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Dairy Farmer Profitability Using Intensive Rotational Stocking

Better grazing management
for pastures



In 1992, Pennsylvania State University researchers conducted a study of the profitability of dairy farms practicing intensive rotational grazing. The 52 cooperating farmers were selected completely at random, with a *stratified random sample statistical design*, from among nearly 15 percent, or 350 farmers, practicing intensive grazing in a five-county region of northeastern Pennsylvania—Bradford, Tioga, Susquehanna, Wyoming, and Wayne Counties.

The results from this study reflect typical use of intensive rotational stocking.

The randomness of the sample selection ensures that the results reported here are representative, and can most likely be achieved by the typical farmer.

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Dairy Farmer Profitability Using Intensive Rotational Stocking



Figure 1. In a study of dairy farmer practices in a five-county area of northeastern Pennsylvania, farmers using pasture cut feed costs and increased profit per cow.

One of the first *representative* studies of dairy farmers practicing intensive rotational stocking was conducted by Pennsylvania State University. The grazing method is defined as rotation of grazing cows among several small pasture subunits called paddocks versus stocking for continuously grazing one large pasture. Each paddock is grazed quickly and then allowed to regrow for several days, ungrazed, until ready for another grazing. The purpose of the study was to provide farm-level information on the profitability of intensive rotational stocking. The study analyzed farm costs and returns of 52 dairy farmers in northeastern Pennsylvania from January to December of 1992 (fig. 1).

The random sample farms were dairy farms that used pasture in the production of milk. The average farm size was 315 acres, with 86 acres of pasture and an average of 59 cows in the milking herd. Pasture acres were divided into an average of six paddocks per farm. The farmers averaged 24 years of farm experience, were between 23 and 67 years of age, and all had completed the eleventh grade, and 17 percent had more than 2 years of college.

Why typical dairy farmers adopt intensive rotational stocking

In this 1992 study, the main reasons cited by dairy farmers (fig. 2) for adopting intensive rotational stocking were reduced costs and labor, they had always grazed, best land use, and improved cow health (table 1). At the time of the study, 15 percent of the dairy farmers in the State of Pennsylvania practiced intensive rotational stocking.

Table 1. Reasons for adopting intensive rotational stocking ¹

Reported reasons	Response percent
Reduced costs/less labor	41
Always grazed/no specific reason	35
Best land use	15
Improved cow health	12
Ease of adoption	6
More time with cows, better manure handling, best feed source	6

¹Dairy farmers were allowed multiple responses.



Figure 2. Dairy farmers in the study area practice intensive rotational stocking. Reasons given: reduced costs, have always grazed, best land use, and improved cow health.

'Reduced costs' spurs grazing

Farmers adopt grazing to lower costs to stay cost competitive. Investment in pasture stocking systems is far less expensive than new farm machinery or livestock facilities.

Small- and mid-sized dairy farms view intensive rotational stocking as technology they can readily adopt, if they choose not to expand confinement facilities.

Thirty-eight percent of the dairy farmers listed *debt reduction* as a major 10-year goal for their farm.

Bottom-line crop returns highest for intensive pasture

Although corn silage had the highest gross return per acre, intensive rotational grazing (pasture) had the highest net returns for the farmers sampled in the study (table 2).

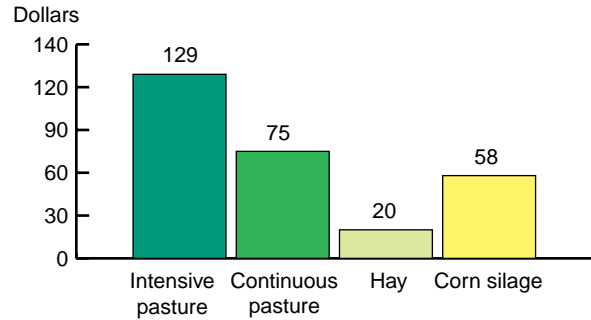
Intensive pasture had the highest net profit of \$129 per acre after covering direct and overhead expenses. *Profit* is feed value less direct and overhead costs, including the opportunity cost of operator labor. Corn silage had a profit of \$58 per acre, less than half that of intensive pasture (fig. 3). *Gross returns* are calculated before storage loss. Pasture returns are based on feed value. Corn silage had the highest gross return of \$313 per acre. Hay had the next highest gross return of \$196 (fig. 4). *Direct costs* include fertilizer, chemicals, fuel, and repairs. Direct costs of \$129 for corn silage and \$53 for hay were far higher than the \$19 cost of intensive pasture (fig. 5).

Table 2. Enterprise budgets for pasture and forage crops ¹

	Intensive pasture	Continuous pasture	Hay	Corn silage
	<i>Per acre</i>			
Gross return in field	\$192.92	\$112.30	\$195.8	\$313.25
Average storage loss	0.0%	0.0%	12.0%	13.0%
Gross return after storage	\$192.92	\$112.30	\$172.31	\$272.52
Total costs	\$63.90	\$36.97	\$151.82	\$214.76
Profit	\$129.02	\$75.33	\$20.49	\$57.76

¹ Feeding loss was not measured. Pasture was valued based on dry matter nutrient value compared to the nutrient value and market price of dry hay.

Figure 3. Profit per acre.



The logic can be summed: If you're going to put cows on pasture, it pays to intensively manage the pasture to produce more feed.

The higher profit from higher management explains the rapid shift in recent years from the more traditional continuous stocking of pastures with little or no management to intensively stocked rotational and well managed pasture.

Cows do the periodic harvesting with intensive pasture

In intensive stocking, dairy cows are rotated for grazing from one pasture paddock to the next either daily or after each milking. In figure 6, the rotation sequence is from left to right. Notice the contrast in tone from grazed paddocks on left to yet-to-be-grazed paddocks on right.

Intensive stocking can be thought of as a feed harvesting system that has cows as the *harvesters*. The cows are rotated to a new paddock to harvest the grass-forage when it is at or near peak quality. The studied farmers

found that *cow harvesting* provided higher profit than *machine harvesting* with a hay baler or a forage harvester.

Intensive pasture practices can include clipping pastures to ensure uniformity of growth, haying pastures in late spring and sometimes in early fall, fertilizing and liming, providing additional water sources and water troughs, installing pipelines, installing portable fences to subdivide pasture into smaller units (paddocks), and moving cows to fresh pasture often.

Figure 4. Gross returns per acre.

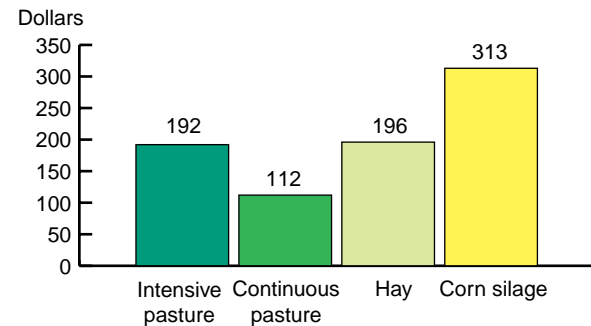
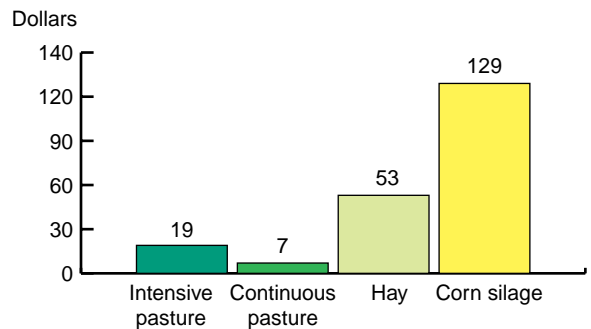


Figure 5. Direct costs per acre.



The *bottom line* is that the feed value of intensive pasture is highly competitive. *Intensive pasture was the lowest cost feed source on the studied farms.*

Intensive pasture outperforms continuous stocked pasture

Another way to look at the pasture decision is that if dairy farmers use pasture as a feed source, they will produce far more feed value with intensively stocked rotational pasture than with continuous stocking.

The \$129 per acre profit with intensive rotational stocking method far exceeded the \$75 profit from continuous stocking.



Figure 6. Aerial view of intensively stocked rotational pasture with recently grazed paddocks on the left and those to be grazed on the right.

Net cash income per cow using intensive pasture: \$550 to \$650

Analysts often divide farm profit on a per cow basis. Net cash income per cow averaged \$623 among the sampled farms (table 3). This compares favorably with the range of net cash income per cow, \$200 to \$800, earned on most Pennsylvania dairy farms.

The more intensive dairy stock managers earned nearly \$100 more net cash income per cow—\$646, compared to the less intensive dairy stock managers—\$550. Net cash income is used to pay for family living expenses, loan principal payments, capital purchases, and for savings and retirement.

The sample farmer's average income in the mid-\$30,000's was not large enough to cover major capital purchases, but adequate for modest investments in grazing technology.

Table 3. Cash income and labor expense

	All farms	Grazing management	
		Less intensive	More intensive
		-----Dollars-----	
Net cash farm income (48 farms)	36,775	34,641	37,486
Cash income per cow	623	550	646
Cash labor expense	8,502	11,353	7,552
Feed inventory increase	3,587	1,374	4,325
Herd size (number)	59	63	58

The more intensive dairy stock managers in the sample had nearly \$4,000 lower cash labor expense. Only part of that savings was the result of fewer cows in the herd. The more intensive farmers also had a nearly \$3,000 higher gain in feed inventories by the end of the year.

As dairy farmers increase their reliance on intensive pasture, the most visible impacts will likely be less labor expense for feeding and manure handling, and a buildup in stored feed such as hay.

The farmers pasturing their cows had a milk production average of 16,045 pounds per cow—that was at the bottom end of the most profitable range of 16,000 to 20,000 pounds for confinement dairy farms in Pennsylvania.

Farmers need to be cautioned that lower milk production can offset the benefit of lower feed costs—especially if rations are not properly balanced once pasture becomes the primary feed source during warmer months.

The survey results show that **dairy farms practicing intensive** rotational stocking can remain competitive with the dairy industry, and **achieve profitability**. The primary advantage is that well-managed pasture can substantially lower feed costs.

Identifying farmers that are likely to intensify grazing management

Willingness to practice more intensive grazing management can be associated with farmers who adopt new technology, such as total mixed rations (TMR), try to minimize culling, and rely more on their milk cows to make a living, rather than a mix of milk and crop sales. Thus, one could suggest that intensive grazing management is more cow focused.

Dairy farmers intensifying grazing management were:

- **More willing to upgrade technology.** They had more experience with other technology and management changes during recent years.
- **More dependent on milk sales.** Milk sales were a higher proportion of total farm sales.
- **Had a lower cull rate.** Two variables, number of years practicing intensive rotational stocking and total-farm-acres-per-cow, did not influence intensification of grazing management. But an attitude of openness toward new ways of doing things was important to fully benefit from intensive rotational stocking.

Financial situations favor intensive rotational stocking adoption

Factors to explain why dairy farmers expand intensively stocked rotational pasture acres were analyzed in the study. Three were found to be significant. Farmers expanding intensive rotational stocking tended to have:

- **High debt.** A higher proportion of farm debt to farm assets, above 40 percent, and thus were more vulnerable to high interest expense.
- **Poor cash flows.** Indicating little available cash for purchases of machinery and other assets.

- *More pasture available.* Facilitating ease of conversion to intensively stocked rotational pasture. Parcels of unused pasture were widely available for most of the farmers in the study.

Data from the surveyed farmers confirmed that the appeal of intensive pasture is particularly strong to financially vulnerable farmers. Intensive pasture can lower feed and labor costs, and at the same time reduce the need for bank credit to finance new machinery purchases. Pastures reduce the time and expense of harvesting and storing feed on a year-round basis (fig. 7).

For numerous dairy farmers, increasing use of intensive pasture may be one of the remaining options to lessen dependence on debt financing.

Education level, milk production level per cow, and level of crop expenses per cow were not significant factors underlying a shift to more dependence on intensive pasture.

Other benefits and features of intensive pasture

The intensively stocked rotational pasture method is:

Flexible—not an all-or-nothing technology. The surveyed farmers displayed widely ranging approaches to intensive pasture stocking. This flexibility allowed most of the sampled farmers to slowly increase dependence on pasture feeding versus stored forage feeding in their dairy management.

Not necessarily a textbook formula technology.

Although there are many recommended supporting practices, such as taking forage samples of pastures, most of the surveyed farmers were applying only parts of an intensive grazing management system. The intensively stocked rotational pasture method is only a component part. They achieved varying levels of success with their individual approach to grazing management. However, profitability increased with the more intensive approach by farmers.

Suitable for small- and medium-sized dairy farms.

The survey found few representative dairy farmers practicing intensive rotational stocking with more than 100 to 125 cows.

Associated with low cull rates and herd health costs.

Veterinary and medicine costs, averaging about \$44 per cow, were relatively low.

For the surveyed farmers, intensive rotational stocking was viewed as a flexible, learn-as-you-go technology that permitted a slow evolution of farm management practices to accommodate the needs, resources, and styles of individual farmers.

Relatively low cost does not typically require large outlays.

Investment in intensive rotational stocking technology, for fencing and water sources for individual paddocks, was typically modest compared to the cost of a new 100 hp tractor.



Figure 7. *Intensively managed pastures reduce the time and expense of harvesting, storing, and feeding on a year-round basis.*

Inexpensive fences using electrified poly-wire or -tape and high tensile wire require less fencing strands and posts. Low impedance, high energy fence chargers make livestock respect lightweight fence boundaries (fig. 8).

Inexpensive water troughs and aboveground pipelines can put water in every paddock. This helps increase milk flow and reduce erosion and mud along lane ways (fig. 9).

A common sense perspective on grazing dairy livestock is that **farmers can vastly increase the feed value obtained from pasture by injecting intensive management practices to pasture similar to the intensification of row crop production..**



Figure 8. *Electrified fencing helps keep cost outlays low and is effective.*



Figure 9. *Inexpensive water trough in paddock.*

Summary of key findings from the farmers surveyed

- Farmers cited several reasons for intensive rotational stocking, which ranged from best land use to improved cow health.
 - Cost-cutting was viewed as the primary benefit.
 - Intensively stocked pasture had the highest profit of any crop.
 - Intensive rotational stocking outperformed continuous stocking in northeastern Pennsylvania by a wide margin.
 - Farmers can view intensive pasture as
 - substituting cows for machines to harvest forages, which lowers harvest costs
 - increasing feed produced per acre of pasture, which lowers feed costs
 - The randomly selected intensive pasture farms were profitable. Net cash income of about \$500 to \$700 per cow is feasible with reliance on intensive rotational stocking, even without practicing *textbook* management of the grazing enterprise.
 - Farmers more dependent on milk sales, with low cull rates and with more experience in adapting new technology, were most likely to intensify grazing management practices on a per acre basis.
 - Financially vulnerable farmers with high debt or poor cash flows, that face tight credit from lenders, can view intensive rotational stocking as a production alternative that lowers interest and investment expenses.
- Farmers can shift gradually to increase reliance on intensive pasture as the primary source of summer forages. Intensive pasture was not an all-or-nothing technology among the surveyed farmers.
- Intensive pasture requires relatively low investment in fencing and materials for water supply to separate paddocks.
 - Intensive rotational stocking can achieve herd cull rates that are lower than average because the cows have less hoof damage, and they are more closely observed when moving the cows from one paddock to another.

Taking cows out to pasture and occasionally repairing fences or adjusting their locations require less time than that required to cut, haul, store, and feed the same amount of mechanically harvested forages (fig. 10). Less money is needed to startup or maintain a pasture system than a total confinement system.

The primary economic benefit from intensive rotational stocking is lower feed costs. Although solidly profitable, the per cow production levels on the surveyed farmers were at the lower end of the most profitable range for the typical confinement herd in Pennsylvania. Thus, the major disadvantage of intensive pasture for many producers is difficulty in balancing rations or providing enough forage to optimize feed intake to maintain milk production levels.

The study of dairy farmers practicing intensive rotational stocking confirms that there is a profit basis for the adoption of this new approach by achieving greater benefit from pasture forages. Although the randomly selected farmers in the study were successful in their use of intensive rotational stocking, their management practices were less than optimal. This inspires a closing word of caution that *intensive rotational stocking, as is the case with any technology, requires close attention to the challenging details of management.*

Staying economically competitive remains a challenge for dairy farmers. Consider that:

- Large confinement-based dairy farms are expanding rapidly, particularly in Western States from Texas to Washington.
- Passage of free trade agreements North America Free Trade Agreement and General Agreement on Tariffs and Trade will eventually result in a competitive free market in dairy products among the United States, Mexico, Europe, and other countries.
- Farm legislation is shifting more risk to farmers' shoulders.

Intensive rotational stocking offers the potential benefits to help dairy farmers meet the competitive challenge.



Figure 10. Moving cows to the next paddock takes less time than that required for harvesting and feeding forages.

Acknowledgment

The study leaders, Lydia Cunningham and Gregory Hanson, Ph.D., of Pennsylvania State University, express their sincere appreciation to the farmer cooperators that made this study one of the first representative studies of farmer success with intensive rotational stocking.

In as much as possible, grazing lands terminology adopted by the Forage and Grazing Terminology Committee convened by the American Forage and Grassland Council is used throughout this publication. Some deviation may occur because of brevity reasons.