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**Commodity
Costs and Returns
Estimation
Handbook**

A Report of the AAEA Task Force on Commodity Costs and Returns

July 20, 1998

Ames, Iowa

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Exhibit 5.1 Alternative Methods to Calculate Interest on Repair Expenses

List price of tractor	58971
Useful life of tractor	20
Annual use	300
Total use	6000
RF1	0.007
RF2	2
Real interest rate	0.05
Inflation rate	0.04
Nominal interest rate	0.092
Monthly inflation rate	0.0032737
Total repair expense over tractor's life (inflation = 4%)	15455.12
Cost/hour for repairs	2.5758533
Cost/year for repairs	772.756
US0 (monthly inflation, 12)	11.748502

Item	Cost Per Hour	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 Jun	7 July	8 Aug	9 Sep	10 Oct	11 Nov	12 Dec	Per Month	Per Year
Hours of use per month		15.00	20.00	20.00	30.00	45.00	30.00	25.00	25.00	30.00	30.00	20.00	10.00	25.000	300.000
Real repair cost (equal use per month)	2.62241	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.56	65.560	
Nominal repair cost (equal use per month)	2.57585	63.25	63.45	63.66	63.87	64.08	64.29	64.50	64.71	64.92	65.13	65.35	65.56	64.396	772.756
Interest on line above		5.31	4.83	4.34	3.86	3.38	2.89	2.41	1.93	1.44	0.96	0.48	0.00		31.837
Nominal repair cost (average cost/hour & actual use)	2.57585	38.64	51.52	51.52	77.28	115.91	77.28	64.40	64.40	77.28	77.28	51.52	25.76	64.396	772.756
Interest on line above		3.25	3.92	3.52	4.67	6.11	3.48	2.41	1.92	1.72	1.14	0.38	0.00		32.497
Inflation adjusted hours		14.47	19.36	19.42	29.23	43.98	29.42	24.59	24.68	29.71	29.80	19.93	10.00		294.589
Real repair cost (actual use)	2.62316	39.35	52.46	52.46	78.69	118.04	78.69	65.58	65.58	78.69	78.69	52.46	26.23	65.579	
Nominal repair cost (actual use)		37.96	50.78	50.94	76.66	115.37	77.17	64.52	64.73	77.93	78.18	52.29	26.23	64.396	772.756
Interest on line above		3.19	3.86	3.48	4.63	6.08	3.47	2.41	1.93	1.73	1.16	0.38	0.00		32.322

Table 5.3 Annualized Repair Cost for Example Tractor

Tractor List price	58971
Useful Life	20
Annual Use	300
Total Use	6000

RF1	0.007
RF2	2
Real interest	0.05
Annual Inflation (if applicable)	0.04
Lifetime repairs (no inflation)	14860.69

Year	Inflation rate (actual)	1+r	1 + π	Hours Beg	Hours End	Cummulated Cost at End of Year j	Repair Cost During year j	Cost in Year j Disc. to Beg Year 1	Cost in Year j Disc. to End Year 1	Annuity with Value of PV0	Discounted Annuity
1	0.000	1.050	1.000	0	300	37.151730	37.152	35.3826	37.151730	624.369383	594.6375076
2	0.000	1.050	1.000	300	600	148.606920	111.455	101.0931429	106.147800	624.369383	566.3214358
3	0.000	1.050	1.000	600	900	334.365570	185.759	160.4653061	168.488571	624.369383	539.3537484
4	0.000	1.050	1.000	900	1200	594.427680	260.062	213.9537415	224.651429	624.369383	513.6702365
5	0.000	1.050	1.000	1200	1500	928.793250	334.366	261.9841733	275.083382	624.369383	489.2097491
6	0.000	1.050	1.000	1500	1800	1337.462280	408.669	304.9551223	320.202878	624.369383	465.9140467
7	0.000	1.050	1.000	1800	2100	1820.434770	482.972	343.2395316	360.401508	624.369383	443.7276636
8	0.000	1.050	1.000	2100	2400	2377.710720	557.276	377.1862985	396.045613	624.369383	422.5977748
9	0.000	1.050	1.000	2400	2700	3009.290130	631.579	407.121719	427.477805	624.369383	402.4740713
10	0.000	1.050	1.000	2700	3000	3715.173000	705.883	433.3508493	455.018392	624.369383	383.3086393
11	0.000	1.050	1.000	3000	3300	4495.359330	780.186	456.1587888	478.966728	624.369383	365.055847
12	0.000	1.050	1.000	3300	3600	5349.849120	854.490	475.8118885	499.602483	624.369383	347.6722352
13	0.000	1.050	1.000	3600	3900	6278.642370	928.793	492.5588908	517.186835	624.369383	331.1164145
14	0.000	1.050	1.000	3900	4200	7281.739080	1003.097	506.632002	531.963602	624.369383	315.3489662
15	0.000	1.050	1.000	4200	4500	8359.139250	1077.400	518.2479033	544.160298	624.369383	300.3323487
16	0.000	1.050	1.000	4500	4800	9510.842880	1151.704	527.6087028	553.989138	624.369383	286.0308083
17	0.000	1.050	1.000	4800	5100	10736.849970	1226.007	534.9028324	561.647974	624.369383	272.4102936
18	0.000	1.050	1.000	5100	5400	12037.160520	1300.311	540.3058913	567.321186	624.369383	259.4383749
19	0.000	1.050	1.000	5400	5700	13411.774530	1374.614	543.9814415	571.180514	624.369383	247.0841666
20	0.000	1.050	1.000	5700	6000	14860.692000	1448.917	546.081756	573.385844	624.369383	235.3182539
Sum							14860.692				
Present Value at Beginning of 1								7781.022582			7781.022582
Present Value at End of 1									8170.073711		
US0(r,20)								12.46221034			
Real Annuity with Value PV 0								624.369383			
Real Annuity with Value PV 1									655.5878521		

Table 5.4 Annualized Repair Cost for Example Tractor with 4% Inflation Each Year

Tractor List price	58971
Useful Life	20
Annual Use	300
Total Use	6000

RF1	0.007
RF2	2
Real interest	0.05
Annual Inflation (if applicable)	0.04
Lifetime repairs (no inflation)	14860.69

Year	Inflation rate (actual)	1+r	1 + π	Hours Beg	Hours End	Cummulated Cost at End of Year j	Repair Cost During year j	Cost in Year j Disc. to Beg Year 1	Cost in Year j Disc. to End Year 1	Annuity with Value of PV0	Discounted Annuity
1	0.040	1.050	1.040	0	300	38.63779920	38.63780	35.3826	38.6377992	649.344158	594.637508
2	0.040	1.050	1.040	300	600	160.73324467	120.54993	101.0931429	110.393712	675.317925	566.321436
3	0.040	1.050	1.040	600	900	376.11579253	208.95322	160.4653061	175.2281143	702.330642	539.353748
4	0.040	1.050	1.040	900	1200	695.39630975	304.23589	213.9537415	233.6374857	730.423867	513.670237
5	0.040	1.050	1.040	1200	1500	1130.01900334	406.80684	261.9841733	286.0867172	759.640822	489.209749
6	0.040	1.050	1.040	1500	1800	1692.31645941	517.09670	304.9551223	333.0109936	790.026455	465.914047
7	0.040	1.050	1.040	1800	2100	2395.56796587	635.55885	343.2395316	374.8175685	821.627513	443.727664
8	0.040	1.050	1.040	2100	2400	3254.06130221	762.67062	377.1862985	411.8874379	854.492614	422.597775
9	0.040	1.050	1.040	2400	2700	4283.15818903	898.93443	407.121719	444.5769171	888.672318	402.474071
10	0.040	1.050	1.040	2700	3000	5499.36360073	1044.87908	433.3508493	473.2191275	924.219211	383.308639
11	0.040	1.050	1.040	3000	3300	6920.39915516	1201.06101	456.1587888	498.1253973	961.187979	365.055847
12	0.040	1.050	1.040	3300	3600	8565.28080560	1368.06568	475.8118885	519.5865823	999.635498	347.672235
13	0.040	1.050	1.040	3600	3900	10454.40107216	1546.50903	492.5588908	537.8743088	1039.62092	331.116414
14	0.040	1.050	1.040	3900	4200	12609.61606242	1737.03895	506.632002	553.2421462	1081.20576	315.348966
15	0.040	1.050	1.040	4200	4500	15054.33754392	1940.33684	518.2479033	565.9267104	1124.45399	300.332349
16	0.040	1.050	1.040	4500	4800	17813.63034530	2157.11930	527.6087028	576.1487035	1169.43214	286.030808
17	0.040	1.050	1.040	4800	5100	20914.31537728	2388.13982	534.9028324	584.1138929	1216.20943	272.410294
18	0.040	1.050	1.040	5100	5400	24385.07857968	2634.19059	540.3058913	590.0140333	1264.85781	259.438375
19	0.040	1.050	1.040	5400	5700	28256.58611714	2896.10439	543.9814415	594.0277342	1315.45212	247.084167
20	0.040	1.050	1.040	5700	6000	32561.60616269	3174.75660	546.081756	596.3212775	1368.0702	235.318254

Sum							25981.646				
Present Value Beginning of 1								7781.022582			7781.02258
Present Value End of 1									8496.876659		
US0(r,20)								12.46221034			
Real Annuity PV 0								624.369383			
Real Annuity PV 1									681.8113662		

Table5.4a

List price	58971
Useful Life	20
Annual Use	300
Total Use	6000
RF1	0.007
RF2	2
Real interest	0.05

Year	Inflation rate (actual)	1+r	1+pi	Hours Beg	Hours End	Cummulated Cost End of Year	Cost during year i	Disc Cost Beg Year 1	Disc Cost End of Year 1	Annuity PV 0	Disc Ann
1	0.040	1.050	1.040	0	300	38.63779920	38.63780	35.3826	38.6377992	549.44987	503.15922
2	0.040	1.050	1.040	300	600	160.73324467	122.09545	102.389209	111.809016	571.42786	479.19926
3	0.040	1.050	1.040	600	900	376.11579253	215.38255	165.4027	180.6197486	594.28498	456.38025
4	0.040	1.050	1.040	900	1200	695.39630975	319.28052	224.533872	245.1909878	618.05638	434.64785
5	0.040	1.050	1.040	1200	1500	1130.01900334	434.62269	279.897621	305.6482021	642.77863	413.95034
6	0.040	1.050	1.040	1500	1800	1692.31645941	562.29746	331.612039	362.1203462	668.48978	394.23842
7	0.040	1.050	1.040	1800	2100	2395.56796587	703.25151	379.797588	414.7389663	695.22937	375.46516
8	0.040	1.050	1.040	2100	2400	3254.06130221	858.49334	424.576372	463.6373981	723.03854	357.58586
9	0.040	1.050	1.040	2400	2700	4283.15818903	1029.09689	466.07147	508.9500454	751.96009	340.55797
10	0.040	1.050	1.040	2700	3000	5499.36360073	1216.20541	504.406353	550.8117375	782.03849	324.34092
11	0.040	1.050	1.040	3000	3300	6920.39915516	1421.03555	539.704354	589.3571551	813.32003	308.89611
12	0.040	1.050	1.040	3300	3600	8565.28080560	1644.88165	572.088207	624.7203222	845.85283	294.18678
13	0.040	1.050	1.040	3600	3900	10454.40107216	1889.12027	601.67963	657.0341556	879.68694	280.17788
14	0.040	1.050	1.040	3900	4200	12609.61606242	2155.21499	628.598965	686.4300702	914.87442	266.83608
15	0.040	1.050	1.040	4200	4500	15054.33754392	2444.72148	652.964865	713.0376324	951.4694	254.1296
16	0.040	1.050	1.040	4500	4800	17813.63034530	2759.29280	674.894011	736.9842597	989.52817	242.02819
Sum							17813.630				
Present Value Beginning of 1								6583.99986			5725.7799
Present Value End of 1									7189.727842		
US0(r,16)								12.4622103			
Real Annuity PV 0								528.317182			
Real Annuity PV 1									576.9223633		

Table 5.5 Annualized Repair Cost for Example Tractor with 4% Inflation in Production Year and None Thereafter

Tractor List price	58971
Useful Life	20
Annual Use	300
Total Use	6000

RF1	0.007
RF2	2
Real interest	0.05
Annual Inflation (if applicable)	0.04
Lifetime repairs (no inflation)	14860.69

Year	Inflation rate (actual)	1+r	1 + π	Hours Beg	Hours End	Cummulated Cost at End of Year j	Repair Cost During year j	Cost in Year j Disc. to Beg Year 1	Cost in Year j Disc. to End Year 1	Annuity with Value of PV0	Discounted Annuity
1	0.040	1.050	1.040	0	300	38.63779920	38.63780	35.3826	38.6377992	649.344158	594.637508
2	0.000	1.050	1.000	300	600	154.55119680	115.91340	101.0931429	110.393712	649.344158	566.321436
3	0.000	1.050	1.000	600	900	347.74019280	193.18900	160.4653061	175.2281143	649.344158	539.353748
4	0.000	1.050	1.000	900	1200	618.20478720	270.46459	213.9537415	233.6374857	649.344158	513.670237
5	0.000	1.050	1.000	1200	1500	965.94498000	347.74019	261.9841733	286.0867172	649.344158	489.209749
6	0.000	1.050	1.000	1500	1800	1390.96077120	425.01579	304.9551223	333.0109936	649.344158	465.914047
7	0.000	1.050	1.000	1800	2100	1893.25216080	502.29139	343.2395316	374.8175685	649.344158	443.727664
8	0.000	1.050	1.000	2100	2400	2472.81914880	579.56699	377.1862985	411.8874379	649.344158	422.597775
9	0.000	1.050	1.000	2400	2700	3129.66173520	656.84259	407.121719	444.5769171	649.344158	402.474071
10	0.000	1.050	1.000	2700	3000	3863.77992000	734.11818	433.3508493	473.2191275	649.344158	383.308639
11	0.000	1.050	1.000	3000	3300	4675.17370320	811.39378	456.1587888	498.1253973	649.344158	365.055847
12	0.000	1.050	1.000	3300	3600	5563.84308480	888.66938	475.8118885	519.5865823	649.344158	347.672235
13	0.000	1.050	1.000	3600	3900	6529.78806480	965.94498	492.5588908	537.8743088	649.344158	331.116414
14	0.000	1.050	1.000	3900	4200	7573.00864320	1043.22058	506.632002	553.2421462	649.344158	315.348966
15	0.000	1.050	1.000	4200	4500	8693.50482000	1120.49618	518.2479033	565.9267104	649.344158	300.332349
16	0.000	1.050	1.000	4500	4800	9891.27659520	1197.77178	527.6087028	576.1487035	649.344158	286.030808
17	0.000	1.050	1.000	4800	5100	11166.32396880	1275.04737	534.9028324	584.1138929	649.344158	272.410294
18	0.000	1.050	1.000	5100	5400	12518.64694080	1352.32297	540.3058913	590.0140333	649.344158	259.438375
19	0.000	1.050	1.000	5400	5700	13948.24551120	1429.59857	543.9814415	594.0277342	649.344158	247.084167
20	0.000	1.050	1.000	5700	6000	15455.11968000	1506.87417	546.081756	596.3212775	649.344158	235.318254
Sum							15455.11968				
Present Value Beginning of 1								7781.022582			7781.02258
Present Value End of 1									8496.876659		
US0(r,20)											12.46221034

Real Annuity PV 0
Real Annuity PV 1

624.369383

681.8113662

Repairs KW

List price 57700
 Useful Life 10
 Annual Use 700
 Total Use 7000
 Total Life 10000

RC1 0.9
 RC2 0.000631
 RC3 1.6
 Real interest 0.06
 Inflation 0 0.05500

Year	Inflation rate (actual)	1+r	1+pi	Hours Beg	Hours End	Cummulated Cost End of Year	Cost during year i	Disc Cost Beg Year 1	Disc Cost End of Year 1	Annuity PV 0	Disc Ann
1	0.000	1.060	1.000	0	700	737.233	737.233	695.502476	737.2326249	2738.9525	2583.9175
2	0.000	1.060	1.000	700	1400	2234.871	1497.639	1332.89318	1412.866774	2738.9525	2437.658
3	0.000	1.060	1.000	1400	2100	4275.615	2040.743	1713.44735	1816.254196	2738.9525	2299.6773
4	0.000	1.060	1.000	2100	2800	6774.863	2499.249	1979.63898	2098.417324	2738.9525	2169.5069
5	0.000	1.060	1.000	2800	3500	9681.810	2906.947	2172.23969	2302.574068	2738.9525	2046.7046
6	0.000	1.060	1.000	3500	4200	12961.240	3279.430	2311.86866	2450.580784	2738.9525	1930.8534
7	0.000	1.060	1.000	4200	4900	16586.754	3625.514	2411.17415	2555.844602	2738.9525	1821.5598
8	0.000	1.060	1.000	4900	5600	20537.545	3950.791	2478.77491	2627.501406	2738.9525	1718.4527
9	0.000	1.060	1.000	5600	6300	24796.624	4259.079	2520.94254	2672.199096	2738.9525	1621.1818
10	0.000	1.060	1.000	6300	7000	29349.759	4553.135	2542.44691	2694.993723	2738.9525	1529.4168
Sum							29349.759				
Present Value Beginning of 1								20158.9289			20158.929
Present Value End of 1									21368.4646		
US0(r,16)								7.36008705			
Real Annuity PV 0								2738.9525			
Real Annuity PV 1									2903.289655		