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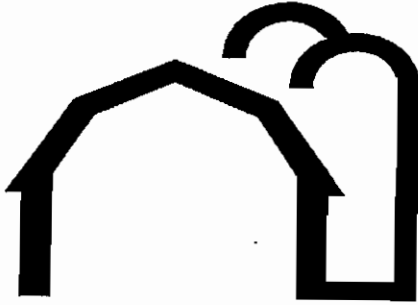
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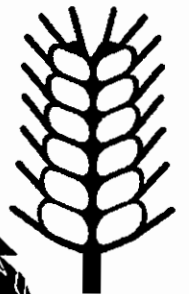
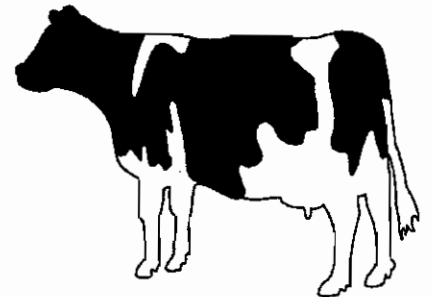
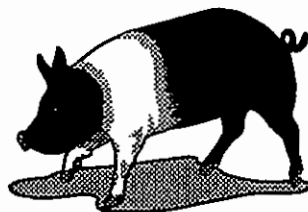
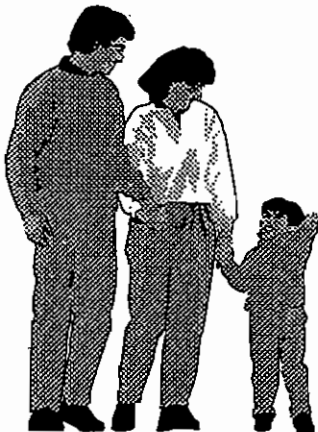




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Introduction

For several years there have been growing concerns about the long-run decline of farm incomes and the future viability of the dairy industry in Wisconsin. These problems are sometimes attributed to declining milk prices, and indeed the average milk price per hundredweight received by Wisconsin farmers has declined by over 40 percent since 1980 when inflation is taken into account. But there is now little optimism that the long-term decline of milk prices can be reversed. There is virtually no chance that the 1995 Farm Bill will raise the federal support price for milk products, and if anything there may be a decline in federal outlays for dairy price supports. It is likewise unclear whether there will be fundamental changes in federal milk marketing order arrangements that disadvantage producers from the Upper Great Lakes states.

The discouraging prospects for increasing the prices received by Wisconsin dairy farmers have led to a rising tide of opinion that the state's producers have no alternative but to become more efficient. There appears to be a growing consensus in the agricultural community that the typical Wisconsin dairy farm — a 50-cow, stanchion-barn operation that relies primarily on family labor — is becoming obsolete. Accordingly, an enormous amount of attention is being paid to dairy expansion by participants in the industry. Almost every

week there are articles in the state farm press that highlight farmers who view expansion to a large scale of operation as the best way of dealing with declining milk prices.¹ These press accounts include "farm success stories" documenting the benefits of expansion, and occasionally there are articles based on speeches by experts from large-scale dairy states that advise Wisconsin farmers to act now to meet the competition of industrial dairy producers elsewhere. There are also frequent "expansion seminars" across the state sponsored by university, state government, or agribusiness personnel aimed at assisting farm operators who want to invest in dairy expansion.

These accounts of expansion tend to involve four main conceptions about the process of increasing the scale of dairy operations in Wisconsin. First, the impression is often created that expansion is becoming increasingly common in the state. Second, it is typically implied that farms that are expanding are the ones that are already much larger than average, so that a typical pattern of expansion would be from an 80- or 100-cow farm to a 150- or 200-cow farm. Third, it is usually implied that those who have expanded or are wanting to expand are the superior managers whose herds have production averages well above the state average. Fourth, expansion is associated with increased efficiency, rising net farm income, and improved competitiveness for the farmer and, if widely diffused, the region.

To be sure, there has been so much interest in expansion — and, in particular, so much discussion of expansions involving several hundred cows and hundreds of thousands of dollars of capital investment — that there is now something of a backlash. The state's farm press has recently published several articles and letters that question the advisability of large-scale expansion for the typical Wisconsin dairy farmer.² There have also been some vigorous discussions within several farm organizations of the virtues of large-scale dairy expansion. Concerns range from the financial feasibility of scrapping existing smaller-scale facilities to quality of life changes associated with becoming a labor manager.

Although expansion has now become a serious issue for the Wisconsin dairy industry, and there is a clear need for objective research data to inform these discussions, the advantages and disadvantages of expansion are almost always discussed in anecdotal or hypothetical terms. In particular, there has been no systematic assessment of whether the prevailing assumptions about the process of dairy farm expansion in Wisconsin conform to the on-farm realities in the state.

This paper's contribution is to explore recent expansion behavior and the expressed expansion intentions of a random sample of Wisconsin dairy farmers. These dairy farm operators were surveyed in November and December of 1994 by the Agricultural Technology and Family Farm Institute as part of an ongoing effort to understand their policy preferences for the 1995 Farm Bill, their technology use patterns, and their views of their future in dairying (Buttel et al., 1995; Barham et al., 1995). The findings reported below on expansion intentions and recent expansion behavior should help farmers and other industry participants to grapple more effectively with the expansion issues facing Wisconsin dairying.

Background on the Farm Structure of the Wisconsin Dairy Industry

Some basic facts about Wisconsin's dairy industry help to frame the discussion of expansion intentions and recent expansion behavior. First, it

is important to recognize that, on average, Wisconsin dairy farms have a relatively high level of investment in building structures and equipment per cow relative to many other states, and that much of this investment is probably rather specific in its use and value to smaller-scale operations. Thus, a wholesale expansion for smaller-scale operators could mean the replacement of existing capital stock with largely new facilities, in a situation where the "salvage value" of the pre-existing investments would probably be quite low.³ A large-scale expansion would therefore mean that these farmers would need to be willing and able to write down some or much of the book value of existing investments and then turn around and finance a significantly larger level of investment.

Second, data from the 1992 U.S. Census show that only 8 percent of Wisconsin's nearly 30,000 dairy farms had more than 100 cows and a mere 1 percent had more than 200 cows. The average Wisconsin dairy farm had about 52 cows in 1992. These figures underscore in a different way that a change to scales of production featured in press accounts of and seminars on dairy expansions could be very challenging for farmers and other industry participants, because relatively few farms in the state currently operate at the type of scale being proposed. Thus, experience with this scale of operation is still rather nascent in Wisconsin. These figures also demonstrate that most of the expansion to large-scale dairy enterprises will have to come either from new entrants or from relatively small and medium-scale operators, simply because that is where the vast majority of the producers still are. This potential reliance on "wholesale transformations" by Wisconsin's dairy operations makes a careful look at their expansion intentions and recent expansion behavior pertinent to assessing the potential efficacy and appropriateness of the strategy of promoting large-scale expansions.

Third, based on recent evidence on the process of entry into Wisconsin dairying, the role of new entrants in an expansion push appears likely to be rather small. Jackson-Smith's (1994) research has demonstrated that recent entrants (1988-1992) into dairying, on average, have herds that are smaller (51 cows) and less productive

(13,453 pounds per cow per year) than the average Wisconsin dairy farm in his sample (54 and 14,834, respectively). In other words, most new entrants seem to be coming into dairying the old-fashioned way — at a bit smaller scale and lower herd productivity than the average — and then presumably moving up both in scale and productivity as they gain experience, expertise, improved herds, and more financial resources. Any major transformation in the scale and organization of Wisconsin dairying therefore seems likely to be driven more by expansions of *incumbent farmers* than by maverick new entrants.

The 1994 Dairy Farmer Polls

In November and December of 1994, the Agricultural Technology and Family Farm Institute sent a mail survey to 1,008 Wisconsin dairy farmers selected at random from the state's Dairy Producer List, which is maintained by the Department of Agriculture, Trade, and Consumer Protection. This survey was a follow-up to one sent to the same farmers in the Spring of 1994 (Barham and Wood, 1994). Slightly over 60 percent of the farmers contacted in November and December responded with completed questionnaires, in which they answered two basic questions regarding their intentions to expand and their recent expansion behavior.

In terms of the former, farmers were asked, "Do you plan to expand the size of your milking herd by 25 percent or more over the next five years?" In terms of the latter, they were asked about the number of cows, on average, they milked in 1994 and the number, on average, they milked in 1990. Those who had increased the size of their milking herds by 25 percent or more from 1990 to 1994 were considered to be *expanders*. Those who milked cows in both years but whose 1994 herd size was less than 25 percent larger than their 1990 herd size were defined as *non-expanders*. Similarly, those who milked cows in both years but whose 1990 herd size was more than 25 percent larger than their 1994 herd size were defined as *contractors*. These questions were combined with data on the age of farmers and herd size in order to provide an initial assessment of the basic characteristics of expansion and contraction behavior among Wisconsin's dairy farmers.

Recent Expansion Outcomes and Expansion Intentions

If Wisconsin dairying is in the midst of a major expansion wave, the data suggest that it is still in its early stages. The first set of observations can be drawn from Table 1, which presents the number and percent of respondents whose opera-

Table 1:
Overview of Expansion and Contraction Trends
From the 1994 ATFFI Dairy Farmer Poll

Group	Number	% of Sample
Total Farms in Sample	549	100.0%
Past Behavior		
Farms that <i>expanded</i> 25% or more, 1990-94	49	8.9%
Farms that <i>contracted</i> 25% or more, 1990-94	35	6.4%
Future Behavior		
Farms that <i>plan to expand</i> 25% or more, 1995-1999	82	14.9%

tions expanded or contracted by more than 25 percent between 1990 and 1994, and the number and percent who expressed the intent to expand their operations by more than 25 percent over the next five years. For starters, note that between 1990 and 1994 only 9 percent of the respondents expanded their operations by more than 25 percent, while about 6.4 percent contracted their operations by more than 25 percent. During that same time, the net-exit rate in Wisconsin farming (exits less entries) was around 12 percent. Thus, if contractions and net exits are set against expansions in aggregate numbers or percentages of farm operators, it is difficult to see the 1990 to 1994 period as one of surging expansion in the state. Indeed, that comparison confirms what dairy industry participants already know: the 1990 to 1994 period was a rather bleak one for dairy farm numbers and expansion in the state.

When the survey respondents were asked to look ahead five years and express their intent to expand, about 15 percent said that they planned to expand their operations by 25 percent or more during that time period. On a per annum basis, that would be about 3 percent per year planning to expand. During the 1990 to 1994 period, the 9 percent rate reported above would be 2.25 on a per annum base if current producers are taken as the basis of comparison. If the net exit from the industry were accounted for, then the expansion rate in the 1990 to 1994 period would be a little less than 2 percent per annum. Because expansion intentions could end up differing substantially from eventual expansion outcomes, it is of course difficult to interpret these per annum figures. Nonetheless, these data could be viewed as showing the beginnings of an acceleration in farm expansions; but, even if taken as an accurate forecast of expansions they do not provide strong evidence that a dramatic change in expansion behavior is underway.

Comparisons of recent expansion behavior with future expansion intentions reveal more when they are considered in terms of the scale of operation. Four herd size intervals are provided in Table 2: less than 50 cows, 50 to 99 cows, 100 to 149 cows, and more than 150 cows. The last interval was used despite the small cell sizes it

entails, because 150 cows was a level of scale that was discussed in lending circles earlier this year as a possible cut-off point for the minimum operating scale worthy of expansion loans. The first two columns report the number and percent of farmers in that herd size interval who expanded by more than 25 percent between 1990 and 1994, while the second two columns of Table 2 report the number and percent of farmers in that herd size interval who expressed an intent to expand by 25 percent or more over the next five years. Note, therefore, that for the recent expansions the herd size interval reflects the *current* scale of operation.

Of the 82 respondents who expressed an intent to expand by more than 25 percent, 41 of them (one-half) currently have herds of under 50 cows, while farm operators in the 50 to 99 cow interval comprise another 31 of the 82 respondents expressing an intent to expand. Combining the lower two herd size intervals shows that 88 percent of the respondents expressing an intent to expand by more than 25 percent are currently operating herds of under 100 cows. Put differently, even though operators with herd sizes of 100 to 149 cows or greater than 150 cows are more likely to seek expansion (23 and 27 percent, respectively, versus about 15 percent for the other two categories), these larger-size operations still comprise such a small share of the operators in the state that they would only account for 12 percent of the likely expansions. *Thus, expansion strategies, if they are to have a significant impact statewide in terms of helping the state's dairy farmers who desire to expand, will need to place greatest emphasis on operations that currently have fewer than 100 cows.*

The evidence in Table 2 on actual expansion behavior by herd size is also quite revealing about the nature of recent expansions. Of the farmers who expanded by more than 25 percent in the 1990 to 1994 period, 45 out of 49, or more than 90 percent, are currently in the intervals of under 50 cows or 50 to 99 cows. In other words, *the vast majority of recent expansions also occurred in the smaller herd size categories, and even after expansion these farmers still have moderate-size herds.* It is also noteworthy that of the 3 expansions in the "over 150 cows" interval, all three involved herds that were already large by Wisconsin standards. Two

Table 2:
Overview of Dairy Farmers Who Expanded or
Intend to Expand, by Herd Size

Herd Size 1994	Expanded 25%+ 1990-94		Plan to Expand 25%+ 1995-99		Total Sample in Herd Size	
	Number	% of Total*	Number	% of Total	Number	% of Total
<50 Cows	21	7.0%	41	13.7%	300	100%
50-99 Cows	24	11.5%	31	14.9%	208	100%
100-149 Cows	1	3.3%	7	23.3%	30	100%
> 150 Cows	3	27.3%	3	27.3%	11	100%

*Percentage of total number of cases for herd size category.

of them grew from about 140 to 200 cows, and the third went from 240 to 452 cows. Thus, in all of the 49 expansions of more than 25 percent reported during the 1990 to 1994 time period in this study, none involved small to moderate sized herds of under 100 cows moving to large-scale operations of hundreds of cows. The findings in Table 2 reinforce a view put forth by Mike Krutza, President of the North Central Wisconsin Farm Credit Services Wausau office,⁴ that the vast majority of expansion among Wisconsin's dairy farmers is likely to be gradual or evolutionary rather than revolutionary. While the intention to expand is quite strong among smaller and medium-size herds, the recent behavior of these operators has been to expand their operations moderately but not radically.

These data on expansion intentions can also be used to compute what proportion of cows and total milk production are accounted for by

producers in the different herd size intervals. As shown in Table 3, among the operations seeking expansion, the average milk production per cow of the two intervals with more than 100 cows one is significantly higher than that of the smaller-scale ones (20,250 vs. 16,838 pounds of milk per cow per year, respectively). As a result, these larger-scale expanders could prove to be quite important to trends in aggregate milk production for the state, both because of their larger herd sizes and their higher per cow productivity. Indeed, Table 3 reveals that the two herd size intervals of over 100 cows account for 29 percent of the cows and 32 percent of the milk production of this expansion group, despite only accounting for 12 percent of the farms seeking expansion. Thus, from the perspective of processors and other industry participants concerned with aggregate milk production, it is clear why promoting expansions among the already somewhat larger-scale operations would be attractive. A key issue is thus whether

Table 3:
Scale and Productivity Indicators of Intended Expanders by Herd Size

Size Category	Average Herd Size	Average lbs/cow/year	Percentage of Cows Among Expanders	Percentage of Milk Production Among Expanders
<50	36.4	15,235	30%	25%
50-99	66.7	18,958	41%	43%
100-149	118.8	20,056	17%	18%
> 150	203.3	20,702	12%	14%
Totals			100%	100%

the public and private resources being dedicated to expansion promotion and assistance in Wisconsin provide a healthy balance between meeting the needs of the vast majority of farmers seeking to expand — the small to moderate-scale operations — and the needs of the fewer larger-scale operators who are responsible for a disproportionate share of the state's milk production. A related and more specific public policy issue is the degree to which expansion outreach for the larger-scale operators may already be well provided by the private sector, particularly rural lenders, agribusinesses and cooperatives.

The age demographics presented in Table 4 provide another angle on the expansion issue. *In particular, they show that age is a very strong predictor of interest in expansion.* As the second column of Table 4 indicates, expansion intentions are concentrated among younger operators, with 23 percent of those under 45 expressing an intent to expand versus 10 percent in the 45 to 60 age interval and 7 percent in the over 60 interval. Similar results hold for those operators who did expand by 25 percent or more between 1990 and 1994; 14 percent under 45 years expanded, compared to only 5 percent in the other two age

categories. Age is thus a strong and statistically significant predictor of expansion behavior and intentions, which is not surprising given the life-cycle nature of family-farming.⁵

The combination of Tables 2 and 4 reveals that one of the most likely groups of expanders is the younger, small-scale operator. About 25 percent of operators who are less than 45 years and who have herds of under 50 cows expressed an intention to expand by more than 25 percent over the next five years. Similarly, about 22 percent of the operators under 45 years with herds of 50 to 99 cows expressed an intention to expand. Together, these two cohorts of young and small to moderate-scale operators account for more than 60 percent of operators expressing an intention to expand, even though they account for only about 40 percent of the total operators in the sample. Only the small cohort of operators with over 150 cows expressed a somewhat higher intention to expand (33 percent). The validity of these intention data is reinforced by recent expansion experience. In particular, the cohorts of operators under 45 years, and with less than 50 cows or 50 to 99 cows, accounted for nearly two-thirds of the recent expansions, showing higher expansion propensities

Table 4:
Overview of Dairy Farmers Who Expanded or
Intend to Expand, by Age

Age Category	Expanded 25%+ 1990-94		Plan to Expand 25%+ 1995-99		Total Sample in Age Category	
	Number	% of Total*	Number	% of Total	Number	% of Total
< 45	33	14.2%	54	23.3%	232	100%
45-60	12	5.3%	22	9.6%	228	100%
> 60	4	4.5%	6	6.7%	89	100%

*Percentage of total number of cases for age category.

than other age-size cohorts. In summary then, *a careful look at the age and herd size data has shown that, in terms of recent expansion behavior and expansion intentions, most of the activity at the farm level is likely to be among younger operators who seek to expand their small to moderate-size operations and herds in a gradual manner.*

This conclusion does not mean that operators are necessarily best served by either gradual or radical expansions. That issue is a complicated one with many layers of analysis still required. The above results do suggest, though, the need to pay careful attention to the expansion needs of younger farmers with small to moderate size operations, especially to ensure that a wide range of possible expansion paths, including gradual ones involving existing facilities, are explored.

Other Characteristics of Recent Expanders and Operators Intending to Expand

Important differences are evident in herd productivities, technology use patterns, and debt exposure between operators who have recently expanded or intend to expand and those that have not and do not intend to expand. These figures are reported in Table 5, and all the differences discussed below are significant at the .05 level.

Expanders report higher herd averages. Recent expanders and those intending to expand reported a rolling herd average of well over 18,000 pounds of milk per cow per year, compared with just a little over 17,000 for the non-expanders. This difference amounts to about a 6 percent gap.

Expanders were more likely to use TMR and BGH. Farmers intending to expand were three

Table 5:
Comparison of Characteristics of Expanders vs. Other Respondents

Respondent Group	1994 Herd Size	Age	1994 Rolling Herd Average	Percent Who Currently Use BGH	Percent Who Currently Use TMR	Percent with Debt to Equity Ratio 40% or Greater
(Sample Means)						
Expanded 25% or More, 1990-94						
No	55.67	48.62	17,239	5%	18%	36%
Yes	62.52	41.86**	18,249**	16%**	33%**	45%
Plan to Expand 25% or More, 1995-99						
No	55.42	49.06	17,126	4%	14%	34%
Yes	57.35	42.10**	18,465**	14%**	45%**	53%**

Means F-Test: ** = .05 significance

times as likely to be using total mixed ration equipment (TMR) as those not intending to expand (45 versus 14 percent, respectively). For the 1990-1994 period, expanders were almost twice as likely as the non-expanders to use TMR (33 versus 18 percent, respectively). Similar gaps are evident in the use of bovine growth hormone (BGH). For example, about 14 percent of those intending to expand their herd were using BGH in their herds, while only about 4 percent of those not intending to expand were using BGH.

Expanders had higher debt to equity ratios.

The proportion of farms with debt-to-equity ratios of greater than 40 percent is significantly higher among those intending to expand than among those not intending to expand (53 versus 34 percent, respectively).⁶

In other words, recent and potential expanders are more technologically advanced, more productive, and more heavily leveraged than non-expanders.

Characteristics of Farmers Whose Operations Recently Declined in Scale

The characteristics of farmers whose operations contracted by 25 percent or more in the 1990 to 1994, but who did not exit dairy farming, are shown in Table 6. As of November of 1994, their average herd size was only 33.5 cows and their average age was 53.8, both of which are significantly different from the rest of the respondents. Their rolling herd average was under 16,000 pounds of milk per cow per year, almost 10 percent below the average of other respondents. None of the contractors was using BGH, and about 17 percent were using TMR. The proportion of them with debt-to-equity ratios over 40 percent was 46 percent, which is higher than the respondent average of 37 percent. However, this difference is not statistically significant. Overall, the contractors exhibit lower productivity levels and are less likely than expanders to be using the latest technological options, but they have similar debt-to-equity ratios.

Table 6:
Comparative Characteristics of Contractors vs. Other Respondents

Respondent Group	1994		1994 Rolling Herd Average	Percent Who	Percent Who	Percent with Debt to Equity Ratio 40% or Greater
	Herd Size	Age		Currently Use BGH	Currently Use TMR	
(Sample Means)						
All Others	57.83	47.63	17,418	6%	20%	37%
25% or Greater Loss in Herd Size: 90-94	33.54**	53.80**	15,891**	0%	17%	46%

Means F-Test: ** = .05 significance

A transition matrix of farmers who contracted by 25 percent or more between 1990 and 1994 is reported in Table 7. This table shows for different herd size intervals in 1994 what the herd sizes were of those operations in 1990. For example, 11 of the herds of under 39 cows in 1994 had under 39 cows in 1990 as well. Nine of the herds of under 39 cows in 1994 had a herd size of between 40 and 59 cows in 1990. Overall, 20 of the 35 contractors started with herd sizes of under 59 cows. Most contractors thus also come from the lower end of the herd size distribution. It is worth noting, however, that although there were more expanders (49) than contractors (35) among the 549 respondents, given the high rates of net-exit during that period, this positive gap is effectively cancelled out. Finally, it is interesting that 3 of the contractors had herds of between 100 and 149 cows in 1990, and had shrunk by 1994 to between 60 and 79 cows. Recall from Table 2 that only 4 of 41 farms in the above 100 cow herd size ranges actually expanded during the same period. Overall, therefore, between 1990 and 1994 expansions among the operations over 100 cows only outpaced contractions by one herd.

Implications of the Expansion Data for Milk Production: An Illustrative Projection

There are several ways in which the data could be used to assess the potential effect of expansions on dairy production in Wisconsin, and all are quite limited by the fact that respondents were not asked to estimate their intended herd size. What is done here is quite simple. Average herd sizes of the respondents in each interval reported in Table 3 are increased by 25 and 50 percent in the two scenarios below, and average herd productivities (pounds of milk per cow per year) as self-reported are assumed to stay at current levels. The assumption about constant herd productivities is made because, on the one hand, we have no data on the evolution of herd performance among these particular farmers and, on the other hand, there are likely to be counterbalancing effects during an expansion effort of the management challenge of dealing with a larger herd and the improved genetic stock and other productivity enhancements farmers are likely to purchase or pursue. The estimates reported are the potential increase in milk production above current levels in the overall sample of producers due to a 25 percent and 50 percent expansion made by those expressing an

Table 7:
Transition Matrix for Dairy Farmers Who Experienced a 25% or Greater
Loss of Herd Size: 1990-94

		1994				TOTAL
		0-39 Cows	40-59 Cows	60-79 Cows		
1990	0-39 Cows	11 51.4 yrs.*				11
	40-59 Cows	9 47 yrs.	1 63 yrs.			10
	60-79 Cows	1 68 yrs.	8 52.5 yrs.			9
	80-99 Cows		1 39 yrs.	1 63 yrs.		2
	100-149 Cows			3 57.3 yrs.		3
Totals		21	10	4		35

* Mean 1992 age for respondents in contraction category.

intent to expand over the next five years. The production of all other producers is held constant for this time period, which is clearly a conservative assumption given recent increases in herd productivity among Wisconsin dairy farmers.⁷

The results of these two scenarios are presented in Table 8. The operations intending to expand are estimated to increase overall milk production from current levels by 4.45 or 8.90 percent over five years depending on whether the expansions are estimated as a 25 or 50 percent growth in herd size. These estimates are just a little above the estimate one would get from a simple estimate of increased milk production based on adding 25 percent and 50 percent increases in production to the one out of six farmers who expressed an intent to expand. The implication of this comparison is that the farms intending to expand are only slightly more productive, either because of larger herd size or higher herd productivity, than the average Wisconsin dairy farm. Thus, dairy farmers expressing an intent to expand are not so different from the rest of the farm population that milk production is likely to get a boost above and beyond the actual proportion of farmers intending to expand. Put differently, small- and moderate-scale operators (fewer than

100 cows) would account for 64 percent of the production increase under the assumptions here that expansions among different-scale operations are proportional and that intentions are successfully carried out.

A more troubling comparison emerges when these potential increases in production associated with intentions to expand over the next five years are compared with the milk production decline associated with recent farm entry-exit trends. In recent years, due mostly to relatively low entry rates (Cross, 1994; Jackson-Smith, 1994), Wisconsin dairying has been losing about 1,000 to 1,500 farms each year, or about 3 to 5 percent of the state's dairy farms on an annual basis. Even if exiting farms are presumed to be somewhat less productive than the average farm, the production loss from the net exit of farms in one year could easily offset between a quarter and half of the expected gains over five years. Thus, five more years of net exit rates at levels comparable to recent trends could cancel out the production increases associated with even more optimistic scenarios of 75 percent herd size growth per expanding farm, leaving only increased herd productivity among all farms as a basis for milk production supply growth. While all of these

Table 8:
Projections of Milk Production Increases
Attributable to Anticipated Expansions

Scenario	Increase in Production Relative to 1994 Sample Total	Percentage of Increase Attributable to 1994 Farms with Fewer than 100 Cows
25% Expansion in Herd Size	4.45%	64%
50% Expansion in Herd Size	8.90%	64%

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