Uprooting Forests, Planting Trees: Success of Compensatory Afforestation Measures Mitigating the Deforestation for the Sardar Sarovar Dam, India

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Abstract Large dams, found on practically all the major rivers of the world, have been criticized for negative environmental, social and economic consequences. This study assesses the success of a process known as Compensatory Afforestation, a measure to mitigate the deforestation of 13,000 hectares of forest land, caused by inundation of land by the Sardar Sarovar Dam on the Narmada River in western India. Tribal people and peasants living in or near these forests, traditionally use the forests as an important community resource for firewood, medicinal herbs, forest produce, etc. The mitigation process involves tree plantations carried out on 13,000 hectares of land to compensate for the forests lost to flooding. The methodology used for the study included a combination of interviewing villagers, village heads, government and forest officials; visiting plantation sites to cross check interviewees claims; and analyzing government documents. It was found that each region displayed different shortcomings in the planning and implementation of CAF. However, results varied widely between different regions. Some sites had healthy plantations, albeit undesired monoculture plantations of invasive species. Other sites had unhealthy plantations with almost no tree cover and no protection. Still other sites have plantations in a different ecological zone from the submerged forests. Hence, the main conclusion of this study is that valuable forests are being lost to inundation by the dam, but they are not being compensated satisfactorily, as laid out by the government's own mitigation policies described in its environmental management plan.

Introduction

"The current state of knowledge indicates that large dams have many mostly negative impacts on ecosystems…to date, efforts to counter the ecosystem impacts of large dams have had only limited success. This is due to limited efforts to understand the ecosystem and the scope and nature of impacts, the inadequate approach to assessing even anticipated impacts and the only partial success of minimisation, mitigation and compensation measures."

(World Commission on Dams, WCD, 2000)

Over the last three decades, large dams have come under harsh criticism worldwide from environmental scientists, human rights activists, economists and intellectuals. Large dams have gained notoriety for the detrimental environmental and social impacts that they cause, and the huge economic burden of their costs. One of the earliest critiques emerged from Nicholas Hildyard and Edward Goldsmith's famous 1986 book entitled "The Social and Environmental Effects of Large Dams," where they claimed that large dams cause "massive ecological destruction, social misery, and increasing ill-health and impoverishment for those very people who are expected to benefit most."

As more and more evidence is gathered about the negative effects of large dams, the criticism has become harsher. McCully (2001) says that "dams have had massive negative impacts on nature and society, and their benefits have been exaggerated and could often have been produced by other less destructive and more equitable means." While the social and human impacts of these dams have been the usual focus of criticism, it has also come to light that these dams can cause severe environmental and ecological damage. The quote from the World Commission on Dams (WCD) above indicates this reality, and the compensation and mitigation for this damage caused by dams is usually inadequate at best and non-existent at worst. Indeed, it is this ecological compensation for deforestation that is the subject of my study.

India has 3600 large dams, 3300 of which have been built since the country gained its independence in 1947 (Roy, 1999). India is the third largest dam-builder in the world. It has spent a staggering Rupees 87,000 crores (a crore is equivalent to 10 million, this amount converts to $20 billion approx. using current exchange rates) on its irrigation sector which includes large dams, and about 50 million people have been displaced by these dams, most of whom are tribal people (Roy 1999). The enormity of these figures is noteworthy in that they reveal an alarmingly fast rate of recent dam building, and document the massive economic and

societal costs of these enterprises. In addition, to address the severe negative environmental and ecological impacts that these dams cause, all projects in India are now required to conduct an Environmental Impact Assessment (EIA) and prepare an Environmental Management Plan that details how the negative impacts will be mitigated (Morse 1992).

My study is based on the Sardar Sarovar dam and irrigation Projects (SSP) being built on the Narmada River in western India. The SSP was envisioned as early as the 1950s, but the inter-state water-sharing plan, as outlined in the Narmada Water Disputes Tribunal Award, was ready only by 1979 (Sangvai, 2002). The Award stated the water sharing plan, the height of the dam and other engineering features. There was no mention of possible environmental damage, or the need for any mitigation measures. The World Bank sanctioned credits and loans of $450 million for the project in 1985, even before the environmental and forest clearances were obtained for the project. The loan was used to put pressure on the Ministry of Environment and Forests (MoEF) to give these clearances, which they did two years later in 1987. Later, due to sustained and vocal opposition to the dam by affected people who organized themselves as the Narmada Bachao Andolan (NBA, or Movement to Save the Narmada River), and after a scathing World Bank-sponsored Independent Review (also called the Morse Committee Report) labeled the project as "flawed," the World Bank was pressured to pull out of the project in 1993 (Sangvai, 2002; Morse, 1992). Construction of the dam had begun around 1987, and today it stands at 100 meters out of a total of 139 meters. In 1994, the NBA filed a lawsuit in the Supreme Court (SC) against the Indian Government, local governments and dam-builders, claiming that the project should be stopped. The judgment came in 2000, saying that the dam could go ahead, the dam height being raised five meters at a time, as long as rehabilitation and environmental work was proceeding sufficiently along with dam construction. Consequently, the dam is currently at 100 meters, and dam-builders are seeking permission to raise the height further (SC, 2000).

Damming a river inundates a large part of land, which in the case of the SSP is about 37,000 hectares in the three states of Gujarat, Madhya Pradesh (M.P.) and Maharashtra (Morse, 1992). The SSP is located in the state of Gujarat. Land in India is officially divided into forest land that is owned and maintained by the Forest Department; and revenue land/non forest land that is owned either privately or publicly and used for the purposes of agriculture, grazing, industry, building homes and cities, etc. In the case of the SSP, it is slated to submerge over 13,000 hectares of forest land at its full planned height of 139 meters.

Due to concerns about the loss of forests in India during the early 1980s, the Forest Conservation Act of 1980 was created, followed up by the National Forest Policy of 1988. These documents place restrictions on using forest land for non-forest purposes, such as building dams and reservoirs, mining, etc. However, as mentioned earlier, in 1987 the Ministry of Environment and Forests gave a conditional clearance for the diversion of over 13,000 hectares of forest land for the Sardar Sarovar Projects (Govt. of India memorandum, 1987). The approval was conditioned on compensation of the forests, a process known as Compensatory Afforestation (CAF). The process of CAF consists of two parts: afforesting and planting an equivalent hectareage of revenue/ non-forest land and turning it over to the Forest Department, and also re-foresting double the hectarage of degraded forest land. The main objective behind CAF is that the total forest land in the country, which has been diminishing for many years due to projects like dams, mines, deforestation, and other projects, should not decrease any further. Since 1988, the country has been trying to increase its forest cover level to one-third. Yet by 1997 the level was still below a quarter (Centre for Science and Environment, 1997). As is common practice, CAF plantations are undertaken by the Forest Department at the local levels. The funds for all projects must be provided by the dam-builders, thus the SSP's funds for CAF are supplied by the government of the state of Gujarat. The Narmada Water Disputes Tribunal Award set up the Narmada Control Authority (NCA) in 1980 as "machinery for implementation of its directions and decision." (NCA 2004, elect. comm.) The Environmental Sub-Group (ESG) of the NCA was set up to plan and implement all the environmental safeguard measures, and to oversee the compliance of the process, by devising a monitoring and evaluation process. For the SSP, CAF began around 1987, and is claimed by the NCA to currently be almost complete. The NCA is also the body that grants permission to dam-builders to raise the dam height.

The CAF process for the SSP dam has been studied on various levels in the past by Kothari and Ram (1994) and Morse (1992) and others. Brieger and Sauer (2000) conducted one such short study, where they conducted interviews with villagers in 19 villages of Maharashtra and Madhya Pradesh. They asked villagers how the CAF process had affected them. My study aims at expanding on their work, by adding more villages as well as using more criteria to evaluate each plantation.

My central research question is, "Has the process of Compensatory Afforestation for the SSP in India been planned and implemented in such a way that fulfills its compensatory purpose?" I

will address the non-forest land plantations, since those done to re-forest degraded forest areas are extremely hard to measure. The NCA's Environmental Management Plan (2000) details several action plan elements in the planning and implementation of CAF, as can be seen in Figure 1 below.

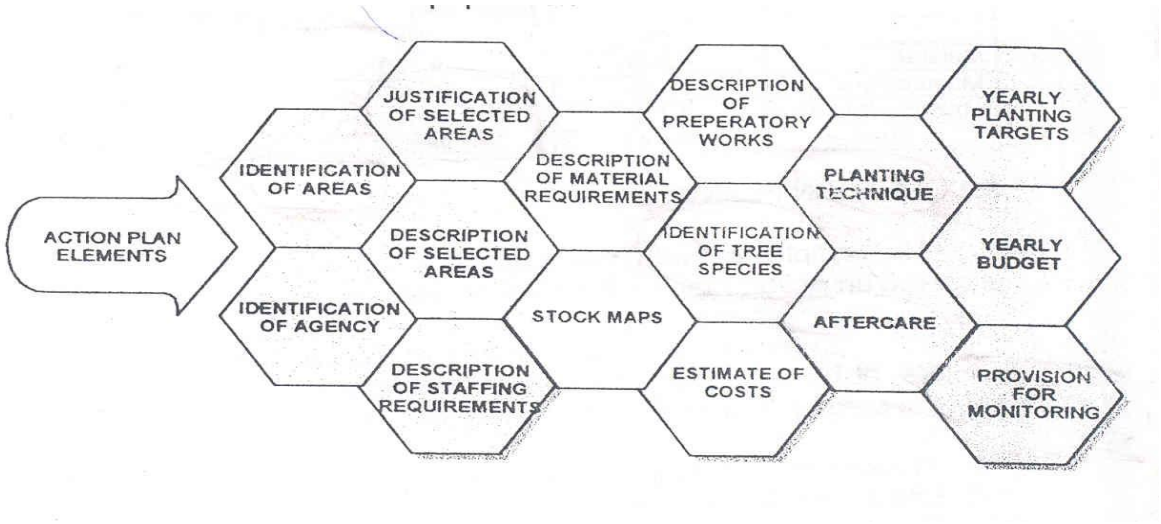


Figure 1: Summary of action plan elements for CAF, as presented by the NCA's Environmental Management Plan (2000)

However, although the Environmental Management Plan lays out the action plan elements clearly, it doesn't detail how all these elements will be implemented. Hence, the official documents of the SSP or of the NCA do not define how exactly the compensatory function would be fulfilled, except to say that these elements will be incorporated. The definition provided by environmentalists Kothari and Ram (1994) says that compensating a forest means to "completely (recover) the loss of these forests, or (save) much of the biological diversity that they contain". To answer my research question, I have developed certain criteria to evaluate each CAF plantation. These criteria are drawn from the action plan elements in the figure above. These criteria include:

1). Where has CAF been geographically undertaken? Are the soil and climate conditions similar to those in the riparian region where forests are being lost?

2). As a tree success indicator, do the CAF plantations have sufficient soil cover and tree height greater than one meter?

3). Are the species planted for CAF at each location indigenous species to the area, or non-native species?

4). Is the CAF plantation clearly a monoculture, or have efforts been made towards creating mixed plantations?

5). What is the land now being used for CAF plantations? How was it used earlier, by whom and is this still the case?

As mentioned above, the NCA provided these criteria through their action plan elements. In this way, I hope to evaluate CAF on its own terms. However, the NCA does not clarify any further information on the action plan elements; hence I devised my own method to evaluate each of the criteria. These analyses will be developed and combined to answer the central question.

Methods

For the Sardar Sarovar Project, which submerges over 13,000 hectares of forest land in the three states of Gujarat, Madhya Pradesh (M.P.) and Maharashtra, CAF is being conducted in all three states. I used a variety of different methods to answer the central research question, and to assess each plantation against the five criteria above. However, these criteria were not given equal magnitude. The first and second criteria, that of the location and health of plantation are the most important factors that I examined.

Document Analysis: My document analysis included studying national government documents including the National Forest Policy of 1988, the Guidelines for Environmental Impact Assessment of River Valley Projects of 1985, and the Environment (Protection) Act of 1986. State/local government documents studied included the Sardar Sarovar Project Environmental Management document of 2000 (published by the NCA) and a Note of Impact of Compensatory Afforestation for Sardar Sarovar Project (published by the Gujarat Forest Department). I scrutinized the minutes and agenda notes of the meetings of the Environment Sub Group (ESG) of the NCA from 1998 to 2003, as well as the ESG's report on its infrequent field visits. I studied detailed lists that documented exact villages and districts where the CAF had been undertaken. I also examined all environment-related documents that were filed in the Supreme Court for the legal battle between the dam builders and those in opposition to it, as well as carefully read the Supreme Court final judgments. Additionally, I studied the Report of the

Independent Review, authorized by the World Bank, and many other documents written about dams since the 1980s.

The document analysis process also helped me to evaluate the first criteria, that of the plantation being in a similar ecological zone, and situated near as the riparian forest. I defined an "acceptable" plantation as being up to 90 to 100 kilometers from the Narmada River, and being situated in a region similar to the original forest ecosystem. Plantations that failed either or both of these conditions were "unacceptable". The documents detailing locations of the villages and districts were able to answer this question.

Interviews with Government, Forest Officials: The Sardar Sarovar is probably the most controversial dam in India today. For this reason, it was hard to interview government officials about it, or to get their views on the environmental mitigation. However, I was lucky to get two key interviews with people responsible for the planning and implementation of CAF. For confidentiality reasons, all the interviewees will remain unnamed.

Village Interviews: From June to August 2003, I traveled to 57 villages located in 9 districts, in the two states of Maharashtra and Madhya Pradesh, where NCA claims that the process of CAF has been undertaken. The districts to examine were chosen randomly and, in each district, the villages were chosen randomly. At each of these villages, I interviewed villagers, and some local village leaders, especially *talathis*, individuals given the task of maintaining land records of the villages. These interviews were informal and open-ended, and lasted approximately 30 minutes. Usually, my appearance in the villages would be a rare sight for villagers, and a large crowd would gather, all of who would usually contribute to answering my questions. Men would usually be the ones eager to answer questions, but wherever possible I would pull some women aside to get their views.

The interviews were largely unstructured. First, I would ask them if they knew of the existence of a forest department plantation in their village. Villagers always knew of the existence of the plantations if they really did take place, since these villages are close-knit units, and everyone has full knowledge of events in the village. For example, everyone in the village was soon to know that I, an outsider had come to the village enquiring about the plantations. If the villagers knew about the plantation, I asked further questions that included the timing of plantation, the people who executed the task, whether or not the villagers' opinions were taken regarding the best species to grow, whether or not there was community involvement in the

process of plantation or of upkeep of the plantation. I also asked the villagers what the land was previously being used for, if it still could be used for that purpose, and if not, then how had they dealt with that change. In case a particular plantation had impeded local villagers from an activity they freely conducted prior to the plantation, it was termed as “unacceptable”. All others were termed “acceptable”. For a complete sample questionnaire, please see Appendix C.

Physical Examination of Plantations in villages: The villagers led me to the plantation so I could physically examine it. The health of the plantation was determined by three factors: how tall the trees were, how many trees there were, and how far apart the trees were. Tree height had to be over approximately one meter, since these are 10-15 year old plantations. Trees also had to be sufficiently in number and sufficiently close so that their canopies were in contact. These were determined by eyeballing. If plantation failed on these criteria, they were termed “unacceptable”. If they succeeded in all three, they were “acceptable”. Tree species were identified as native or non-native by villagers and, in some cases, by a botanist who was traveling with me. Here I define non-native species, as those that do not originate in the regions where the plantations are being carried out. A plantation bearing non-native species to the extent of 50% or more was “unacceptable”. By physical inspection, I also determined tree species, and the mixed or monoculture nature of the plantations. The mixed or monoculture nature of the plantation was evident on inspection. A plantation with a certain species pervading more than half of it was “unacceptable”.

Results

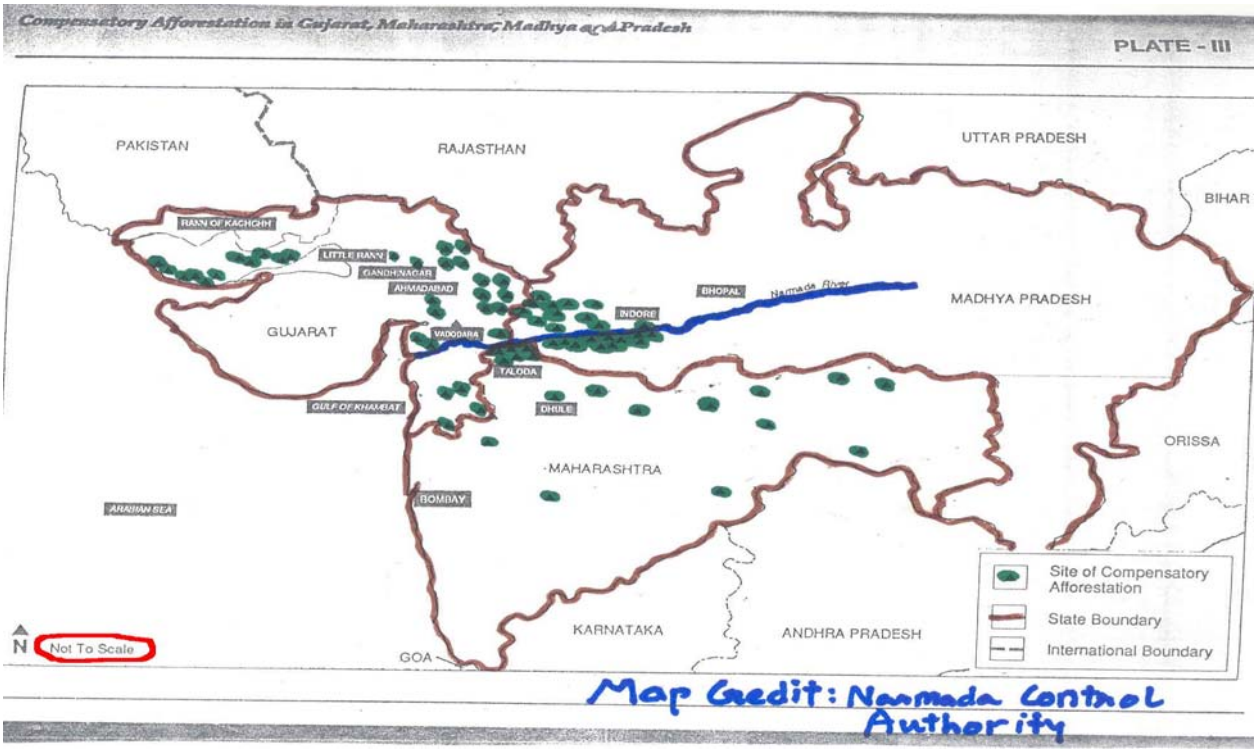
Document Analysis: I used the document analysis to provide me with general information about large dams, as well as specific information about the CAF process for the SSP. A literature review provided me with the context for this project, by providing me with information about the history, benefits and negative impacts of large dams worldwide. The document analysis supplied concrete information about the environmental aspects of the Sardar Sarovar Dam. National and local government documents illustrated how the government had planned and sought to implement CAF, including identification of CAF areas, identification of tree species, provision of monitoring, etc (NCA, 2000). The Report of the Independent Review commissioned by the World Bank, for example, gave specific information about the Sardar Sarovar Dam itself, and also its “history of non-compliance” (Morse, 1992). Moreover, recent government documents

also detailed the completion levels of CAF. A field visit report of the ESG of the NCA from 1999 details the progress levels of clearing of forest land and of CAF. Table 1 below is taken from this document.

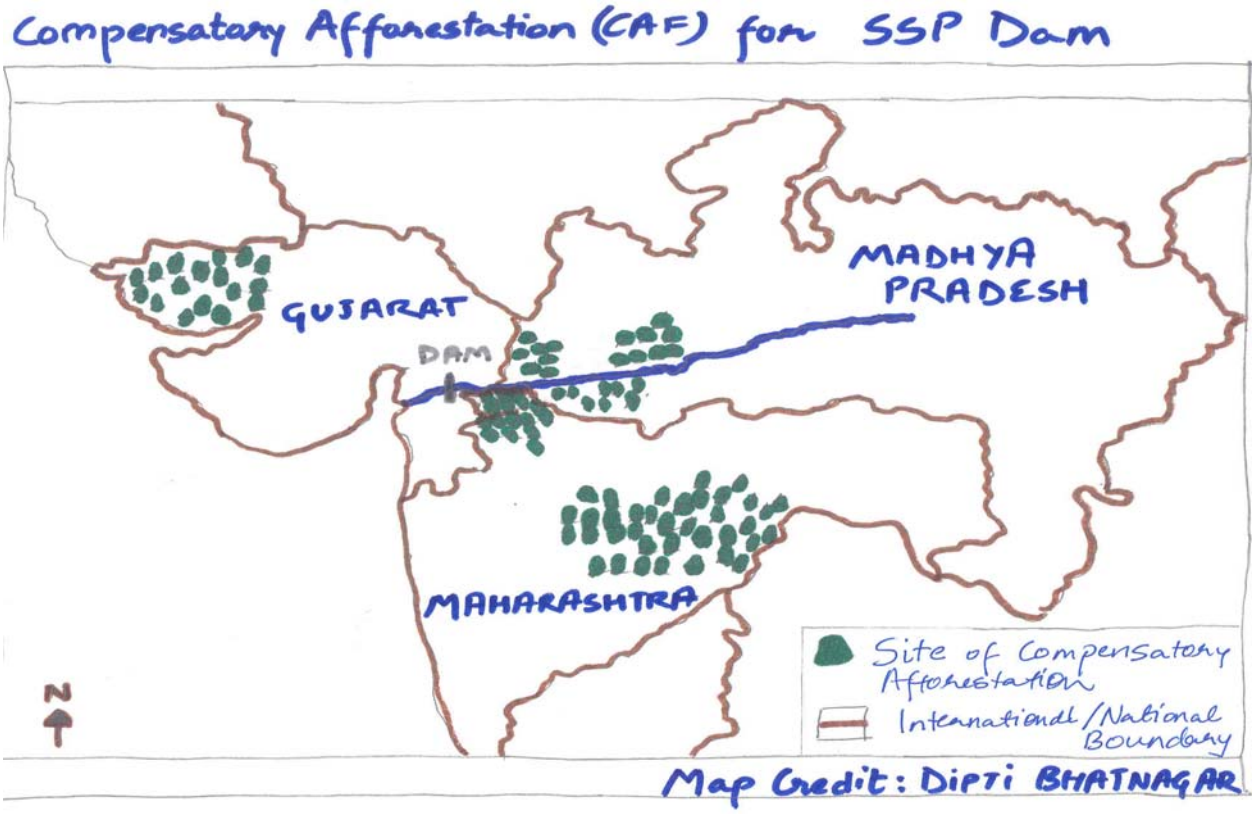
	Present Status	Remarks
Gujarat		Entire forest area (4523 ha) in the submergence is clear felled. Plantation works are also completed.
Final Targets (ha)	13950	
Present Status of Progress (ha)	13950	
Overall Progress (ha) (%)	100%	
Maharashtra		Entire forest area (6488 ha) area in the submergence is clear felled. Plantation works are also almost completed.
Final Targets (ha)	23668	
Present Status of Progress (ha)	22962	
Overall Progress (ha) (%)	97%	
Madhya Pradesh		Forest area (2732 ha) area in the submergence is being felled. Plantation works are also almost completed.
Final Targets (ha)	8740	
Present Status of Progress (ha)	8710	
Overall Progress (ha) (%)	99%	
SSP		
Final Targets (ha)	46358	
Present Status of Progress (ha)	45622	
Overall Progress (ha) (%)	98%	

Table 1: Progress of works for SSP, according to the NCA, 1999

The Environmental Management Plan of the NCA (2000) also includes a map detailing the sites of CAF plantations. It is presented as Map 1 below is claimed by the NCA to be ‘not to scale’. With my document analysis detailing the specific locations of plantations, coupled with village visits, I was able to re-draw the map to scale to show the exact locations of the plantations, and this is presented as map 2 below.



Map 1: Official NCA map detailing locations of CAF plantations. The map is 'not to scale'.



Map 2: My re-drawn map detailing locations of CAF plantations. The map is drawn to scale.

Interviews with Government, Forest Officials: I met with one official of the Environment Sub Group of the NCA in early June 2003. Initially, this person was somewhat suspicious of me, but later he began to openly express his views on the project and on environmental guidelines in general. He said the SSP builders were being very magnanimous in carrying out these mitigation measures, but he admitted that there was no way to adequately compensate a submerged forest by planting another. He also said that environmental regulations were a conspiracy of the West to keep the Third World from building dams and increasing their food production. (Unnamed 1, 2003, pers. comm.) I also met a forest official in Madhya Pradesh who told me that he did not expect more than 20% of plantations to survive. His own predictions said that 20% survival rate for plantations would be considered good. (Unnamed 2, 2003, pers. comm.)

Village Interviews and Physical Observations of Plantations: CAF plantations were carried out in the three states of Maharashtra, Madhya Pradesh (M.P.) and Gujarat, and the plantation area in each state is proportionate to the amount of forest land to be lost. For administrative purposes, each state is further divided into districts.

In Maharashtra, CAF was carried out in two separate regions- North Maharashtra (district Nandurbar) and Marathwada (districts Osmanabad, Latur, Nanded, Beed, Aurangabad, Jalna, and Parbhani). I separate out these two regions because of the geographic distance between them. North Maharashtra is located near the Narmada River, but Marathwada is at least 100 kilometers away.

In M.P., CAF has been carried out in the districts of Jhabua, Badwani and Khargone, which are all situated near each other, and near the Narmada River.

In Gujarat, CAF has been done in a region called Kutch (Kutch district). I visited Kutch in late July, but I was unable to visit villages, interview villagers and observe plantations since I would be at risk if I attempted to do so. This is because the SSP dam is located in the state of Gujarat, and the government has succeeded in spreading propaganda about its benefits and its absolute necessity. Therefore, the people of Kutch are suspicious of anyone trying to check on, and possibly question, any aspect of the SSP. This put me at risk and prevented me from collecting data. However, for Kutch, I observed the land, climate, soil and vegetation patterns, which are very different from the riverine ecology of the Narmada region. Kutch, which borders Pakistan to the north, is mostly desert land, has very harsh and dry summers and cold winters. A large part of Kutch, known as the Rann of Kutch has huge salt deposits on the land and is

completely unusable. Kutch is a region with marginal forests and marginal agriculture. Also, this region is located about 350 kilometers away from the river and the original forests.

Hence, from my village visits, I have physical data, plantation observations, and interviews from people in several villages in two out of three states. Figure 2 displays the villages visited in different regions of the three states.

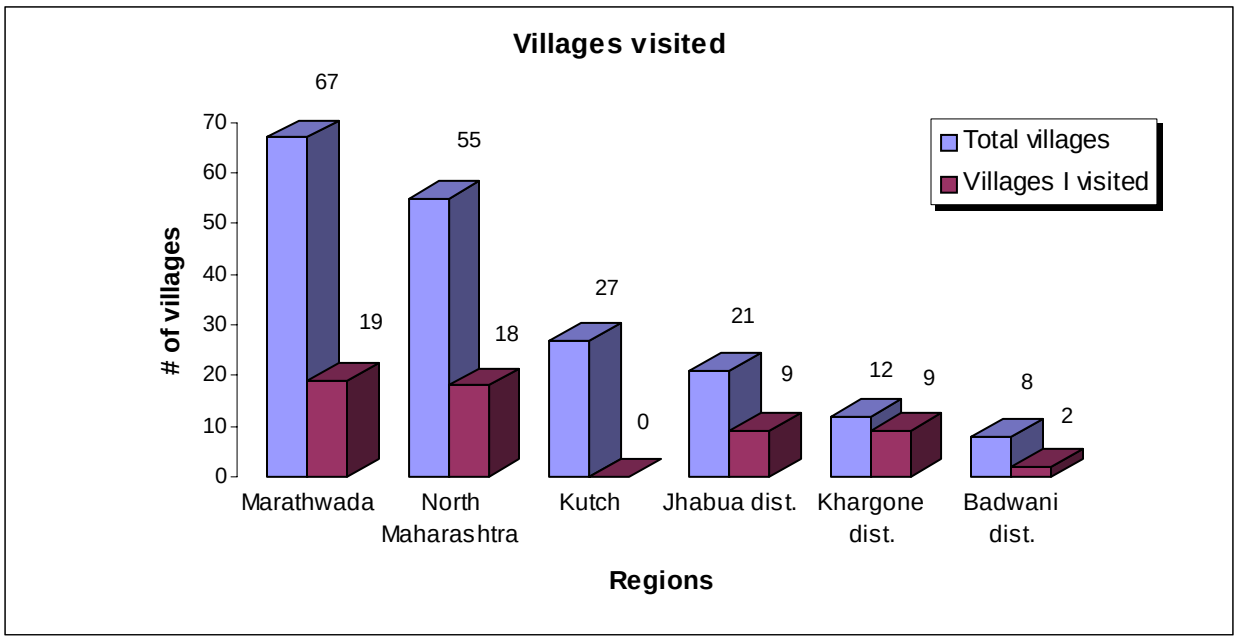


Figure 2: Figure showing total villages of CAF plantations, and villages visited by me

Each village I visited corresponds to one plantation. I visited a total of 57 villages in two states, corresponding to 35% of the villages in these two states of Maharashtra and M.P., and 30% of all CAF villages in all three states.

I judged each plantation on the basis of the five criteria outlined earlier. To reiterate, these include:

1). Where has CAF been geographically undertaken? Are the soil and climate conditions similar to those in the riparian region where forests are being lost?

2). As a tree success indicator, do the CAF plantations have sufficient soil cover and tree height greater than one meter?

3). Are the species planted for CAF at each location indigenous species to the area, or non-native species?

4). Is the CAF plantation clearly a monoculture, or has effort been made towards creating mixed plantations?

5). What is the land now being used for CAF plantations? How was it used earlier, by whom and is this still the case?

The graphical representation of results of the five criteria is shown in the figures below.

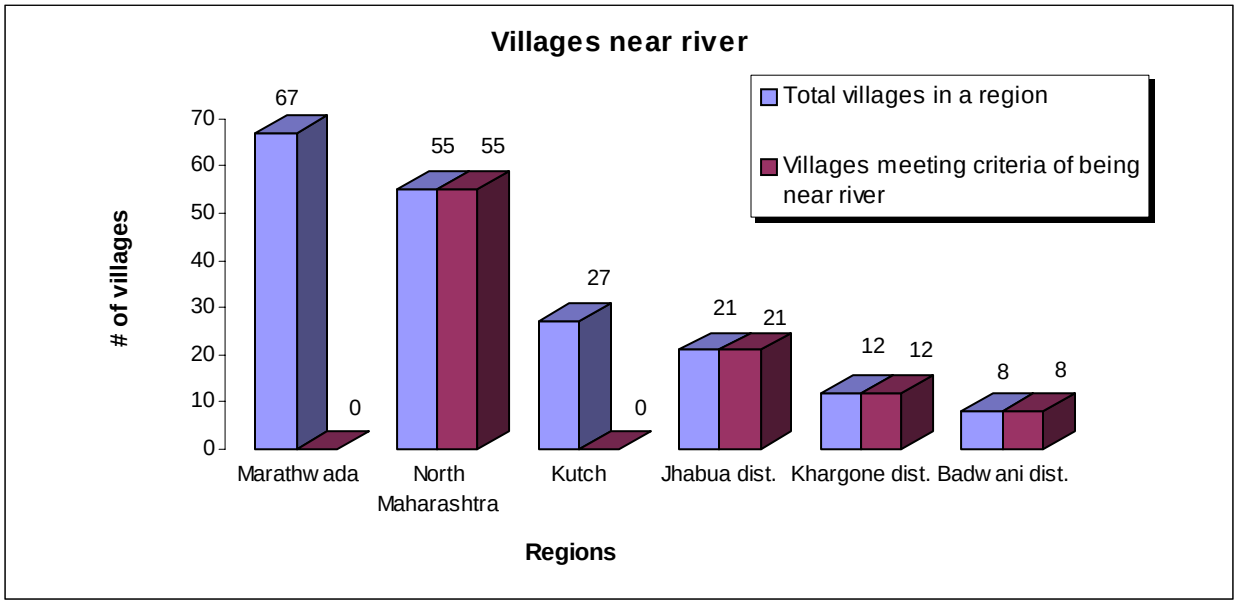


Figure 3: Summary of results for first criteria, how many villages are "acceptable" by being located near river and in same ecological zone

Figure 3 shows that 51% of all plantations are "unacceptable", since they have been completed in a region where the soil and climate are different from the original riverine forests, and these plantations are more than 100 kilometers away from the Narmada River. As explained in the methods above, these plantations do not qualify as having compensated the original forest.

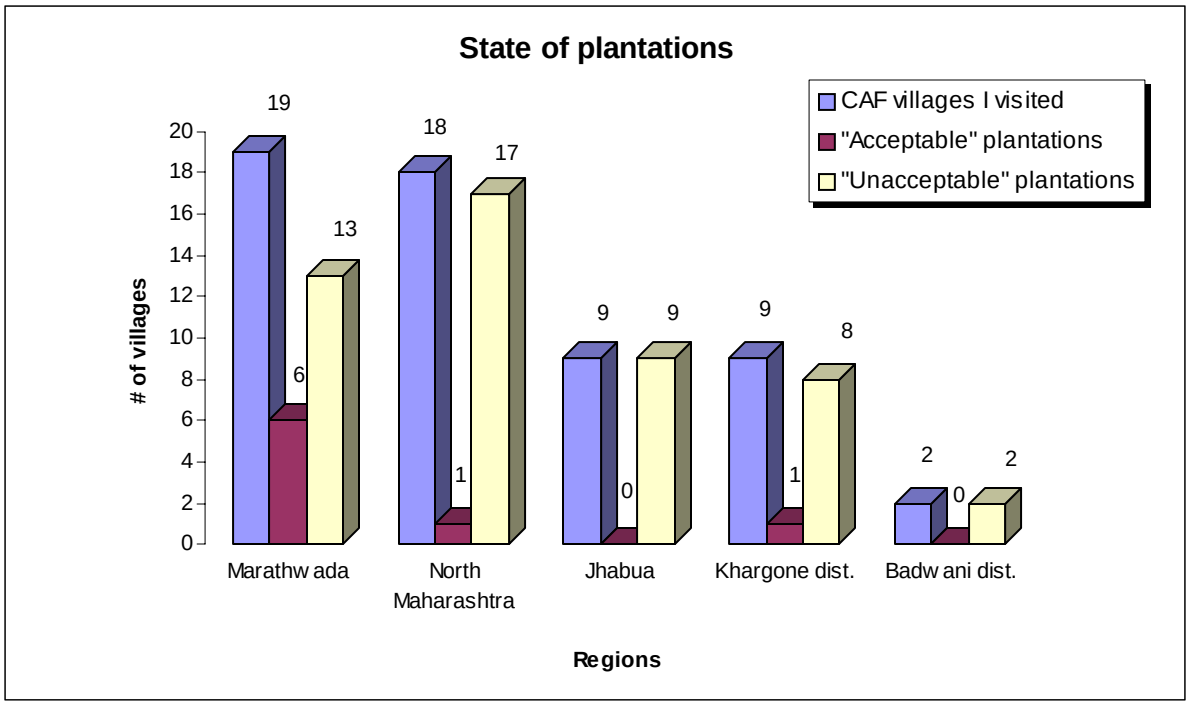


Figure 4: Summary of results for second criteria detailing health of the plantations. Plantations are "acceptable" or "unacceptable".

Figure 4 shows that 86% of plantations are "unacceptable" with regard to health of the plantation. This was evaluated as described in the methods section. This number also includes nine villages of Jhabua, where plantations were non-existent, hence "unacceptable" by my definition.

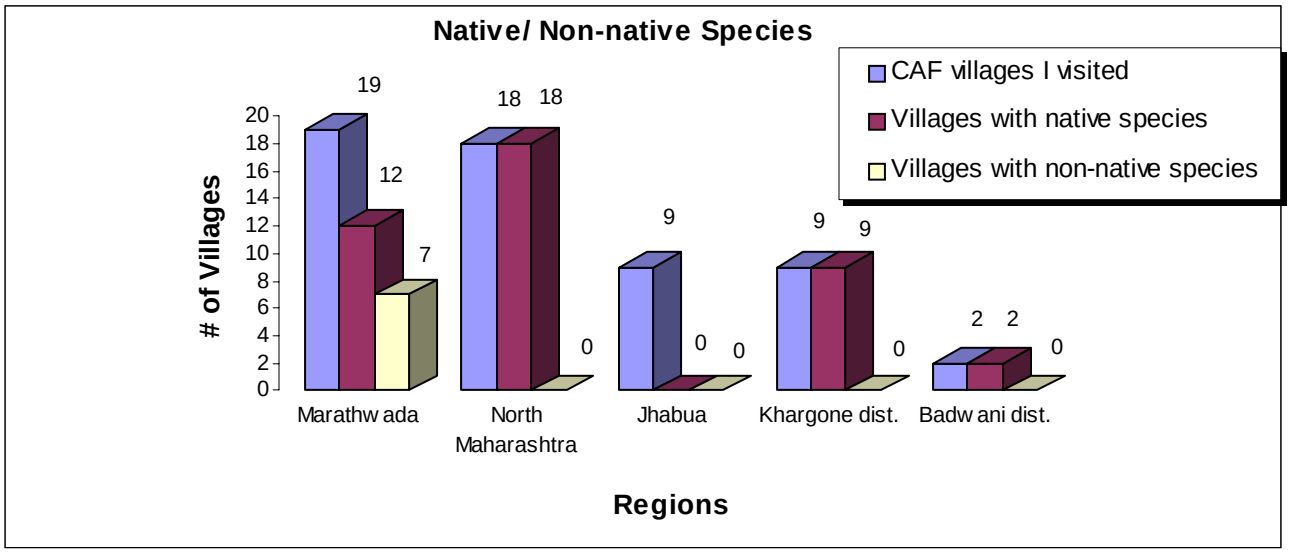


Figure 5: Summary of results for third criteria, villages are "unacceptable" if they have non-native species

Figure 5 shows that 12% of all plantations visited were “unacceptable” since they had non-native species. These plantations were found solely in Marathwada region; with 37% of Marathwada plantations visited possessing non-native species. Hence these were “unacceptable”. The non-native species was primarily Gliricidia, but Eucalyptus and Acacia were also planted. It can also be noted from the figure that Jhabua district registers neither plantations of native nor of non-native species. This is because no plantations were found in Jhabua at all. This shall be further described in the discussion section.

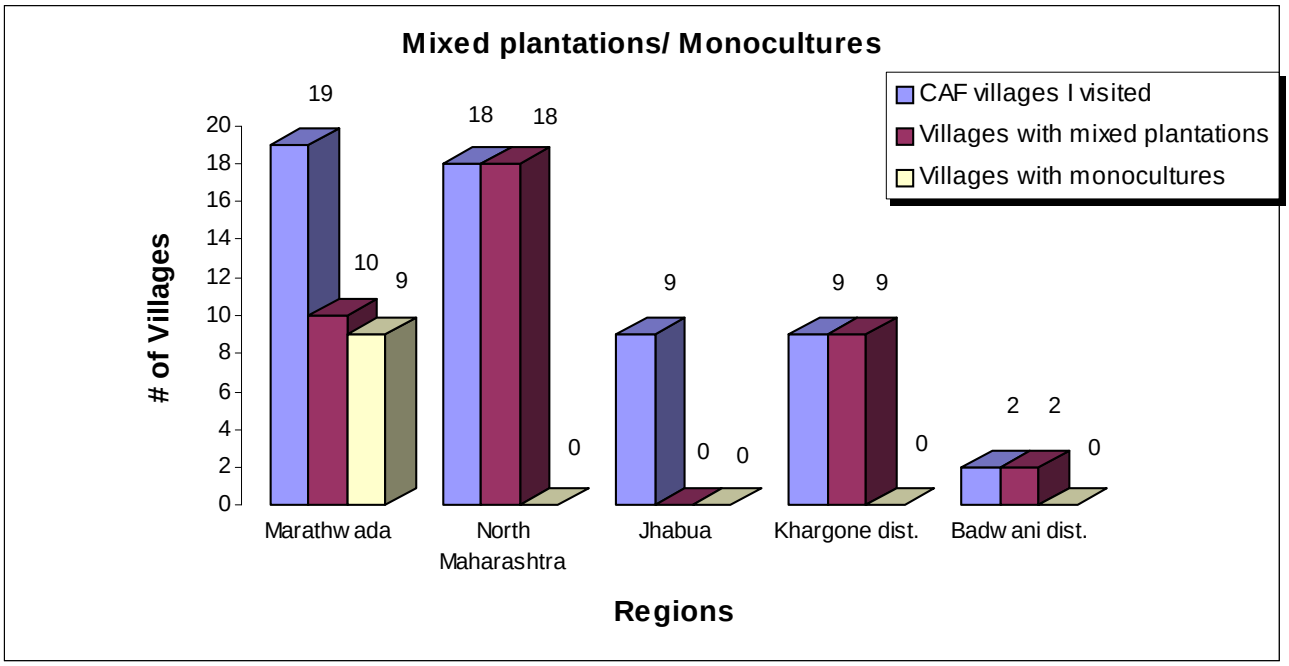


Figure 6: Summary of results for fourth criteria, villages are “unacceptable” if they have monoculture plantations.

Figure 6 shows that 16% of plantations were “unacceptable” as they were monocultures. These also were concentrated in the Marathwada region, where 47% of plantations visited were monocultures. Again, Jhabua district did not register any plantations, since I did not find any there.

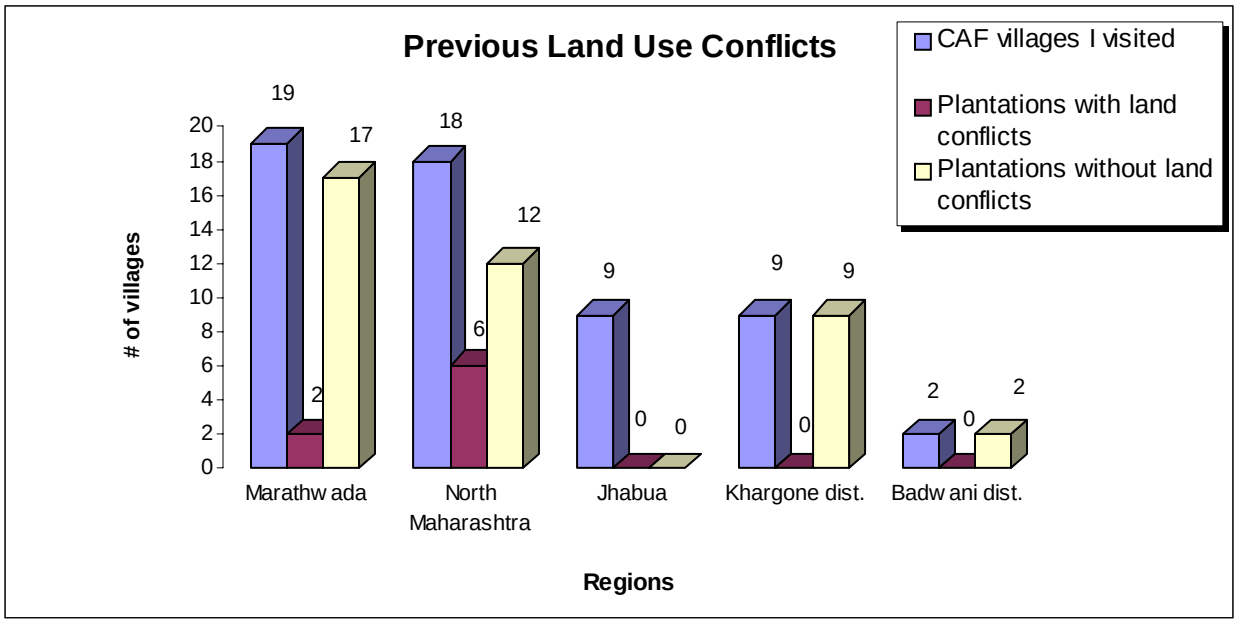


Figure 7: Summary of results for fifth criteria, plantations are "unacceptable" if they have previous land use conflicts

Figure 7 shows that 14% of all plantations visited had previous land use conflicts; hence "unacceptable". In addition, these seem to be concentrated in North Maharashtra, where 33% of plantations had land use conflicts. Again, Jhabua registers no plantations, since none were found in this region.

Discussion

Forests in a country like India mean very different things from forests in countries like the United States (U.S.). In countries like the U.S., forests are appreciated for the things they provide, such as raw materials for building, paper, and recreational experiences, and for their ability to maintain the environment and provide habitat for wildlife (Society of American Foresters, 2004). In India, uses of forests include all of the above. In addition, they meet requirements of fuel, fodder, fruit, non-timber minor forest produce, medicinal herbs and timber to build huts for the millions of people who live in and around these forests (GoI, MoEF, 1988). Consequently, loss of forests in India means not just the loss of timber, recreation or logging materials, but for many people this might result in the loss of life or livelihood. The Morse Committee Report addresses this by saying that there is more to CAF than numerical targets, numbers of seedlings and hectares planted; and the need to address botanical composition and

long-term viability. “The test for implementation is of the afforestation program is whether or not there is adequate compensation for the forest lands being lost by submergence.” (Morse, 1992) They add that, “The history of the environmental aspects of Sardar Sarovar is a history of non-compliance.” (Morse, 1992)

The forests that have been or are to be submerged by the SSP are often referred to, in government documents, as *degraded*, in what seems to be a justification for clear-felling and submerging them. Kothari and Ram (1994) argue that even though these forests can be called degraded, they still “continue to be an important life-support system for the people in the submergence zone, and still contain a diversity of plant and small animal life.” Hence the loss of these forests is very meaningful to the forest inhabitants who use it.

That said, the deforestation of these 13,000 hectares of forest land, and its compensation through the CAF process has been seen by many as environmentally unsustainable and leading to a loss of biodiversity. Brieger and Sauer conducted 19 interviews with villagers in mid-2000 to document the process of CAF as it stood then. They state that, “a plantation, frankly put, is a tree farm, which if it is properly planted and if it survives, will take decades to come close to resembling any kind of forest.” (Brieger and Sauer, 2000) It naturally follows that if the plantations are not carried out satisfactorily, or if they do not survive, then the CAF program fails in its ability to compensate the forests lost to inundation. I examined five criteria to determine the compensatory ability of each plantation that I visited. I found that each criterion seemed to be lacking in the different plantations.

Geographic location of plantations: Much of the Compensatory Afforestation (CAF) was planned and executed to be very far away from the original riparian forest that is being submerged near the Narmada River. The wisdom of this is certainly questionable, since it is supposed to compensate the original forest. Including the 27 villages of Kutch, 51% of the plantations were created in regions where the soil and climate is very different from that which is being submerged in the riparian region. The Morse Committee Report noticed the futility of these far away plantations. Talking about the plantations in Kutch, they said, “By placing the Compensatory Afforestation in an entirely different ecological zone, one that is marginal for forest development in any case, Gujarat has ensured that the forest created will have no resemblance to that submerged.” (Morse, 1992) Kothari and Ram (1994) also promoted the same

sentiment about plantations in Kutch when they said that, “If the intention is to replace the forest that is being lost, the SSP effort is a mockery.”

In addition to Kutch, plantation works have also been completed in 67 villages of Marathwada, which is over 100 kilometers away from the Narmada River, and where thorn forest types are abundant. The plantations in the state of Madhya Pradesh as well as those in North Maharashtra were carried out in acceptable regions, in similar soil and climate zones as the forests being lost. Hence, the failure of planting 51% of the new forests near the old one represents a lack of compensation for the original forests.

Health of the Plantations: As mentioned earlier, the present forests that have been, and are to be, submerged by the SSP dam have been described as “degraded”, yet they continue to serve the important functions of forests in India, and have long served the people who depend on them. In sharp contrast, it was found that 86% of plantations were moderately or highly degraded, to an extent that they were termed as “unacceptable”.

In North Maharashtra, 94.4% of plantations evaluated were highly degraded with insufficient canopy cover and mostly dotted with shrubs. These plantations have failed to live up to their compensatory abilities.

In Madhya Pradesh too, the plantations fall short of fulfilling any compensatory functions. In the Badwani and Khargone districts of M.P., 91 % of the forest plantations are very unhealthy and degraded. They were degraded with insufficient canopy cover and inadequate tree height. These regions are close to the riparian forests and the river; hence they have the ability to compensate the lost forests in some measure. However, they are “unacceptable” due to their unhealthy state. In the Jhabua district of M.P., I found some unique data- unique because this situation was different from all the other villages and regions I visited. The villagers here told me that no forest officials had ever visited the villages or done any plantations. Hence, there were no plantations done in these regions. This is a contradiction between the claims of the NCA and the reality on the ground. The plantations in these villages exist purely on paper; there are no trees in the villages.

In contrast, 32% villages in the Marathwada region of Maharashtra are very healthy, and have significant canopy cover, with tall trees. Especially notable is the plantation at Shelgaon village in the Latur district of Maharastra, which is a vibrant, healthy plantation on all counts.

Native/ Non-native Species: I defined non-native species as those not originally found in the specific regions where plantations were carried out. This definition does not necessarily mean that the species are invasive or harmful to the region. I found that 37% of plantations in Marathwada have predominantly non-native species such as Gliricidia, Eucalyptus and Acacia. Local villagers informed me that Gliricidia indeed is a species that is completely useless to them. They said that even birds were unable to make a nest in a tree like Gliricidia, and that it was used for plantations only because it is a fast-growing plant and it provides a green, thick canopy. (Unnamed 3, 2003, pers. comm.) Eucalyptus, on the other hand, is also non-native, but it has been planted in rural Indian communities for the last few years. Hence it useful to villagers, since they have adapted to its use, but it continues to be a water-demanding tree species. The villagers did not seem to have much information about Acacia, but it seemed like they were somewhat familiar with the species.

Other regions did not seem to have plantations with an abundance of non-native species. However, at several villages, the plantations were non-existent, as in Jhabua, or in a very unhealthy state, as in Badwani and Khargone villages. Hence, it is difficult to determine whether non-native species were ever planted in these villages. They were given the benefit of the doubt, and I assumed that they did not have non-native species.

Mixed/ Monoculture plantations: 47% plantations in Marathwada are monocultures. The most dominant species is Gliricidia, which is also non-native to the region as explained above. The compensatory abilities of these forests are undermined since they are monocultures, especially if they also have non-native species.

Again, other regions did not seem to have monoculture plantations, but this might be misleading, since some of the plantations were too degraded to ascertain their mixed nature. They were given the benefit of the doubt, and I assumed that they did not have monoculture plantations.

Previous land use conflicts: All of the plantations in Marathwada that I evaluated were carried out on the communal grazing lands of the villages, known as *gayran*, which are officially owned by the government and not the village community, hence the government felt that it had a right to use these lands for CAF purposes. While some people do not feel the burden of the loss of these grazing lands, several others, especially landless people, feel the brunt of lack of grazing land for their cattle. While land-owners can often use agricultural waste products to feed their

cattle (they do this for about nine months of the year, and require grazing lands only for the remaining three months), but landless people do not generate agricultural waste, and require the use of grazing land for all months of the year. No one was compensated for any loss they might bear in relation to loss of grazing land. So, in situations where the process of CAF has alienated landless people from their grazing land, people who are the weaker sections of rural Indian society in any case, these plantations must be seen as "unacceptable", and this represents a failure of CAF to fulfill its compensatory purpose. More studies are required on what percent of people in these villages have been adversely affected by the take-over of land for CAF, and how seriously they have been affected.

In North Maharashtra, I learned that some of these plantations have been performed on land that was previously used for agriculture by villagers. 33% of the plantations I studied were associated with land disputes in this way. In Old Dhadgaon village, Mr. Lal Singh, Mr. Ramesh and others had been given land several years ago by the government, since they had been landless *dalits* (lower caste persons). They showed me their legal land titles that bear their names and plot numbers; the numbers matched with those on government records of CAF locations. Observing their land, it was clear that about ten-year old forests are thriving on it, which has prevented them from doing agriculture for at least 10 years, and has forced them into manual labor. Till now, they have been apprehensive about raising their voices against the government, but now they have decided to pursue the matter legally. Again, if the CAF process alienates vulnerable sections of society from their source of sustenance, without compensation, this process must be seen as "unacceptable".

Not all the land claims in this region, however, are associated with legal land titles. Some of these villagers I spoke to did not have *satbara*, or legal title, to the land they were cultivating. These villagers are said to be engaging in a process called *atikraman* or "encroachment", which is defined to mean that they are "encroaching" onto government or forest land for agriculture purposes. It would appear that these people do not have rights to the land they are cultivating. However, this issue needs to be explored further. Independent India inherited a complex but vague set of land laws from the British. At some stage after independence, the government sanctioned large-scale land surveys, to determine land ownership and give people legal title in remote rural areas such as the ones I visited, a process known as regularization of "encroachments". This was done for "encroachments" that occurred before 1987, since much of

this land is traditionally owned by people, and the Indian state did not get around to giving them official title for it until the late 1980s. For many villages, including several in North Maharashtra, the land titles have been promised to many villagers, but were never delivered due to political dynamics of the region. The process of CAF is meant to create new forests to compensate the old ones. It is certainly not meant to hinder the livelihoods of some of India's poorest farmers. The fact that this is happening in one-third of the plantations in North Maharashtra renders them "unacceptable", and the compensatory abilities of these plantations is undermined.

In considering the regions studied herein, it can be seen that the CAF plantations undertaken to compensate the loss of over 13,000 hectares of forest land due to the Sardar Sarovar dam, have collectively failed to do so. Each region and each plantation presents unique problems and unique reasons for failing to do so, but collectively they have failed. In North Maharashtra, 17 of the 18 plantations I visited were "unacceptable" due to their unhealthy state. The 18th plantation, an "acceptable" healthy one, was the one done on the agricultural titled land of Mr. Lal Singh and others. How, then, can any of these plantations claim to have fulfilled their compensatory purpose? Indeed, all of them have failed. In Marathwada, some of the plantations were "acceptable" on the grounds that they are healthy. However, at the same time, they are "unacceptable" because all of them are far away from the river, and also most of them are monocultures of non-native species. Hence, these plantations have also failed to fulfill their compensatory function.

The NCA recently met to approve the raising of the dam height from 100 to 110 meters. This height increase has been sanctioned. However, I believe that this increase, as well as further height increases, is not acceptable because the CAF environmental processes have not sufficiently compensated the forest loss.

Additionally, at a time in India when CAF is used as a justification for continuously using forest land for non-forest purposes like constructing large projects, this study demonstrates that the CAF process is not working. Sardar Sarovar is one of the most controversial dams in India today, and is constantly under scrutiny by the NBA and the people. If the CAF procedures for this dam can be so inadequate, they certainly cannot be expected to be any better in any other dam which is not subject to harsh scrutiny. Hence, before any other diversions of forest land are permitted by the Ministry of Environment and Forests, the short comings of the current systems

of planning and implementation must be accepted and corrected. Without that, even the current forest cover level of less than a quarter will diminish quickly.

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Appendices

Appendix A: List of Abbreviations

CAF- Compensatory Afforestation

EIA- Environmental Impact Assessment

ESG- Environment Sub Group

GoI- Government of India

GoG- Government of Gujarat

GoM- Government of Maharashtra

GoMP- Government of Madhya Pradesh

MoEF- Ministry of Environment and Forests

M.P. - Madhya Pradesh (state)

NBA- Narmada Bachao Andolan (Movement to Save the River Narmada)

NCA- Narmada Control Authority

SSP- Sardar Sarovar Project

WCD- World Commission on Dams

Appendix B: Glossary

Atikraman- “encroachment” of farmers onto forest land

Crore- 10 million

Dalit- lower caste person in society, usually landless

Gayran- common grazing land, in Maharashtra state

Lakh- 100,000

Patta/ Satbara- official legal title to land

Talathis- individuals in villages assigned the responsibility of maintaining land records

Appendix C: Questionnaire Copy

Q1). Do you know of the existence of a forest department plantation in the area?

Q2). When was the plantation carried out? Who came to do it?

Q3). Did you ever hear the name of the Sardar Sarovar Dam mentioned in relation to the plantation?

Q4). Who provided the labor for plantations?

Q5). Were your opinions asked on what species to plant, best times to plant, etc?

Q6). Where is the plantation located?

Q7). What was the land earlier being used for? Do you miss that particular use?

Q8). What species were planted? Are these useful to you?

Q9). Was there a watchman to guard the plantation? Was he from this village or another one?

Q10). What is the state of the plantation right now? Can you please lead me to the plantation?