



Full Length Research Article

IMPACT OF SILVICULTURAL TREATMENTS ON ESTABLISHMENT OF SEEDLINGS OF SAL  
(*SHOREA ROBUSTA*) AND ITS ASSOCIATES IN NATURAL SAL FORESTS

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ABSTRACT

Sal (*Shorea robusta*) which is the most dominant tree species of the Sal forests in India is under threat. Sal seeds germinate profusely but the establishment of seedlings and conversion of seedlings into trees is very low. 'Die back' of Sal seedlings prevents its establishment due to several factors. This paper studies the impact of certain treatments; like opening of canopy, soil & moisture conservation, Protection against fire and grazing; on the establishment of Sal seedlings as well as seedlings of its associates. These simple treatments have a great improvement potential in the growth and establishment of seedlings of Sal and its associates in a natural Sal forest.

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INTRODUCTION

Sal (*Shorea robusta*) is the widely distributed species covering more than 10 million hectare area in India and having global range between 20<sup>o</sup>-30<sup>o</sup> N latitude and 75<sup>o</sup>-95<sup>o</sup> E latitude. Natural regeneration of Sal has several stages to pass through for getting established. These stages are seed production which varies from good seed year to moderate and bad seed year, dispersal and germination of seeds which require timely rains as soon as the seeds fall because seed viability is hardly ten days, and finally establishment of seedlings. Sal has good population of seedlings in natural forests but these do not mature in enough number to juveniles and young stages (Uma Shanker, 2001). Mortality at seedling stage of *Shorea robusta* is high (Chauhan *et al.*, 2010). The Problem of natural regeneration of Sal has eluded a satisfactory solution (Pandey, 1956). Juvenile root system supports the intake of water and food requirement of the seedlings once the seed germinates and stored food is consumed. Lack of proper root system, at this stage, results in heavy mortality of seedlings. Insufficient soil moisture and nutrients also adversely affect the growth of

seedlings even if root system has been properly developed. Sal is light demander. Sufficient light is required for proper growth of seedlings. Temperature and humidity are the major factors which affect the germination and growth of the seedlings to a great extent. Root competition with weeds etc., frost, fire and grazing have a devastating effects on the establishment of seedlings of Sal and its associates. This study throws the light on the impact of silvicultural interventions on the establishment of seedlings of Sal and its associates in natural Sal forests of Jharkhand state.

MATERIALS AND METHODS

For studying the impact of certain interventions; such as silvicultural operations, soil and moisture conservation, protection against grazing and fire on the establishment of seedlings of Sal and its associates, 'Kena' forest of Latehar districts of Jharkhand was selected. The details of the site is given in Table 1. For this study, 40 hectare area was selected and it was divided in two equal and similar parts of 20 hectares each. One portion is named as 'Control Plot' which is left as such without any management intervention. Other plot is named as 'Sample Plot' which is subjected to management intervention in the form of complete fencing, protection

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Table 1. Details of Study Site

S.N.	Name of Study Site	Thana/ Thana No.	District	Location	Area in Hectare	
					Sample Plot	Control Plot
1	Kena	Latehar 306	Latehar	23 <sup>o</sup> 47.144 N 84 <sup>o</sup> 29.709 E	20	20

Table 2. Established Seedlings of Sal and its Associates in Number/Hectare

Plot	Species	March 2008	March 2009	March 2010	March 2011	March 2012
Sample Plot	Sal	524	682	692	785	905
	Associate of Sal	182	287	283	442	624
	Total	706	969	975	1227	1529
Control Plot	Sal	409	499	466	536	656
	Associate of Sal	141	142	145	179	227
	Total	550	641	611	715	883

Table 3. Percentage increase/ Decrease in No. of Established Seedlings

Sample Plot/Control Plot	% increase /decrease in Established seedlings of Sal	% increase /decrease in Established seedlings of Sal Associates	% increase /decrease in Established seedlings of Sal and its associates
Sample Plot	(+)72.71	(+)88.74	(+)116.57
Control Plot	(+)60.39	(+)57.33	(+)60.55

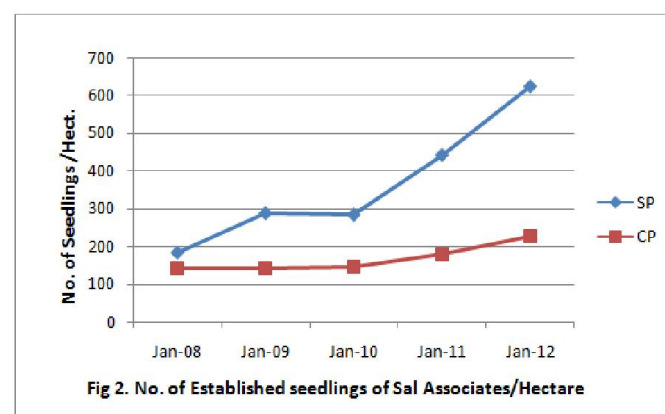
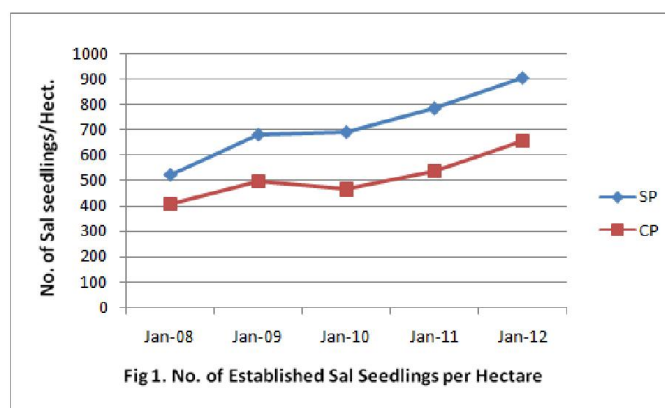
against grazing and fire, soil and moisture conservation measures and silvicultural operations to open the canopy for sufficient light. In 'Sample Plot' and 'Control Plot', 40 quadrants of 10 mt.x10 mt. were made on the basis of random grid sampling. In each quadrant, 5 sub- quadrants were laid- 4 on each corner and one in the centre to count the regeneration in the form of established seedlings. Thus a total of 200 sub-quadrants were laid on each plot of 20 hectare. Starting from 2008, the regeneration data were recorded every year continuously for five years.

## RESULTS AND DISCUSSION

Biotic and climatic factors have a great negative impact on the natural regeneration of Sal and its associates in Jharkhand. Sal seeds have wings, and are dispersed by wind up to 100 meters from the mother tree (Jackson, 1994). Sal seeds germination rate is very high over 90%, the seeds get rain or sufficient moisture within a week. The seed loses its viability within a week, and so if the monsoon, which usually starts in mid June, is delayed, the seed may fail to germinate (Gautam and Devoe, 2006). The Sal tends to regenerate as a mass of seedlings where conditions (Light, soil, moisture with drainage) are favorable and form more or less even aged crops, which are relatively pure, or it forms the bulk of the stock in mixed stands (Troup *et al.*, 1986). In this study, the study site is located in Latehar district where quantum of natural regeneration was not satisfactory which is evident from the five years regeneration data recorded in 'Control Plots'.

'Sample Plot' was protected against grazing and fire. Management interventions were given through soil and moisture conservation measures in form of contour trenches and gully plugging. Silvicultural operations were adopted to facilitate the overhead light and prevent root competition with weeds etc. Sal is a light demanding species, and complete overhead light is needed in most cases from the earliest stages

of its development (Champion and Seth, 1968). For promoting the growth of regeneration opening of canopy is essential. Opening of canopy in a forest stand promotes regeneration and the growth of understory seedlings and saplings (Troup, 1986, Gautam, 1990). The established seedlings data recorded from 2008 to 2012 is given in Table 2.



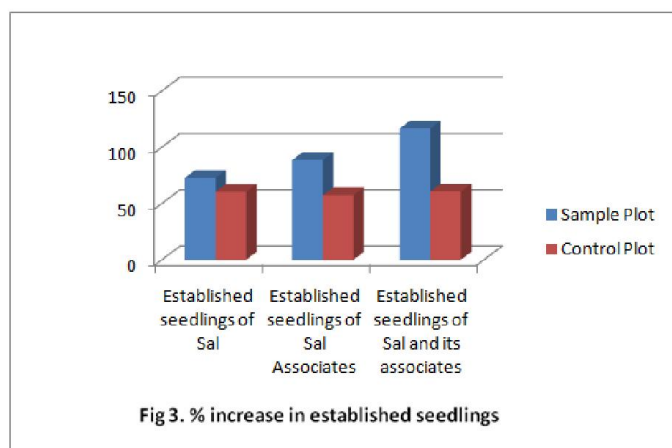


Fig 3. % increase in established seedlings

The data clearly shows that the 'Control Plots' without any interventions had much less established regeneration over the years in comparison to sample plots treated and protected. Percentage growth in 'Sample Plot' and 'Control Plot' has been compared in Table 3. The Fig. 1 to 2 illustrate that establishment of seedlings of Sal and its associates is many folds better in treated 'Sample Plots' in comparison to untreated 'Control Plots'.

### Conclusion

Sal (*Shorea robusta*) is the state tree of Jharkhand state. Planting through plants raised in poly bags is being tried in many states to compensate the inadequate natural regeneration of Sal. Planting of two years old seedlings have been found most suitable as far as growth and feasibility for large scale plantation is concerned (Singh, 2014). But there cannot be any better alternative than finding ways and means to facilitate natural regeneration. This study reveals and validates that simple interventions in form of protection against grazing and fire, soil and moisture conservation measures and silvicultural operations can bring about considerable improvement in establishment of seedlings of Sal and its associates both qualitatively and quantitatively in natural Sal Forests.

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