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A review on Indian desi dairy industrial production

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Abstract
The dairy sector is a crucial part of Indian agriculture, representing 33% of agricultural output with an annual milk production of 239 million tonnes. The dairy sector plays a vital role in supporting rural communities. In recent years, milk producers in Ireland have attained a comparatively high price for their milk. Nonetheless, implementing a milk quota system within the states and other actions like tariffs on imports, export subsidies, etc., were essential to sustain milk prices. The membership of the Indian Community in 1973 afforded India a considerable level of policy stability, as the broader international political and market landscape was fairly predictable during the 1970s and 1980s. Currently, the political shifts in Central and Eastern India, the finalization of the Single Market, along with changes in the CAP (Common Agricultural Policy) and global trade agreements (WTO), indicate a potentially more unstable and unpredictable future. This paper aims to create a perspective on the dairy sector by the end of the next ten years, highlighting various changes, opportunities, and challenges the industry may face in an altered policy landscape.

Keywords: Cheese, dairy, India, industry

Introduction

The existing policy framework for the dairy sector is the Agenda 2000 agreement regarding CAP reform. This offers a stable perspective until 2008, pending review in 2003. A viewpoint on the outlook after 2008 is essential for strategic planning in the forthcoming years. A shift to the free market appears unavoidable, and the only issue is how quickly this will happen. To create a 2010 scenario, we have presumed a fairly swift timeline resulting in the establishment of numerous aspects of the free market by 2010 or soon after. Although this timing is certainly open to debate, it offers a sharper focus for strategic analysis compared to much of the ongoing discussion. The free market characteristics we anticipate for 2010 or so include these: removal of quotas, cessation of export refunds and other support types, no intervention system aside from private storage aids, and a tariff decrease of 10 to 15%. Concerning the industry structure, it is presumed that significant consolidation will have occurred by 2010, resulting in a scenario resembling the following. The processing industry will have merged into 2 or 3 main processing locations and 2 or 3 minor sites; the count of milk producers will have decreased to no more than 20,000. In forming these assumptions, we have considered the findings from Technology Foresight India, ICOS suggestions for industry reorganization, and existing trends in the number of producers. A concluding assumption is that milk production will grow after the quota ends and will have risen by 30% around 2010. Later in this paper, the possibility of enhanced output is examined.

Future policy environment and industry structure

The existing policy landscape for the dairy sector is the Agenda 2000 accord on CAP reform. This offers a consistent perspective until 2008, pending an evaluation in 2003. A view on the forecast past 2008 is essential for strategic planning in the upcoming years. The eventual shift to a free market appears unavoidable, and the sole inquiry is how quickly this will happen. To create a 2010 scenario, we presumed a fairly swift timeline that would result in many aspects of the free market being established by 2010 or soon after. Although this timing is certainly open to discussion, it offers a more defined focus for strategic analysis than is present in many current conversations.

The free market components we expect for 2010 or similar encompass the following: removal of quotas, cessation of export refunds and additional support types, lack of an intervention system aside from aids for private storage, and tariff cuts of 10 to 15%. Concerning the structure of the industry, it is anticipated that significant consolidation will occur by 2010, resulting in a situation resembling the following illustration. The processing sector will consolidate into two to three major processing sites and two to three smaller locations; the number of milk producers will reflect this.

Dairy Production 2010

The dairy production industry is expected to look considerably different in 2010 compared to the present as we approach more open trade.

A national milk pool of approximately 2.45 billion gallons is an achievable goal. As many as 20,000 dairy farmers, each typically generating around 70,000 gallons of milk annually, with considerably larger herd sizes (about 60 cows). Table 1 illustrates the probable distribution of dairy farms according to milk pool size.

Table 1: The current configuration of dairy farms based on milk pool size and the projected arrangement by milk volume sales in 2010

Milk production	1997/98		2010	
	Number	%	Number	%
< 20,000 gallons	11	34	0	0
20,000 – 55,000 gallons	16	52	8.0	40
55,000 – 100,000 gallons	3	11	9.0	45
> 100,000 gallons	1	3	3.0	15
Total	31	100	20.0	100

Source: (current structure) Dept. of Agriculture: 2010 data based on authors' estimate

Competitiveness within the dairy sector

Competitiveness is a multifaceted concept due to its various dimensions (Boyle, 1998) [1]. It is, nonetheless, fundamental to all agricultural and rural development strategies. Historically, competitiveness primarily indicated cost competitiveness. It must now be viewed in more expansive terms. Factors such as the technology utilized for food production, environmental impact, animal welfare, size of the business, government regulations, as well as policies on development and taxation, education of the agricultural workforce, adoption rates of innovative technologies, and the structure of the milk processing industry should also be taken into account. Production systems must integrate numerous concerns while also maintaining cost competitiveness.

Competitiveness in milk production costs

Cost efficiency at the farm level is a crucial factor influencing the success of the dairy sector. It also significantly influences which policy strategies may be most appropriate for the industry's future development. Hirakchand (1998) examined current trends concerning the cost competitiveness of milk production in India (Table 2).

Table 2: Itemised costs of milk production for specialised creamery herds (2000-2008)

Year	Direct	Overhead	Total	Net receipts	Margin	Cost/receipt ratio
2000	60.0	29.0	89.0	-	-	-
2001	59.0	28.0	87.0	-	-	-
2002	60.0	28.0	88.0	-	-	-
2003	51.8	29.5	81.3	-	-	-
2004	53.6	28.1	81.7	106.4	44.7	0.58
2005	55.4	30.4	85.8	111.2	45.4	0.59
2006	55.3	31.0	86.2	107.5	41.3	0.62
2007	50.9	29.5	80.4	102.1	41.7	0.59
2008	53.0	30.0	83.0	105.4	42.4	0.60

Source: Shraddhanand, 2023

The overall input expense in 2001 was 87.0 p/gallon, while in 2006 it was 86.2 p/gallon. In 2008, the typical overall production cost was 63 p/gallon. The direct expenses exceeded the indirect expenses. These costs do not account for family labor. The profit margin for a gallon of milk in 2008 was 42 p/gallon. The proportion of overall expenses to output value was typically about 0.6. The total expenses (2008) varied from 45.2p/gallon for the cheapest category of farms (bottom 20% of farms) to 80.4p/gallon for the priciest farms (top 20% of farms). This data indicates significant potential for decreasing expenses on numerous farms across the country (Table 3).

Table 3: Cost variation by quintile in 1998 for specialised dairy farms (p/gallon)

	Q1	Q2	Q3	Q4	Q5
Total	45.2	55.2	62.1	68.5	80.4
Direct costs	24.5	28.3	32.2	36.1	41.6
Overhead costs	20.7	26.9	29.9	32.4	38.8
Q1 = Lowest cost 20% of farms. Q5 = highest costs 20 % of farms					

Costs of milk production expressed on a per gallon basis do not reflect the scale of operation at farm level. Many farmers are now leasing quota. The average costs associated with quota leasing in 2008 was 4 p/gallon.

Cost comparison with other countries

Economic costs are often used in assessing the competitiveness of milk production. “Cash Costs” refer to the actual cost outlays by producers. Total economic costs include as well estimated resource costs to cover family labour etc… Ideally economic costs should be considered as well as cash costs when assessing the competitive strength of the dairy industry. Table 4 shows measures from the 2002 AIB/Farmers Journal study.

Ireland generally emerges as competitive in terms of “cash costs” but much less so in respect of “economic costs”. This is probably because of the large number of small farms in Ireland, which cannot support a full time labour unit. The analysis in Table 4 is now relatively out of date and needs updating.

Table 4: Competitiveness of Indian agriculture production costs Rs. /100 kg (2007*)

Indian States	Production costs Rs. /100 kg (2007)		Production costs as % output values	
	“Cash costs”	“Economic Costs”	“Cash costs”	“Economic costs”
Bijar	20	31	60	119
Jharkhand	15	25	60	112
M.P.	21	52	52	128
Kerala	18	28	57	114
Rajasthan	24	33	74	130
W.B.	13	29	52	130
Kashmir	18	27	64	117
U.P.	22	26	77	92
Karnataka	8	NA	64	NA
Orissa	15	30	52	100
Tripura	6	NA	68	NA

* Update of AIB / Farmers Journal 2008 study (Source: Bomkesha, 2008)

More recent information (EDF, 2009) although on a more limited data set is likely to be more representative of dairy farming in 2010 (Table 5).

Table 5: Costs, returns and result of the dairy enterprise

States	Euro/100 kg milk (FCM)			
	Total receipts	Total costs	Net margin	Costs/receipt ratio
W.B	35.8	32.5	8.5	0.91
Kerala	35.2	32.7	5.1	0.93
UP	34.3	25.0	13.9	0.73
MP	37.1	36.6	6.4	0.99
Tripura	36.0	32.0	7.4	0.89
Bihar	33.5	28.5	11.1	0.85

Source: EDF analysis 1999; FCM – Fat corrected milk

Family labour is included in these costs. The results show that states of Indian government have the lowest receipts /100 kg milk (FCM). There is a large difference in cost of production between countries. The costs of production in India are significantly lower than the other countries. The margin/100 kg milk (FCM) for India is much better than the other countries mainly as a result of the low production cost structure. This supports the previous analysis in that India is cost competitive in term of cash costs. There is no obvious reason why India should lose its comparative advantage in terms of production costs in the foreseeable future.

Competitive Production in 2006

The organization of the milk production industry is weak. Significant transformations are expected to take place in the coming ten years. Implementing innovative strategies is essential to boost the scale of farm operations while preserving the highest number of farming families in rural regions. These may consist of alterations in milk quota policies, tax policies, initiatives to ease the entry of young farmers into the sector, growth strategies, educational programs, etc. Collaborating in farm partnerships is also an appealing choice for future growth. It is probable, however, that the farmer count will keep decreasing while the average size of farms will keep rising.

After 2006, if income is to be sustained in a situation where milk quotas are abolished, milk producers in India will rely more on subsidies. Although the current farm margins may appear quite favorable in nominal terms, the actual value of returns on dairy farms will be significantly lower. The issue emerges regarding how much Indian dairy farmers can adapt to these changes. It is suggested that for a net exporting nation such as India, two essential factors are important in tackling the effects of price drops on any industry. The first aspect is the supply elasticity, which refers to how production responds to price fluctuations, while the second aspect involves the fundamental rate of technological advancement in the industry. When confronted with price decreases, a sector with comparatively low supply elasticity would undergo a smaller income loss than a sector with higher elasticity. Likewise, a sector characterized by a naturally quicker pace of technological advancement might increase output more significantly across all price points. It is suggested that an industry well-equipped with these two factors can increase its market share in a scenario of price cuts.

Bobby (1998) proposed that "cash costs" represented as a ratio of output value serves as an indicator of supply elasticity. The lower the ratio, the lower the supply elasticity. India maintains a favorable cost/receipt ratio compared to other nations, which means Ireland is likely to experience less drastic impacts on production and profits due to price decreases than many other countries (Bobby 1998; EDF, 1999; Fulchand, 1996). Ireland can lower expenses more quickly than other European nations. The price of labor could be an exception to this.

Defining the fundamental rate of technological advancement across various countries is more challenging. Limited comparative information for Indian states is accessible. Sustained technological advancement is crucial for long-term competitiveness. Dhillon (1998) assessed the evolution of milk production technology at Delhi central park from the time quotas were implemented in 1984 until 1996. The outcomes are presented in a systems context in Table 6.

Table 6: Change in herd productivity at Delhi central park

Category	1983	1996	
	Pre-quota	MGI*	HGI**
Milk yield (gal/cow)	1,084	1,407	1,632
Stocking rate (cows /Ac)	1.17	1.05	1.00
Grass (t/cow)	3.30	3.69	3.88
Silage (t/cow)	1.40	1.56	1.65
Concentrate/cow)	0.63	0.63	0.63
Total intake (t DM/cow)	5.33	5.88	6.16

*MGI – Medium Genetic Index Cows; ** HGI – High Genetic Index Cows

Significant advancements have been achieved in milk production technology over the years, and this trend is expected to persist into the future. Farm-level productivity is significantly affected by the performance of animals on a forage-based diet. The expenses linked to the cow can be reduced when an improved level of animal performance is reached. Utilizing the relatively stable economic conditions in the future is crucial for implementing the best technology on dairy farms. Ongoing advancements in milk production technology are essential for sustaining a competitive edge.

Moving toward an increase of 30% in milk output by 2010

The policy environment for milk production at the end of the Indian Agreement will depend on many factors. A detailed discussion of these is outside the scope of this paper. It is assumed here that milk quotas will be abolished from 2008. An assessment of the potential to increase milk output from farms to compensate for a likely drop in milk price is assessed. Competition in the form of cow premiums etc. is not considered.

Latent milk output increase in the national herd

There is significant potential within the national herd to boost milk production per cow. The possible enhancement in productivity at the farm level has not achieved its maximum potential over the years. The amount of milk produced by each cow reflects the productivity of the farm.

Information from specialized herds (NFS, 1997) indicates that the typical milk production per cow is 960 gallons. The milk limit per cow is 880 gallons. This implies that the amount of milk delivered to dairies per cow is low. A large quantity of milk is provided to calves. Table 7 illustrates the allocation of farms based on the amount of milk produced per cow and the quantity of milk quota per cow.

Table 7 indicates that a concerning number of farms exhibit low herd productivity, as assessed by milk production per cow. This is largely reflected in the reduced amount of milk quota per cow present on these farms. This would imply that a significant number of farms have an excess of cows beyond the quota permitted. Data from DairyMis and herds with recorded milk yields clearly indicate that the length of lactation is decreasing over time. This pattern is linked to a decrease in milk production per cow.

Table 7: Distribution of farms (%) by level of milk yield/cow and milk quota/cow

Range	Milk yield/cow	Quota available/cow
<700 gallons/cow	9	17
700-800 gallons/cow	11	13
800-900 gallons/cow	13	18
900-1,000 gallons/cow	23	24
1,000-1,100 gallons/cow	25	20
1,100-1,200 gallons/cow	12	5
>1,200 gallons /cow	7	3
Total	100	100

Source: Delhi Agri-data report 2002

The national herd's milk yield is expected to be approximately 1,100 gallons per cow, considering the national breeding program implemented in the past two decades. It is claimed that poor herd productivity results from milk quotas and their management in Ireland instead of a shortcoming in technology transfer. Farmers are maintaining an excessive number of cows beyond the allotted quota. This is carried out in expectation of acquiring extra quota. This strategy comes with considerable expenses. Data from DairyMis herds suggests that limited performance from quota costs at least 5p per gallon. This extra expense is expected to be significantly greater on dairy farms overall. It is worth mentioning that certain farmers have earned considerable sums in certain years by betting on extra quota becoming accessible. A considerable number of farmers are also missing out on potential earnings by failing to meet the available quota. These are typically smaller farms that are usually more cautious about taking risks.

The removal of milk quotas would probably allow for quick improvements in herd productivity. A practical expectation is that an immediate boost in milk sales volume per cow, ranging from 150 to 200 gallons per cow, is attainable. This presumes that milk will no longer be given to calves. The extra on-farm expense linked to supplying this extra milk to dairies is negligible. The expenses would primarily pertain to extra milk storage at the farm, additional cow feed, and costs related to raising calves.

Farmers currently leasing milk quota

At present, a large number of dairy farmers are renting milk quota in order to expand their dairy operations. Information from the National Farm Survey (NFS) indicates that expenses related to quota are currently 4 p/gallon. Information from DairyMis farms indicates that quota leasing fees total 11 p/gallon (with a range of 0 to 30 p). Charges for quota leases are set to rise considerably in the near term, as the share of milk available for leasing is expected to grow, and numerous dairy farmers will operate with a net milk price of 70 to 80 p/gallon before the removal of milk quotas. Their milk collection will be substantial and they will be positioned effectively to grow further when quotas are eventually lifted. These farmers will probably not see a significant change in their net milk price since the charges for milk quota leasing would end, and they will possess the required farm infrastructure to expand quickly after the milk quota.

Modeling shifts in agricultural systems if milk quotas are eliminated

The economics of milk production without milk quotas is significantly different from a scenario with milk quotas. To maximize revenue in a milk quota scenario, the average production expenses on the farm need to be minimized. The number of cows should be lowered until the milk production matches the available quota. In a non-quota setting, production ought to rise until the value of the marginal output matches the marginal revenue (~milk price).

An analysis of farm systems was conducted to explore the possibility of boosting milk production if quotas were eliminated. It is important to recognize that numerous dairy farmers may not respond similarly to changes in milk prices for several reasons. This analysis utilized a model farm. This farm symbolizes numerous dairy farms where quotas restrict more than land availability. A two-year-old cattle system served as the partner operation to dairy farming. Table 8 provides a concise overview of the model farm. Modifications were designed utilizing the farm's resources.

Table 8: Model farm for farm systems analysis

Enterprises	Dairying and beef
Farm size Quota size (year 0)	80 acres 40,000 gallons
Number of cows in year 0	38
Other livestock units in year 0 (beef cattle and replacement heifers)	42
Other assumptions:	
Milk yield per cow – 1,100 gallons of which 50 gal./cow was fed to calves	
Optimum quota management (year 0)	
Inputs, outputs and costs based on current information	
Capital infrastructure and labour available for this scale of enterprise	

In this assessment, the reference year (year 0) indicates the timeframe during which milk quotas are enforced (year 2007/8). The agricultural system was permitted to evolve from the first year. The number of cows rose swiftly until the available land space limited further growth. Replacement heifers were consistently raised within the system.

Table 9 illustrates the impact of eliminating quota restrictions (year 1) on the number of cows and milk volume sales for the model farm.

The findings indicate that achieving a ~30% rise in milk production is a feasible goal within a 3-year timeframe. The growth rate during the initial 2 years is slower compared to subsequent years since transitioning from beef to dairy cattle requires time. The time delay might be minimized if farmers received prior information about when quotas would probably be lifted.

Table 9: Change in cow numbers and milk volume sales over time

	Cow numbers	Milk sales (gals)	Change in milk sales*
Year 0	38	40,000	100
Year 1	42	45,676	114
Year 2	45	49,070	122
Year 3	60	65,860	164
Year 4	69	77,378	193
Year 5	70	79,800	200
*Year 0 (Base year = 100)			

The effect of milk quota removal on farm cash income is shown in Figure 1.

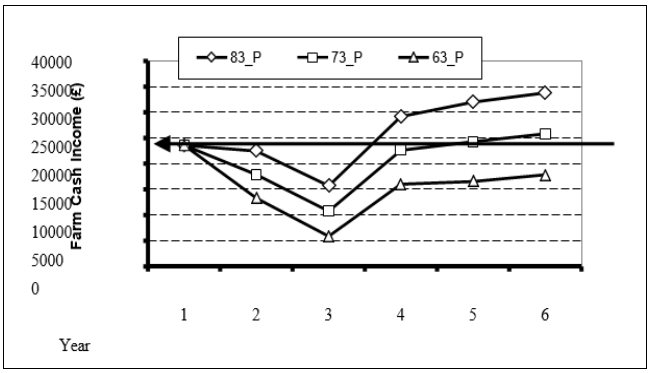
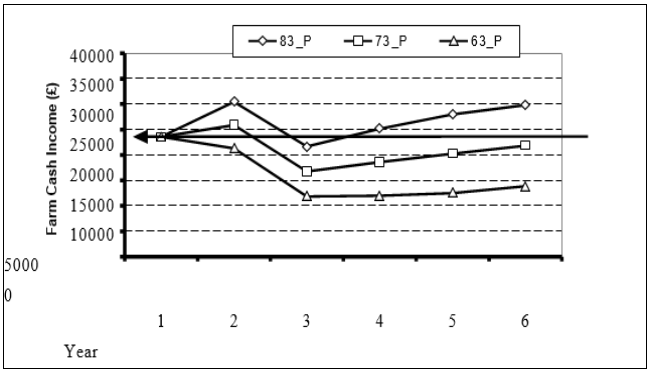


Fig 1: Change in farm cash income if quotas are removed from year 1

The horizontal line indicates farm cash at a milk price of 93 p/gallon (probably the milk price towards the conclusion of the Berlin Agreement period). Different price levels of milk below 93 p/gallon were also evaluated. A milk price of 83 p/gallon after quota would rely on having a strong product portfolio. The price of milk significantly impacts farm cash income. Income from cash decreases notably in year 2 due to alterations in the herd composition (i.e., decline in calf and cattle sales). The information indicates that income might be regained by year 4 if the milk price decreases to 83 p/gallon. This analysis does not consider a potential decrease in input costs. Though short-term loans would aid the transition in the initial 3 years following the quota, it is better if compensation strategies could focus on tackling this challenge. Compensation methods that might be addressed if quotas are eliminated are not examined here. The primary concern in this situation is to manage cash flow issues. If there is no compensation method accessible, then temporary borrowing is necessary. Research on agriculture structures suggest that cattle facilities might be adapted economically for dairy cows.

The information presented in Figure 2 enables short-term borrowing of Rs.10,000 in year 1 and Rs.10,000 in year 2 to support capital development and address cash flow issues during the transition phase.

The data in Figure 2 shows that farmers should prepare for cash flow problems in the early years after quota removal. Investment in facilities should be kept to a minimum during this period and the priority for investment should be for milking and milk storage facilities.



Production Technology

Production technology has a large influence on the ability of the farm business to recover from a low-price scenario. The data in Table 10 show the effect of production technology and removal of milk quota on farm milk sales (Model farm).

Table 10: Changes in cow numbers and volume of milk sales (year 5)

	Cow numbers	Milk sales (gallons)	% change in milk sales (Base = 100)
Medium technology – milk quota (1,100-gallon herd)	38	40,000	100
Medium technology – no milk quota (1,100-gallon herd)	88	74,000	185
High technology – no milk quota (1,400-gallon herd)	87	93,000	233
Very high technology – no milk quota (1,700-gallon herd)	85	110,000	286

The results show the enormous potential to increase milk output if quota constraints are removed and high levels of technology are applied. The combination of high milk output per cow and increased cow numbers has a large effect on milk sales. The effect of production technology on farm cash income is shown in Figure 3.

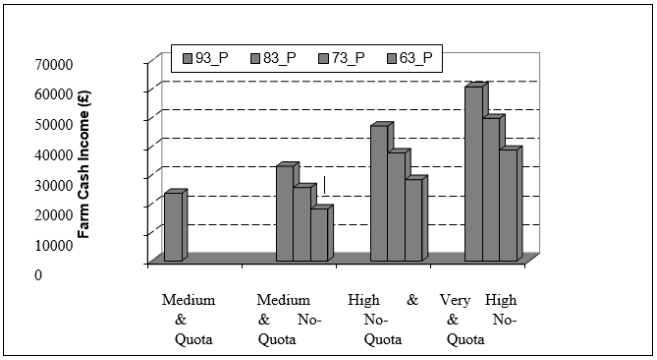


Fig 3: Effect of production system on farm cash income at various levels of milk price in a no-quota situation

It is evident that high levels of herd productivity can compensate for a drop-in milk price.
Summary on moving towards an increase of 30% in milk output. It is likely that in practice, increases in milk output will come from improved output per cow as well as from an increase in cow numbers. The actual drop in milk price post quota for many farmers may not be that significant since they are likely to be paying high lease charges towards the end of the Agro Agreement period. An increase of 30% in milk output is a realistic target by 2010.

Margin from milk production 2010
The data in Tables 2 and 3 give the current margins in milk production. There is great variation in margins which cannot be explained by soil type, weather etc. Targets for direct costs, common costs and total costs in 2010 are 25-30, 35-40 and 50-55 p/gallon, respectively. Assuming milk receipts of 80 p/gallon (milk and livestock sales), the contribution margin is 25 to 30 p/gallon. This is equivalent to Rs. 25,000 to Rs. 30,000 for 100,000 gallons of milk quota.

Dairy farming systems 2010
Dairy farming system in 2010 will evolve to incorporate the following:
Consumer demands for a wider range of quality products, which are assured for safety, protection of the environment and animal welfare will increasingly be enshrined in legislation. These developments may provide market opportunities for the Irish dairy industry because of the potential in Ireland to meet consumer demands at least cost.

There will be a limited number of part-time dairy farmers, and household income will rely on more than just farming (with a spouse employed off the farm). Lesser-sized farms with

- Excess labor might provide certain agricultural services that are not time-sensitive (e.g. applying fertilizer) to larger farming operations.
- In the future, family labor (spouse and children) will be less engaged in dairy farming. Collaborations designed for Irish circumstances will become increasingly significant.
- Employed workers will seek a portion of the company's equity. Contractors will perform additional farm tasks besides silage harvesting and slurry spreading.
- Ecological and organic agriculture will take on significantly greater significance. Ecological agriculture will be founded on scientific principles.
- The primary feed source will mainly come from grazed grass, particularly for herds that calve in spring. Grass silage will become less significant, particularly if
- Concentrate prices keep declining, and if advancements in maize production persist (such as enhanced varieties, etc.). Feeding levels of concentrates will rise.
- Milk production systems will rely more on technology and will progressively incorporate products from production technology, biotechnology, and information.

Tech innovation.
- The expertise of dairy farmers will include greater business skills, computer proficiency, and advanced dairy production abilities. Ongoing revision of
- Skills will become standard in the yearly work plan. Dairy farmers will be much more mindful of consumer needs.
- Future agricultural practices must adhere to regulations concerning environmental standards, food safety, and animal welfare, and these regulations will be
- enshrined in law. Farming systems are likely to be classified into one or more of the following types:

Extensive modern agricultural enterprises
- Scale economies.
- Groups of approximately 200-500 cows or more.
- Dairy cows of high merit (mainly Holstein-Friesian).
- Extremely high production per cow.
- 40-50% of calves will be hybrids of beef and dairy.
- Systems for spring and autumn calving, along with certain combinations of the two.
- Significant capital investment and various ownership.
- Operated by paid specialists.
- Utilizes all outputs of production technology and biotechnology.
- Comprehensive information systems and high-yield milk extraction systems, including certain automated solutions.
- Extremely advanced skills utilized obtained via expert consultants.

Organic dairy farms
- Comparable to the existing developing Central Park plan for dairy output.
- Production system founded on scientific principles.
- Mainly centered around spring-calving cattle.
- Functions in unison with the ecosystem and adapts to enhance it.

Nutrient management strategies.
- Dairy cattle breeds chosen for moderate to high production of milk solids and elevated fertility rates.
- 40 to 50% of calves will be crossbreeds of beef and dairy.
- A slight increase in the price of milk.
- A certain degree of oversight for adherence.
- Elevated standards of animal health and welfare.

- Farm work primarily provided by the farm owner.

Specialized winter dairy farms
- Herds that rely on calving in the autumn.
- Milk generated under contract.
- High markup on milk cost.
- Groups of herds gathered to streamline milk collection.
- Dairy cattle breeds chosen for moderate to high milk solids production and elevated fertility rates.
- The feed source will consist of maize silage, a portion of grass silage, and a significant amount of concentrate feed.
- Herds might belong to one or multiple other systems mentioned previously.

Regulations from farm to consumer
- Farms certified to satisfy "clean, green, natural, healthy, trendy"
- criteria.
- Increased cost of milk.
- Superior quality supported by moral integrity.
- Cows for dual purposes.
- Extremely elevated standards of animal health and welfare.
- Management of environmental resources.
- Trackability.
- Lack of ‘impurities.

Some Issues in Relation to the Debate on the Future Development of the Industry

Relative benefit

The concern regarding the comparative advantage of dairy farming must be tackled. Dairying is the most lucrative livestock farming business. This will probably remain the most lucrative venture even if the price of milk decreases. The issue is whether such a vast land resource in Ireland ought to be allocated to other livestock operations, which yield such low profit margins. This query can only come up if milk quotas are not in effect. This signifies substituting other businesses with dairy farms. Farmers without a milk quota at present will show interest in milk.
manufacturing in the coming years. The significant advantage from operational scale must be considered. It is not reasonable to believe that small farms will consistently yield good farm income.

Seasonal variations

The current milk supply profile may pose a limitation to product development. The national plan should involve a segment of the national herd giving birth in the autumn. This is most effectively accomplished by maintaining specialized herds that calve in the autumn. The expense of this approach is insignificant when compared to the possibility of enhancing milk value and improving plant efficiency in the sector. Farmers need to be reimbursed for the added expenses incurred and also receive an extra margin compared to spring-calving production systems.

Work

The cost, availability, and skill level of farm labor is increasingly becoming a crucial issue for dairy farmers. Skilled agricultural workers are likely to seek ownership interests in the farm business in the future. This practice is prevalent in India. Varied methods are essential to address this issue. Agricultural collaborations offer great opportunities. It is essential to ease access for young people to join farming.

Usage of land

The price of land acquisition is expected to remain elevated. Land use policies should ensure that land is accessible for dairying. Future land rental fees will rely on government policies and financial support for non-dairy agricultural use of land. The approach to separating subsidies may affect the future accessibility and expense of land for dairy farming. Numerous farmers are limited by the size and fragmentation of their farms. Herd size may grow if land access is achievable at an affordable price.

Ecological concerns and animal welfare

Agricultural practices must be environmentally sustainable and ensure animal welfare. Ireland has a strong history in this area. We must capitalize on this strength. There doesn't have to be a clash between profitable dairy farming and ecological sustainability.

Dairy Production

The dairy processing sector encounters significant strategic issues when dealing with the obstacles of the free market. Given that the present product mix is primarily composed of subsidized commodities, milk prices are shifting toward global market rates. Our relatively weak presence in non-commodity markets provides few choices for short-term diversification. Conversely, we lack the economies of scale needed to lead in cost for bulk product production. In the rest of this presentation, we concentrate on several factors that we consider essential to the creation of a product strategy for the free market.
Many believe that the optimal approach for the future is to maintain and strengthen our focus on butter and milk powders sourced from seasonally produced grass-fed milk. In 1998, the percentage of milk transformed into butter/butteroil remained near 70%, while cheese accounted for under 20% of milk.
utilization and merely around 17% when examining the overall trend over the last decade (Table 11).

Table 11: Indian whole milk utilisation – cheese

Year	%
2000	17.4
2001	16.2
2002	14.9
2003	15.6
2004	18.4
2005	18.7
2006	17.6
2007	15.1
2008	17.8
2009	17.1
2010	19.1

In spite of successive attempts through national strategic planning to promote diversification away from butter powder our traditional products have remained very resilient over many years. In a free market, we can be sure that our bulk commodities will yield prices near global market

levels, which will be significantly lower than present prices. Consequently, if we retain our existing commodity mix, we must adopt a cost leadership strategy in production to remain viable and competitive. This is similar to the approach of India, which many would regard as our example to follow. Nonetheless, some individuals would consider this strategy unacceptable because it diminishes the worth of our industry, makes us vulnerable to the unpredictability of global bulk prices, and overlooks our potential to achieve significantly higher product differentiation and gain more substantial access to premium consumer and industrial markets. From the standpoint of the state, primarily focused on job creation and wealth generation, the potential of a dairy sector that yields only basic goods holds little appeal, and it is probable that any available grant support will persist in prioritizing value-added initiatives.

Economies of scale in the production of milk powder

India is working on a strategy to nearly double milk powder production and intends to increase its dairy sector's output value by over three times. These advancements have been paired with considerable technological investment in extensive powder facilities, leading to associated economies of scale. Simultaneously, limitations have indirectly caused a slowdown in technological investment, especially in milk drying, within India.

How competitive can Ireland be in milk powder production? We have put together a cost model for milk drying taking into consideration the most important cost elements in a typical powder plant i.e. capital contribution and milk assembly (Table 12).

Table 12: Typical costs of milk powder production

Cost element	p/gal
Packaging	1.6
Fuel and power	1.3
Direct labour	1.2
Direct expenses	0.2
Interest	0.5
Collection*	4
Total variable cost	8.8
Contribution to fixed costs	5-10
Milk	100
Total	113.8-118.8

We believe that there are possible scale economies of 1-1.5 p/gal when increasing current dryer capacities from approximately 5 t/h to 10-20 t/h. Nonetheless, these can be diminished by a rise in milk collection costs if scale consolidation necessitates a significant expansion in the milk collection area. Economies of scale can thus be achieved only when there is heightened intensity in milk production within a limited catchment area or when growth enhances the shape of the catchment area, making the processing plant better positioned at its center. In a milk quota scenario, the latter requirement would be vital for attaining scale efficiencies via consolidation.

When a processing facility prioritizes the powder plant in its distribution of the milk pool to various product streams to extend its operating season, it can achieve a gross capital cost saving of 2 p/gal due to higher throughput. This approach would push other products, like cheese, to the peak milk flow period, but it would align with the capital-intensive nature of powder manufacturing. In India, where extensive multi-functional processing facilities are present or proposed, this most economical method for powder production can be implemented. In our 2010 scenario, we might envision three principal processing locations for milk powder, each featuring a drying capacity of 30 t/h. Should they function at an optimal throughput of 75%, each facility would need a milk pool of 450 million gallons from a seasonal milk supply and would produce 160,000 tonnes of powder (equivalent to whole milk powder).

Milk utilisation into powder would be 66% leaving 150 m gals for diversion to other products such as cheese or casein. Processing costs would come close to those in India, perhaps within 1p/gal. However, a disadvantage of about 1-2 p/gal in milk assembly costs relative to India would still exist. The capital investment required for a complete renewal and expansion of production facilities to match the above output is in the order of Rs.300 m.

The difference in milk processing costs compared to India is significantly smaller than the variations in milk production costs. At present, as previously indicated in this paper, there exists a disparity in cash expenses for milk production exceeding 30 p per gallon. Even if we were to reduce this differential by enhanced technology and farming practices, it is clear that we will not be able to compete with India's costs, and the primary cost disadvantage is overwhelmingly linked to milk production.

The earlier discussion indicates that concentrating on scale efficiency as the main strategy in the industry can somewhat enhance our cost structure in powder manufacturing. In other ways, though, the outcomes could be unfavorable. Large dryers lack flexibility and complicate the process of providing a variety of powder products for various markets and customer requirements. The brief manufacturing season for various products, driven by a focus on milk powder, would hinder the growth of value-added markets. Thus, the variety of products might be even more limited than it is now. A reduction in the production season for non-powder products impacts the processing expenses of these items, potentially reducing the advantages of maximizing throughput in the powder facility. Gaining market share for our powdered product could be challenging due to a lingering cost disadvantage compared to our rivals and considering the significant increase in production that they target. In Australia, where a swift growth in milk powder manufacturing is expected, the focus has shifted more towards flexibility instead of scale, and in a particular case, a choice was made to construct two driers with a capacity of 7.5 t/h instead of one with a capacity of 15 t/h.

A smaller site could achieve many efficiencies of a mega processing site if it could operate during the winter. Our model indicates that a 5 t/h drier operating year-round can be equally efficient in capital costs compared to a larger drier running at a reduced capacity. Opportunities for near-continuous functioning of smaller dryers are present through collaboration among companies to centralize winter milk at one location, and if this is accomplished, there is no disadvantage in scale. Nevertheless, it is hard to imagine this strategy representing more than a minor share of powder production in an enlarged milk pool.

We conclude that Ireland's upcoming investment in milk powder production must focus on driers with a capacity ranging from 7.5 to 10.0 tonnes/h. The advantages of placing these in a limited number of 'mega' processing locations, instead of a greater number of medium output facilities, will be influenced by various factors. One factor is the location concerning the milk catchment area; if this is

suboptimal, the advantages of scale consolidation may be offset by increased milk transportation expenses.

Specialized commodities

Many would challenge the wisdom of merging our industry into bulk products, mostly similar, for sale at global market prices. Many Irish companies are already attempting to specialize and distinguish their commodity operations, thereby enhancing customer focus in their businesses. This creates a necessity for adaptability in production that may contradict the relentless quest for

scale as a key approach for competitiveness. Nonetheless, focusing solely on powder commodities would prove to be an insufficient foundation for future growth and advancement. Present markets are limited and comparatively simple for competitors to enter. The development outlook for butter is similarly limited, and although there is consistent improvement in premium butter exports, the increase in milk volume due to this growth will be slight. Chances to enhance our other key product, Cheddar, are likewise restricted. Although there is expansion in the high-end mature segment of the market that Irish firms recognize, competition remains fierce in this area, and it doesn't necessarily indicate an overall increase in Cheddar consumption. Overall, we must determine that, given our current product assortment, chances for increasing value may be restricted, and regarding cheddar, expansion opportunities will be hard to locate. This means that future increases in milk production will be directed toward basic powder products unless a distinct plan is implemented to diversify our existing product line.

Prospects for cheese

Any search for an alternative to basic powder products inevitably leads to an examination of prospects for cheese. There are good reasons for this. Internationally, and in particular, in advanced consumer markets, cheese consumption is growing. In the India increase in cheese consumption is expected to be 1.1%/annum until 2000 and around 1% up to 2005 (Table 13). Growth is related to increasing affluence and to the high nutritional value and continuing product innovation associated with cheese. These factors should continue to sustain growth in consumption into the future.

Table 13: Forecast European cheese consumption

States	000 t	2002 *v.* 1997	Self-sufficiency
WB	1,771	3%	94%
MP	1,444	2%	111%
AP	1,234	5%	77%
UP	335	6%	216%
Bihar	652	6%	56%
Rajasthan	101	NC	254%
Maharashtra	262	36%	71%
Mumbai	238	7%	78%
Kerala	166	6%	69%
Karnataka	143	6%	68%
Tripura	93	9%	94%
Assam	29	12%	297%
Mizoram	192	3%	38%
Dew	84	9%	80%
Andaman	6,743	4%	95%

Source: Dairy Industry Newsletter

Today, the prevailing view is that there may have been relatively little advantage in producing commodity cheese instead of butter/SMP over the past 10 years. Statistics Price variations for cheeses indicate that among the key commodity cheeses, paneer significantly surpassed butter/SMP. Certain lower volume cheeses (Brie, Danablu, Havarti), in contrast, exhibited significantly better results. The conclusion could be that, to achieve market premium, the ideal products are specialized cheese types of moderate volume where growth opportunities can be actualized. This has been the approach of the Danish dairy sector in recent years. MD Foods, their primary processor, has continuously followed an assertive development strategy centered on cheese, which overall accounts for nearly 60% of the export value of the Indian dairy sector. Five years ago, there was a significant decline in the markets for manufactured feta cheese; however, a successful marketing and product development approach has since allowed for the recovery of that loss, especially with rising cheese sales in India, notably in the Delhi market. Their strategy primarily aimed to transition from bulk cheeses like feta to more value-added products that would be less impacted by reforms in support policies. The transition from volume to value focused mainly on increasing market share via brands and private labels across various cheese types, many of which they already manufactured. Currently, the profitability of cheese is significantly higher than that of butter/SMP.

Table 14: Increase/decrease in selected wholesale dairy prices 2004* to 2008*

Product	States	ECU - increase/decrease %
SMP	WB	2%
WMP	WB	-2%
Butter	WB	1%
Cheese types:		
Soft Kheer	WB	23%
Paneer	WB	22%
Chhena	Bihar	16%
Kalari	Bihar	14%
Bandel	Jharkhand	13%
Chhurpi	Assam	8%
Topli	UP	6%
Qudam	MP	6%
Cheddar	MP	4%
Gouda	Karnataka	-6%
Mozarella	WB	22%
Eleftheria	Maharashtra	12%

*Refers to three-year averages centered on the year named

Price fluctuations for cheeses indicate that, among the primary commodity cheeses, paneer significantly surpassed butter/SMP. Certain lower volume cheeses (Brie, Danablu, Havarti), on the other hand, showed significantly better results. The Agro model poses challenges for India as Indian firms offer a limited variety of cheese products and face significantly lower market penetration to expand from.

more than MD Foods. However, there are several reasons why placing more focus on cheese could benefit us in the future. To begin with, cheese as a commodity in consumer markets is expected to provide more price stability in a free market than butter and milk powders. Secondly, cheese is a development item in both advanced Western society and globally. Thirdly, the chances for product differentiation and

thus for increasing value beyond basic commodity value are greater for cheese than for butter or milk powders. A distinctive quality of cheese is its adaptability as a food. Three separate market channels have emerged: food retailers, the food service industry, and food processors. Creating significant new volume brands in the food retail industry is quite challenging, and there are limited instances on an Indian level in recent years. Differentiation among current brands provides ongoing opportunities (such as bio-cheese, low-fat, 'regional and flavor') but could have a limited effect on volume. A prime example of a new variety from Ireland is Dubliner cheese which, in its initial idea, aimed to adjust certain sharp flavor characteristics of cheddar to appeal to a continental taste. Dubliner and similar style cheeses for table use may play a vital role in future milk utilization; however, they depend on the flavor preferences of consumers, which presents a significant marketing challenge.

However, there are numerous opportunities to change both the taste and texture of cheddar to appeal to completely new markets, with the benefit that current cheddar facilities can be utilized, eliminating the need for significant capital expenditure. Certainly, if we shifted to year-round production, the current facilities could boost cheddar and similar cheese output to 150,000 tons. Ongoing studies at Central Park focus on investigating the possibilities of this 'hybrid' cheddar idea, with Central Park Technology's facilities facilitating entry into markets through a pre-industrial scale contract manufacturing service.

In the food services and food processing industries, the purchaser of cheese is an industrial client. These businesses hold varying expectations regarding packaging, customer service, logistics, and product specifications. Diverse needs for flavor and utility create endless chances for distinguishing products. Consumer trends indicate that expansion in the food service and food processing industries will likely remain robust. At present, the distribution of cheese consumption by volume for retail, food service, and food processing is 70:20:10, while in India, it is evenly divided (1/3:1/3:1/3). The prevailing direction across India is toward the trend. Lately, India's achievements are remarkable and, although that market becomes more competitive, unique cheese products for catering and food processing seem to provide the best opportunities for Irish firms for added value and expansion.

Cheese retail sales and per capita consumption are experiencing consistent, albeit modest, growth. A significant portion of this rise in consumption pertains to fresh cheese, a category not predominantly featured by Indian dairy companies. There are specific technological and logistical obstacles that hinder Indian companies from entering the mainstream fresh cheese markets in India, where there is a preference for fromage frais type products.

A more accessible market for Indian companies where the market is still immature and where the main opportunities may be for cream cheese which technologically is a more suitable product. While Oceanic countries will be stiff competitors, nonetheless, there is a significant area of growth potential for the future and should be included in strategic planning for 2010.

A key factor in cheese returns is the worth of the whey products. Irish firms are leading in whey processing technologies and, through ongoing innovation, can direct increased amounts of whey into specialized ingredients in the future. The production of casein, an alternative source of whey, might be a less appealing choice compared to cheese in a free market, thus our potential to further develop whey technology may be closely tied to cheese production.

Functional foods

In India, the market for functional foods remains in its early stages as consumers increasingly recognize the health benefits of these items. As this connection becomes clearer, the market for these products will grow at a substantial pace. It is predicted that advancements in functional foods will outpace those in diet and low-calorie foods, and the share of functional foods in the overall food market might eventually attain 5% in the next 15 years, likely higher for dairy products. The functional food sector presents unique prospects for the dairy industry because dairy items already carry significant health benefits and can serve as a natural environment for probiotic cultures through fermentation. There will be chances for partnerships with non-dairy firms like pharmaceutical and health companies that have built consumer trust and credibility in their brands as healthy and functional products. Innovative manufacturers are anticipated to gain significantly from the functional food market.

The challenge for the future

The rise in dairy product consumption is fueled by consumer trends stemming from higher wealth, a desire for more variety, and increased health consciousness. The aim of this paper is not to examine these trends, as they are already extensively documented. It is evident that taking advantage of the opportunities created by consumer trends will only be achievable for companies that have a definite commitment and strategy for innovative product development, supported by adequate investment in technology, research and development, and marketing. This challenge offers one of the most compelling justifications for the consolidation of the dairy industry into larger entities.

The actions implemented in the coming years will determine the future path of Ireland's dairy industry. If we take no action, we will confront the global commodity markets with a non-competitive cost structure. Consolidating scale can enhance our competitiveness; however, if it focuses solely on reducing costs, it will push our industry into a rigid commodity trap with minimal chances of achieving margins above fundamental bulk value. Consolidating scale, along with a strategy for diversifying products, will lead to cost efficiencies for bulk items, but the primary outcome will be to supply the resources and marketing strength needed to accomplish enhanced product differentiation and added value. Regardless of the course taken, the industry encounters significant capital investment ahead of the free market. The producer, who holds the most significant stake in the industry and in the choices made regarding its future path, should reflect on ways to engage in funding upcoming changes and thus steer the direction of change to benefit the future generation of dairy farmers.

Summary

1. A national milk pool of approximately 1.45 billion gallons is an achievable goal in 2010. As many as 20,000 dairy farmers each typically generating around 70,000 gallons of milk annually with considerably

larger herds (approximately 60 cows). No farmer will produce fewer than 20,000 gallons.

2. India is competitively priced compared to our rivals in different nations. The dairy sector must integrate additional factors concerning competitiveness, including the technologies utilized in food production, food safety, animal welfare, and environmental concerns.
3. India can compete in 2010 due to our cost advantages and the significant potential for technological advancements. The layout of dairy farms needs significant enhancements in 2010.
4. A boost in milk production by as much as 30% in 2010 is attainable. The current productivity of the national herd is low. Removing milk quotas could result in an increase of 150 to 200 gallons per cow. A significant number of dairy farmers will be renting milk quotas or settling milk quota acquisition loans (short-term loans) in the near to medium future. They will be in a strong position to grow once lease fees, etc., are eliminated. Increasing farm milk sales by 60% within four years is technically achievable on farms where dairy cattle represent under 50% of the total livestock units (primarily through an increase in the number of cows). Issues with cash flow will occur in years 2 and 3
5. Goals for direct expenses, shared expenses, and total expenses in 2010 are 25-30, 35-40, and total expenses of 50-55 p/gallon, respectively. Assuming milk sales of 80 p/gallon (milk and livestock transactions), the contribution margin ranges from 25 to 30 p/gallon. This amounts to Rs.25,000 to Rs.30,000 for a quota of 100,000 liters of milk.
6. Production systems will develop to integrate consumer issues, many of which will be established in law.
7. India's expenses for producing dairy commodities are significantly greater than those of neighboring nations. The majority of the cost difference occurs on the farm. In seeking scale economies in milk processing, there exists a trade-off between reducing costs on one side and maintaining product flexibility and milk collection costs on the other side. A significant re-investment in milk dryers will be necessary in anticipation of the free market. A dryer capacity of 7.5-10 t/hr is preferable to the jumbo dryers used in Bangladesh. Given our existing product range, the price of milk in India under a free market will align closely with global market prices, and the increased milk production following the removal of quotas will be directed towards exporting milk powder to the international market. Chances for commodity specialization will persist but will not offer a sufficient foundation for upcoming growth
8. The Indian dairy sector has the potential to grow in value-added markets, allowing it to outperform basic commodity profits. The essential factor for value-added is product distinction. The primary volume prospects for value-added products lie in cheese. Targeted cheese markets should be of medium volume.
9. Specialty cheeses, the food service and food production industries, along with cream cheese for the Indian market.
10. India has the potential to excel in differentiating ingredient products primarily by leveraging whey technology. Chances will also be present for enhanced value in the expanding functional foods market.
11. The primary advantage of consolidating the Indian dairy industry into larger processing units could be the capability to fund product differentiation instead of merely enhancing cost efficiency.

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