low economic status. His wife and neighbour agreed. This was a statement that many other villagers said was not true. Another woman indicated that *thenai* and other millets might be important as a healthy food, but that rice was still considered to be high status. Thus, it seems that perspectives on millets are not without contradictions; for some people, millets might continue to be seen as a low status food that is an indicator of poverty, others may see it as high quality, but low status. This could have implications for any agricultural/nutritional millet promotion projects.

The final aspect of dietary changes in Chittor Nadu involves the movement from growing food to buying food. This was discussed in the March 2004 Interim Report. Most villagers in Chittor Nadu are at least partially dependent on shops for food. Few

vegetables are grown, and while rice is grown, if the harvest is successful, it is generally not enough to feed a family for a year.¹² As people began to grow fewer of their foods, they began to purchase more of them. Geographic location *vis-à-vis* markets and the cost of foods have also affected dietary diversity, as has the kinds of foods available for sale. Thus, if people buy vegetables at the weekly market in the plains, they have to carry them back to their villages via a foot path. The difficulties of the journey, coupled with carrying food on their heads, means that people purchase foodstuffs in restricted quantities. Vegetable purchases may be limited to tomatoes, garlic and onions. Pulses and legumes may be grown in small quantities, but most people will purchase their grams and beans in the shops. Fruits such as guava, oranges, jackfruit and bananas are seasonally available, but many of these fruits will be diverted to sales in markets or to fruit brokers, rather than consumed. Other fruit varieties will rarely be eaten. Finally, the consumption of meat and milk products is rare, and reserved for special occasions.

The dependence on purchased foods is clearly articulated by villagers. In some cases, households do not grow any of their food, as a 23-year-old woman said,

I would like to grow food crops, but we have no land. We can grow other crops, *samai*, *thenai*, but nobody is doing, so we too are not doing. Nobody is growing vegetables, we too are not doing. Everybody is on tapioca. Some are growing tomatoes, lady's finger, brinjal, but we are not doing.

Here, the statement that her family has no land refers not to no land at all, but a lack of land which can be diverted from tapioca to food crops.

A dependence on purchased foods means a dependence on work for a daily wage. If there is no work in the nearby villages, people may go to the plains to work as seasonal, migrant labourers.

We were eating millets before, not much rice, but now we are eating rice rather than millets. We only cultivate tapioca because there is no rain. No paddy. We sell the

¹² There are some exceptions to this, including one household with over 30 acres. They grow all of their own rice.

tapioca and buy rice and cook and eat it. I work for myself and I eat. If there is no work we are going to Erode [outside of the Kolli Hills]. (35-year-old woman)

Buying food means having enough money to do so. Even those who do grow some of their food supplies do not get enough to supply the needs of the household for a full year. Tapioca income, therefore, is key in enabling people to purchase their own foods. One woman, in her late 40s, expresses this problem in the following way:

Last year we got Rs.15 000 [tapioca income] because the price was high. This year we got only Rs.10 000. After commission, worker's charge, and lorry charge, we got only Rs.7000. It was not enough for our food. We have to buy rice from outside and what we got is not enough for a year...We are borrowing money for planting and for buying food. It is not sufficient the income that we get from the land. If we go to work everyday we can buy and eat. If we don't go to the daily work we are not able to buy food. Then we have to borrow money.

The issue of buying food was put more succinctly by a 40-year-old woman, who said,

Before, we used to eat *ragi*. It is good for health. But now we only eat rice and rice comes from the shop...For the past 10 years we have only been eating rice.

As with many situations where people switch from growing subsistence crops to cash crops, the dependence on purchased foods can become problematic. Bohle (1992) has argued that a transformation of traditional resource systems, in the form the shift towards cash cropping in the Kolli Hills, aided by infrastructure such as roads and markets near some central communities, would lead to a decrease in food security and an increase in vulnerability. The move towards tapioca cultivation, initiated by sago-starch companies and local people has "considerably reduced subsistence cultivation in the Kolli Hills" (Bohle 1992:144). This, he suggests, will result in major ecological disturbances, and the destabilization of indigenous socio-cultural and economic relations. He points out that a shift to cash cropping risks an increasing dependence on lowland

supplies of food, something which is highly vulnerable to disruption. Over a decade later, it appears that some of Bohle's concerns have manifested, particularly the dependence on outside sources of food. When the need for money for food is coupled with the need for money for chemical fertilizers, tapioca in fact represents a considerable economic risk for people. Bohle also pointed out that chemical fertilizers were increasingly purchased, since traditional crop rotation methods had been abandoned. This continues to be a problem, with almost every household planting tapioca year after year in the same fields. In many cases, villagers state they now must purchase more fertilizers for these fields.

The cost and availability of purchased foods can contribute to reduced dietary diversity. In the case of Chittor Nadu, the long walk to the nearest market means limited access to vegetables. Buying rice, rather than growing millets, concentrates the diet on one staple food. Reduced production of beans and lentils means that these must also be purchased. And finally, cash cropping may not supply enough money to afford a variety of foodstuffs. Villagers readily make use of the ration shops that provide rice at a subsidized rate. This does not present a positive picture of current and future household food security or dietary diversity. People are dependent on the environment for providing decent harvests. A lack of irrigation systems places villagers in need of adequate rainfalls. Should tapioca crops begin to fail, or if market prices should fall, the dependence on purchased foods for daily consumption could present a number of problems for people.

Food ranking exercises were undertaken with groups of women. The purpose of these exercises was for women to list all the foods they consume, and then rank them in terms of how frequently they are eaten. The methodology allows women to determine how these foods will be ranked. Women consistently ranked rice¹³ as the major food consumed in the household, with rasam, a spicy, onion and garlic broth, as the second most consumed. A wide range of vegetables were listed included on the list. These were generally ranked as low- to medium-consumed foods, suggesting that vegetables are

¹³ Rice is a filling, bulky food. It is not very surprising, therefore, that while women often complained about dietary monotony, they also frequently stated that they "never feel hungry".

eaten when they are seasonally available, either in markets or in their fields. *Samai*, *thenai*, *ragi* and *varagu* millets were only included in the lists women constructed in Mel Poosanikullipatti, and they were ranked very low in consumption.

Chicken, pork and mutton are reserved for special occasions. There appears to be a reluctance to consume eggs and chicken in most households, as these either have to be purchased at relatively high costs¹⁴, or chickens are being reserved for sale on the market. Milk products appear to be rare partially because there is less and less scrubland/grass for cow grazing and feeding. This can be linked to the conversion of what was previously classified as 'waste' lands to tapioca fields. However, this may change with the recent (October 2004) inauguration of a Milk Society in Nariyankadu.

Twenty-four hour dietary recalls were particularly revealing, as they reinforced and elaborated on the food diversity exercises and interviews. Table 4 gives a selection of the meals of several villagers. All 24-hour dietary recall records can be found in Appendix IV.

Table 4: Selection of 24-Hour Dietary Recalls

Villager	Day One	Day Two	Day Three	Day Four
Woman, 33-years old, 2 acres of land, 3 children	M – rice, sambar without vegetables, black coffee L – rice and the same sambar D – rice and rasam Snacks – 3 biscuits	M – rice, beans sambar, black coffee L – rice and same sambar, 1 guava D – rice and rasam, 3 guava	M – rice and greens, black coffee L – rice and greens, 4 guava D – rice and coconut, black coffee	M – rice and grams sambar, black coffee L – rice and same sambar D – rice and same sambar
Woman, 35-years old, no land, 2 children	M – rice and sambar without vegetables, black coffee L – rice and same sambar D – rice and rasam, black coffee	M – rice and rasam L – rice and rasam, 2 guava D – rice and greens, black coffee	M – rice, sambar without vegetables, black coffee L – rice and same sambar D – rice and rasam	M – rice and curd (yoghurt), black coffee L – Rice and curd D – rice and sambar without vegetables, black coffee
Woman, 31-years old, 4 acres of land, 2 children, shopkeeper, husband has outside job	M – idli and coconut chutney, milk coffee L – rice and sambar without vegetables D – idly and the same sambar with green grams added, 1 tumbler of milk Snacks: 4 sweet biscuits	M – rice and okra sambar, milk coffee L – rice and same sambar, curd D – semia oopuma and 1 tumbler of milk Snacks: Salty fried chip mixture	M – rice and sambar without vegetables, milk coffee L – rice and onion chutney D – rice and rasam, one tumbler of milk Snacks: 4 salty biscuits	M – idli, coconut chutney, black coffee L – rice and sambar without vegetables D – tamarind rice Snacks: 4 salty biscuits
Woman, 40-years old, 3 acres of land, 5	M – rice and rasam, black coffee L – same rice and rasam	M – rice and green bean sambar and rasam, black coffee	M – rice, rasam, black coffee L – rice, rasam, 1	M – tamarind rice, black coffee L – same tamarind

¹⁴ One egg costs approximately 2.15 rupees, and chicken can be purchased for 50-70 rupees/one-half kilogram.

children	D – rice water (Kanji)	L – same rice, sambar and rasam D – Kanji, black coffee	guava D – Kanji, black coffee	rice D – same tamarind rice, black coffee
Man, 57-years old, 2 acres of land, 3 children	M – rice and sambar with grams, black coffee L – rice and rasam D – rice and sambar with grams	M – rice and greens L – rice and greens D – rice and rasam	M – rice and rasam L – rice and rasam D – rice and rasam	M – rice and rasam, black coffee L – rice and rasam D – rice and grams sambar

Notes: M = morning, L = lunch, D = dinner; rasam is an onion, garlic and chili broth; idli are made from a dough of rice and Bengal grams; sambar is a lentil and onion curry. Vegetables can be added to it.

It is possible to see in this chart that people have remarkably similar diets. Sambar without vegetables other than onion and garlic, rasam and rice are key staples. Poorer families may rely on kanji as part of their diet. Kanji is a watery rice soup with little nutritional value when consumed alone. Milk products are rare, although some families may buy milk. Others may drink milk from their cows and/or goats, but having livestock does not guarantee that people use the milk. Vegetables are limited, and may include greens (*keera*), which are leaves taken from different roadside bushes and trees. Onions and garlic are consumed daily in sambar and rasam. Tomatoes may be included in the sambar. Other than that, okra, pumpkin, eggplant, carrots and potatoes are consumed, but not daily. Additionally, observation during cooking and at meal times indicated that when they are available, the amounts of vegetables consumed are small, generally amounting to less than 3/4 of a cup per person at a meal. It is not uncommon for people to state that if they lived in the lowlands, they would be able to afford to purchase and eat vegetables each day. They would also be able to buy such things more conveniently. In contrast, villagers often say that they do not have vegetables. A lack of rainfall, a lack of markets, and a lack of money are all factors people cite for the limited vegetables.

Environmental Effects: Emerging but Largely Unstudied

With the expansion of tapioca fields and a concentration on monetary income, there are two primary environmental factors that are potential problems. The first is deforestation, the second is soil loss and fertility.

There is little information about forest-cover changes in the Kolli Hills. Kumar-Range found that in 2000, 44% of the Hills were classified as forest. In 1882, close to 84% of the area was forest covered (2001:18-19). Rajasekaran and Warren (1994) found

that of 22 species of trees in the Hills, 15 could be classified as endangered or rare. The more plentiful trees are fruit-bearing species and the introduced eucalyptus. In the absence of quantitative study data, it is only possible to understand deforestation and land-use changes through memories and observed actions. Interviews indicated that in 1985, when a dirt road was created to Chittor Nadu, it became feasible for people to begin to cut and sell their trees to wood brokers. In time, the move towards tapioca has encouraged land clearing. Conceptual land-use exercises showed how surrounding slope lands that were once covered with bush and forest land are now used for tapioca cultivation. It is also possible to observe land clearing and to hear about land-use plans. Villagers who continue to own some bush and forest land speak of yearly plans to expand tapioca fields. Between my two field terms, one family cleared approximately 13 acres of high slope land. When I arrived in September 2004, this household was in the process of planting the land with tapioca.

There is some awareness of the potential problems with deforestation, particularly with regards to rainfall pattern changes. Some villagers are aware that they may be influencing rain, and a small-scale villager-initiated reforestation project in Averikadu is part of a response to this; others are not convinced that trees and rain are related. Although there are no studies of rainfall pattern changes in the Kolli Hills, Meher-Homji's (1980) work on deforestation in Karnataka provides some basis for comparison. He found that although the amount of rain did not change, there were fewer rainfall events. This means that there is a greater amount of rain falling over shorter periods. Soil absorption is a problem in such cases, and the heavier rainfall can contribute to soil loss. There is no data for pre-tapioca years in Chittor Nadu. The Kolli Hills Agricultural Department does have rainfall statistics for the central Hills from 1991-2004. It does appear that during high rainfall months of June and November, the trend is to fewer days of rain and less rainfall. However, longitudinal studies need to take place.

A second concern is that of soil fertility. Traditional rotational crop methods have been abandoned in most households. Tapioca is planted each year. The harvest may be in August, with the next crop planted in September. Villagers feel that the soil is less fertile, and some put increasing amounts of chemical fertilizers each year. Comments included:

The soil was good before. Before the fertilizers, we used only cow dung. And the soil was so good and the tapioca grew well. And now if don't put fertilizers, the tapioca doesn't grow. Only according to the measure of fertilizers, only that way it grows. Before, the soil was good and the tapioca was healthy. (20-year-old woman)

To plant ragi, maize, we need a lot of rain. But now the rainfall is less, so we cannot plant it. Before, the soil in the fields was very nice. But now we need to add urea to the soil. To buy it, we spend Rs.2000-3000 for one year for our land. (Woman, 50 years old)

Now we are using fertilizers; complex, urea, potash. Before we were only using cow dung. There were more cattle then. Every year we have to use a little more than the last year. Because we are planting each year in the same fields the soil loses its fertility. (46-year-old man)

We decided to plant tapioca because of the less rainfall. When we first planted it, it was very good. But we repeatedly planted it and the soil lost its strength. *Ragi*, *thenai*, *samai*, they are good for the soil because after the harvest, we put the dried leaves into the soil. But for tapioca, we need urea and other fertilizers. We spend Rs.2000 for urea for one year. (40-year-old woman)

The last comment is particularly interesting because agricultural workers in the LAMP Society have suggested that tapioca leaves are good for the soil, and can be used as an organic fertilizer. This does not correspond to villagers' experiences. They feel that tapioca leaves are not useful as a fertilizer, and are not even good for livestock. It is possible that traveling fertilizer salesmen have helped to foster this belief. It is also equally possible that tapioca leaves are less useful than some anticipate.

Future Research, Development Implications

The nature of my research changed from primarily examining infrastructural development, to focusing on the ways that diet, agricultural priority change and infrastructure interact. There are several recommendations that could come out of this kind of research, and there are several possible future research/development projects that seem to be relevant to the area. The following is a brief accounting of these recommendations and future possibilities.

1. In the Kolli Hills, there is currently an ongoing project operated by an NGO that is attempting to reintroduce millets to household farms. Some people in Nariyankadu, Sundakadu and Mel Poosanikullipatti have received seeds from this project, and have attempted to grow millets. However, these attempts are considered by householders to be failures. Generally, the crop dies due to lack of rain. If there is some yield, it may not be considered worth the effort. As discussed above, millets can represent a considerable amount of field and processing work. Thus, there are two major recommendations that might be useful for this project. First, providing seeds alone will have little use if people do not have irrigation. Indeed, the massive rainfalls during the October-December rainy season, and the smaller, but regular seasonal rainfalls could be more efficiently used if there were better irrigation ponds and infrastructure. Old, inefficient and broken check dams need to be updated hand-in-hand with seed distribution. New wells with pumped irrigation systems could be installed. Small rainwater storage tanks could be constructed throughout the field network. Second, providing communities with a communal millet grinder would make women's work considerably easier. The onerous task of handpounding millets would be eliminated with the installation of such a grinder in each village. The current rice grinders available in Sundakadu and Nariyankadu will not work with millets. Making processing easier would likely increase the willingness of women to grow and prepare millets. This is particularly the case given the perception of millet as a high status and high quality food among many villagers.

2. In terms of long-term ecological health, it will be necessary to reforest parts of the area. However, reforestation needs to go hand-in-hand with economic incentives if it is going to be successful. Such a project is likely going to be better received by villagers if the trees planted are useful in their daily lives. The trend towards reforestation with silver oak and eucalyptus in the more central part of the Kolli Hills is less useful than providing jackfruit, mango, orange and guava seedlings. These trees will reforest the area while continuing to provide sources of income for people. Indeed, Kumaran et al (1998) note that these are the traditional cash crops of the Kolli Hills. However, the trees alone will have little economic effect without better infrastructure to get these crops to market. Although there is a weekly market in Solakkadu, in the central part of the Kolli Hills, this is not easily accessible to Chittor Nadu residents. It is possible that should the road to Mullukurichi be built, a local fruit market could be implemented. The potential success of such a fruit-tree reforesting project is suggested by the fact that some villagers in Averikadu have started planting fruit trees on a denuded hillside. This is a project of their own initiative.

3. The lack of short- or long-term studies on soil loss, soil fertility, rainfall patterns and other possible consequences of monocropping and deforestation points to a need for a multi-disciplinary, participatory research project in the area. Nutrition and health status need to be quantitatively assessed over a long time and across a large geographical area. This would require agricultural, hydrological, medical, anthropological, and other experts, along with a team of NGO workers, villagers and research assistants. It would need to be highly directed and organized by villagers and locals. Such a project has exciting possibilities, both for local people and for a wider Indian and global audience. I have already begun raising the possibilities of such a project with some villagers, academics and NGO workers.

Final Outputs

As with any initial, doctoral research project, part of the final outputs include plans for projects that would address broader problems, or problems that it is not possible for one graduate student to examine alone. These are detailed above. In terms of more concrete plans for this research, I intend to:

1. Provide a report for two NGOs that will hopefully assist these organizations with their own ongoing project. One of these NGOs is a catholic, non-missionary group run by nuns. The other is a secular, research-based NGO with practical agricultural and nutritional projects ongoing. I hope that my analysis of perceptions of millets and tapioca will be particularly useful in these projects.
2. Provide similar reports to research participants who are able to read English. Dissemination among research participants is somewhat of a logistical problem, given that the literacy rate is so low, and the English literacy rate even lower. I plan to get the report translated to Tamil, although finding someone to do this may be difficult.
3. Provide reports to my academic liaisons at Madras University. This is a step towards the planning of the larger research project mentioned above.
4. Write academic papers for anthropological and non-anthropological audiences. Hopefully this will contribute to the theory and practice of research that examines the intersections of agricultural, nutritional and environmental changes and priorities.

Acknowledgements

I am very grateful to IDRC for giving me the opportunity to pursue this research. The experience has provided me with the confidence to continue to conduct research and development projects; it also enabled me to form close relationships with people in the Kolli Hills and Tamil Nadu.

Several people have been instrumental in this research. They include my supervisor, Dr. Tina Moffat; geographer and professor Dr. T. Vasantha Kumaran; research assistants Ms. N. Annammadevi, Ms. A. Chitra, Ms. Vimala Matthew, Ms. Gracy Sevariammal, Mr. K. Vikram, Mr. Suresh, and Ms. A. Kavitha; Sister Francina; and Mr. K. Annamalai, who first introduced me to his community. I would also like to thank the people who welcomed me into their communities.

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Appendix I: Questionnaire 2003-2004¹⁵

Name:
Male/Female:
Age:
Level of Education:
Married?:
Number of children:
Number in household:

1. Income and Land Use

How does your household get money?

How much money do you get in a month? In a year?

Who keeps control of the money and how it is spent?

How many members earn a cash income?

Do you farm cash crops? Do you farm primarily crops used in your household?

How much land does your household farm?

Do you use land for other reasons than farming?

Do you raise any animals? What kinds? What do you use them for?

How much land do you own?

2. Food Sources and Household Use

From where does your household get food?

Do you access forest foods?

How much of your food resources are from your own fields? How often do you receive food gifts from relatives or friends? How often do you give food gifts, or otherwise share food?

¹⁵ Some questions were modified in the field to suit different circumstances. Some questions were eliminated in the field.

How often do you purchase foods? For what reasons do you make these purchases?
What foods are available for purchase?

What are the most common foods consumed in your household in a week?

How often during the day and week do you eat meat (and what kinds of meat)? Rice?
Dal? Vegetables? Fruits? Fish? Eggs? Leafy green vegetables? Sweets?

Do you think there are some foods which are special? Why? When do you eat
them/prepare them?

What drinks do you consume most often? Are they sweetened?

How do you decide what crops to grow? Why do you pick certain crops?

Are there seasons/months when there are sometimes food shortages?

3. Intakes and Distribution

How many meals do you eat in a day?

How many meals do you prepare in a day?

Are there some foods that you do not eat? Why?

Are there some foods that only women or men eat?

Are there some foods that children eat? Or do not eat?

Are there some foods that members of your household do not eat? Why?

Do you usually have second servings of some foods? Which foods? Why or why not?

Who usually does have second servings?

Do you snack between meals? What do you eat? How often?

Who prepares the meals in your household? How many meals are eaten in a day?

How do you determine serving sizes? Are there differences between serving sizes for
some individuals?

4. Water Resources and Food Questions

What were harvests like before the irrigation dams were built?

What are harvests like now? Would you say you have more food? More kinds of foods?

Are there other factors which affect harvest yields?

What relationships do you think there are between irrigation dams and harvests?

What relationships do you think there are between irrigation dams and hunger or amounts of food available to your household?

What relationships do you think there are between irrigation dams and your health/the health of household members?

What is the most useful kind of land?

What kinds of dams are the most useful? Least useful?

How do you market the foods you grow? Is it easy and economical to get your foods to market? How do you get foods to markets?

Where do you get your water?

5. Gender, Labour and Health Questions

Do women work in the fields? Do men work in the fields? Who spends the most time working in the fields?

What farming tasks do women perform? Men?

Who collects the water for your household use?

Who collects the water for agricultural use?

How many times a day do you need to get water for your house?

How many times a day do you need to get water for your crops/animals?

Who cooks meals?

Who prepares the food for cooking/market?

Are there other jobs that only men do? Are there other jobs that only women do?

What time of year/seasons/months do you work the most? What kind of work is it? Why is it so busy?

What time of year/seasons/months do you work the least? Why?

Who decides when to plant crops?

Are there seasons/months when your family is more likely to become sick? What kind of sickness?

Do children get more sick? Or women? Or men?

What happens when people get sick?

Is there a doctor that you go to?

Do women go to the doctor more often? Or do men? Or children?

Do you have to pay for the doctor?

What kinds of medicines do you use? Where do you get them?

Do you need to pay for medicines?

Do you think your children are healthy? Do you think you are healthy? Why/why not?

Do you feel sick today? Have you been sick within the last week? The last month? The last year? How many times?

What time of year do most people get sick?

Appendix II: Questionnaire 2004

Name:
Male/Female:
Age:
Education level:
Married?:
Number of children:
Number in household:
Amount of land owned:

1. Wage Labour

- 1) Do you remember when people started paying each other for working in their fields? Did people always pay?
- 2) Who decides how much money men and women are paid for each day's work?
- 3) Do people sometimes work without pay in your fields, if you promise to help them for without pay later?

2. Tapioca

- 1) Do you have contracts with traders or mill owners to buy your tapioca? Or do you take the tapioca to market and sell it to whomever is there?
 - a) Do you get some money from traders/mill owners before you grow the tapioca?
- 2) How did you decide to grow tapioca?
- 3) How long does it take for tapioca to grow?
 - a) Do you grow different crops in the same fields as tapioca?
 - b) Do you grow tapioca every year in the same field?
 - c) if tapioca is not grown: Why did you decide not to grow tapioca? Did you used to plant it?
- 4) How much money do you have to spend on chemical fertilizers for tapioca fields? Did you spend this much in the past?
 - a) How is the soil now? How was it in the past? Does it need more fertilizers now?
 - b) Do you need to use pesticides? How much do the pesticides cost?
 - c) Where do you get the chemical fertilizers and/or pesticides?

- 5) Do you think that tapioca is a good crop to grow for a long time? Or is it becoming more difficult to grow?
- 6) Does the price you get for tapioca change over time? What kinds of things do think make the prices change?
- 7) What is good about growing and selling tapioca? What is bad about growing it?
- 8) Is there another crop you would rather grow than tapioca?

3. Land

- 1) How much does land cost here?
- 2) Can you buy land easily?
- 3) Have you ever been able to buy land?

4. Food

- 1) What kinds of rice do you grow? Why do you choose these kinds of rice?
 - a. Where do the rice seeds come from?
 - b. Do you store your seeds?
 - c. Do you need to use chemical fertilizers and pesticides for your rice?
 - d. Do you need to use chemical fertilizers and pesticides for other crops that you grow?
 - e. Do you use organic fertilizers?
- 2) In the past, if families did not have land to grow their own food, where did they get their food?
- 3) If you have food or water difficulties, what do you do?
- 4) When you have money to spend, what do you like to use it for?
 - a. (if list of things is given?) What is the most important of these things? What is the least important? Why do you like these things?
 - b. (if commercial items): When did you decide you wanted these things? When did you learn about these things?
- 5) Do you get good food from your land?
 - a. (if answer is no): How do you feel about that?
- 6) Do you ever sell your hens or goats or pigs? Where do you sell them? What price can you sell them for?

5. Food and Identity

- 1) Are millets important to you? Why?
- 2) Do other people outside the Kolli Hills eat millets? Did they in the past?
 - a. Why do you think people who are outside the Hills do/do not eat the millets?
- 3) Do you think that millets are a 'tribal food'? Why?
- 4) Is rice a tribal food? Why?
- 5) Does eating millets make you different? Why? Is it a good difference?
- 6) Do you prefer to grow your food?
- 7) Is it more healthy to eat rice or millets?
- 8) Do you think that the Kollimalai are more like people in Salem or Namakkal or in the down villages than they were in the past? Why? Do you think this is good?

6. Economics (visual/verbal)

- 1) World Demographic Health Survey Checklist for Households

Durable items:

Radio

TV

Fridge

Bike

Motorbike

Car

Housing:

Piped Water

Well

Flushing Toilet

Pit Toilet

Flooring: Dirt/concrete

And my addition: Tile/thatched roof

Also my additions:

Metal Closet

Rice grinder

Jewels – necklace, earrings, nose ring, bracelets, rings, toe rings

Clothes

DVD/MP3 player

Water pump (electric)

Kerosene stove
Sewing machine
Number of rooms in house

Appendix III: 2004 Follow-up Questions (Developed in field)

1. How were people able to afford the current connection?
2. What were your profits from tapioca this year? What were your profits from tapioca last year?
3. Do you think there are village changes related to the tapioca? If yes, what kinds of changes do you see?
4. People have money now. Do you think this helps with things like the road struggle?
5. Are you using more chemical fertilizers in your fields than in the past? If yes, how much more?

Appendix IV: 24-hour Dietary Recalls

Villager	Day One	Day Two	Day Three	Day Four
Woman, 33-years old, 2 acres of land, 3 children	M – rice, sambar without vegetables, black coffee L – rice and the same sambar D – rice and rasam Snacks – 3 biscuits	M – rice, beans sambar, black coffee L – rice and same sambar, 1 guava D – rice and rasam, 3 guava	M – rice and greens, black coffee L – rice and greens, 4 guava D – rice and coconut, black coffee	M – rice and grams sambar, black coffee L – rice and same sambar D – rice and same sambar
Woman, 33, 2 acres of land, 1 child (gets milk from her cow and goats)	M – rice and bean sambar, black coffee L – same rice and sambar D – milk coffee, no food Snacks – salty snack mixture	M – rice, greens, black coffee L – rice and greens D – rice and greens, milk coffee	M – rice and beans sambar L – rice and same sambar D – rice and same sambar, milk coffee	M – rice and sambar without vegetables, black coffee L – rice and same sambar, 2 guava D – rice and same sambar, milk tea
Woman, 45, 3 acres of land, 1 child (adult)	M – dosa, coconut chutney, black coffee L – greens and rice D – rasam and rice Snacks: salty/spicy mixture	M – dosa, coconut chutney, egg, black coffee L – rice, okra sambar, rasam D – dosa, rice, potato and tomato curry, okra sambar Snacks – 1 guava, 1 spicy, fried ring	M – dosa, tomato chutney L – rice, beans, tomato chutney D – vadai, dosa, egg, tomato chutney	M – dosa, tomato chutney, rice, egg L – rice, beans sambar D – rice, beans sambar, dosa Snacks: Laddu (sweet), boiled tapioca piece
Woman, 23, less than one acre of land (leased), 1 child	M – rice, rasam L – greens and rice D – rice, sambar without vegetables, tumbler of milk	M – rice, sambar without vegetables L – didn't eat – no reason given D – rice, greens	M – rice and greens L – didn't eat – too much work D – rice and rasam	M – thenai, sambar without vegetables L – same thenai and sambar D – rice and rasam
Woman, about 35, 2.5 acres of land	M – rice, greens, black coffee L – rice, greens D – rice, rasam	M – rice, brinjal sambar, black coffee L – same rice and sambar D – rice and potato sambar	M – rice and bean sambar, black coffee L – same rice and bean sambar D – same rice and bean sambar	M – rice and sambar without vegetables, black coffee L – same rice and sambar D – rice, rasam, black coffee
Woman, 31 years, 5 acres of land, 2 children	M – rice and greens, black coffee L – rice and rasam D – rice and greens/tomatoes, black coffee	M – rice and rasam, black coffee L – rice and greens, 2 guava D – rice and rasam	M – rice and sambar without vegetables, black coffee L – rice, curry leaf chutney, 2 guava D – rice, rasam, black coffee	M – rice, sambar without vegetables, black coffee L – same rice and sambar D – rice, rasam Snack: 1 guava
Woman, 20, 12 acres, no children	N/A	M – rice, pumpkin sambar, black coffee L – same rice and sambar, 2 guava D – drumstick sambar, rice Snacks – 3 sweet biscuits	M – rice, beans sambar L – rice, curd, cake, 2 guava D – rice, greens	M – rice, potato sambar, black coffee L – rice, same sambar D – dosa, tomato chutney Snack – 1 orange
Woman, 35-years old, no land, 2 children	M – rice and sambar without vegetables, black coffee L – rice and same sambar	M – rice and rasam L – rice and rasam, 2 guava D – rice and greens,	M – rice, sambar without vegetables, black coffee L – rice and same	M – rice and curd (yoghurt), black coffee L – Rice and curd

	D – rice and rasam, black coffee	black coffee	sambar D – rice and rasam	D – rice and sambar without vegetables, black coffee
Woman, 23, 2.5 acres of land, unmarried (buys their milk)	M – rice, tomato chutney, milk coffee L – rice, same chutney D – rice, rasam, 1 tumbler of milk	M – rice, bean sambar, rasam, milk coffee L – rice, same sambar and rasam D – kanji, 1 tumbler of milk	M – rice, bean rasam, milk coffee L – same rice, rasam, 5 guava D – rice, beans, 1 tumbler of milk	M – rice, bean rasam, coconut chutney, black coffee L – same rice, beans, chutney D – rice, rasam, 1 tumbler of milk
Woman, 31-years old, 4 acres of land, 2 children, shopkeeper, husband has outside job, they buy their milk	M – idli and coconut chutney, milk coffee L – rice and sambar without vegetables D – idly and the same sambar with green grams added, 1 tumbler of milk Snacks: 4 sweet biscuits	M – rice and okra sambar, milk coffee L – rice and same sambar, curd D – semia oopuma ¹⁶ and 1 tumbler of milk Snacks: Salty fried chip mixture	M – rice and sambar without vegetables, milk coffee L – rice and onion chutney D – rice and rasam, one tumbler of milk Snacks: 4 salty biscuits	M – idli, coconut chutney, black coffee L – rice and sambar without vegetables D – tamarind rice Snacks: 4 salty biscuits
Woman, 40 years, 1.5 acres of land, 2 children	M – rice, sambar without vegetables, black coffee L – same rice and sambar D – rava oopuma ¹⁷ , black coffee	M – rice, sambar without vegetables, black coffee L – idli, potato sambar D – dosa, potato sambar, black coffee	M – idli, potato sambar, coconut chutney, black coffee L – rice, sambar without vegetables D – rice, sambar without vegetables, black coffee	M – rice, rasam, sambar without vegetables, black coffee L – rice, sambar, rasam D – rice, bean and vegetable sambar
Woman, 50 years, 2 acres of land, 4 children (all married)	M – rice, sambar without vegetables, black coffee L – rice, same sambar D – rice, rasam, black coffee	M – rice, sambar without vegetables, black coffee L – rice, same sambar D – rice, rasam, black coffee	M – rice, sambar without vegetables, black coffee L – rice, same sambar D – rice, okra sambar black coffee	M – rice, sambar without vegetables, black coffee L – rice, same sambar D – rice, rasam, black coffee
Woman, 30 years, 4 acres of land, 3 children	M – rice, greens, black coffee L – rice, greens D – rice, greens	M – rice, sambar without vegetables L – same rice, sambar D – rice, rasam	M – greens, rice, black coffee L – greens, rice D – greens, rice	M – black coffee, thenai, rasam L – thenai, rasam D – thenai, rasam, black coffee Snacks – 3 guava
Woman, 40-years old, 3 acres of land, 5 children	M – rice and rasam, black coffee L – same rice and rasam D – rice water (Kanji)	M – rice and green bean sambar and rasam, black coffee L – same rice, sambar and rasam D – Kanji, black coffee	M – rice, rasam, black coffee L – rice, rasam, 1 guava D – Kanji, black coffee	M – tamarind rice, black coffee L – same tamarind rice D – same tamarind rice, black coffee M – rice, sambar without vegetables, black coffee L – rice, same sambar D – rice, rasam, black coffee
Woman, 35 years (?), 2	M (outside home) – idli, coconut chutney, sambar,	M – rice, bean sambar, black coffee	M – rice, sambar without vegetables,	M – greens, rice, black coffee

¹⁶ Semia oopuma is a rice noodle, tomato, garlic, onion, chili and curry leaf dish. It is mostly noodles with few vegetables.

¹⁷ Rava oopuma is the same as semia oopuma, but made with wheat grains instead of rice noodles.

acres of land, 2 children (both married)	milk tea (at home) L – milk tea, rice, sambar without vegetables D – rasam with grams, rice Snacks: salty/spicy mixture	L – same rice, sambar D – rice, greens Snacks – salty/spicy mixture	black coffee L – same rice, sambar D – rice, rasam, egg	L – bean and vegetable sambar, rice D – rice, greens
Woman, 21 years, 1 acre of land, no children	M – rice, sambar without vegetables, black coffee L – rice and same sambar D – rice and same sambar	M – rice, sambar without vegetables, black coffee L – nothing – not hungry D – rice, greens, kanji with dal and sugar	M – rice, greens, black coffee L – rice, same greens D – fried rice with carrots and potatoes	M (outside the home) – rice, onion chutney, tumbler of milk L (outside the home) – rice, curd D – rice, rasam, tumbler of milk
Woman, 36 years, no land, no children (divorced)	M – rice, greens, rasam L – rice, rasam D – rice, sambar with grams, rasam	M – tomato sambar, rice, black coffee L – pumpkin sambar, rice D – greens, rice	M – rice, bean sambar, black coffee L – rice, bean sambar, 1 orange D – rice, pumpkin sambar, semia oopuma (tiny bit), 1 piece of jackfruit	M – rice, rasam, black coffee L – rice, rasam D – rice, greens
Woman, 18 years, 12 acres, 2 children	M – rice, pumpkin sambar, black coffee L – rice, pumpkin sambar D – rice, greens	M – rice, greens, black coffee L – rice, brinjal sambar D – rice, pumpkin sambar	M – rice, grams sambar, black coffee L – rice and same sambar D – rice, rasam	M – rice, tomato chutney, black coffee L – rice, same chutney D – dosa, potato sambar
Woman, 30s, 3 acres of land, 2 children	(day outside of village) M – rice, rasam, milk coffee, vegetable sambar L – rice, same sambar D – rice, sambar with beans	M – semia oopuma, black coffee L – rice, beans sambar, 2 guava D – rice, rasam	M – rice, bean and vegetable sambar, black coffee L – same sambar and rice D – rice, greens Snacks – salty/spicy mixture	M – rice, pumpkin sambar, black coffee L – rice, same sambar D – rice, greens, black coffee
Man, 25 years, 2 acres of land, no children (married)	M – idli, coconut chutney L – rice, sambar without vegetables, rasam D – dosa, potato sambar, coconut chutney Snacks – salty/spicy mixture	M (outside village) – parrotta, potatoes L (outside village) – drumstick and brinjal sambar, rice, vegetable side dish D – tamarind rice Snacks – salty/spicy mixture	M – rice and sambar without vegetables L – same rice and sambar D – rice, rasam	N/A – left to journey to temple for religious function Wife's intakes: M – rice, grams sambar, black coffee L – same rice and grams sambar D – rice, rasam
Man, 57-years old, 2 acres of land, 3 children (all married)	M – rice and sambar with grams, black coffee L – rice and rasam D – rice and sambar with grams	M – rice and greens L – rice and greens D – rice and rasam	M – rice and rasam L – rice and rasam D – rice and rasam	M – rice and rasam, black coffee L – rice and rasam D – rice and grams sambar

Notes: M = morning, L = lunch, D = dinner; rasam is an onion, garlic and chili broth; idli are made from a dough of rice and Bengal grams; sambar is a lentil and onion curry. Vegetables can be added to it.

Appendix V: CASCA Paper, May, 2004

Title: “We feel like we are dry husks”: Food Security, Cash Crops and the Environment in the Kolli Hills, India/ Water Resource Management/Development and Food Security in the Kolli Hills, India: A Gendered Approach.

Elizabeth Finnis

Canadian Anthropology Society (CASCA) Annual Meeting
Richard Salisbury Award Talk
May, 2004

[slide] My talk is based on five months of preliminary fieldwork with four tribal Malaiyali villages in the Kolli Hills, South India. This paper and the title differs somewhat from my abstract for the conference, since in the process of doing research, different questions and issues emerged.

[slide] Thus, my research continues to centre on food security and dietary diversity, but water resource management is one small aspect in a number of issues affecting food in the area. Food security and dietary diversity are related to decisions to enter the cash economy via the large-scale production of cash crops, with consequent food delocalization (Pelto & Pelto 2000); and they are shaping and being shaped by environmental changes in the Kolli Hills. The shift from subsistence to market agriculture is eliciting contradictory responses, as changes in traditional foods are lamented (Weismantel 2000), even as a cash income is desired and welcomed. Moreover, the environmental changes that villagers associate with cash cropping are an increasing cause of concern. So basically my research is about local experiences within a context of global processes of food delocalization, market integration and environmental change.

[slide - picture] Household food security and changes in the cultural and physical environments are closely related, particularly in farming communities. So for example, decisions about what to plant are related to observations on climate and rainfall. Things like deforestation are associated with decisions about crop priorities. Crop priorities, at least in these villages, are linked to active decisions to become more involved in a cash economy. And household food security and dietary diversity are linked with processes that encourage the delocalization of food production and distribution.

Changes in indigenous people's agricultural and resource use practices are often framed in terms of responding to overt force by outside structures (Henrich 1998). However, as Henrich (1998) points out, as valid as such a framework is in some contexts, we must also consider how indigenous peoples actively alter their agricultural practices to reflect changing household and community priorities and circumstances. In this case it appears that people are becoming integrated in a cash economy largely of their own volition.

[slide] First I'll talk a give a little background of the area, followed by a discussion of dietary diversity, food security and cash cropping, and then moving on to discuss some of the environmental changes that villagers are experiencing.

Research Background

[slide] The Kolli Hills are inhabited primarily by the Malaiyali tribal peoples, and are between 1100 and 1400 metres in height. Covering 283 km², the Hills support a population of around 37 000. Politically, the area is divided into 14 revenue districts, or Nadus.

The Malaiyali as a cultural group are scattered throughout hill ranges in Tamil Nadu (Parimurugan 2001), and the Malaiyali living in the Kolli Hills refer to themselves as the Kollimalai. As a group, the Kollimalai are primarily farmers growing a variety of subsistence and cash crops.

I worked in four villages – three are located in one of the most isolated and least populated Nadus of the Hills, the fourth is centrally located, close to a hospital, bank, markets, and secondary schools. Due to time limits, I'm only going to talk about the three more isolated villages. These villages are within walking distance of each other, and most households in one village will have relations in the other two. I'm going to refer to this Nadu with a pseudonym, Thakkalipatti Nadu.

[slide] Thakkalipatti Nadu is a peripheral area where buses are infrequent, phone lines are non-existent, and electricity arrived in the year 2000. The Nadu has a population of approximately 1750 people.

The three villages I worked with are more properly classified as hamlets with less than 200 people. Crops in the area include some fruits and vegetables, some coffee and some rice, but the primary crop is the cash crop tapioca. Although most households grow cash crops, income is generally supplemented with a variety of activities including seasonal wage labour, house construction, tailoring, bike and other machine repairs, and government jobs.

Methodology

[slide] In terms of methodology, my research assistants and I gathered data through semi-structured interviews, focus groups and participant observation. In total we conducted 35 interviews with 64 people between the ages of 18 and 85, primarily women. We held one focus group in each community to discuss household food diversity and labour issues. These focus groups were with women only.

I have focused on women's perceptions and experiences for a number of reasons. First, women are responsible for preparing foodstuffs. Women generally have household gardens, and while it is generally men who go to market to purchase food, women and

men together decide what is needed. Women are also responsible for gathering water and wood fuel, and thus have direct experiences with changes in the quality and availability of these resources. This is not to say that men aren't experiencing environmental changes. However, I wanted to gain an understanding of women's coping and household food methods when they are faced with changes in food and resource flows.

Food

[slide] Traditionally, villagers in the Kolli Hills state they have grown and consumed a variety of millets and vegetables, as well as some paddy rice. The staple foods were the millets *samai*, *thenai*, *ragi* and *varagu*, with each meal consisting of a different kind of millet. This is unlike the situation now, where rice or rice-based products are usually eaten two to three times a day. Before I go into how people think about these changes in their staple foods, I have some detail on food diversity in the area.

During focus groups, women listed between 21 and 46 different kinds of foods consumed. Most of these foods were varieties of vegetables and fruits. Vegetables were generally medium-ranked in focus groups, suggesting that while people eat them regularly, the type of vegetable depends on seasonal availability.

High ranked foods, those identified as regularly eaten included:

- rice
- rasam – a thin onion, garlic and chili broth

Low ranked foods included milk, meat, eggs and millets.

Most households own some wetlands and some drylands. Wetlands are reserved for growing paddy rice, but drylands have traditionally supported the local millets, pulses, vegetables, coffee and fruit trees. However, with the introduction of large-scale cash cropping of tapioca, most drylands have been converted to tapioca fields. Clearing of the land is to increase tapioca production, rather than to offer space for subsistence crops.

[slide – quote] Sticks are cash crops, that's why people grow them, not only no rain. The people want jewels, the cash...we can't sell and make money from *samai* and *thenai*. We can only eat it. [29-year old woman]

The themes of this quote were repeated in many interviews. This statement is indicative of changes in agricultural and food attitudes associated with the introduction of tapioca. Although other cash crops, mostly peanuts, coffee and fruit, were cultivated in the past, these were grown at much smaller scales. Tapioca became viable when paved roads to markets began to allow for truck transportation. This became possible about 20 years ago. Until then, most foods were grown in household fields, and many women stated they didn't want money in the past.

[slide] With the introduction of tapioca, household food flows have changed in two main ways: First, food has become increasingly purchased, and delocalized, and second, staple foods are less diverse.

The purchasing of foods is related to a number of factors. With the transition of fields from subsistence staples to tapioca, there is less space for household gardens. This is not to say that crops are no longer grown for household use. Onions, tomatoes, corn, curry leaves, brinjal, okra and beans continue to be planted in the area, in some cases intercropped with tapioca. Bananas, oranges, guava, papaya, jackfruit and coconuts are grown by some households, both for consumption and sale. Even millets are grown in some fields. However, the scale of these crops is limited, especially millets. Households are reliant on purchasing staple foods, which means rice.

[slide] The loss of millets is important for a number of reasons. Millets are more nutritious than rice, containing more calcium, iron and protein. Additionally, women tend to complain about having monotonous, rice-based diets, lamenting the loss of millets. It is not that rice is new to the area, but in the past, each meal would consist of a different kind of grain accompanied by vegetable or bean/lentil curries. Now, curries and rasam are the accompaniment to rice, with some people feeling that curries don't taste as good with rice. A typical comment, made by one older woman, was, " I don't like rice, but there is no other choice, so I am eating it. Here, nobody sells *samai*, *thenai*. We would like to buy them."

Rice offers an example of both delocalization and decreased staple diversity. As drylands used for millets were converted to tapioca lands, paddy rice became the staple grain. However, rice crops are increasingly failing, especially over the last few years, due to changes in rainfall patterns and a lack of irrigation. Rice may be planted during the rainy season, with farmers hoping that the rain will continue throughout the growing period. When the rains and crops fail, households must use tapioca profits to purchase rice at markets or at ration shops. The ration shops are government-run and the rice is provided from central locations, so villagers do not know where in India it was produced.

Moreover, eating rice up to three times a day is considered to be unhealthy, especially if it is purchased rice. People consider rice they cultivate and mill themselves to be healthier because they know exactly what happens to it. Purchased rice is thought to be dirty, poorly milled and contaminated by pesticides and chemical fertilizers. Not only do women link a number of ailments with a rice-based diet, they resent having to purchase it, even at subsidized prices. Buying rice is often described as "having food poverty". In contrast, one man stated, "In the past we grew millets and felt wealthy because of it." So, complaints about eating rice are not just related to health concerns and food monotony, but are ultimately linked with control over systems of food distribution.

Cash Crops and a Cash Income

So, I've suggested there has been a shift in cultural priorities over the years. Whereas older women spoke of food as being pride and priority in the past, cash is now classified as the priority, as indicated by this quote [slide].

In recent years we are eating rice only. Recently the people want more money. In the past years, when we were getting married, we brought clothes only. But now the ladies, they are asking for gold bangles, chains, and jewels. So the people like only money. So they need money. That's why they're cultivating now the tapioca. [60-year old woman]

Money is necessary to purchase a number of commodity items. People are not content to only have enough money for clothing and household goods. Land, jewels, English medium education for children, electronic items such as radios, televisions, motorcycles and motorized water pumps are all important commodities.

Land and jewels in particular are status-indicating items, but they also play important roles in providing security. Land represents the security and wealth of the next generation. Jewels for wives and daughters provide wealth and security for women and families, and can be sold in times of drought or when large amounts of cash are immediately needed.

In contrast, eating diverse foods is not necessarily an indicator of status, and in any case, it is often difficult to find millets available for sale. Food is also a short-term benefit, rather than a measure of security for an uncertain future.

[slide] Part of this uncertainty is related to observations about environmental changes. Although some people state that "God only knows" why rainfall patterns are changing, and why there is less water, other women interviewed are beginning to directly link this with deforestation to increase tapioca fields.

Environmental Changes

[slide] Although there is little land-survey data on the Kolli Hills, there are a few indications about how forest cover has changed. Noted for containing some of the last remaining rainforests in Tamil Nadu, the Hills are currently about 44% forestlands, which compares to 84% in the late 1800s. Rajasekaran and Warren (1994) found that of 22 tree species enumerated in the Hills, 15 could be classified as rare or endangered.

This data does not indicate if deforestation is due to relatively recent, rapid actions.

However, women's memories do suggest that deforestation has been relatively recent and rapid. They talk of changes in their lifetimes, changes that have primarily occurred with the introduction of tapioca in the last 15 to 20 years. For example, women of all ages tell stories of forests once being so thick that strangers could not be seen approaching the village. This is no longer the case.

[slide] Changing rainfall patterns is also an important issue, both in terms of the rainy season, and rains throughout the year. There is, again, limited quantitative data on

rainfall patterns or decreases in annual rainfall in the area, other than a mention by Kumaran and colleagues (1998) of changes in monsoon rhythms, but women think about rain patterns in terms of activities and resource availability.

This includes statements that the rainy season is shorter, with fewer heavy rains. For example, I was told that in the past during the rainy season there would be periods of 7-10 days when villagers would not be able to leave their houses due to heavy rainfall. Now this is less common.

Many women expressed concerns about water quantity and quality. Quality changes, such as a different taste and warmer water, were discussed in all three communities, but only in one did women express severe concern about water quantity. This village is now limited to two pots of water per household, per day, compared to the 10-14 pots that households in the other villages gather.

Finally, women equate rainfall patterns with changes in trees and crops. For example, one 70-year old woman talked of fruit trees, stating,

[slide] There is less rainfall, so the jackfruit tree gives less fruit. There was a lot of rain in the past during October and November. But...the rainfall is less during these months.

Final Remarks

In these communities, certain outside influences do not appear to be forcing agricultural changes. Villagers, for example, are not being constrained by large plantation landowners, are not being relocated due to resource development projects, and are not forced to relocate to access basic services. Most research participants are landowners who make their own crop decisions based on their own priorities.

[slide] Kumaran and colleagues (1998:22) found that the introduction of tapioca to the Kolli Hills is related to the agro-industry and middlemen moneylenders, who have "...forced the tribal farmers to grow tapioca instead of fruit and wild trees", in the process encouraging the abandonment of traditional agricultural foods, methods and knowledge.

[slide] While traditional foods are being eclipsed by a move towards a monoculture, and pressure by moneylenders may be an issue in parts of the Hills, according to my data thus far, in Thakkalipatti Nadu, the introduction of tapioca appears to have been largely a decision that households made for themselves. The availability of truck transportation to markets, coupled with guaranteed income, makes tapioca cultivation an attractive option. The initial success of the crop encouraged the clearing of land in order to expand fields.

[slide] Even as villagers are becoming increasingly concerned about the long-term implications of deforestation these problems and losses are balanced by what are considered to be improvements in quality of life. While the past was classified by many

women and men as a time when people did not need much money, and ate well, the present is a time of high cash demands and food monotony. However, cash income and its associated benefits are seen as necessary.

[slide] I am planning a second field visit, and I hope to answer a number of questions that have emerged from my current data. This includes gaining a better understanding of the sustainability of tapioca; and why some families choose not to grow it. I'm also interested in exploring potential issues of identity linked with staple foods, similar to some of Weismantel's (2000) work on dietary delocalization, the introduction of commoditized foods and ethnicity/identity in the Ecuadorian highlands. The replacement of millets with rice has nutritional impacts, however, it is also important to examine the possible tribal identity issues that may be shifting. As there is currently a small-scale project taking place to encourage millet cultivation in part of the Kolli Hills, getting a better sense of the cultural meanings of millets might help with the success of these kinds of projects.

[slide] There are a number of people I need to thank, as I would not have been able to do this work without them. They include, but are not limited to, my research supervisor Dr. Tina Moffat, my two research assistants Ms. N. Annammadevi and Ms. A. Chitra, Mr. K. Annamalai who introduced me to the area, Indian researchers Dr. T. Vasantha Kumaran and Dr. Rani Senthamarai; the villagers of Thakkalipatti Nadu, as well as the support of CASCA, IDRC and SSHRC. Thank you.

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