Estimated Costs of Pasture and Hay Production

Ag Decision Maker

File A1-15

This report summarizes estimated costs of improving pasture by five different systems. For each system, both the initial cost per acre and the annual maintenance cost per acre are presented. In addition, costs of establishing alfalfa or alfalfa-grass hay meadows and annual maintenance costs for alfalfa-based hay production are presented.

Included in the pasture and hay alternatives listed are the recommended steps for achieving rapid establishment and productive forage stands. Individual producers may wish to add to, delete or otherwise modify some of these estimated cost factors where better estimates are available or where local site conditions, equipment availability or producer expectations are appropriate.

Pasture Improvement Alternatives:

Improving the existing grass with lime, fertilizer and weed control – For more details see PM-869, *Fertilizing Pastures* and PM-1688, *General Guide for Crop Nutrient Recommendations in Iowa*.

Complete renovation with a new grass seeding –A seedbed is prepared with primary and secondary tillage as needed. For best results, needed lime should be incorporated six months or more before seeding. Needed fertilizer can be incorporated during seedbed preparation. Grass seed and a companion crop of oats are sown with a grain drill or other effective seeding technique.

Complete renovation with a legume-grass mixture –This involves the same steps as renovation with a new grass seeding except that a legume is included in the seeding mixture and nitrogen fertilizer is not used. Steps to follow are described in PM 1008, *Steps to Establish and Maintain Legume-Grass Pastures*, available online at www.store.extension.iastate.edu/.

Interseeding and no-till renovation – Weeds are controlled several months before seeding with 2,4-D. Lime and fertilizer are applied and a seeding of one or more legumes is made in an established grass sod using a drill designed for sod seeding (interseeder). Steps to follow are described in PM 1097, *Interseeding and No-Till Pasture Renovation*.

Frost seeding – One or more legumes are broadcast on established grass in late February or March. Freezing and thawing plus early spring rains provide seed coverage and aid seeding establishment. Weed control, fertilization and grazing management help establishment and growth. For details, see PM 856, *Improving Pasture by Frost Seeding*.

The production from improved pasture will vary with the kind of soil, annual rainfall, plant species and level of management. Unimproved grass pastures usually have weedy, unthrifty stands and require three acres or more to support the grazing needs of a mature cow. The improvement programs suggested here, when developed with moderate success, and with good grazing management, can be expected to provide the pasture needs for about one cow/calf pair on 1.5 to 2 acres. With top-level grazing management, adequate fertilizer and favorable environmental conditions, production can be increased even further, reaching production requiring 1 to 1.5 acres of pasture per cow/calf pair.

Hay Production Management Alternatives

Alfalfa-grass seeded with an oat companion crop – Many alfalfa and grass-legume hay meadows are seeded in early spring with an oat companion crop. A seedbed is prepared and fertilizer is incorporated as needed during seedbed preparation. For best results, needed lime should be incorporated in the seedbed six months or more before seeding. Grass and legume seed should be sown more shallow than the oats and the soil firmed over the seed. While oats often are harvested as grain and straw, the sown forage seedlings will develop more rapidly if oats are removed earlier as hay or silage. One harvest of the new hay meadow can usually be taken in late summer of the establishment year. Grass-legume seedings can be made in late August without a companion crop when soil moisture and field slope conditions permit.

Herbicide-assisted alfalfa seeding – Alfalfa spring-seeded with a preplant herbicide will establish quickly. A fine, firm seedbed is prepared and preplant herbicide is incorporated prior to seeding. Alternatively, alfalfa can be seeded without a companion crop with post-emergence herbicides used for weed control if needed. Two or more harvests of alfalfa can usually be taken during the seeding year where an establishment herbicide program has effectively controlled weed competition.

In developing the following cost estimate tables, it was assumed that lime would be needed for initial improvement or establishment. The soil phosphorus index was assumed to be in the low or medium range and the soil potassium index was assumed medium. General fertilizer rates are included based on these assumptions. Lime and fertilizer rates are best determined by soil test. Different grass and legume species and mixtures can be selected to fit specialized site, livestock and management objectives.

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Table 1. Summary of pasture improvement costs. [a/]

	Initial Cost Per Acre					
	Grass Improve-ment	Grass Seeding	Legume-Grass Mix	Inter-Seeding	Frost Seeding	Killed Sod, No-Till Renovation
Machinery	$18.20	$60.30	$60.30	$28.20	$23.00	$28.20
Lime and fertilizer	67.20	163.00	145.00	106.50	106.50	106.50
Herbicide	13.13	0.00	0.00	6.56	9.84	0.00
Sod suppression				6.56	0.00	0.00
Burn-down existing sod				0.00	0.00	10.00
Seed	0.00	28.30	60.90	35.15	42.25	48.70
Labor	7.02	21.65	21.65	8.19	7.02	8.19
Total Cost per Acre	$105.55	$273.25	$287.85	$191.17	$188.61	$201.59
Total Cash Cost per Acre	$88.53	$220.90	$235.50	$172.98	$168.69	$183.40
Expected Life in Years		10	5	5	5	7

	Annual Pasture Cost Per Acre				
	Grass Seeding	Legume-Grass Mix	Inter-Seeding	Frost Seeding	Killed Sod, No- Till Renovation
Machinery	$18.20	$14.20	$14.20	$14.20	$14.20
Fertilizer, herbicide	80.33	41.20	41.20	41.20	41.20
Labor	17.55	17.55	17.55	17.55	17.55
Land	54.00	64.00	64.00	64.00	64.00
Annual Maintenance Cost	$170.08	$136.95	$136.95	$136.95	$136.95
Initial Cost Amortization	$37.13	$68.33	$45.38	$44.78	$36.11
Total Cost per Acre	$207.20	$205.28	$182.33	$181.73	$173.06
Total Cash Cost per Acre	$88.53	$47.40	$47.40	$47.40	$47.40

Total costs for each pasture system and hay have been calculated to include ownership costs of machinery and land (including a return on investment) as well as a charge for labor. In the case where machinery and land are owned and labor is supplied by the operator, cash costs will include fuel and oil, machinery repairs, fertilizer, seed, herbicide and farm operating overhead, which represents miscellaneous farm expenses not specifically identified with pasture or hay production. Annual pasture costs also include the initial renovation costs amortized over the expected life of the improved pasture. Annual maintenance cost for grass improvement will be the same as for grass seeding.

Table 2. Pasture improvement by fertilization or renovation with a grass or legume-grass seeding: Initial cost per acre.

	Improvement of Existing Grass		Renovation with Grass Seeding		Renovation with Legume-Grass Mix	
	Fixed	Variable	Fixed	Variable	Fixed	Variable
Machinery Costs						
Spray herbicide	$2.00	$2.00				
Moldboard plow			$9.00	$11.00	$9.00	$11.00
Tandem disk (2 times)			7.20	6.20	7.20	6.20
Spread fertilizer	1.80	1.70	1.80	1.70	1.80	1.70
Harrow			2.10	1.80	2.10	1.80
Seed (drill)			4.40	4.40	4.40	4.40
Clip weeds	6.20	4.50	6.20	4.50	6.20	4.50
Total Machinery Cost	**$10.00**	**$8.20**	**$30.70**	**$29.60**	**$30.70**	**$29.60**
Lime and Fertilizer [a/]						
Lime			2 tons	$58.00	2 tons	$58.00
Nitrogen	80 lb.	$48.00	30 lb.	18.00		
Phosphorus	30 lb.	19.20	50 lb.	32.00	50 lb.	32.00
Potash			100 lb.	55.00	100 lb.	55.00
Total Lime and Fertilizer		**$67.20**		**$163.00**		**$145.00**
Seed [b/]						
Oats			1.5 bu.	$12.75	1.5 bu.	$12.75
Bromegrass			10 lb.	10.00		
Birdsfoot trefoil					6 lb.	42.60
Orchardgrass			3 lb.	5.55	3 lb.	5.55
Total Seed Cost		**$0.00**		**$28.30**		**$60.90**
Herbicide		13.13		$0.00		$0.00
Labor	.6 hr.	$7.02	1.85 hr.	$21.65	1.85 hr.	$21.65
	Fixed	**Variable**	**Fixed**	**Variable**	**Fixed**	**Variable**
Total Initial Cost per Acre	**$17.02**	**$88.53**	**$52.35**	**$220.90**	**$52.35**	**$235.50**

[a/] These are average rates and may vary from .33 to 1.5 times these values for soils with different soil tests.

[b/] Omit oats from August seedings. Higher priced seed varieties or different seed mixtures could vary these costs by 1.2 to 2.0 times.

Table 3. Pasture improvement with interseeding, frost seeding or killed sod, no-till renovation: Initial Costs/Acre

	Interseeding with Legume		Frost Seeding		Killed Sod, No-till Renovation	
	Fixed	Variable	Fixed	Variable	Fixed	Variable
Machinery Costs						
Spray herbicide	$2.00	$2.00	$2.00	$2.00	$2.00	$2.00
Leased interseeder or		10.00				10.00
broadcast seeder			2.90	1.90		
Spreading fertilizer	1.80	1.70	1.80	1.70	1.80	1.70
Clip weeds	6.20	4.50	6.20	4.50	6.20	4.50
Total Machinery Cost	**$10.00**	**$18.20**	**$12.90**	**$10.10**	**$10.00**	**$18.20**
Lime and Fertilizer [a/]						
Lime	2 tons	$58.00	2 tons	$58.00	2 tons	$58.00
Phosphorus	50 lb.	32.00	50 lb.	32.00	50 lb.	32.00
Potash	30 lb.	16.50	30 lb.	16.50	30 lb.	16.50
Total Lime and Fertilizer		**$106.50**		**$106.50**		**$106.50**
Herbicide [b/]		$6.56		$9.84		
Suppression [c/]		6.56				
Burn-down [d/]						$10.00
Seed						
Birdsfoot trefoil	4 lb.	$28.40	5 lb.	$35.50	4 lb.	$28.40
Red clover	3 lb.	6.75	3 lb.	6.75	3 lb.	6.75
Orchardgrass					3 lb.	5.55
Bromegrass					8 lb.	8.00
Total Seed Cost		**$35.15**		**$42.25**		**$48.70**
Labor	.7 hr.	$8.19	.6 hr.	$7.02	.7 hr.	$8.19
	Fixed	**Variable**	**Fixed**	**Variable**	**Fixed**	**Variable**
Total Initial Cost per Acre	**$18.19**	**$172.98**	**$19.92**	**$168.69**	**$18.19**	**$183.40**

[a/] These are average rates and may vary depending on soil test results.

[b/] Two sprayings (spring and fall) may be necessary for thistle control. Spraying should be done the year before seeding. Follow herbicide label instructions regarding rate, timing, and cautionary statements for the following crop and animal use of treated fields.

[c/] Chemical suppression may be desirable to improve success of interseeding.

[d/] Fall burn-down of exiting grass, September-October.

Table 4. Maintaining productive pastures: Annual cost per acre.

		Improved Grass [b/]			Improved Grass-Legume [c/]	
		Fixed	Variable		Fixed	Variable
Machinery Costs						
Spreading fertilizer		$1.80	$1.70		$1.80	$1.70
Spraying herbicide		2.00	2.00			
Clipping weeds		6.20	4.50		6.20	4.50
Total Machinery Cost		**$10.00**	**$8.20**		**$8.00**	**$6.20**
Fertilizer and Herbicide [a/]						
Nitrogen		80 lb.	$48.00			
Phosphorus		30 lb.	19.20		30 lb.	$19.20
Potash					40 lb.	$22.00
Herbicide			13.13			
Total Fertilizer and Herbicide			**$80.33**			**$41.20**
Labor						
Growing practices	0.5 hr.	$5.85		0.5 hr.	$5.85	
Fence maintenance	1.0 hr.	11.70		1.0 hr.	11.70	
Total Labor		**$17.55**			**$17.55**	
Land Charge						
Cash rent equivalent		$54.00			$64.00	
		Fixed	**Variable**		**Fixed**	**Variable**
Total Annual Cost		**$81.55**	**$88.53**		**$89.55**	**$47.40**
Total Annual Cost per Acre		**$170.08**			**$136.95**	

[a/] These are average rates and may vary with soil test and the level of management on a particular fi eld. Diff erent herbicide alternatives could vary this cost.

[b/] Improved grass pastures assume a dominance of cool season grasses such as smooth bromegrass, orchardgrass, tall fescue or reed canarygrass.

[c/] Improved grass-legume pasture assumed one-third of the forage is made up of red clover, birdsfoot trefoil or alfalfa.

Table 5. Hay production: Seeding year costs.

		Alfalfa-Grass Seeded with Oat Companion Crop [a/]			Alfalfa Seeded with Herbicide [b/]	
		Fixed	Variable		Fixed	Variable
Preharvest Machinery						
Spray herbicide					$2.00	$2.00
Tandem disk (2 times)		$7.20	$6.20		7.20	6.20
Spread fertilizer		1.80	1.70		1.80	1.70
Harrow		2.10	1.80		2.10	1.80
Seed (drill)		4.40	4.40		4.40	4.40
Total Preharvest Machinery Cost		**$15.50**	**$14.10**		**$17.50**	**$16.10**
Seed [c/]						
Oats		2 bu.	$17.00			
Alfalfa		8 lb.	30.80		15 lb.	$57.75
Bromegrass		6 lb.	6.00			
Orchardgrass		3 lb.	5.55			
Total Seed Cost			**$59.35**			**$57.75**
Herbicide						13.13
Lime (total cost for hay lifetime)			29.00			29.00
Labor	1 hr.	$11.70		1 hr.	$11.70	
Total Establishment Costs		**$27.20**	**$102.45**		**$29.20**	**$115.98**
One-Third of Establishment Costs (for establishment year)		$9.07	$34.15		$9.73	$38.66
Fertilizer (for establishment year)						
Nitrogen		60 lb.	$36.00			
Phosphorus		45 lb.	28.80		35 lb.	$22.40
Potash		130 lb.	71.50		125 lb.	68.75
Total Fertilizer			**$136.30**			**$91.15**
Labor	4 hr.	$46.80		3 hr.	$35.10	
Land Cash rent equivalent		$120.00			$120.00	
Harvest Machinery						
Oats: combine and haul grain		$15.40	$8.80			
rake, bale and haul straw		$14.90	$12.35			
Alfalfa: mower-conditioner, rake, bale and haul		$20.20	$17.15		$41.40	$36.18
Total Harvest Cost		**$50.50**	**$38.30**		**$41.40**	**$36.18**
		Fixed	**Variable**		**Fixed**	**Variable**
Total Fixed and Variable Costs		**$226.37**	**$208.75**		**$206.23**	**$165.98**
Total Cost per Acre		**$435.12**			**$372.22**	

[a/] Assumes 80 bushels oat yield, 1 ton straw yield and 1 ton per acre alfalfa yield from 1 cutting.

[b/] Assumes 2.5 tons per acre from two alfalfa cuttings with a herbicide-assisted seeding.

[c/] Omit oats from August seedings. Higher priced seed varieties or different seed mixtures could vary these costs by 1.2 to 2.0 times.

Table 6. Annual production costs for established alfalfa or alfalfa-grass hay.

	Present Hay Production Level 4 tons per acre [a/]		6 tons per acre [a/]		Your Estimate	
	Fixed	Variable	Fixed	Variable	Fixed	Variable
One-third of establishment costs						
Machinery, seed, lime and herbicide [b/]	$9.07	$34.15	$9.73	$38.66		
Annual fertilizer [c/] 0-13-50/ton removed plus spreading	$1.80	$144.98	$3.60	$216.62		
Harvesting Costs: Large Round Bales [d/]						
Mower-conditioner, rake, baling and hauling	$68.00	$60.00	$92.00	$82.50		
Labor Costs: 1.33 hr./cutting @ $11.00 per hour	$46.80		$62.40			
Land Cash rent equivalent	$120.00		$150.00			
Total Cost Using Large Round Bales	$245.67	$239.13	$317.73	$337.78		
Cost per Ton	$61.42	$59.78	$52.96	$56.30		
Total Cost per Acre	**$484.80**		**$655.51**			
Total Cost per Ton	**$121.20**		**$109.25**			
Harvesting Costs: Small Square Bales [d/]						
Mower-conditioner, rake, baling, stacking and hauling	$62.60	$55.20	$84.80	$76.10		
Labor Costs: 1.8 hr./cutting @ $11.00 per hour	$70.20		$93.60			
Land Cash rent equivalent	$120.00		$150.00			
Total Cost Using Small Square Bales	$263.67	$234.33	$341.73	$331.38		
Cost per Ton	$65.92	$58.58	$56.96	$55.23		
Total Cost per Acre	**$498.00**		**$673.11**			
Total Cost per Ton	**$124.50**		**$112.19**			

[a/] For harvest as silage use machine cost estimates from Table 7.

[b/] Assumes alfalfa-grass seeded with oat companion crop. If alfalfa seeded with preplant herbicide then use other costs. [c/] For 6 ton yield goal, a split application of fertilizer is assumed.

[d/] Harvest cost estimates assume three cuttings for 4 tons and four cuttings for 6 tons; stacker cost per acre.

Table 7. Estimated machinery costs for forage production.

The following cost estimates are for on-farm use, excluding labor. Depreciation is based on current replacement cost, and interest is based on average market rates. Fixed costs will be greater for newer machinery. If annual machine use is greater than that assumed, fixed costs per acre will be lower, and vice versa. Hauling costs are based on a round trip of one mile. Remember these are estimates only, and they should not take the place of accurate recordkeeping.

Operation	Hours of Use Assumed per Year	Fixed Cost per Acre (depreciation, interest, insurance, housing)	Variable Cost per Acre (fuel, oil, repairs)
Moldboard plow	120	$9.00	$11.00
Chisel plow	120	3.80	4.80
Chop stalks	120	5.10	5.70
Tandem disk	120	3.60	3.10
Peg tooth harrow	60	2.10	1.80
Sprayer/disk	120	3.60	3.30
Field cultivator	120	2.50	3.10
Bulk fertilizer spreader	60	1.80	1.70
Grain drill	100	4.40	4.40
Broadcast seeder	100	2.90	1.90
Sprayer	150	2.00	2.00
Combine small grain	120	12.20	5.60
Haul grain (on farm)	300	0.04 /bu.	0.04 /bu.
Forage chopper	200	16.60	14.10
Haul silage	140	1.25 /ton	1.50 /ton
Forage blower	100	0.80	0.90
Rotary mower	120	6.20	4.50
Mower-conditioner	120	5.30 /cutting	4.80 /cutting
Windrower	200	3.10 /cutting	2.40 /cutting
Rake	120	3.80 /cutting	2.60 /cutting
Square baler (inc. twine)	120	9.10 /cutting	6.00 /cutting
Round baler (inc. twine)	120	10.90 /cutting	7.60 /cutting
Stacker	120	7.70	6.30
Haul hay & straw	120	2.00 /ton	3.75 /ton

Table 8. Price and cost assumptions used.

Lime and Fertilizer	Dollars per unit	Seed	Dollars per unit
Lime, ton	$29.00	Oats, bu.	$8.50
Nitrogen, lb.	0.60	Bromegrass, lb.	1.00
Phosphorus, lb.	0.64	Birdsfoot trefoil, lb.	7.10
Potash, lb.	0.55	Orchardgrass, lb.	1.85
Diesel, gal.	3.25	Red clover, lb.	2.25
Herbicide, pts.	6.56	Alfalfa, lb.	3.85
Labor, $ per hour	$11.70		

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