TRIAL ESTABLISHMENT REPORT OF 1999 FARM FIELD TEST OF DOUGLAS-FIR PRODUCTION POPULATION CANDIDATES

D Maika

Report No. 27 February 2000

DOUGLAS-FIR COOPERATIVE

DOUGLAS-FIR COOPERATIVE

EXECUTIVE SUMMARY

TRIAL ESTABLISHMENT REPORT OF 1999 FARM FIELD TEST OF DOUGLAS-FIR PRODUCTION POPULATION CANDIDATES

D. Maika

Report No. 27 **February 2000**

This report details the establishment phase of the Farm Field Test of polycross progeny from Douglas-fir production population candidates. This trial was established in August 1999 at Compartment 602, Beaumont Forest in Southland.

©NEW ZEALAND FOREST RESEARCH INSTITUTE LIMITED - JUNE 1999. All rights reserved. Unless permitted by contract or law, no part of this work may be reproduced, stored or copied in any form or by any means without the express permission of the NEW ZEALAND FOREST RESEARCH INSTITUTE LIMITED.
IMPORTANT DISCLAIMER: The contents of this publication are not intended to be a substitute for specific specialist advise on any matter and should not be relied on for that purpose. NEW ZEALAND FOREST RESEARCH INSTITUTE LIMITED and its employees shall not be liable on any ground for any loss, damage or liability incurred as a direct or indirect result of any reliance by any person upon information contained, or opinions expressed, in this work.
Confidential to participants of the Douglas-Fir Cooperative

INTRODUCTION

The 1959 Douglas-fir provenance trial demonstrated that Douglas-fir from the fog-belt zone of southern Oregon and California was best suited to New Zealand conditions. Because of this, 200 selections were made in trials and stands of those provenances throughout New Zealand. The sources of these selections were from the 1957 and 1959 provenance trials, 1971 and 1974 seed source tests and two seed stands at Rotoehu and one at Mount Thomas.

Scion material was collected from all selections, and of these, 185 clones were successfully grafted and archived at PROSEED's Waikuku seed orchard. The Douglas-fir Co-operative supported progeny testing these selections through control-pollinated seed, using a polycross of ten pollens from trees of Fort Bragg origin (See Appendix 11 for Pollen Mixes and Pollen Quantities). A delay in the availability of pollen meant that few crosses were successful in 1995. More were attempted in 1996, but seed numbers were disappointing. PROSEED augmented the number of crosses with seed produced from several other polycrosses intended for commercial seed production. The main objective of polycross progeny testing of the 185 selection was to select a superior small group of clones to produce commercial control-pollinated seed and for use in open-pollinated seed orchards.

Appendix 9 and 10 lists the parent clones whose progenies were tested in this trial.

TRIAL DESIGN

The trial design is sets-in-replications with single tree plots. There are two sets, nominally of 24 crosses plus one control seedlot. However, due to poor germination of seed in a number of seedlots, those crosses with high germination may be duplicated in a few plots of Set A and several plots in Set B to balance the design.

There are also eight demonstration blocks of 5-tree row plots of most families with surplus trees.

Farm Field Test

This 'farm-field' type of experiment is designed to reduce the waiting time for obtaining assessment data. This is done by using a fertile site to promote rapid growth, accompanied by careful elimination of weed growth. Since the envisioned duration of the test is much shorter than normal, less land is required, as tree spacing can be much closer than normal and site variability within the trial should be reduced.

A farm field test of Douglas-fir in British Colombia, Canada, was compared to 10 forest sites testing the same progenies. The correlations between progeny means for height at age three in the farm field test and volume at age fifteen in forest sites ranged from 0.37 to 0.69 compared to -0.11 to 0.82 for correlations amongst the forest sites. Family mean heritability for age three height at the farm field site was extremely high at 0.88 compared to 0.65 for age fifteen volume at the best forest site.

Plot Dimensions

The spacing of trees within the trial is 1.5m x 2.5m. The dimension of each block is 5 rows x 5 rows and measured 7.5 metres by 12.5 metres, giving an initial stocking of 2667 trees per hectare. The total area planted is 0.47 ha.

The demonstration plots measured 15 metres by 12.5 metres and were planted at a spacing of 3m x 2.5m. The reason for the different spacing from the trial was so to allow retention of 5 trees per row after thinning.

One row of surround was planted around the edge of the trial at the same spacing as the plot trees.

TRIAL SITE

FR375 – Compartment 602, Beaumont Forest, Southland

The ex-pasture site runs along the Clutha river and has favourable site qualities for growing Douglas-fir. The soil classed as 'Clutha' is made up of schist alluvium and schist loams, is medium to high in nutrients and has good drainage. The site has good air drainage and is at an elevation of around 140 masl and was provided by Ernslaw One Ltd.

FIELD LAYOUT

Each block demarcated with yellow numbered 50 mm by 25 mm treated pegs in each corner at the dimensions was 7.5 metres by 12.5 metres for the Single-Tree-Plot Trial and 15 metres by 12.5 metres for the Demonstration Blocks. Each peg was then assigned a number and aluminium tags with corresponding red numbers were stapled to each peg.

Trial Map

A map of the trial was drawn using Autodesks 'AUTOSKETCH" which was later drawn in Microsoft's Excel 97. The trial map, Single-Tree-Plot-map and location maps have been included in the Appendices (Appendix 3-8).

NURSERY

The plants were raised in containers at Forde's nursery, Oamaru in 1997, with the intention of raising plants in one year for planting in 1998. However an inspection of the plants in 1998 revealed that they would benefit from an extra year in the nursery.. A survival count was undertaken in May 1999 (see Appendix 9 &10 for Survival Counts), and due to poor germination of seed, a limited number of plants were available to supply the two planting sites required by the original Workplan. As a compromise, one site was planted with 25 trees per cross. Imbalance in numbers of plants per cross means that some crosses have fewer than 25 plants, so this has been corrected by planting leftover stock from crosses with more than 25 plants.

Lifting

Due to the difficulty posed by uneven numbers of trees per progeny, a spreadsheet was used to show which crosses were present in each set/replicate block for lifting (Appendix 12 & 13).

There were 3 crosses in Set A that had more trees than required and so it was decided to put the extra trees in the trial rather than using fillers. Set B was worse affected, requiring doubling up of 11 crosses, including some used in set A. Where a cross was been used twice, 200 was added to the code number for the extra stock.

One tree of each of the 25 family codes per replication/set were lifted, the roots dipped in water and divided into bundles of five trees. Each bundle was placed into a plastic bag, labelled with the replication number and the set letter code and placed into cardboard boxes for transportation.

TRIAL ESTABLISHMENT/MAPPING

A planting crew was provided by Ernslaw One Ltd. After planting, the position of every tree in each block was mapped on an electronic data logger and all the labels were left on the trees.

REFERENCES

Low C. B. 1997 : Workplan No. 2678 – Farm Field testing of Douglas-fir Production Population Candidates

Low C. B. 1996 : Control pollination of NZ Douglas-fir clones for GCA testing and breeding population establishment - Douglas-fir Co-op report no. 18

Shelbourne C. J. A. 1995 : Douglas-fir Breeding Plan - Douglas-fir Co-op report no. 12

APPENDICES

APPENDIX 1

Register of Field Experiments

F	R	EXPT:		3	7	5	SUB EXPT:		

Forest	Compartment	Year Estab.	Total Area (ha)
BEAUMONT FOREST	**602**	**1999**	**0.47**

Forest Owner:
ERNSLAW ONE LTD

Purpose: (100 Characters Maximum)

TO FARM FIELD TEST DOUGLAS-FIR PRODUCTION POPULATION CANDIDATES

Species Code:				
P	**S**	**M**	**E**	**N**

Key words: (Up to 6 words or phrases of 35 characters)

POLYCROSS PROGENY TEST
PSEUDOTSUGA MENZIESII
FARM FIELD TEST

Experiment Start Year	Current Plots	Plots Terminated	Control Agency	***FR*** Related Projects	***FR*** WP/no.
1999	**50**	**-**	**FRIG**		**2678**

Related Programs							

Contact Officer:
PROJECT 25 – ALTRNATIVE SPECIES

Number of treatments conducted to date: | | |

Treatment:	By Whom:	Date:

Future Management: Up to 300 letters on the proposed management of the trial:
HEIGHTS AND ROOT COLLAR MEASUREMENTS TO BE TAKEN AFTER PLANTING.
A GROWTH AND FORM ASSESSMENT WILL TAKE PLACE AT YEARS 3, 5 OR 6.

GENETIC IMPROVEMENT OF RADIATA PINE IS TO BE CONTACTED BEFORE ANY SILVICULTURAL TREATMENT IS APPLIED

forest research
creative wood-based solutions

Forest Research
Private Bag 3020, Rotorua
Ph: 07 347 5899
Fax: 07 347 9380

APPENDIX 2

TRIAL DESCRIPTION SHEET

FOREST OWNER: ERNSLAW ONE LTD

EXPT. No.: **FR375**

FOREST: BEAUMONT

CPT.: 602

CONTACT PERSON: JOHN PARISH

PHONE: (03) 204-8061
FAX: (03) 204-8067

CONTROLLING AGENCY: ***Forest Research***

WORK PLAN #: 2678 **PROJECT:** 29 **FRI CORR. File:**

PURPOSE: TO FARM FIELD TEST PROGENY FROM DOUGLAS-FIR PRODUCTION POPULATION CANDIDATES

SITE DETAILS:

LATITUDE: 45^0 51′ 30′′ S Lat **LONGITITUDE:** 169^0 29′ 20′′ E Long

ALTITUDE: 140 masl **ASPECT:** Nor-west **SLOPE:** $0\text{-}3^0$

GROUND PREPARATION: Ripped

SOIL TYPE: Clutha soils, made up of schist alluvium and schist loams

PREVIOUS USE: Ex Farm Site

EXPERIMENTAL DETAILS:

SPECIES: *P. menziesii* **STOCK:** 2/0 Plug 1 **DATE PLANTED:** August 1999

 # OF PLOTS: 50 + 8 Demo plots **SIZE OF PLOTS:** Trial (7.5 x 12.5m) Demo Plots (15 x 12.5m) **SPACING:** Trial (1.5 x 2.5m) Demo Plots (3 x 2.5m)

TOTAL AREA: **0.47 ha** **DEMARCATION:** 2 x 1 pegs

EXPERIMENTAL DESIGN:
Sets in replications with single tree plot. 25 Reps and 2 sets (A & B)

PROPOSED TREATMENT:
Height and root collar to be measured after establishment

GTI is to be advised before any silvicultural treatment is applied

PROPOSED YEARS OF ASSESSMENT: 3, 5 or 6 **PERMANANCY:**

ATTACHMENTS:
Trial Map
Single Tree Plot Map
Compartment Map
Forest map
Location Map

APPENDIX 9

DOUGLAS-FIR SEED FOR SET A, FARM FIELD PROGENY TEST, 1998/1999

Code	Clone	Pollen	Seeds	Plants
1	889.589	Fort Bragg pollen mix	81	41
2	888.498	Fort Bragg pollen mix	81	42
3	889.545	Fort Bragg pollen mix	81	33
4	889.598	Fort Bragg pollen mix	32	28
5	888.406	Fort Bragg pollen mix	81	7
6	888.404	Fort Bragg pollen mix	81	21
7	888.468	Fort Bragg pollen mix	81	42
8	889.558	Fort Bragg pollen mix	81	27
9	889.605	Fort Bragg pollen mix	81	48
10	888.467	Fort Bragg pollen mix	81	32
11	888.426	Fort Bragg pollen mix	81	41
12	889.529	Fort Bragg pollen mix	81	59
13	888.456	Fort Bragg pollen mix	81	0
14	889.547	Fort Bragg pollen mix	81	38
15	889.635	Fort Bragg pollen mix	32	0
16	888.420	Fort Bragg pollen mix	81	5
17	889.546	Fort Bragg pollen mix	81	48
18	888.499	Fort Bragg pollen mix	81	33
19	888.495	Fort Bragg pollen mix	81	36
20	889.599	Fort Bragg pollen mix	81	49
21	889.563	Fort Bragg pollen mix	81	47
22	889.532	Fort Bragg pollen mix	81	56
23	889.609	Fort Bragg pollen mix	81	49
24	888.447	Fort Bragg pollen mix	81	54
25	889.592	Fort Bragg pollen mix	81	57
26	889.633	Fort Bragg pollen mix	39	32
27	889.618	Fort Bragg pollen mix	33	25
102	888.452	Berteleda Pollen Mix	62	11
108	889.559	O.P. at Waikuku	81	3
125	889.617	O.P. at Waikuku	81	15
100	Control	Seedlot 94/33	162	40

APPENDIX 10

DOUGLAS-FIR SEED FOR SET B, FARM FIELD PROGENY TEST, 1998/1999

Code	Clone	Pollen	Seeds	Plants
28	889.615	Fort Bragg pollen mix	81	61
29	889.621	Fort Bragg pollen mix	73	43
30	889.611	Fort Bragg pollen mix	55	38
31	889.604	Fort Bragg pollen mix	77	62
32	889.622	Fort Bragg pollen mix	81	52
33	888.432	O.P. ex ortet	81	0
34	888.433	O.P. ex ortet	81	0
35	888.434	O.P. ex ortet	81	0
101	888.431	O.P. at Waikuku	81	3
103	888.452	O.P. at Waikuku	81	23
104	889.538	O.P. at Waikuku	40	3
105	889.554	O.P. at Waikuku	81	2
106	889.555	O.P. at Waikuku	81	1
107	889.557	DeHaven Pollen Mix	81	25
109	889.559	DeHaven Pollen Mix	81	12
110	889.575	O.P. at Waikuku	81	3
111	889.576	O.P. at Waikuku	39	15
112	889.580	O.P. at Waikuku	81	8
113	889.586	O.P. at Waikuku	81	8
114	889.592	O.P. at Waikuku	81	16
115	889.595	Ashley Pollen Mix	53	25
116	889.596	Ashley Pollen Mix	81	23
118	889.598	Ashley Pollen Mix	81	25
119	889.600	Ashley Pollen Mix	70	18
120	889.603	Ashley Pollen Mix	81	10
122	889.613	O.P. at Waikuku	81	20
123	889.614	O.P. at Waikuku	81	5
126	889.617	Berteleda Pollen Mix	47	44
127	889.618	Oregon Pollen Mix	53	15
129	889.624	O.P. at Waikuku	81	4
130	888.424	O.P. at Waikuku	55	3
100	Control	Seedlot 94/33	162	33

APPENDIX 11

POLLEN MIX DETAILS

Pollen Mix	Clone numbers, with ml of pollen in parenthesis
Ashley Pollen Mix	889.554(1300), 889.557(1300), 889.559(1300), 889.561(1300)
Berteleda Pollen Mix	888.402(65), 888.407(88), 888.496(145), 889.526(121), 889.581(147), 889.611(315), 889.612(190)
DeHaven Pollen Mix	888.493(150), 889.585(150), 889.615(150)
Fort Bragg Pollen Mix	895.301(150), 895.302(150), 895.303(150), 895.304(90), 895.305(150), 895.306(110), 895.307(120), 895.308(100), 895.309(65), 895.310(110), 895.311(150)
Oregon Pollen Mix	889.533(70), 889.578(70), 889.609(70), 888.461(70), 889.584(70), 889.607(70)

APPENDIX 12

LIFTING LIST FOR SET A

1A	1	2	3	4	5	6	7	10	11	12	14	16	17	18	19	21	22	23	24	25	26	100	102	108	125
2A	1	2	3	4	5	6	7	10	11	12	14	16	17	18	19	21	22	23	24	25	26	100	102	108	125
3A	1	2	3	4	5	6	7	10	11	12	14	16	17	18	19	21	22	23	24	25	26	100	102	108	125
4A	1	2	3	5	6	7	8	10	11	12	14	16	17	18	19	21	22	23	24	25	26	100	102	125	212
5A	1	2	3	5	6	7	8	10	11	12	14	16	17	18	19	21	22	23	24	25	26	100	102	125	212
6A	1	2	3	4	5	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125
7A	1	2	3	4	5	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125	212
8A	1	2	3	4	5	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125	212
9A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125	212	222
10A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125	212	222
11A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	102	125	212	222
12A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	125	212	222	224
13A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	125	212	222	224
14A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	125	212	222	224
15A	1	2	3	4	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	125	212	222	224
16A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
17A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
18A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
19A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
20A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
21A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
22A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
23A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	212	222	224
24A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	108	212	224
25A	1	2	3	4	6	7	8	10	11	12	14	17	18	19	21	22	23	24	25	26	27	100	108	212	224

APPENDIX 13

LIFTING LIST FOR SET B

1B	9	20	28	29	30	31	32	100	101	103	104	105	106	107	109	110	126	207	209	220	223	228	229	231	232
2B	9	20	28	29	30	31	32	100	101	103	104	105	107	109	110	126	207	209	217	220	223	228	229	231	232
3B	9	20	28	29	30	31	32	100	101	103	104	107	109	110	126	207	209	217	220	221	223	228	229	231	232
4B	9	20	28	29	30	31	32	100	103	107	109	126	129	130	202	207	209	217	220	221	223	228	229	231	232
5B	9	20	28	29	30	31	32	100	103	107	109	126	129	130	202	207	209	217	220	221	223	228	229	231	232
6B	9	20	28	29	30	31	32	100	103	107	109	115	118	126	202	207	209	217	220	221	223	228	229	231	232
7B	9	20	28	29	30	31	32	100	103	107	109	115	118	126	202	207	209	217	220	221	223	228	229	231	232
8B	9	20	28	29	30	31	32	100	103	107	109	115	116	118	126	207	209	217	220	221	223	228	229	231	232
9B	9	20	28	29	30	31	32	100	103	107	109	115	116	118	126	207	209	217	220	221	223	228	229	231	232
10B	9	20	28	29	30	31	32	100	103	107	109	115	116	118	126	207	209	217	220	221	223	228	229	231	232
11B	9	20	28	29	30	31	32	100	103	107	109	115	116	118	122	126	207	209	217	220	223	228	229	231	232
12B	9	20	28	29	30	31	32	100	103	107	109	115	116	118	122	126	207	209	217	220	223	228	229	231	232
13B	9	20	28	29	30	31	32	100	103	107	115	116	118	119	122	126	209	217	220	221	223	228	229	231	232
14B	9	20	28	29	30	31	32	100	103	107	115	116	118	119	122	126	202	209	217	220	221	223	228	231	232
15B	9	20	28	29	30	31	32	100	103	107	114	115	116	118	119	122	126	209	217	220	221	223	228	231	232
16B	9	20	28	29	30	31	32	100	103	107	111	114	115	116	118	119	120	122	126	127	217	223	228	231	232
17B	9	20	28	29	30	31	32	100	103	107	111	114	115	116	118	119	120	122	126	127	221	223	228	231	232
18B	9	20	28	29	30	31	32	100	103	107	111	112	113	114	115	116	118	119	120	122	126	127	223	228	232
19B	9	20	28	29	30	31	32	100	107	111	112	113	114	115	116	118	119	120	122	126	127	221	223	228	232
20B	9	20	28	29	30	31	32	100	107	111	112	113	114	115	116	118	119	120	122	126	127	221	223	228	232
21B	9	20	28	29	30	31	32	100	111	112	113	114	115	116	118	119	120	122	123	126	127	221	223	228	232
22B	9	20	28	29	30	31	32	100	111	112	113	114	115	116	118	119	120	122	123	126	127	202	223	228	232
23B	9	20	28	29	30	31	32	100	111	112	113	114	115	116	118	119	120	122	123	126	127	130	202	228	232
24B	9	20	28	29	30	31	32	100	111	112	113	114	115	116	118	119	120	122	123	126	127	129	202	228	232
25B	9	20	28	29	30	31	32	100	111	112	113	114	115	116	118	119	120	122	123	126	127	129	202	228	232