Working paper

The Impact of the Forest Rights Act 2006 on Deforestation, Tribal Warfare and Poverty

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Exploratory research on the impact of the Forest Rights Act, 2006, on deforestation, tribal welfare, and poverty, with implications for implementation strategies

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The purpose of the project was to explore data availability in order to examine the feasibility of the four research questions in the proposal, and to develop tentative strategies for addressing the feasible questions. In this report, we first briefly consider the feasibility of the larger research program and then report on **preliminary and tentative** findings from the data gathered.

The first research question was

> 1. Did the Forest Rights Act (FRA) lead to an increase in forest clearing in order to establish claims to individual title?

It appears that the administrative data on claims as well as satellite images are available to throw some light on this question. Paper copies of approved (individual) claims were obtained from the block office in Jhadol and keyed in. Approved claims that had GPS locations are shown in the map below.

We conclude that it is feasible to use these data to address question 1, that is, whether forest clearing and fragmentation accelerated before or after the Act, or whether it slowed down as a result of the Act.

The second research question was

> 2. Does community control lead to better forest protection and soil conservation than state forest department control?

Regarding question (2), the field trip has provided some new insights on the management of forest land. It appears that most of the plots are demarcated by linear elements, such as walls and hedges. These linear elements can easily be spotted with satellite images and they do provide an instrument to identify the effectiveness of management regime by relying on the discontinuity between different management regimes across similar ecosystems. It means that in further steps, this question might be answered by collecting the administrative boundaries of forest land and identifying their managers.

> 3. Has the FRA achieved its aim of "correcting historical injustices" by giving titles to the poor?

Regarding question (3), it appears that it is not possible to use the two comprehensive household surveys done in 2002-03 and 2007-09 as historical background. The datasets collected by Seva Mandir (refer to 5: Stakeholder Demand), Vidya Bhavan (another NGO headquartered in Udaipur) and Abhijit

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Banerjee and Esther Duflo from MIT does not suit our research questions because the sample was only drawn in villages where Seva Mandir was active. Seva Mandir is actually supporting applications for community titles in its work area while it is clear that without such an external intervention, most of the villagers are claiming individual rights. As a consequence, the former dataset would not allow us to carry on a consistent research project with sufficient external validity. It means that an answer to the third question can only be provided through the techniques described below.

4. How are claims to title mediated by political and other networks, caste, and status?

Question 4 will be addressed through appropriate surveys of households and other entities, matched with data mentioned above. An alternative methodology may be used to investigate the political determinants of land titling by correlating village levels claims introduced/approved and political affiliation/support (e.g. using election data). The pilot phase of the project allowed us to carry on some first semi-structured interviews in two-villages as well as 10 households' surveys in both of them. It gives substance to our conjectures with respect to the importance of being educated and being informed in the claim process. Based on this first set of information, combined with our field visits, encroachers are relatively richer households who already own land and are able to invest time and resources in forest clearing, cultivation and eventually dwelling construction. New questions also arise. Most of the claims were rejected at village or Gram Panchayat level. Moreover, even in approved claims, there is a discrepancy between the amount of land claimed and the amount of land titled. Administrative records are not sufficient to capture this phenomenon. Systematic field surveys are required to understand the importance of political connections and social networks in the amount of land received.

Preliminary findings from the pilot study

Background

When the United Progressive Alliance came to power in the Indian general elections of May 2004, it published a Common Minimum Programme in which it promised to end the eviction of tribal and other forest-dwelling people from forest lands. In March 2005, the Ministry of Tribal Affairs presented the first draft of the Forest Rights Act that guaranteed the right of tribal and other forest-dwellers to continue to cultivate forest land that they had cultivated in the past. The draft Bill was tabled in Parliament on the 13th of December, 2005, and passed a year later after much contentious debate that was widely reported in the news media. The Government of India issued Rules under the Act in January 2008, and the Government of Rajasthan published its own Rules as required under the Act shortly after.

The process of applying for claims for individual and community rights began in Udaipur district in 2008. As of August 2012, all the individual claims in Jhadol block had been filed and rejected or approved in 2008 and 2009. None of the 66 community claims to manage, extract forest produce, and conserve forest in Udaipur district filed by Forest Protection Committees created in the pre-existing Joint Forest Management system have been approved to date. Accordingly, we focus on individual claims to cultivate and live on forest land. The Act states that "*such land shall be under the occupation of an individual or family or community on the date of commencement of this Act and shall be restricted to the area under actual occupation and shall in no case exceed an area of four hectares*".[1]

Descriptive statistics

According to the 2001 census of India, Jhadol taluk has 258 villages. In more than 80% of them, not a single claim has been approved according to the information collected at the block office. 51 villages have no area under forest land, which means that it is hard to expect any legitimate claims for these villages. However, it is worth noticing that 3 villages which have no forest land according to the census have approved claims.

Figure1: Number of approved claims per village in Jhadol taluk
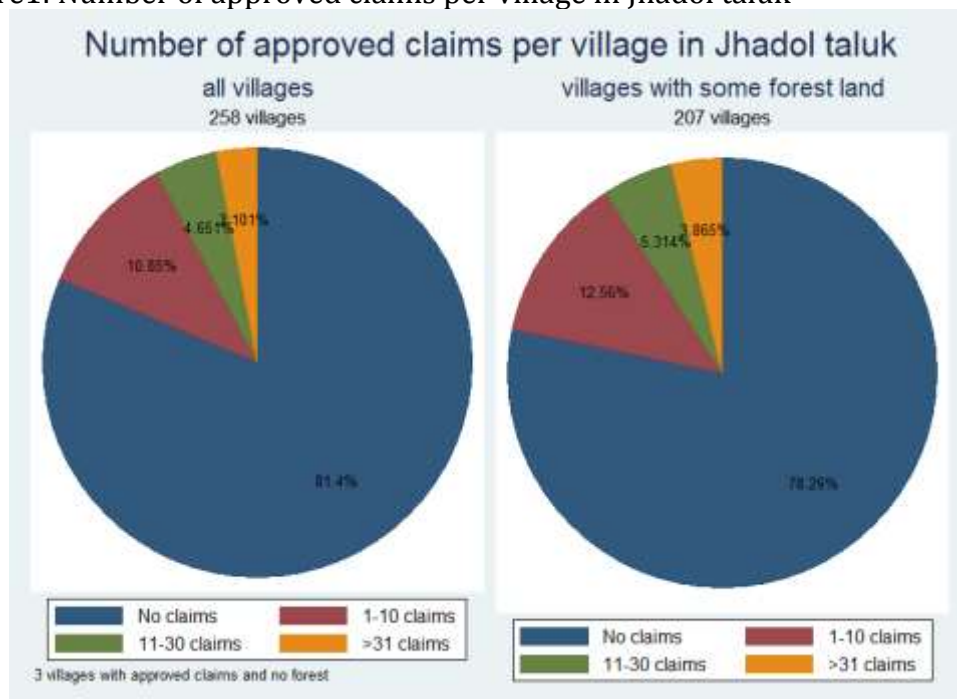
N.B: percentages in the pie depict the proportion of villages in each class of number of approved claims

The 2001 census records 37,648 households in Jhadol taluk. Since we have 859 approved claims in the whole taluk, it means that just over 2% of the households

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[1] The date of commencement of the Act is the date the Bill was tabled in Parliament, the 13th of December, 2005.

have received a title.[2] In Jhadol, only Scheduled Tribe claimants got their claim approved. So if we assume that only STs are eligible for a title, and since 70% of the Jhadol population is ST, we might consider that just over 3% of the targeted population received land. On average, a receiving household has been granted 0.66 ha of land. In total 3112 claims have been received at the Gram Panchayat level, which means that 8% of the households have filed a claim in Jhadol. This represents a lower bound of households actually claiming some land since some claims might have been rejected at the very early stage of application, i.e. by the Forest Rights Committee at the village level. From a list of 312 rejected claims in Jhadol, it appears that the most common reason for rejection was that the land claimed had been occupied after the cut-off date of 13 December, 2005. Other reasons included invalid certificates of Scheduled Tribe status, and the claimant being not a tribal and not meeting the requirement for other traditional forest dwellers of having occupied the land for three generations, and in a few cases, the claimant's livelihood not being tied to the land.

We conclude that only a small fraction of tribal and other households have benefited from the Act in Jhadol. The collection of first hand data among claimants (and non claimants as comparison group) is needed to provide further information about the "correction of historical injustices to the forest dwelling Scheduled Tribes".
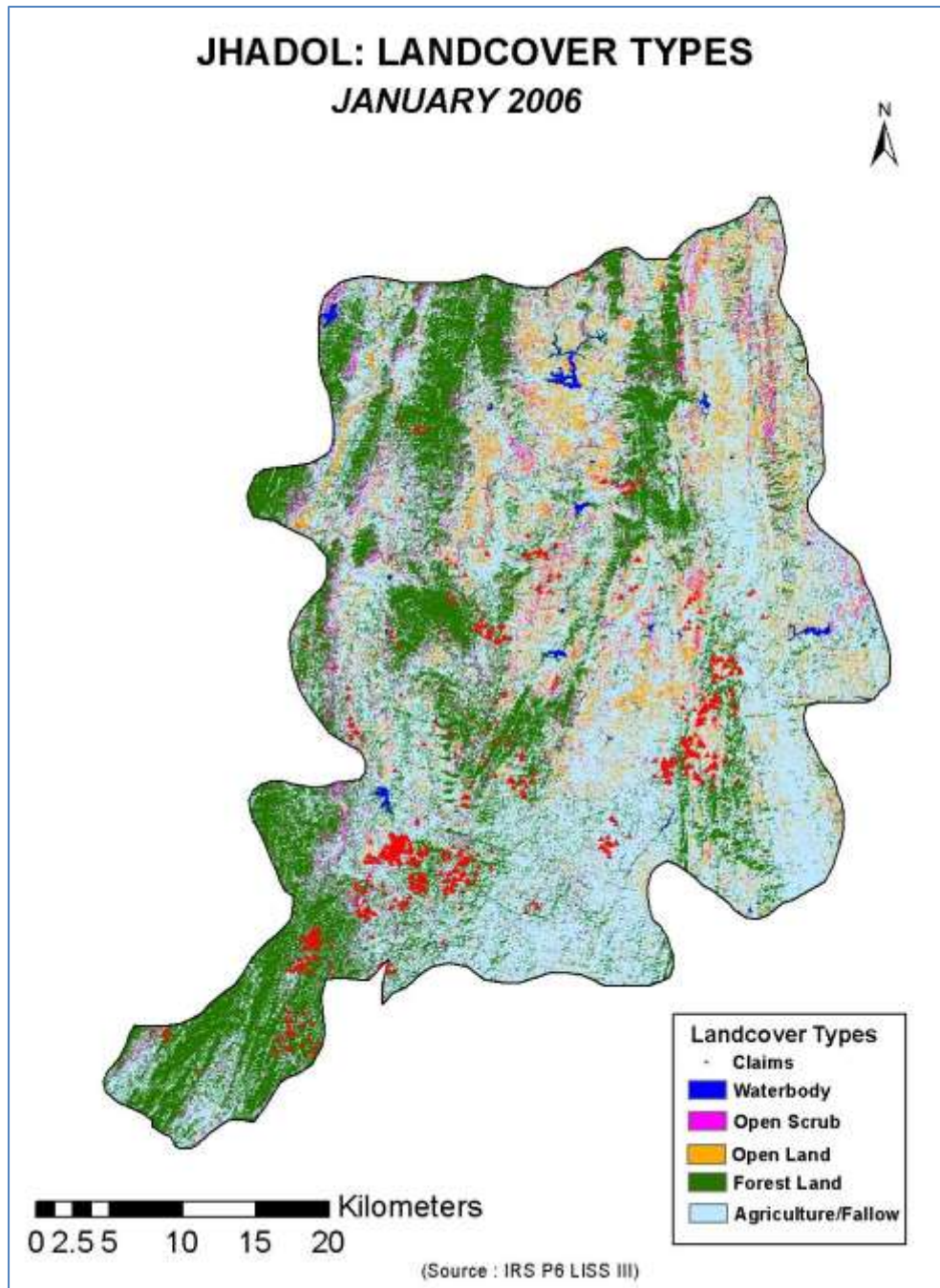
With regard to deforestation associated with the Act, we note that in the 2001 census, forest land in Jhadol amounted to 76,451.4 ha. Claims have been approved on a total of 566.8131 ha, which means that 0.74% of forest land has been formally privatized. **The effect of the Act on deforestation has, therefore, been negligible.** This does, not, of course, rule out the possibility that the Act has had an effect on the degradation of forests surrounding claims. We examine this further below.

Village proportion of ST in Jhadol taluk

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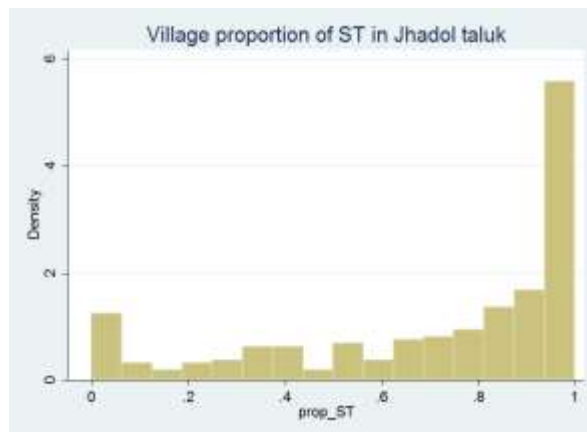
[2] The data from different sources within the government are not fully consistent. A document in the office of the Collector, Udaipur states that 1156 claims in Jhadol were granted. This would still imply that fewer than 3% of households had received titles.

There are 674 claims within the Jhadol taluk for which GPS co-ordinates were recorded by the authorities. A circular buffer of radius 50 meters around each claim location was constructed (an area of about 0.8 hectares). Land cover maps for the years 2003, 2006, 2009 and 2012 were prepared for areas within these buffers. The maps were prepared through maximum likelihood classification techniques using satellite images of the IRS LISS III sensor. The images were of the month January for the years 2003, 2006 and 2012. For 2009, the image was from the month of February since no cloud-free January image was available. The 2012 image was considered as a reference image and other images were georeferenced to this with RMS error < 0.5 pixels.

The initial land cover classification had three major classes. These are (i) forest (ii) standing crops and (iii) open areas. The open areas may include fallow lands, harvested croplands and naturally open areas. But it was not possible to reliably distinguish between these categories. Hence it was decided to combine the standing crops and open categories to arrive to final classes, viz. (i) forest and (ii) non-forest.

JHADOL: LANDCOVER TYPES
JANUARY 2006

Landcover Types
- Claims
- Waterbody
- Open Scrub
- Open Land
- Forest Land
- Agriculture/Fallow

(Source : IRS P6 LISS III)

N.B.: Red triangles represent the location of geo-coded approved claims

Another interesting feature touches the legality of the claims. New clearing happening after the cut-off date of 13 December 2005 is illegal. If there is considerable clearing around a claim after 2006, we can suspect that the claim is not wholly legal and that the household behaved strategically, knowing that the FRA was passed, and cleared land in order to establish a claim to a large area. The next pie charts present the proportion of claims for which the claimed area has been cleared in year *t*. As is clear from the charts, major clearings happen between 2003 and 2006 and between 2006 and 2009.[3] Additional clearings are still present between 2009 and 2012, but are less extended. The main result from the charts is the tremendous increase in plots totally cleared between 2006

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[3] It should be noted that the image interpretation for 2003 is still tentative.

and 2009. 61% of plots were cleared at more than 90% in 2006, this proportion goes up to 83.5% in 2009.
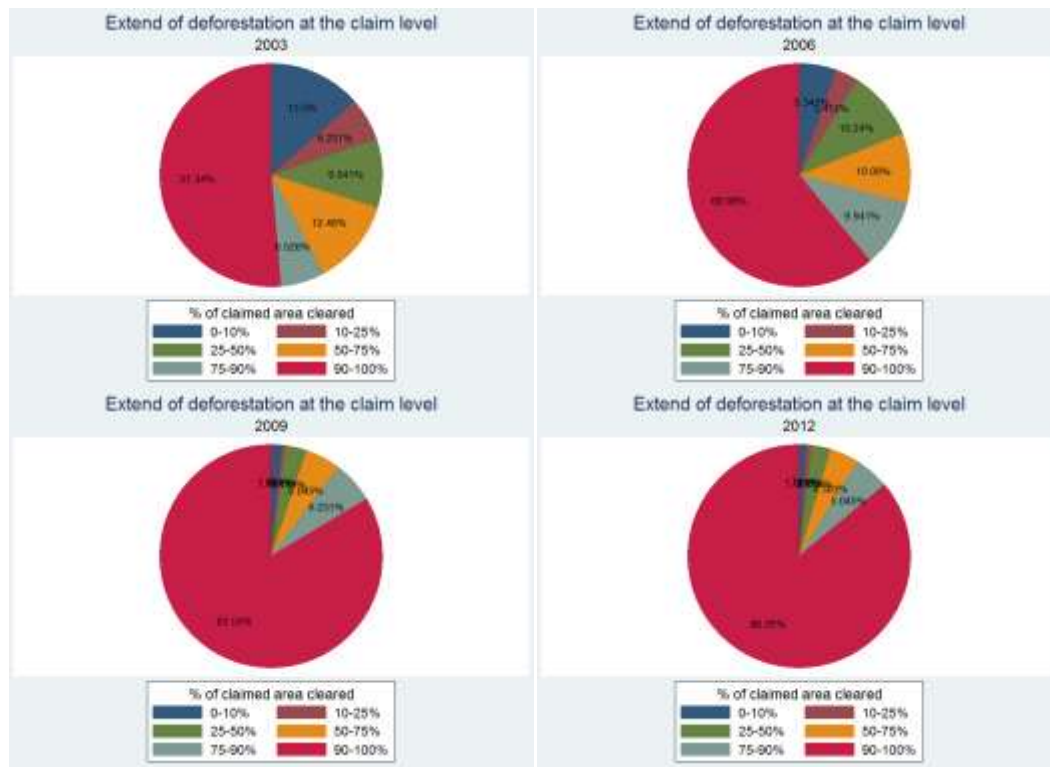
If we look more carefully at the change in the proportion of land cleared around a claim between 2006 and 2009, it is worth pointing out that 176 plots of the 674 analyzed have additionally been cleared by at least 20%.[4] These 176 plots (26% of 674) appear to be either illegitimate claims or illegitimate extension of claims. Despite our current concerns related to the potential overestimation of forest cover in 2003, only 145 plots have additionally been cleared by at least 20% between 2003 and 2006 (21.5% of 674). The deforestation rate has increased after the FRA was passed. Between 2009 and 2012, only 6 plots witness such a clearing.

Notice also that we do not observe any single plot where the area forested increases between the two periods. It is possible, of course, that over a longer period, tenure security may lead to reforestation of some of the titled plots.

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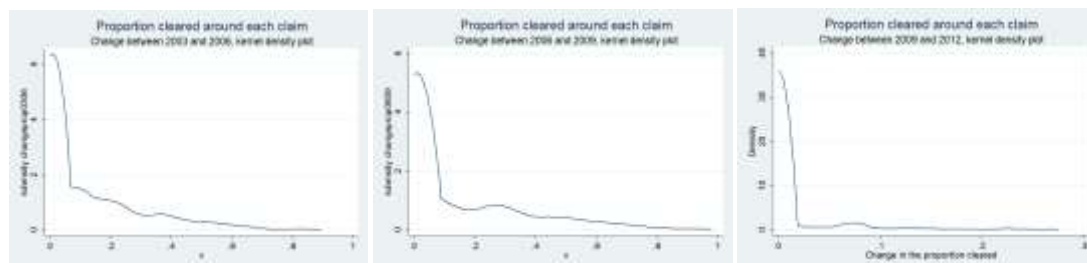
[4] 20% of the buffer area of 7853 square meters is 1570 square meters.

The village-level determinants of approved claims

In this section, we focus on the correlates of claim approval at the village level. The unit of observation is the village. The dependent variable in the first two columns of Table 1 is the proportion of households receiving a title in a given village. In the last two columns of the same table, the dependant variable is the area received per household. The set of explanatory variables includes variables influencing the demand for new land (proportion of tribals, connectivity to better outside opportunities and cultivable land per household) as well as variables determining the supply (amount of forest land per households in 2001).

From Table 1, it is clear that villages with more forested land per household got more claims approved. Also, when the pressure on cultivable and non-cultivable land is higher then more titles were granted. Better outside opportunities do not seem to matter, with the notable exception of villages connected to the power grid where significantly more claims were approved.

Econometric specification:

$$Claim\_hh_v = \alpha_0 + \alpha_1 \, prop\_ST_v + \alpha_2 \, area\_forested\_hh_v + \alpha_3 \, area\_cult\_hh_v + \alpha_4 \, area\_notcult\_hh_v +$$
$$\alpha_5 \, dist\_udaipur_v + \alpha_6 \, dum\_pavedroad_v + \alpha_7 \, dum\_bus_v + \alpha_8 \, dum\_power_v + \varepsilon_v \qquad (1)$$

$$Areaclaim\_hh_v = \beta_0 + \beta_1 \, prop\_ST_v + \beta_2 \, area\_forested\_hh_v + \beta_3 \, area\_cult\_hh_v + \beta_4 \qquad (2)$$
$$area\_notcult\_hh_v + \beta_5 \, dist\_udaipur_v + \beta_6 \, dum\_pavedroad_v + \beta_7 \, dum\_bus_v + \beta_8 \, dum\_power_v + \upsilon_v$$

With
v :	village indicator
claim_hh :	percentage of households having received a title
areaclaim_hh :	area claimed per household
prop_ST:	proportion of tribals in the village
area_forested_hh :	hectares of forest land per household (in 2001)
area_cult_hh :	hectares of cultivated land per household (in 2001)
area_forested_hh :	hectares of not cultivated land per household
dist_udaipur :	distance to Udaipur
dum_pavedroad :	=1 if the village is connected to a paved road
dum_bus :	=1 if the village has a bus stop
dum_power :	=1 if the village is connected to the power grid
ε_v , υ_v :	idiosyncratic components

Data source: approved claim list for Jhadol and Census 2001.
Estimation method: maximum likelihood of a tobit model taking into account the left censoring in 0 of the data.

Table 1

	(1) claim_hh	(2) claim_hh	(3) areaclaim_hh	(4) areaclaim_hh
model				
prop_ST	0.0835 [0.0683]	0.0478 [0.0601]	0.0640 [0.0509]	0.0403 [0.0467]
area_fores~h	0.0187*** [0.00547]	0.0139*** [0.00455]	0.0153*** [0.00403]	0.0121*** [0.00350]
area_cult_hh	-0.124** [0.0587]	-0.0813* [0.0467]	-0.0912** [0.0436]	-0.0629* [0.0362]
area_notcu~h	-0.0359* [0.0189]	-0.0285* [0.0156]	-0.0276** [0.0138]	-0.0227* [0.0118]
dist_udaipur	-0.00121 [0.00101]	-0.000952 [0.000857]	-0.000829 [0.000749]	-0.000674 [0.000664]
dum_pavedr~d	0.0307 [0.0517]	0.0471 [0.0453]	0.0196 [0.0385]	0.0317 [0.0352]
dum_bus	-0.0296 [0.0483]	-0.0559 [0.0421]	-0.0197 [0.0358]	-0.0384 [0.0325]
dum_power	0.107** [0.0488]	0.0764* [0.0418]	0.0739** [0.0362]	0.0537* [0.0324]
N	258	207	258	207

Tobit regression with left-censoring in 0 for 210 observations in the full sample and 162 observations in the sample restricted to villages with some forest land.
Coefficients reported, Standard errors in brackets * p<0.10, ** p<0.05, *** p<0.01

When we estimate the same models as above but interact all the variables with the proportion of ST in the village, no systematic pattern emerges. Results reported in Table 2 would suggest that the proportion of ST is not relevant in the implementation process of the act. On the other side, we've already pointed out the lack of variability of the proportion of ST within Jhadol which might explain why we lack power to detect any systematic relation linked to this variable.

Table 2

	(1) claim_hh	(2) claim_hh	(3) areaclaim_hh	(4) areaclaim_hh
model				
prop_ST	-0.0101 [0.366]	0.0872 [0.320]	0.0564 [0.276]	0.145 [0.253]
area_fores~h	0.0257 [0.0190]	0.0186 [0.0163]	0.0216 [0.0143]	0.0173 [0.0127]
area_cult_hh	-0.104 [0.135]	-0.0880 [0.124]	-0.0884 [0.106]	-0.0873 [0.103]
area_notcu~h	-0.101 [0.124]	-0.112 [0.109]	-0.0722 [0.0945]	-0.0814 [0.0870]
dist_udaipur	-0.00127 [0.00360]	0.000290 [0.00317]	-0.000520 [0.00272]	0.000737 [0.00250]
dum_pavedr~d	0.00715 [0.146]	0.0424 [0.137]	0.00942 [0.111]	0.0393 [0.108]
dum_bus	0.0291 [0.138]	-0.0186 [0.129]	0.0274 [0.105]	-0.00650 [0.102]
dum_power	-0.00747 [0.136]	0.0185 [0.120]	0.0204 [0.104]	0.0444 [0.0960]
propST~st_hh	-0.00898 [0.0220]	-0.00615 [0.0189]	-0.00787 [0.0164]	-0.00657 [0.0147]
pro~_cult_hh	-0.0247 [0.178]	0.0126 [0.160]	-0.000630 [0.137]	0.0358 [0.130]
pro~tcult_hh	0.0724 [0.130]	0.0908 [0.114]	0.0496 [0.0990]	0.0636 [0.0905]
propST_dis~r	0.000153 [0.00434]	-0.00144 [0.00381]	-0.000328 [0.00327]	-0.00167 [0.00300]
propST_dum~d	0.0261 [0.185]	0.00183 [0.173]	0.0100 [0.140]	-0.0121 [0.136]
propST_dum~s	-0.0762 [0.173]	-0.0530 [0.161]	-0.0627 [0.131]	-0.0471 [0.126]
propST_dum~r	0.150 [0.166]	0.0818 [0.149]	0.0724 [0.127]	0.0173 [0.118]
N	258	207	258	207

Standard errors in brackets
* p<0.10, ** p<0.05, *** p<0.01

The village-level determinants of clearing in approved claims

In this section, we restrict the analysis to the 39 villages where at least one claim has been approved. Within these villages, we will focus on the proportion of land which has been cleared around the GPS point mentioned in the title granted. All regressions but the second one include village fixed-effects. Deforestation increases in each three-year period, with the largest increase occurring between 2006 and 2009 (on average, an additional 12.8% of the area surrounding the GPS point was cleared). The second regression indicates that clearings were less important in villages where the pressure on forest land was low and the availability of uncultivated land high.

The third regression shows that villages with a higher proportion of tribals do not experience a different trend in deforestation. The fourth regression tells us that the deforestation trend was less acute in villages where households had a lot of cultivable and non-cultivable land at their disposal, while more forest area per household lead to more deforestation between 2009 and 2012. The fifth column reports that the distance to Udaipur increases the speed of deforestation but only after 2006. It might indicate that the information about the act percolated slowly in more remote area. However, it might also simply indicate that more remote area had still forest to be cleared… The last regression puts all variables together, suffers from collinearity but can be seen as a robustness check since no drastic change is observed with respect to the previous estimations.

This analysis points to several possible research directions. It would be interesting to understand if the distance to Udaipur reflects some systematic pattern with respect to information diffusion about the FRA and about the speed and the effectiveness of its implementation. The negative correlation between clearings and cultivable land availability suggest that the FRA might have been an opportunity to relax the constraint on land existing in some villages by allowing investment on marginal lands.

Table 3

Dependant variable: Percentage cleared land within the 50m radius circle around GPS point of claim$_i$
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	(1)	(2)	(3)	(4)	(5)	(6)
dum_year2006	0.102***	0.102***	0.131*	0.149***	-0.0126	0.0443
	[0.0153]	[0.0158]	[0.0698]	[0.0314]	[0.0550]	[0.0694]
dum_year2009	0.230***	0.230***	0.361***	0.295***	-0.104	0.0875
	[0.0299]	[0.0307]	[0.133]	[0.0527]	[0.104]	[0.124]
dum_year2012	0.238***	0.238***	0.368**	0.307***	-0.110	0.0916
	[0.0310]	[0.0318]	[0.137]	[0.0553]	[0.108]	[0.130]
prop_ST		0.140				
		[0.101]				
area_forested/hh		-0.0166***				
		[0.00611]				
area_cultivated/hh		0.0825				
		[0.0634]				
area_notcutivated/hh		0.0315**				
		[0.0141]				
dist_udaipur		-0.00387***				
		[0.000994]				
dum_pavedr~d		0.0378				
		[0.0558]				
dum_bus		0.0203				
		[0.0584]				
dum_power		-0.111**				
		[0.0506]				
propST*2006			-0.0373			-0.0272

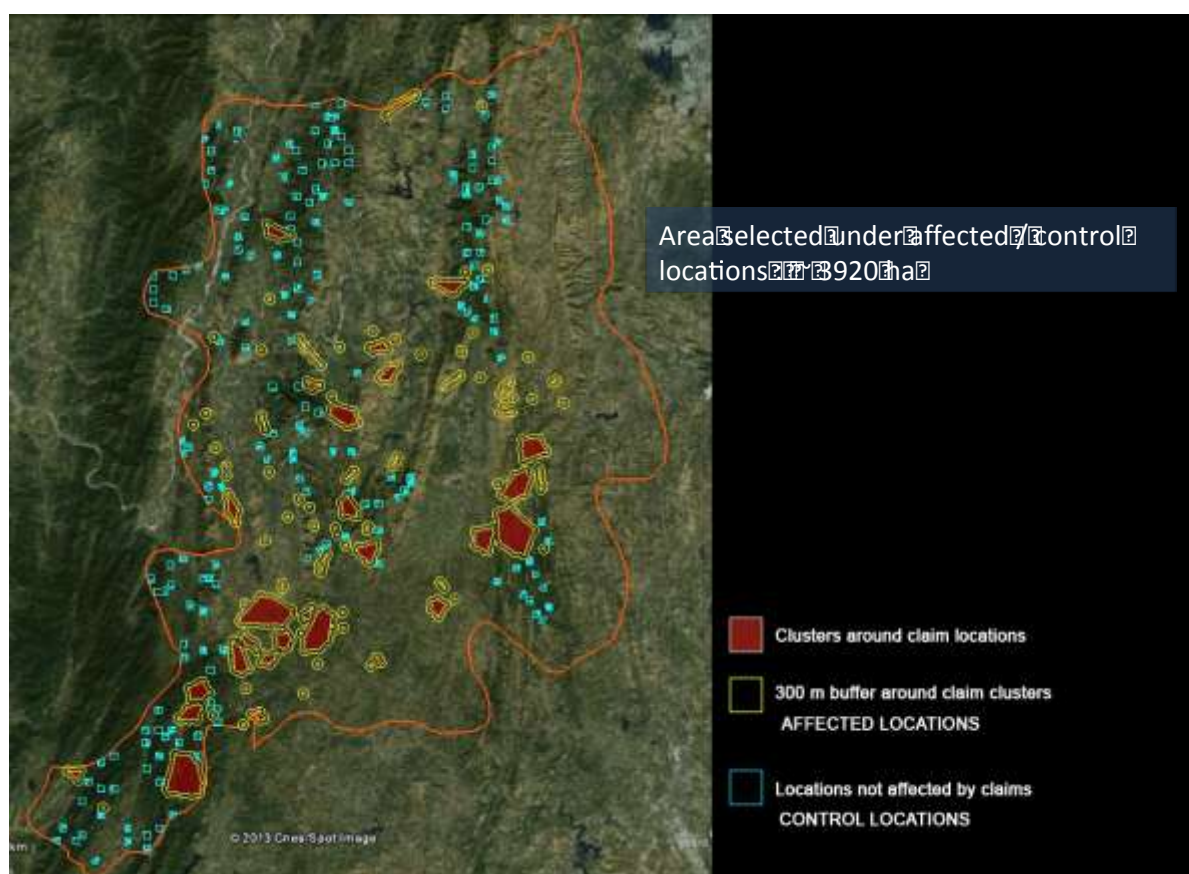|				
	[0.0816]			[0.0643]
propST*2009	-0.167			-0.183
	[0.160]			[0.131]
propST*2012	-0.166			-0.190
	[0.167]			[0.138]
area_forested*2006/hh		0.00281		0.00473
		[0.00327]		[0.00533]
area_forested*2009/hh		0.0121*		0.0163*
		[0.00676]		[0.00908]
area_forested*2012/hh		0.0126*		0.0167*
		[0.00699]		[0.00931]
area_cultivated*2006/hh		-0.111***		-0.134**
		[0.0394]		[0.0509]
area_cultivated*2009/hh		-0.156*		-0.194**
		[0.0831]		[0.0941]
area_cultivated*2012/hh		-0.166*		-0.197**
		[0.0861]		[0.0963]
area_notcutivated*2006/hh		-0.0209*		-0.0109
		[0.0111]		[0.0112]
area_notcutivated*2009/hh		-0.0607***		-0.0286
		[0.0220]		[0.0227]
area_notcutivated*2012/hh		-0.0642***		-0.0309
		[0.0229]		[0.0237]
distudaipur*2006			0.00103	0.000932
			[0.000670]	[0.000879]
distudaipur*2009			0.00338**	0.00276*
			[0.00127]	[0.00161]

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distudaipur*2012					0.00355** [0.00133]	0.00289* [0.00169]
pavedroad*2006					0.0148 [0.0368]	-0.00739 [0.0283]
pavedroad*2009					-0.0580 [0.0962]	-0.0723 [0.0843]
pavedroad*2012					-0.0543 [0.100]	-0.0682 [0.0887]
bus*2006					-0.00888 [0.0371]	0.0336 [0.0409]
bus*2009					0.0152 [0.0958]	0.0431 [0.0921]
bus*2012					0.00000672 [0.102]	0.0270 [0.0972]
power*2006					0.0603* [0.0307]	0.0620 [0.0388]
power*2009					0.174** [0.0692]	0.206*** [0.0758]
power*2012					0.185** [0.0735]	0.216** [0.0797]
_cons	0.707*** [0.0183]	0.916*** [0.0994]	0.707*** [0.0182]	0.707*** [0.0173]	0.707*** [0.0173]	0.707*** [0.0159]
VILLAGE FIXED EFFECT	YES	NO	YES	YES	YES	YES
N	156	156	156	156	156	156
r2_w	0.580		0.594	0.641	0.656	0.727

Standard errors in brackets
* p<0.10, ** p<0.05, *** p<0.01

Forest degradation in the neighborhood of approved claims

Seva Mandir is concerned that the proliferation of individual claims to cultivate forest land could result in forest fragmentation that makes it harder for communities to conserve the forest for fodder and other forest produce. While the available data does not allow us to address this issue directly, we do compare a measure of forest density in forest surrounding titled claims to forest in randomly selected locations.[5] This measure, the NDVI (normalized difference vegetation index), is a measure of greenness and typically is higher in less degraded forest.

As seen in the box plots below, the distribution of NDVI is shifted to the left in the forest surrounding approved claims as compared to randomly selected forest, although the shift is not large.

Area selected under affected / control locations : ~ 3920 ha

Clusters around claim locations

300 m buffer around claim clusters
AFFECTED LOCATIONS

Locations not affected by claims
CONTROL LOCATIONS

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[5] Buffers of radius 100m were created around claims. These are large enough to encompass most claims. Adjacent areas in buffers were grouped to form claim clusters. Buffers of 300m radius were created around these clusters. After removing non-forest and the 100m buffers of claim clusters, the remaining areas within the 300m buffers are what we call "forest areas surrounding titled claims".
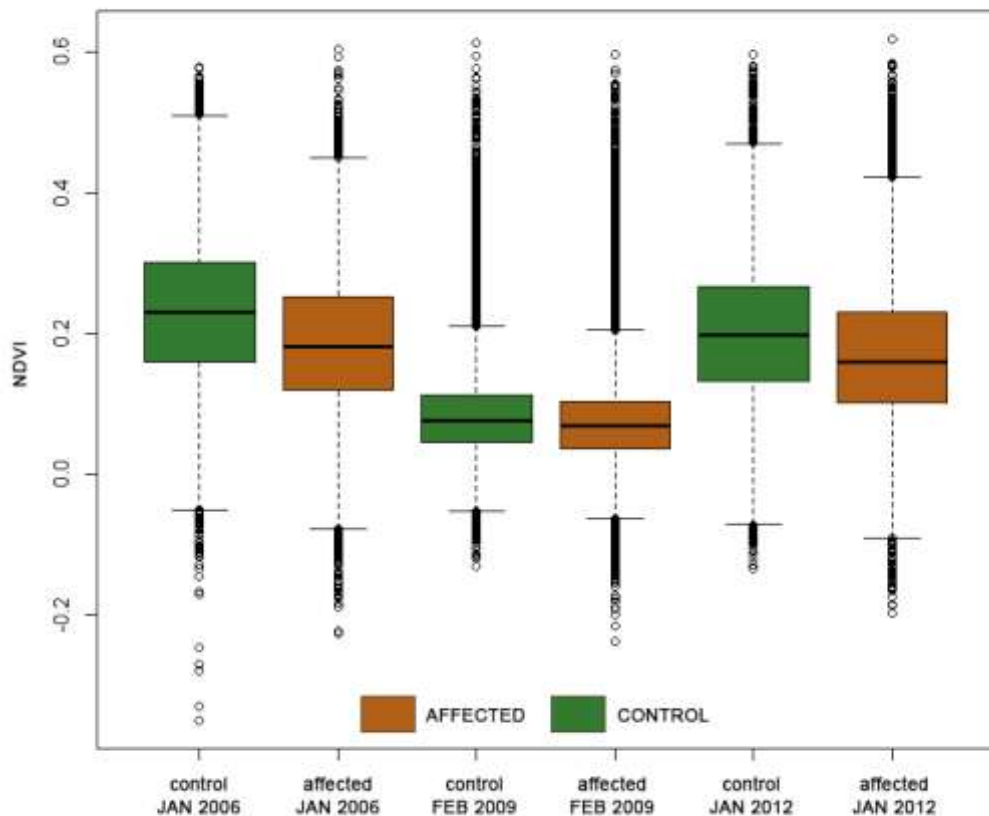
Note: The dark lines are medians, the ends of the boxes are the lower and upper quartiles, the distance from the edges of the box to the whiskers are 1.5 times the inter-quartile range, and the dots are outlying values in the distribution.

Conclusions

There are some suggestive findings from Jhadol block, a tehsil of Udaipur district in Rajasthan 70% of whose population is from the Scheduled Tribes. First, the Forest Rights Act has benefitted at most a small fraction, 3 percent, of tribal families. This constitutes about 2% of all families in Jhadol. About four times as many households applied for individual titles to land as got them. It appears that rejections were most frequently because land was occupied after the cut-off date. This suggests that the Act did trigger attempts to privatize land, in addition to securing title to land that had already been occupied. It also suggests that the proportion of tribal and other households who had insecure holdings of land in the forest was small. Therefore, the provision for individual claims under the Act has the potential to benefit only this small proportion of households. Of course, the potential benefit to these households could be large and merits further study. This will require household surveys.

None of the 66 community claims to manage much larger areas of forest, that have been filed by village Forest Protection Committees (formed earlier under the system of Joint Forest Management) has been approved (nor rejected). These claims were filed with the support of Seva Mandir. Last month a protest march

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was taken out in Udaipur and a petition given to the Commissioner of Tribal Affairs for Rajasthan in this regard.

Turning to the impact on deforestation, the extent of land under forest department control to which people have been given title for cultivation and housing is likewise very small: less than 1%. Even though not all forest department land is forested, (and it could be the case that actually forested land has been disproportionately titled, at any rate this is a possibility that we cannot rule out) this clearly means the effect on deforestation has been very small in Jhadol block.

We also find evidence that in a substantial fraction of cases where titles were granted, substantial clearing took place after the cut-off date. The most likely reason for this would have been attempts to extend the amount of land titled over and above what had been occupied before the cut-off date. In a few cases, clearings appear to have been wholly new. In the pilot study, we did not obtain GPS coordinates of rejected claims. Therefore, we cannot use our satellite images to examine whether and how often claims were wrongfully denied. This, too, is important for further study in order to determine the success of the Act in meeting its principal stated aim.

Regarding the pattern of titles, it appears that more densely populated villages, villages with less cultivated land per person, and villages with more forest land in their revenue boundaries have been granted more titles. This is an unsurprising pattern. We may expect to find larger impacts of the Act in parts of the country with these characteristics. This is important for further study.

Satellite image analysis of the forest surrounding titled land indicates that such forest is slightly more degraded than randomly selected forest. An important question (raised by Seva Mandir) is whether the relative ease of obtaining individual titles for cultivation compared to community titles for forest management leads to forest degradation that leaves communities with worse off than they would be under a neutral regime. This is an issue that would require geographically more extensive study.

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