

Systems Cost

Objectives for Today

- Review logging costs across entire harvest system
- Compare costs by harvest system

1

System Costs

- What makes a system different?
 - Different equipment for different functions
 - Scheduled hours may vary with function
 - Multiple pieces of equipment within a function
 - Equipment/functions interact with each other

2

Modified Machine Rates

- Handles an unlimited number of functions
- Handles different scheduled hours per function
- Handles multiple pieces of equipment per function
- System productivity is limited to the slowest function
 - Models interaction between functions
 - Maximum utilization
 - Effective utilization

3

System Cost Example

- 200 acre tract
- 28.35 cords/acre to be removed
- 45 scheduled weeks/year, 5 days/week
 - truckers 12 hours/day, others 9 hours/day
- System:
 - 5 chainsaws/operators
 - 2 cable skidders/operators
 - 1 knuckleboom loader/operator
 - 2 tri-axle trucks/operators

4

Felling, limbing, topping, & bucking details

initial investment: \$550
salvage value: 0%
int., insur, & taxes: 20%
maintenance & repairs: 100%
fringes: 36%

economic life: 1 year
utilization: 50%
fuel & lube: \$1.20/phr
operator's wage: \$7.25/hr
productivity: 1.70 cords/phr

5

Skidding details

initial investment: \$75,000
salvage value: 25%
int., insur, & taxes: 20%
maintenance & repairs: 60%
operator's wage: \$7.50/hr
productivity: 5.14 cords/phr

economic life: 3 years
utilization: 67%
fuel & lube: \$3.81/phr
tires: \$2.68/phr
fringes: 36%

6

Loading details

initial investment: \$55,000
 salvage value: 30%
 int., insur., & taxes: 20%
 maintenance & repairs: 50%
 operator's wage: \$7.00/hr
 productivity: 14.18 cords/phr

economic life: 5 years
 utilization: 65%
 fuel & lube: \$2.55/phr
 tires: \$0.50/phr
 fringes: 36%

7

Hauling details

initial investment: \$57,000
 salvage value: 30%
 int., insur., & taxes: 32%
 maintenance & repairs: 50%
 operator's wage: \$7.30/hr
 productivity: 3.61 cords/phr

economic life: 4 years
 utilization: 90%
 fuel & lube: \$6.85/phr
 tires: \$2.50/phr
 fringes: 36%

8

System Costs -- Productivity

SYSTEM HARVESTING COSTS

	Acres	200	Woods		Hauling	
			Hours/Day	9		12
	Tree/Acre	112	Days/Week	5	5	
	Cord/Acre	28.35	Weeks/Year	45	45	
Production per Unit						
			FELLING	SKIDDING	LOADING	HAULING
Number			5	2	1	2
Cord/Phr			1.70	5.14	14.18	3.61
Max Util (%)			50	67	65	90
Cord/Phr			1.70	5.14	14.18	4.81
Cord/Shr (one)			0.85	3.44	9.22	4.33
Cord/Shr (all)			4.25	6.89	9.22	8.66
Effective Util			50	41	30	44

9

Background info

	FELLING	SKIDDING	LOADING	HAULING
Background Info				
Initial Investment	\$550	\$75,000	\$55,000	\$57,000
Lifetime	1	3	5	4
I,I,T rate	20	20	20	32
Salvage %	0	25	30	30
M & R rate	100	60	50	50
Salvage Value	0	18750	16500	17100
AFI	550	56250	39600	42038
Pay Rate	\$7.25	\$7.50	\$7.00	\$7.30
Fringe Benefits	36	36	36	36

10

Cost info

	FELLING	SKIDDING	LOADING	HAULING
Cost per Unit				
Depreciation (\$/Shr)	\$0.27	\$9.26	\$3.90	\$4.93
I,I & T (\$/Shr)	\$0.05	\$5.56	\$3.91	\$6.64
Maint & Rep (\$/Yr)	\$550.00	\$11,250.00	\$3,850.00	\$4,987.50
Fuel & Lub (\$/Phr)	\$1.20	\$3.81	\$2.55	\$6.85
Tires (\$/Phr)	\$0.00	\$2.68	\$0.50	\$2.50
Labor (\$/Shr)	\$9.86	\$10.20	\$9.52	\$13.24
Costs per Function				
Fixed Cost/SHr	\$1.60	\$29.64	\$7.71	\$23.14
Oper. Cost/SHr	\$4.36	\$16.43	\$2.82	\$13.15
Labor Cost/SHr	\$49.30	\$20.40	\$9.52	\$26.48
Total Cost/SHr	\$55.26	\$66.47	\$20.05	\$62.77
Cost/Cord	\$13.00	\$15.64	\$4.72	\$14.77

11

System Costs

System Rate (Cord/SHr)	4.25
System Cost/SHr	\$204.55
System Cost/cord	\$48.13
Weekly Prod (cords)	191
Days to cut tract	149

12

System Cost Form

SYSTEM HARVESTING COSTS					
	Acres	200	Hours/Day	Woods	Harvest
	Trees/Acre	112	Days/Week	5	5
	Cord/Acre	28.35	Weeks/Year	45	45
Production per Unit					
Name	5	2	1	2	
Cord/PHr	1.70	5.14	14.18	3.61	
Max Util (%)	50	67	65	90	
Cord/PHr	1.70	5.14	14.18	4.81	
Cord/SHr (one)	0.85	3.44	9.22	4.33	
Cord/SHr (two)	4.25	6.89	9.22	8.66	
Effective Util	50	41	30	44	
Background Info					
Initial Investment	\$550	\$75,000	\$65,000	\$67,000	
Lifetime	1	3	5	4	
I,T rate	20	20	20	32	
Salvage %	0	25	30	30	
M & R rate	100	60	50	50	
Salvage Value	0	18750	16500	17100	
AFI	550	56250	39800	42038	
Pay Rate	\$7.25	\$7.50	\$7.00	\$7.30	
Fringe Benefits	36	36	36	36	
Cost per Unit					
Depreciation (\$/SHr)	\$0.27	\$9.26	\$3.80	\$4.93	
I,U,T (\$/SHr)	\$0.05	\$5.66	\$3.91	\$6.64	
Maint & Rep (\$/Yr)	\$550.00	\$11,250.00	\$3,850.00	\$4,987.50	
Fuel & Lub (\$/PHr)	\$1.20	\$3.81	\$2.56	\$6.85	
Tires (\$/PHr)	\$0.00	\$2.88	\$0.50	\$2.50	
Labor (\$/SHr)	\$9.86	\$10.20	\$9.52	\$13.24	
Costs per Function					
Fixed Cost/SHr	\$1.60	\$29.64	\$7.71	\$23.14	
Oper. Cost/SHr	\$4.36	\$16.43	\$2.82	\$13.15	
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Total Cost/SHr	\$55.26	\$66.47	\$20.05	\$62.77	
Cost/Cord	\$13.00	\$15.64	\$4.72	\$14.77	
System Rate (Cord/SHr) 4.25					
System Cost/SHr \$304.56					
System Cost/cord \$48.13					
Weekly Prod (cords) 191					
Days to cut tract 149					

13

Balanced Systems

- Lowest cost per unit of volume will occur when all functions operate at their maximum utilization
- Balancing is achieved by adding or subtracting pieces of equipment from each function
 - Add equipment to the limiting function
 - Subtract equipment from non-limiting functions
 - Do additions/subtractions one at a time

14

Balancing Example

System Configuration (F,S,L,H)	System Cost \$/cd	System Rate cd/SHr	Days to Cut Tract	Limiting Function	Effective Utilization Felling (max U=50)	Effective Utilization Skidding (max U=67)	Effective Utilization Loading (max U=65)	Effective Utilization Hauling (max U=90)
4,1,1,1	39.06	3.40	186	Felling	50	66	24	71
5,1,1,1	41.67	3.44	183	Skidding	41	67	24	72
6,2,1,1	41.71	4.25	149	Felling	50	41	30	88
5,2,1,2	48.13	4.25	149	Felling	50	41	30	44
6,2,1,2	42.87	5.10	124	Felling	50	50	35	53
7,2,1,2	39.09	5.95	106	Felling	50	58	42	62
8,2,1,2	36.25	6.80	93	Felling	50	66	48	71
9,2,1,2	37.36	6.89	92	Skidding	45	67	49	72
9,3,1,2	38.04	7.65	83	Felling	50	50	54	79
10,3,1,2	35.87	8.50	75	Felling	50	55	60	88

15