

Appendices

APPENDIX- I

Measurement of height of coconut palms in different districts

Sl No & Location	District 1 Malappuram	District 2 Palakkad	District 3 Thrissur	
	Location - 1	Location - 1	Location - 1	Location - 4
1	12	12.8	11.5	12.9
2	9.5	13.4	14	13.7
3	11	13.2	18	10.6
4	10	12.9	13	9.8
5	11	14.2	15	14
6	13.5	14	12.5	11.5
7	11	13.8	13.5	10.9
8	17	13.5	13	14.6
9	9	12.5	13	9.9
10	11	15.2	15	8.9
11	9	14.9	15.5	13.1
12	8	12.6	13	12.4
13	15	13.4	10	11.8
14	12.5	15	9.5	10.8
15	13	14.4	11	10.5
	Location -2	Location - 2	Location - 2	Location - 5
1	13.5	11.2	9	4.5
2	15	10.5	9.5	4.7
3	17.5	11.5	9	3
4	11.5	9.8	11	4.2
5	13	11.7	10	4.2
6	15.5	12.3	8.5	6
7	14	13.2	12	5.1
8	15	10.5	12	3
9	11.5	10.9	9	3.3
10	12	11.5	8.5	3
11	13	12.2	9	4.7
12	12.5	11.8	11	6.3
13	13	11	12	4.3
14	12	9.8	10	5.2
15	15	10.5	9.5	4.5

	Location -3	Location - 3	Location - 3
1	3.1	2.6	11.8
2	3.7	5	11.3
3	3.3	4.7	10.7
4	3.5	5	13
5	4	5.3	12.8
6	3.5	3.6	9.9
7	4.2	4.6	12.9
8	3.3	3.3	12
9	4.5	4.9	12.2
10	3.5	3.8	10.7
11	3.8	3.1	9.8
12	4.2	4.2	10.6
13	3.8	3.8	11.4
14	4.5	3.2	9.7
15	4	2.7	12.6

APPENDIX - II

Measurement of diameters (cm) at three levels of coconut palms in different districts

SI No & Location	District 1 Malappuram			District 2 Palakkad			District 3 Th			
	Location - 1			Location - 1			Location - 1			
	DBH	Mid dia	Top dia	DBH	Mid dia	Top dia	DBH	Mid dia	Top dia	I
1	20	19.5	19	28.9	27.8	27	22.3	23.5	22	
2	26	24	23	30.2	28.6	28.2	28.5	27	23	
3	18.5	17	17	27.5	26	25.2	29.6	28	24	
4	24.5	24.5	23	28	27.5	25	27.5	28	27.5	
5	22	20.5	20	29.5	27	25.9	29.3	26	23	
6	24.1	24	24	27.6	26.4	25.9	30.3	28	26	
7	19	19.5	19	24.5	24	23.1	29.8	30	29.5	
8	27	25.5	25	26.8	25.4	24.2	26.8	26	26	
9	25	24.5	24	26	24.7	23.9	26.9	25	24	
10	21.5	20	18.5	28.4	26.3	24.8	29.3	30.5	28.5	
11	23	21	20.5	29	28.2	27.7	26.6	29.5	27	
12	22.6	20.6	20	28.5	27.9	27	23.7	25.5	24	
13	25	23.5	22.5	26.4	25.8	24.6	24.8	27	25.5	
14	22	21	20.5	24.9	24	22.8	22.9	25.5	24.5	
15	24	23.5	22	27.5	26.8	24.9	26.2	25	24	
	Location -2			Location - 2			Location - 2			
1	26.3	25.8	25.6	24.5	23.8	22	25.5	25	22.5	
2	24	23.2	22.8	26	24.9	23.8	27.2	25.5	24	

3	26.7	26.3	25.6	25.8	24.8	23.5	25.2	24.7	24.2	
4	25.2	24.8	23.7	24.9	23	22.5	26.4	25.6	25	
5	26.3	25.5	25	30.1	28.5	26.5	25.3	24.5	24.2	
6	26.9	26.6	26	28.5	27.2	26.9	27.4	27.2	26.6	
7	24.8	24.2	23.6	26.4	25.2	24.1	29.5	28.3	27.7	
8	24.8	24	23.7	25	23.5	22	29	28.5	28.2	
9	21.9	20.9	20.2	26.8	26.2	25.1	27.7	28	27.1	
10	24.2	24.2	23.4	25.5	24.9	23.2	24.5	23.7	22.6	
11	25.9	25.5	25	24	23.2	22.2	27.5	26.9	26.4	
12	21.9	20.9	19.7	26.7	25.4	24.4	28.8	28	27.7	
13	25.4	25.2	23.4	24.9	24.2	22.9	30.2	29	28.7	
14	22.1	21.8	20.9	25.6	23.5	21	28.3	27.9	28	
15	26.6	26.2	25.4	26.6	25.9	24.1	26.8	26.4	26.4	
	Location -3			Location - 3			Location - 3			
1	23.4	22.5	22.2	26.3	25.6	25	25.6	23	20.5	
2	32	31.7	30.5	29.4	29.2	28.2	23	20.5	19	
3	29	28.2	26.9	30.9	30.4	29.5	24.5	22	21	
4	27.3	27.1	26.6	30.7	30.2	29	24.1	22	20	
5	30.3	29.3	28.3	31.5	30.3	30	25.5	22.5	21.5	
6	26.6	25.6	24.5	27.3	26.5	25.5	20	19.5	18.5	
7	26.2	25.1	24.3	30.4	29.5	28.6	25	22	20.5	
8	24	23.3	22.2	27.1	26.1	25.6	20.9	20.5	18.5	
9	29.5	28.2	27.7	28.7	28	27.3	25.7	22	18.5	
10	27.6	27.4	27.1	31.8	30.5	29.7	22.2	22	20	
11	27.2	25.8	24.2	25.3	23.6	23.2	20.8	20.5	20.5	
12	30.6	30.3	29.4	27.3	26.1	25.6	22.2	21.5	18.5	
13	29.4	27.7	27.1	26.8	25.9	25.4	32	25	22.5	
14	26.6	26.4	25.5	28.2	27.3	27.1	19.5	17.5	17	
15	24.4	23.1	22.5	27.6	26.5	26.1	21.5	21	20.5	

APPENDIX III

Measurement of girths at three levels of coconut palms in different districts

SI No & Location	District 1 Malappuram			District 2 Palakkad			District 3 Thrissur		
	Location - 1			Location - 1			Location - 1		
	GBH	Mid girth	Top girth	GBH	Mid girth	Top girth	GBH	Mid girth	Top girth
1	62.8	61.2	59.7	90.7	87.3	84.8	70	73.8	69.1
2	81.6	75.4	72.2	94.8	89.8	88.5	89.6	84.7	72.2
3	58.1	53.4	53.4	86.4	81.6	79.1	93	87.9	75.4
4	76.9	76.9	72.2	87.9	86.4	78.5	86.5	87.9	86.4
5	69.1	64.4	62.8	92.6	84.8	81.3	92	81.6	72.2
6	75.6	75.5	75.3	86.7	82.9	81.3	95	87.9	81.6
7	59.7	61.2	59.7	76.9	75.4	72.5	93.5	94.2	92.6
8	84.8	80.1	78.5	84.2	79.8	76	84	81.6	81.6
9	78.5	76.9	75.4	81.6	77.6	75	84.4	78.5	75.4
10	67.5	62.8	58.1	89.2	82.6	77.9	92	95.8	89.5
11	72.2	65.9	64.4	91.1	88.5	87	83.5	92.6	84.8
12	70.9	64.8	62.7	89.5	87.6	84.8	74.5	80.1	75.4
13	78.5	73.8	70.7	82.9	81	77.2	77.8	84.8	80.1
14	69.1	65.9	64.4	78.2	75.4	71.6	72	80.1	76.9
15	75.4	73.8	69.1	86.4	84.2	78.2	82.4	78.5	75.4
	Location - 2			Location - 2			Location - 2		
1	82.5	81	80.5	76.9	74.7	69.1	80	78.5	70.7
2	75.5	73	71.5	81.6	78.2	74.7	85.5	80.1	75.4
3	83.7	82.5	80.3	81	77.9	73.8	79	77.5	76
4	79	78	74.5	78.2	72.2	70.7	83	80.5	78.5
5	82.5	80	78.5	94.5	89.5	83.2	79.4	77	76

6	84.4	83.5	81.5	89.5	85.4	84.5	86	85.5	83.5
7	77.8	76	74	82.9	79.1	75.7	92.5	88.8	87
8	77.9	75.5	74.5	78.5	73.8	69.1	91	89.4	88.5
9	68.8	65.5	63.4	84.2	82.3	78.8	87	88	85
10	76	76	73.5	80.1	78.2	72.8	77	74.5	71
11	81.3	80.2	78.5	75.4	72.8	69.7	86.5	84.5	83
12	68.8	65.7	62	83.8	79.8	76.6	90.4	87.9	87
13	79.6	79	73.5	78.2	76	71.9	94.8	91.2	90
14	69.5	68.4	65.7	80.4	73.8	65.9	89	87.7	88
15	83.6	82.2	79.7	83.5	81.3	75.7	84	83	83
	Location -3			Location - 3			Location - 3		
1	73.5	70.6	69.8	82.5	80.4	78.6	80.5	72.2	64.4
2	100.48	99.6	95.8	92.3	91.8	88.7	72.2	64.4	59.7
3	91	88.5	84.4	97	95.4	92.6	76.9	69.1	65.9
4	85.6	85	83.6	96.5	94.8	91	75.6	69.1	62.8
5	95	92	89	98.9	95	94.2	80	70.7	67.5
6	83.5	80.5	76.8	85.8	83.2	80	62.8	61.2	58.1
7	82.4	78.9	76.2	95.4	92.6	89.7	78.5	69.1	64.4
8	75.5	73.2	69.8	85	82	80.3	65.5	64.4	58.1
9	92.5	88.6	87	90.2	87.9	85.6	80.7	69.1	58.1
10	86.7	86	85	99.8	95.9	93.4	69.8	69.1	62.8
11	85.5	81	76	79.4	74.2	72.7	65.4	64.4	64.4
12	96	95	92.3	85.6	82	80.3	69.8	67.5	58.1
13	92.4	87	85	84.3	81.4	79.8	100.4	78.5	70.7
14	83.5	82.8	80.1	88.5	85.8	85	61.2	55	53.4
15	76.5	72.4	70.6	86.8	83.2	82.1	67.5	65.9	64.4

APPENDIX - IV

Measurement of crown width and number of leaves of coconut palms in different dis

SI No & Location	District 1 Malappuram		District 2 Palakkad		District 3	
	Location - 1		Location - 1		Location - 1	
	Crown width (m)	No.of leaves	Crown width (m)	No.of leaves	Crown width (m)	No.of leaves
1	7.5	28	10.2	32	7.5	2
2	9.4	19	9.8	29	9	3
3	8.5	12	8.7	32	8	3
4	7.3	23	10.1	28	9.5	2
5	8	32	8.9	29	9	3
6	8.8	34	9.4	28	9	3
7	7.5	17	9.5	27	11	3
8	8.5	18	10.3	32	10.5	2
9	9.2	24	9.8	31	10	3
10	9	17	9.5	28	9	3
11	8.5	21	9.8	26	10	3
12	8	26	10.1	29	8.5	2
13	8.5	28	8.7	31	7.5	2
14	7.8	24	8.9	29	9	3
15	8	26	9.5	27	9.2	2
	Location -2		Location - 2		Location - 2	
1	8.5	28	8.9	32	9	2
2	9	24	10.2	30	11	3
3	9.4	31	8.7	32	9.5	2

4	8	27	9.2	28	10	3
5	8.5	23	9.4	27	9	2
6	9.5	29	8.5	29	10	2
7	10.5	27	7.9	32	11	3
8	9	30	8.9	31	10.5	3
9	10	28	10.5	28	8.5	2
10	8.5	28	11	27	9.5	3
11	11	21	8.9	31	11	2
12	8.5	19	7.8	30	10.8	3
13	9.5	27	8.8	28	9	2
14	9	28	9.5	26	8.5	3
15	10.5	25	10.5	29	9	3
	Location -3		Location - 3		Location - 3	
1	10.5	28	9	27	10.2	3
2	9.5	32	8	26	10.5	2
3	9	28	9	28	9.6	3
4	8.5	29	7.6	32	10.6	3
5	7.5	31	10	34	10.2	2
6	9	27	9.5	24	10.3	2
7	9.5	31	8	28	7.9	3
8	8.6	29	8.3	25	8.6	3
9	11.5	29	8.2	32	7.9	3
10	8.5	32	7.8	23	10.6	3
11	9	27	9.3	25	9.9	3
12	9.5	29	9.8	21	8.2	2
13	10	31	8.2	27	10.4	3
14	7.6	28	9.7	26	9.4	2
15	7.5	27	9.4	29	8.4	2

APPENDIX – V

Measurement of inclination (⁰) of coconut palms in different districts

SI No &	District 1 Malappuram	District 2 Palakkad	District 3 Thrissur	
Location	Location - 1	Location - 1	Location - 1	Location - 4
1	90	90	90	90
2	90	90	70	90
3	90	90	90	90
4	90	90	90	90
5	70	90	90	90
6	90	75	75	90
7	90	90	90	90
8	75	90	90	90
9	90	70	90	90
10	90	90	90	90
11	90	90	90	90
12	90	75	90	90
13	90	90	90	90
14	90	90	90	90
15	90	90	90	90
	Location - 2	Location - 2	Location - 2	Location - 5
1	90	90	75	90
2	90	90	90	75
3	68	90	90	90
4	90	90	90	90
5	90	75	90	90
6	90	90	90	90

7	90	90	70	90
8	90	80	90	80
9	75	90	90	90
10	90	90	90	90
11	90	90	90	90
12	90	80	90	90
13	90	90	80	90
14	90	90	90	90
15	90	90	90	90
	Location -3	Location - 3	Location - 3	
1	90	90	90	
2	90	90	90	
3	90	80	90	
4	90	90	80	
5	90	85	90	
6	90	90	90	
7	80	90	85	
8	90	90	90	
9	90	80	90	
10	90	90	90	
11	90	90	90	
12	90	90	90	
13	90	90	90	
14	80	90	90	
15	90	90	90	

APPENDIX- VI

Hardness of coconut palm using wedge shaped tool at four different depths

Sl. No.	At 1 mm		At 2 mm		At 3 mm		At 4 mm	
	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)
1	144.49	4.19	41.07	6.59	548.21	4.63	835.06	4.97
2	253.92	7.36	72.17	5.04	474.62	4.00	532.21	3.17
3	208.85	6.05	59.36	4.48	634.94	5.36	536.33	3.19
4	273.40	7.92	77.71	6.03	437.76	3.69	821.94	4.89
5	180.20	5.22	51.22	4.22	475.46	4.01	709.93	4.22
6	213.11	6.17	60.57	5.93	474.55	4.00	493.25	2.93
7	230.13	6.67	65.41	6.40	649.83	5.48	488.17	2.90
8	323.60	9.38	91.97	4.74	543.32	4.58	844.92	5.03
9	149.22	4.32	42.41	6.39	458.14	3.87	675.75	4.02
10	238.83	6.92	67.88	4.82	440.21	3.71	527.08	3.14
11	232.14	6.73	65.98	5.14	680.07	5.74	772.25	4.60
12	241.74	7.00	68.71	4.28	575.97	4.86	634.82	3.78
13	209.16	6.06	59.45	5.13	433.74	3.66	670.85	3.99
14	175.02	5.07	49.74	5.03	454.56	3.84	778.55	4.63
15	140.52	4.07	39.94	6.51	484.87	4.09	714.57	4.25
16	214.70	6.22	61.02	4.27	512.46	4.32	687.94	4.09
17	229.67	6.65	65.28	4.87	489.92	4.13	511.23	3.04
18	194.08	5.62	55.16	5.67	534.96	4.51	557.63	3.32
19	138.48	4.01	39.36	5.05	479.13	4.04	567.35	3.38
20	179.75	5.21	51.09	4.21	455.89	3.85	688.11	4.09
21	262.13	7.59	74.50	5.74	552.44	4.66	576.07	3.43
22	209.31	6.06	59.49	4.55	484.79	4.09	513.69	3.06
23	233.89	6.78	66.48	5.95	580.19	4.90	867.32	5.16
24	169.97	4.92	48.31	3.89	503.91	4.25	778.14	4.63
25	177.83	5.15	50.54	4.21	430.58	3.63	694.67	4.13
26	242.58	7.03	68.95	5.62	512.33	4.32	732.97	4.36
27	182.99	5.30	52.01	4.68	456.81	3.85	582.07	3.46
28	232.88	6.75	66.19	4.43	489.92	4.13	556.36	3.31
29	251.96	7.30	71.61	5.21	532.80	4.50	588.67	3.50
30	240.96	6.98	68.49	4.02	478.02	4.03	569.99	3.39
Avg	212.52	6.16	60.40	5.10	508.68	4.29	650.26	3.87

APPENDIX- VII

Hardness of coconut palm using square shaped tool at four different depths

Sl.No.	At 1 mm		At 2 mm		At 3 mm		At 4 mm	
	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)
1	148.71	4.65	191.55	3.99	222.33	3.47	244.97	3.06
2	220.45	6.89	290.24	6.05	331.78	5.18	340.81	4.26
3	179.73	5.62	224.26	4.67	241.03	3.77	277.82	3.47
4	228.99	7.16	276.92	5.77	317.67	4.96	355.37	4.44
5	282.73	8.84	322.24	6.71	364.94	5.70	400.60	5.01
6	261.16	8.16	300.36	6.26	355.94	5.56	380.01	4.75
7	212.80	6.65	286.75	5.97	345.35	5.40	393.64	4.92
8	259.03	8.09	300.53	6.26	327.77	5.12	383.75	4.80
9	293.83	9.18	306.31	6.38	347.07	5.42	410.26	5.13
10	165.03	5.16	208.57	4.35	248.03	3.88	291.78	3.65
11	150.21	4.69	181.30	3.78	228.11	3.56	257.25	3.22
12	206.02	6.44	275.73	5.74	297.92	4.65	315.19	3.94
13	159.91	5.00	213.48	4.45	246.47	3.85	292.62	3.66
14	149.48	4.67	208.17	4.34	263.71	4.12	301.37	3.77
15	172.94	5.40	224.55	4.68	234.10	3.66	273.10	3.41
16	177.87	5.56	228.60	4.76	283.39	4.43	335.30	4.19
17	216.09	6.75	257.06	5.36	285.65	4.46	342.38	4.28
18	192.77	6.02	237.69	4.95	279.86	4.37	296.50	3.71
19	217.44	6.79	291.64	6.08	315.56	4.93	344.57	4.31
20	162.12	5.07	188.32	3.92	219.04	3.42	248.22	3.10
21	178.35	5.57	238.40	4.97	287.45	4.49	317.77	3.97
22	234.32	7.32	262.14	5.46	295.63	4.62	318.02	3.98
23	190.21	5.94	222.02	4.63	257.38	4.02	302.99	3.79
24	222.65	6.96	275.69	5.74	316.02	4.94	297.73	3.72
25	176.85	5.53	228.21	4.75	259.30	4.05	293.17	3.66
26	155.81	4.87	184.68	3.85	224.10	3.50	236.66	2.96
27	209.16	6.54	247.29	5.15	291.60	4.56	327.67	4.10
28	237.21	7.41	299.33	6.24	362.26	5.66	374.82	4.69
29	256.65	8.02	317.02	6.60	371.31	5.80	391.28	4.89
30	162.07	5.06	208.10	4.34	248.67	3.89	276.72	3.46
Avg	202.69	6.33	249.90	5.21	288.98	4.52	320.74	4.01

APPENDIX- VIII

Hardness of coconut palm using sphere shaped tool at four different depths

Sl.No.	At 1 mm		At 2 mm		At 3 mm		At 4 mm	
	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)	Force (N)	Hardness (N/mm ²)
1	437.90	10.73	547.75	6.71	663.97	5.42	717.88	4.40
2	263.53	6.46	439.79	5.39	499.54	4.08	665.82	4.08
3	249.98	6.12	337.12	4.13	582.15	4.75	613.83	3.76
4	171.41	4.20	290.48	3.56	565.78	4.62	639.14	3.91
5	229.67	5.63	307.47	3.77	553.90	4.52	636.87	3.90
6	190.01	4.65	485.85	5.95	560.87	4.58	749.30	4.59
7	270.55	6.63	533.10	6.53	577.79	4.72	681.52	4.17
8	316.33	7.75	383.88	4.70	664.48	5.43	646.12	3.96
9	336.89	8.25	366.11	4.48	572.66	4.68	658.49	4.03
10	237.68	5.82	360.87	4.42	570.27	4.66	699.71	4.29
11	400.60	9.81	474.56	5.81	536.31	4.38	662.38	4.06
12	332.20	8.14	400.03	4.90	551.15	4.50	685.05	4.20
13	281.28	6.89	349.59	4.28	584.88	4.78	653.47	4.00
14	341.18	8.36	438.67	5.37	573.06	4.68	705.21	4.32
15	389.21	9.53	425.51	5.21	512.22	4.18	679.21	4.16
16	256.13	6.27	406.66	4.98	624.70	5.10	688.14	4.21
17	264.93	6.49	564.40	6.91	495.69	4.05	681.17	4.17
18	214.66	5.26	416.81	5.11	581.00	4.74	708.54	4.34
19	249.79	6.12	526.58	6.45	678.99	5.54	661.51	4.05
20	317.12	7.77	484.43	5.93	651.59	5.32	671.17	4.11
21	261.51	6.41	374.47	4.59	630.80	5.15	625.15	3.83
22	191.51	4.69	502.81	6.16	609.45	4.98	630.93	3.86
23	271.32	6.65	374.01	4.58	481.87	3.93	686.91	4.21
24	227.87	5.58	528.57	6.47	477.70	3.90	632.02	3.87
25	320.19	7.84	374.26	4.58	561.16	4.58	648.90	3.97
26	306.63	7.51	482.40	5.91	610.76	4.99	665.92	4.08
27	269.30	6.60	540.54	6.62	580.73	4.74	669.17	4.10
28	328.71	8.05	487.78	5.97	539.07	4.40	689.66	4.22
29	178.90	4.38	533.32	6.53	581.25	4.75	681.16	4.17
30	285.74	7.00	373.88	4.58	560.70	4.58	625.20	3.83
Avg	279.76	6.85	437.06	5.35	574.48	4.69	668.65	4.10

APPENDIX - IX**Performance of developed coconut climbing device with load**

Sl. No.	Setting time (s)	Time to climb up 1 m (s)	Speed of climbing up (m s⁻¹)	Total time to climb up 7 m	Total time to climb up 12 m palm (s)	Time to climb down 1 m (s)	Speed of climbing down (m s⁻¹)	Total time to climb down 7 m	
1	38.0000	2.9425	0.3398	20.5975	58.5975	2.8167	0.3550	19.7167	
2	41.0000	2.9833	0.3352	20.8833	61.8833	2.6817	0.3729	18.7717	
3	49.0000	2.9167	0.3429	20.4167	69.4167	2.4800	0.4032	17.3600	
4	42.0000	2.9617	0.3376	20.7317	62.7317	2.4367	0.4104	17.0567	
5	41.0000	2.9583	0.3380	20.7083	61.7083	2.6908	0.3716	18.8358	
6	37.0000	2.9175	0.3428	20.4225	57.4225	2.7933	0.3580	19.5533	
7	44.0000	2.9192	0.3426	20.4342	64.4342	2.4733	0.4043	17.3133	
8	38.0000	2.9433	0.3398	20.6033	58.6033	2.7858	0.3590	19.5008	
9	43.0000	2.9325	0.3410	20.5275	63.5275	2.7108	0.3689	18.9758	
10	38.0000	2.9192	0.3426	20.4342	58.4342	2.7875	0.3587	19.5125	
11	39.0000	2.9483	0.3392	20.6383	59.6383	2.8767	0.3476	20.1367	
12	44.0000	2.9792	0.3357	20.8542	64.8542	2.4625	0.4061	17.2375	
13	40.0000	2.9233	0.3421	20.4633	60.4633	2.6842	0.3726	18.7892	
14	39.0000	2.9625	0.3376	20.7375	59.7375	2.7508	0.3635	19.2558	
15	41.0000	2.9500	0.3390	20.6500	61.6500	2.5767	0.3881	18.0367	
Average	40.9333	2.9438	0.3397	20.6068	61.5402	2.6672	0.3760	18.6702	

APPENDIX- X

Performance of developed coconut climbing device without load

Sl. No.	Setting time (s)	Time to climb up 1 m (s)	Speed of climbing (m s ⁻¹)	Total time to climb up 7 m	Total time to climb up 12 m palm (s)	Time to climb down 1 m (s)	Speed of climbing down (m s ⁻¹)	Total time to climb down 7 m	r
1	38.0000	2.9425	0.3398	20.5975	58.5975	2.8167	0.3550	19.7167	
2	41.0000	2.9833	0.3352	20.8833	61.8833	2.6817	0.3729	18.7717	
3	49.0000	2.9167	0.3429	20.4167	69.4167	2.4800	0.4032	17.3600	
4	42.0000	2.9617	0.3376	20.7317	62.7317	2.4367	0.4104	17.0567	
5	41.0000	2.9583	0.3380	20.7083	61.7083	2.6908	0.3716	18.8358	
6	37.0000	2.9175	0.3428	20.4225	57.4225	2.7933	0.3580	19.5533	
7	44.0000	2.9192	0.3426	20.4342	64.4342	2.4733	0.4043	17.3133	
8	38.0000	2.9433	0.3398	20.6033	58.6033	2.7858	0.3590	19.5008	
9	43.0000	2.9325	0.3410	20.5275	63.5275	2.7108	0.3689	18.9758	
10	38.0000	2.9192	0.3426	20.4342	58.4342	2.7875	0.3587	19.5125	
11	39.0000	2.9483	0.3392	20.6383	59.6383	2.8767	0.3476	20.1367	
12	44.0000	2.9792	0.3357	20.8542	64.8542	2.4625	0.4061	17.2375	
13	40.0000	2.9233	0.3421	20.4633	60.4633	2.6842	0.3726	18.7892	
14	39.0000	2.9625	0.3376	20.7375	59.7375	2.7508	0.3635	19.2558	
15	41.0000	2.9500	0.3390	20.6500	61.6500	2.5767	0.3881	18.0367	
Avg	40.9333	2.9438	0.3397	20.6068	61.5402	2.6672	0.3760	18.6702	

APPENDIX- XI

Cost analysis of developed coconut palm climber

Sl. No.	Particulars	Calculation	Unit	Amount	Remarks
1	Capital Investment	C	Rs	95000.00	
2	Life	L	yrs	15.00	
3	Resale value	S	Rs	9500.00	10 % of C
4	Hours of operation in a year	H	hr	1800.00	6 × 25 × 12
Fixed cost					
5	Annual depreciation	$C - S \div L$	Rs/year	5700.00	
6	Depreciation	$C - S \div L \times H$	Rs/hr	3.17	
7	Interest on C	$((C + S \div 2) \times I) \div H$	Rs/ hr	2.18	I= 7.5 %
8	Housing charges	$(C \times 20/100)/L \times H$	Rs/hr	1.06	2%
9	Total F C		Rs/hr	6.40	
Operating Cost					
10	Engine Gen set	Rs/hr	Rs/hr	52.000	FC=0.5 Lit/hr
11	Labour	Daily wage/ hrs of work	Rs/hr	166.67	6 hrs/day@ 1000/day
12	Lubrication charges		Rs/hr	15.60	30 % of FC
13	Total operating cost		Rs/hr	234.27	
14	Total cost	FC + OC	Rs/hr	240.67	Rs 182 only in case of Electric power
15	Cost of climbing /tree		Rs/tree	40.00	6 trees/hr
16	Break-even point	$(C - S) \div \text{hire rate} - \text{Cost of climbing/tree}$	No.of trees	8550	Custom hire charges as Rs 50/tree
			Days	1425	@ 6 hrs per day
			Months	57	@ 25 days per months
			Years	4.75	