

THE KENYA FORESTRY RESEARCH INSTITUTE

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**PROSPECTS OF RE-PLANTING CLEARFELLED
FOREST PLANTATIONS WITHOUT SHAMBA SYSTEM**

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the Forest Department to induce them to work in more remote and agriculturally less profitable areas. As licensees, the cultivators also began to maximise crop production and paid less attention to tending of the young trees.

Following these developments, plantation establishment became less successful under shamba system and it became necessary to investigate on other alternative methods such as natural regeneration and direct planting. Initially, natural regeneration appeared promising. However, observations made in 1980 from a clearfelled plantation of Cupressus lusitanica at Ndaragwa Forest Reserve indicated that it was expensive because it resulted in dense patchy regeneration requiring intensive silvicultural operations (Forest Department, 1980). The method was also not favoured for further investigations because it was inappropriate for

utilising the genetically improved seed which was already available in the country.

In 1981, investigations were initiated on direct planting method. The results of a trial with C. lusitanica established at Molo on clearfelled plantation are reported in this paper.

Material and Methods

The experiment (R.E. 392) was located at Molo Forest Reserve situated at $0^{\circ} 17'S$ latitude and $35^{\circ} 45'E$ longitude. The area stands at an altitude of 2,400 m above sea level and receives mean annual rainfall of 1171 mm. The soils are imperfectly drained loams.

The trial was planted in compartment 4H where clearfelling of C. lusitanica was completed in 1980. The experiment had

two treatments. These were site preparation and weeding methods. The site preparation methods were:

1. Clearing and removal of slash from planting lines.
2. Clearing and burning.
3. No preparation (control treatment).

Treatments were carried out during the dry season of February - March 1981. By then the site was covered with light weeds of mainly broad-leaved species. The experiment was planted in April 1981 using C. lusitanica seedlings raised in boxes. The seedlings were about 20 cm in height at the time of planting.

The weeding methods were:

- a. Spot slashing
- b. Spot hoeing
- c. Combination of line slashing and spot hoeing
- d. No weeding (control).

In the weeded treatments, patches of one metre in diameter were slashed or hoed around each tree. Line slashing involved cutting weeds in lines of one metre width, i.e. half metre on each side of the tree. The weeding treatments were carried out twice in the first year (soon after planting and at the end of rainy season) and once in the second year. The design was split-plot of 4x3x4 sub-plots in 4 randomised blocks. The main treatments were site preparation while the weeding methods formed sub-treatments. In each sub-plot, there were 60 trees planted in 3 lines of 20 trees each at square espacement of 2.5 m. The

trees were pruned to half height at the age of two years. The duration of the experiment was three years. At this age the trees are considered established and their canopies closed.

Survival and height assessments were based on the inner 18 trees in each sub-plot. The assessments were done one month after planting and then annually for three years. Height was measured with a graduated stick. Analysis of variance was carried out on the parameters assessed.

Results

The results of survival and height for site preparation and weeding methods are given in Tables 1 and 2 respectively. At three years, there was no significant difference in tree survival between site preparation methods. The percentage

survival was high for all treatments. Under the weeding methods survival difference between treatments was also not significant (Table 2).

At 1, 2 and 3 years, height growth did not differ significantly between the site preparation methods. Trees in the control treatment grew as fast as the other treatments and were even slightly taller by the third year.

Table 1: Effect of site preparation treatments on survival and height growth at 1, 2 and 3 years.

Site preparation treatment	Mean height (m)				Survival at 3 yrs(%)
	At Planting	1 Year	2 Years	3 Years	
Clearing and removal of slash from planting lines	0.20	0.92	1.85	2.68	90.4
Clearing and burning of slash	0.19	0.94	1.89	2.65	88.8
Control - no preparation	0.19	0.89	1.84	2.78	91.6
L.S.D. at 5	-	n.s	n.s	n.s	n.s

As indicated in Table 2, there was no significant difference in height growth between the weeding treatments during the first two years but trees in the control treatment had the lowest mean height.

Table 2: Effect of weeding treatments on survival and height growth at 1, 2 and 3 years

Weeding treatment	Mean height (m)				Survival(%)
	At Planting	1 Yr	2 Yrs	3 Yrs	
Spot slashing	0.20	0.92	1.84	2.81	90.9
Spot hoeing	0.19	0.96	1.90	2.80	90.7
Line slashing & spot hoeing	0.19	0.95	1.95	2.82	90.7
Control - no weeding	0.20	0.83	1.75	2.38	88.8
L.S.D. at 5%	n.s	n.s	n.s	0.12	n.s

In the third year, trees in the weeded treatments had significantly better height growth compared to trees in the control treatment. Height growth of trees did not differ significantly among the weeded treatments.

The interaction between site preparation and weeding methods did not give any significant difference in survival and height growth of trees for the three-year period.

Discussion

The high percentage survival in all treatments was attained mainly because the trial was planted early in the rains and immediately after clearfelling. This allowed the trees to get established before the start of the dry season and before weeds had invaded the planting site. In another direct planting

experiment with the same species, high survival was reported under various site preparation and weeding treatments (Ochieng', 1969). The survival of C. lusitanica on clearfelled plantations is therefore acceptable without any form of site preparation or weeding. However, planting has to be done as soon as logging is completed and before the emergence of weeds.

During the three-year period, the site preparation methods did not improve height growth as compared to the control. This was probably because weed growth was initially light and made little difference. However, Ochieng' (1969) found that cutting and burning all the vegetation gave upto 20 per cent better height growth. It therefore, appears that site preparation is not necessary on clearfelled plantations unless the areas have dense weeds or logging debris. The condition of the site will mainly be

influenced by the duration taken to clearfell a given plantation and the method of logging.

The three weeding methods improved growth compared to the unweeded control. By the third year, height growth in the weeded treatments was about 18 per cent better than in the unweeded control. The weeds therefore, reduced growth in the control plots. In well cultivated plots of C. lusitanica, Pudden (1953) found that trees attained mean height of 3.8 m in three years while in half cultivated and grass infested plots, they had a mean height of 1.8 m. C. lusitanica established under shamba system would normally attain mean height of about 3.3 m by the third year. Height growth under the three weeding treatments was therefore about 15 per cent lower than the average.

Conclusion and Recommendation

High survival and satisfactory establishment of C. Lusitanica can be achieved by means of direct planting of clearfelled plantations. In areas with light weeds and log debris, site preparation may not be necessary. Planting should however, be done as soon as clearfelling is completed and before invasion by weeds. In areas with dense weeds or debris, clearing and burning will give good results but planting must again be done early in the rains. The minimum weeding requirements should be either spot slashing/hoeing carried out twice and once in the first and second years respectively. The second weeding in the first years should be done towards the end of the rains. Further research is needed to determine the appropriate frequencies of weeding. These conclusions and recommendations may also be applied to Pinus patula since it is

less sensitive to weed competition compared to C. lusitanica. However, further studies should be extended into other species.

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