

A photograph of a woman in a red sari with gold borders leading a black and white cow. The woman is on the left, looking towards the cow. The cow is on the right, facing left. They are in a dirt area with a white wall in the background.

India's Dairy Industry at a Crossroad

A Current View of the World's Largest Milk Producer

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THE BACKDROP

- For the year ended March 31, 2009, India's GDP was Rs 61642 billion (\$ 1.37 trillion) at current market prices, translating into a per capita product of Rs 52,685 (\$ 1,170).
- For the US, the corresponding 2009 figures were \$ 14.26 trillion and \$ 46,364. *The Indian economy is one-tenth of the US' and an average Indian's income 2.5% of the average American!*
- But India is growing. In 2004-05, GDP was only \$ 740 billion, with per capita GDP at \$ 680. So in current dollars, the economy has grown to nearly *twice* its size of five years back.

GROWTH STORY

- Dollar comparisons are, moreover, misleading as they do not capture local purchasing power differences. A dollar can buy two liters (0.5 gallons) of 3% fat 'toned' milk in India, whereas it can buy just 1.2 liters (0.3 gallons) in the US.
- In real terms, India's GDP has since 2003-04 grown by an average 8.3% per year, boosting incomes of a rising middle class in particular.
- Car and bike sales reflect this trend. Between 2002-03 and 2009-10, annual car sales have *trebled* from 0.54 to 1.53 million and *doubled* from 4.81 to 9.37 million units for two-wheelers.

Real GDP growth in % (April-March fiscal years)

| | |
|---------|-------|
| 2003-04 | 8.52 |
| 2004-05 | 7.47 |
| 2005-06 | 9.49 |
| 2006-07 | 9.71 |
| 2007-08 | 9.22 |
| 2008-09 | 6.72 |
| 2009-10 | 7.17* |

*Advance Estimate

GROWTH IMPLICATIONS

- Sustained growth, from low per capita levels, has implications beyond auto sales. With rising incomes, people not only consume more; the *composition* of their consumption also changes.
- It is no different in food. As growth trickles down, the absolute quantities eaten go up alongside diet diversification in favor of 'superior' foods like milk, eggs, meat, fruits and beverages.
- Meeting these demands pose huge production challenges in terms of pressure on land, water and even labor resources. The resulting impact on the *economics of farming* may not be small.

MILK CONSUMPTION PATTERNS

SHARE OF FOOD IN CONSUMER SPENDING IS FALLING (%)

| | RURAL | URBAN |
|---------|-------|-------|
| 1972-73 | 72.81 | 64.49 |
| 1977-78 | 64.35 | 59.98 |
| 1983 | 65.56 | 58.69 |
| 1987-88 | 63.77 | 55.91 |
| 1993-94 | 63.18 | 54.65 |
| 1999-2K | 59.40 | 48.06 |
| 2007-08 | 52.35 | 39.58 |

Source: National Sample Survey Organization

BUT MILK'S SHARE ISN'T REALLY SO!

| | RURAL | | URBAN | |
|---------|-----------------------|----------------------|-----------------------|----------------------|
| | % of Total | % of Food | % of Total | % of Food |
| 1972-73 | 7.29 | 10.01 | 9.33 | 14.47 |
| 1977-78 | 7.68 | 11.93 | 9.53 | 15.88 |
| 1983 | 7.57 | 11.54 | 9.21 | 15.69 |
| 1987-88 | 8.62 | 13.52 | 9.54 | 17.06 |
| 1993-94 | 9.49 | 15.02 | 9.80 | 17.94 |
| 1999-2K | 8.75 | 14.74 | 8.68 | 18.05 |
| 2007-08 | 7.79 | 14.88 | 7.25 | 18.31 |

‘SUPERIOR GOOD’

- Indians take naturally to milk. Besides its nutritional value for a significant section of the population that is *lacto-vegetarian*, milk is part of the country’s socio-cultural and religious traditions, linked to its strong association with purity and good health.
- The bulk of indigenous sweets consumed during festivals and social ceremonies are milk-based. *Ghee* (clarified butter) is a common frying and flavoring medium in India, where people generally avoid use of other animal fats like tallow and lard.

‘SUPERIOR GOOD’

- No wonder, an average Indian family’s expenditure on milk is next only to cereals among all food items. Milk is a classic ‘superior good’: As people’s incomes rise, the share of milk and dairy products in their total spending goes up, while declining for cereals (an ‘inferior good’).
- Average income elasticity of demand for milk and milk products – % rise in consumption for every 1 % rise in income – is estimated at 1.9 in rural India and 1.2 in urban India (***Dairy India 2007***). It is *higher* among lower income groups.

MILK'S (CEREALS') SHARE IN RURAL FOOD SPEND: 2007-08

| Decile Class | % of Food Expenditure | Decile Class | % of Food Expenditure |
|---|------------------------------|------------------------|------------------------------|
| Lowest | 4.56 (45.37) | 6 th lowest | 13.29 (32.55) |
| 2 nd lowest | 7.50 (41.14) | 7 th lowest | 15.83 (29.80) |
| 3 rd lowest | 8.98 (38.51) | 8 th lowest | 16.93 (28.04) |
| 4 th lowest | 10.61 (36.12) | 9 th lowest | 19.46 (25.78) |
| 5 th lowest | 12.09 (34.65) | Highest | 21.61 (20.29) |
| Average for All Classes: 14.88 (30.69) | | | |

MILK'S (CEREALS') SHARE IN URBAN FOOD SPEND: 2007-08

| Decile Class | % of Food Expenditure | Decile Class | % of Food Expenditure |
|---|------------------------------|------------------------|------------------------------|
| Lowest | 9.91 (35.75) | 6 th lowest | 18.61 (24.19) |
| 2 nd lowest | 12.58 (31.00) | 7 th lowest | 19.70 (22.51) |
| 3 rd lowest | 15.16 (28.41) | 8 th lowest | 19.93 (20.60) |
| 4 th lowest | 16.53 (26.39) | 9 th lowest | 21.15 (18.85) |
| 5 th lowest | 17.41 (24.90) | Highest | 20.47 (14.42) |
| Average for All Classes: 18.31 (22.43) | | | |

MILK PRODUCT CONSUMPTION PROFILE

- Organized dairies handle barely a fifth of India's total milk output. Their product portfolio includes liquid milk (estimated yearly sales of \$ 5.8 billion), powders/baby-foods (\$ 1.2 billion), *ghee* (\$ 1.1 billion), ice-cream (\$ 400 million), table butter (\$ 250 million) and cheese (\$ 80 million).
- The balance 80% milk is produced for rural self-consumption or handled by unorganized players. This milk either gets consumed as such or goes for making traditional dairy products and sweets. The organized sector is yet to fully tap into the latter segment, estimated at \$ 15 billion-plus.

ESTIMATED PRODUCTION BY ORGANIZED SECTOR

| Product | Quantity | Price (Rs) | Value (Rs million) |
|----------------|-----------------------|-------------------|---------------------------|
| Liquid milk | 30 million liters/day | 24/liter | 262800 |
| Powders | 425000 tonnes | 125/kg | 53125 |
| Ghee | 215000 tonnes | 230/kg | 49450 |
| Ice-cream | 200 mn liters | 90/liter | 18000 |
| Table butter | 50000 tonnes | 230/kg | 11500 |
| Cheese | 15000 tonnes | 250/kg | 3750 |

MILK-BASED ETHNIC SWEETS

| PROCESS | INTERIM PRODUCT | FINAL PRODUCTS |
|-----------------------|---------------------------------------|---|
| Acid heat coagulation | <i>Chhana</i> | <i>Paneer, Rasogolla, Rajbhog, Rasmalai</i> |
| Heat desiccation | <i>Khoa</i> | <i>Gulabjamun, Peda, Burfi, Kalakand</i> |
| Culturing | <i>Dahi (Curd)</i> | <i>Mishti doi, Lassi, Chhach, Shrikhand</i> |
| Milk Puddings | <i>Kheer, Payasam, Sevian, Phirni</i> | |

Source: Dairy India 2007

HOW PRODUCTION HAS FARED

STAGNATION AND REVIVAL

- Through the 1950s and 1960s, India's milk output was virtually stagnant, with a 1.2 per cent annual average growth trailing population increase. Between 1950-51 and 1970-71, per capita daily milk availability *fell* from 132 to 114 grams.
- But since the 1970s, the average growth rate, at 4.3 per cent, has surpassed population increase, generating a *rise* in per capita availability to 258 grams/day.

PRODUCTION TRENDS

| | Production (million tonnes) | Availability per capita (gm/day) |
|---------|--|---|
| 1950-51 | 17.41 | 132 |
| 1960-61 | 20.38 | 127 |
| 1970-71 | 22.20 | 114 |
| 1980-81 | 31.60 | 128 |
| 1990-91 | 53.94 | 176 |
| 2000-01 | 80.61 | 220 |
| 2007-08 | 104.84 | 252 |
| 2008-09 | 108.46 | 258 |

TURNAROUND EXPLAINED

One could broadly identify three sources here:

- Creation of appropriate marketing institutions linking rural producers to urban consumers.
- Augmented supply of crop residues and agro byproducts in post-Green Revolution period.
- Diffusion of cross-breeding and selected breed upgradation technologies.

SOURCE 1

THE ORIGINAL APPROACH

- Till the 1960s, government policy was focused on supplying milk to urban centers through establishment of dairies and cattle farms in the city suburbs (now precious real estate!).
- The Aarey Milk Colony near Mumbai and the Delhi Milk Scheme were products of this strategy that sought to rear milch animals and produce milk close to cities/towns instead of rural areas.
- This was combined with sale of milk recombined from cheap imported powder and butter oil. About 60,000 tonnes of solids had to be imported annually to feed the city milk schemes.

REWORKING MARKETING STRUCTURES

- The above policies kept milk prices low and city-folk happy. But it disincentivized rural producers from raising milk yields. There were no takers for the Intensive Cattle Development Project and other government schemes providing artificial insemination or veterinary support.
- All this changed with Operation Flood, a \$ 1.9 billion (1996 prices) investment project spread over 1970-96, which sought to develop *rural* milk sheds and create cooperatively-owned facilities to process milk procured *directly* from farmers for marketing in urban areas.

IMPETUS TO ORGANIZED DAIRYING....

- Operation Flood laid the foundations for organized dairying and marketing in India. It also created conditions for the eventual entry of large private players, especially after the industry's de-licensing in 1992.
- Cooperatives today collect about 25 million liters of milk a day or 9.4 million tonnes, with an equal, if not more, quantity handled by large private dairies. Together, it adds up to some 19 million tonnes or 18 % of India's production.

....AND EMERGENCE OF A NATIONAL MARKET

- The 18%, although seemingly low, is significant enough to influence prices and for farmers to view milk as a *marketable* commodity rather than simply a product for home consumption.
- Once a national market for milk emerged, the rural producer had every incentive now to keep an additional buffalo, feed his existing animal better and invest in AI/veterinary support to sell an extra liter or two. *Earlier, this extra liter had no market.* Ergo, producing beyond what could be consumed at home or sold in the neighborhood made little sense.

SOURCE 2

CROP RESIDUE EFFECT

- In India, dairying is part of a mixed crop-livestock farming system, with animals fed on herbage and crop residues not edible by humans.
- The Green Revolution enhanced availability of not only grains, but even straws, stovers, tops, oil-meals, bran and other crop by-products. Spread of irrigation, too, boosted supply of grass and natural herbage around canals and fields.
- Increased production and consumer preference for wheat and rice, further, enabled diversion of surplus coarse grain (corn, sorghum, pearl millet) for manufacture of concentrate feeds.

SOURCE 3

TECHNOLOGY DIFFUSION

- In India, cows were traditionally reared to produce milk *and* male offspring valued for draught power. Milk, in a sense, was a by-product of bullock production.
- Since they were selected over centuries for characteristics other than milk production, the bulk of indigenous cattle are 'non-descript', i.e. randomly bred with no recognizable breed traits.
- With 'tractorization' and steady mechanization of agricultural operations, the share of animal (and human) power in total farm power has fallen from 95% in 1961 to 15% now.

TRACTORIZATION AND BUFFALOIZATION

- Farmers view cows today mainly as milch animals. That, in turn, has stimulated 'cross-breeding', i.e. crossing indigenous cattle with high milk-yielding western breeds (Holstein Friesian, Jersey, Brown Swiss).
- In 2007, exotic/crossbred cows accounted for 12% of India's milch animal population, but produced 22% of its total milk. Non-descript cows were still numerically dominant (45%), but their share in output was only 22%.
- Complementary to tractorization and emphasis on milk has been 'buffaloization'.

BUFFALO COUNTRY

- The share of buffaloes in India's milch animal population has risen from 28% in 1951 to 43% in 2007. 56% of the country's milk now comes from buffaloes.
- Milk yields from buffaloes average 1,400 kg per lactation, with breeds like Murrah, Jaffarabadi and Nili-Ravi giving up to 2,000 kg. This is above the 600-odd kg for non-descript cows, while below the 2200-plus for crossbreds. But fat content in buffalo milk being *twice* that of cow milk makes it a value proposition for farmers.

UPGRADATION FROM WITHIN

- Unlike 'cross-breeding' for cows, the strategy for raising milk yields in buffaloes has involved 'upgradation', i.e. use of genetic material from selected, progeny-tested bulls of proven native breeds like Murrah and their propagation through artificial insemination/frozen semen technology.
- The rise in milk yields of animals, albeit gradual, has thus come from both cross-breeding as well as buffaloization. Over time, these have translated into higher production.

**IS THERE AN
'INDIAN' DAIRYING
MODEL?**

THE 'WESTERN' MODEL

- The 'western' dairying model relies on relentless labor substitution (automated milking and feeding systems, on-farm bulk-cooling tanks, etc), augmentation of both quantity and quality of feed rations, and heavy investments in animal health, nutrition and breed improvement.
- These have helped push up milk yields and output, despite the number of milch animals and dairy farms coming down. Also, dairying has become a specialized, full-time rather than a sideline affair, with rising herd sizes. Farms with 100-plus cows produce 84% of milk in the US.

US DAIRY FARMING PROFILE

| | No. of dairy farms | No. of milk cows (million) | Milk Production | |
|------|--------------------|----------------------------|-----------------|----------------|
| | | | Million pounds | Million tonnes |
| 1950 | 3,681,627 | 21.367 | 116,602 | 52.89 |
| 1970 | 647,860 | 12.000 | 117,007 | 53.07 |
| 1980 | 334,180 | 10.799 | 128,406 | 58.24 |
| 1990 | 192,660 | 9.993 | 147,721 | 67.01 |
| 2000 | 105,250 | 9.199 | 167,393 | 75.93 |
| 2009 | 65,000 | 9.201 | 189,320 | 85.87 |

THE 'INDIAN' MODEL

- In India, 'pure' dairy farming is practically non-existent. Dairying is *subsidiary* to the farmers' primary crop growing activity, basically entailing (a) conversion of agricultural wastes and (b) use of surplus family labor.
- In this model, animals don't compete with crops for resources and instead utilize agri-residues that are otherwise wasted. Likewise, family labor has virtually zero opportunity cost. These keep production costs very low.
- Costs are also kept low by small herd sizes and very little capital being invested in farms.

KEEPING IT SMALL

- The western farmer looks at returns on not just operating costs and overheads (including rentals foregone on land and unpaid labor), but even on investment in machinery & equipment.
- The Indian farmer, by contrast, seeks to recover only his *paid-out* expenses, while not imputing any value on family labor and land nor incurring large capital costs. Any money earned over and above pocket-paid expenses constitutes 'return'.
- While the western model aims at economies of scale to cut costs, the very *absence* of scale keeps production costs low for the Indian farmer.

YIELDS FOREGONE

- But low costs also come with low milk yields per animal – averaging 1,500 kg (3,307 pounds) annually, against 20,576 pounds (9,333 kg) for the US in 2009. Further, milch animal population in India has only *gone up* over the years.
- Low herd sizes and yields mean companies having to deal with large numbers of farmers. India's top dairy concern, Amul, procures 3.5 million tonnes (mt), i.e. 7.72 billion pounds, of milk from over 2.5 million farmers. By contrast, Dairy Farmers of America markets 63 billion pounds (28.5 mt) of just 18,000 producers!

INDIAN MILCH ANIMAL NUMBERS (ADULT FEMALES)

| | Cows (million) | Buffaloes (million) | Total (million) |
|------|---------------------------|--------------------------------|----------------------------|
| 1951 | 54.40 | 21.00 | 75.40 |
| 1961 | 51.00 | 24.30 | 75.30 |
| 1972 | 53.40 | 28.60 | 82.00 |
| 1982 | 59.21 | 32.50 | 91.71 |
| 1992 | 64.36 | 43.81 | 108.17 |
| 2003 | 64.51 | 50.97 | 115.48 |
| 2007 | 69.60 | 52.90 | 122.50 |

THE DROPS ALL ADD UP

- While dairying for the *individual farmer* is a subsidiary activity, the fact that every farmer (irrespective whether his primary crop is wheat, paddy, sugarcane or cotton) maintains an animal or two translates into the little drops of milk becoming a humungous ocean at the *aggregate* level.
- This explains why milk, despite being a residual product of regular crop agriculture, is India's No.1 'crop' by value. The 'milk group' made up 18% of the total value of output from agriculture and livestock in 2007-08.

FARMGATE VALUE OF MAJOR CROPS (2008-09)

| | Output (mt) | Price (Rs/kg) | Value (Rs million) | Value (\$ million) |
|--------------|-------------|---------------|--------------------|--------------------|
| Milk | 108.46 | 15.00 | 1626900 | 35367 |
| Rice-in-husk | 148.77 | 9.00 | 1338930 | 29107 |
| Wheat | 80.68 | 10.80 | 871344 | 18942 |
| Oilseeds | 27.72 | 18.00 | 498960 | 10847 |
| Sugarcane | 285.03 | 1.50 | 427545 | 9294 |
| Seed-cotton | 14.79 | 27.00 | 399330 | 8681 |
| Pulses | 14.57 | 20.00 | 291400 | 6335 |

**WHERE'S THE
FUTURE HEADED?**

SUSTAINING THE 'MODEL'

- The present model has been sustained by (a) abundant, underutilized family labor embodying zero/low opportunity cost, and (b) animals being fed mainly on agri-residues or natural herbage in land not used for regular crop farming.
- There are pressures developing on both fronts. Surplus labor reserves are depleting, with greater mobility options through migration and growth in construction and other non-farm jobs. Families are also laying stress on education. All these are tightening up rural labor supplies, which are not as 'free' and unlimited as before.

THE FODDER CHALLENGE

- The second pressure point is fodder and feed. Animals are now fed through four sources: (a) Green fodder from common property and forest lands; (b) Cultivated green fodder; (c) Dry fodder from crop residues; (d) feed concentrates.
- There are not many *Gochar* (community) lands left vacant for livestock grazing in villages today, having been encroached upon or distributed by governments to landless people. Forest lands are increasingly coming under conservation or protection and no longer a reliable fodder source for traditional livestock-rearing communities.

RESIDUE DEPENDENCE

- Cultivated fodder is limited to under 10 million hectares or 5% of India's arable area. The major fodder crops are sorghum and berseem, followed by lucerne, corn, pearl millet and oats.
- With (a) and (b) not providing enough, the burden of feeding animals has fallen more and more on (c) and (d). Crop residues supply an estimated 60% of the total dry matter intake of India's livestock. And within this, the contribution of slender straws from rice and wheat is about half, courtesy mainly the Green Revolution.

THE COST OF NARROW FEED OPTIONS

- But even crop residue availability is under threat, as farmers are taking to mechanical combine-harvesting, which reduces straw recovery by half. Straw is also getting diverted for bio-fuel, paper, packaging and other industrial applications. The result: straw prices have doubled in many States in the last 3-4 years.
- A similar trend is seen in concentrated feed ingredients (next slide). Amul has had to raise cattle-feed prices charged to its farmers from Rs 6.6 to Rs 10/kg since April 2008.
- Official projections point to a widening feed gap.

Average feed ingredient prices (Rs/tonne, ex-dairy)

| | Mar-08 | Mar-09 | Mar-10 |
|--------------------------------|--------|--------|--------|
| <i>Bajra</i> (Pearl millet) | 6926 | 7900 | 9350 |
| <i>Jowar</i> (Sorghum) | 7560 | 8443 | 9344 |
| Corn | 8271 | 8650 | 9750 |
| Rapeseed extraction | 9207 | 9175 | 11005 |
| Groundnut extraction | 3300 | 4084 | 4115 |
| Rice polish Gr-1 (16%) | 8977 | 7086 | 9731 |
| De-oiled rice bran | 4834 | 4959 | 6394 |
| Molasses | 2944 | 8634 | 8235 |
| <i>Guar</i> (Clusterbean) meal | 8931 | 9091 | 15786 |

DEMAND-SUPPLY GAP IN 2020 (MILLION TONNES)

| | Supply | Demand |
|--|--------|--------|
| Green Fodder (25% Dry Matter) | 405.9 | 1134.2 |
| Dry Fodder (90% Dry Matter) | 473.0 | 630.1 |
| Total Digestible Nutrients (Including Concentrates) | 281.2 | 368.6 |
| Crude Protein (Including Concentrates) | 37.5 | 51.0 |

‘PURE DAIRYING’?

- In the long run, dairying will have to transcend subsidiary/residual status and farmers encouraged to pursue it on a full-time basis.
- But the ‘pure dairying’ model must be adapted to Indian conditions, where capital and energy costs are high. *Even without accounting for purchasing power or quality differences*, a gallon of diesel retails at \$ 3.2 and electricity at 9-10 cents/kwhr in India, compared to \$ 3.0 and 9-10 cents/kwhr in the US.
- Dairy farms with 100-plus animals and excessive mechanization are not viable options in India.

AN ALTERNATIVE MODEL

- Hatsun Agro in Chennai has demonstrated the feasibility of 'pure dairying' by five-acre farmers raising 25-30 cows and exclusively growing high-yielding protein-rich fodder. By this, they rely less on costly purchased concentrate feeds.
- Besides on-farm fodder cultivation, Hatsun's project emphasizes *selective* mechanization (brush-cutters for harvesting, rain-guns for reducing water consumption, milking machines for labor saving) to reduce per liter costs. The company has so far helped create 165 such farms, each supplying 250-300 liters daily.

SUMMING UP

- Indian dairying has some basic strengths like a large and growing domestic market, unlike Australia or New Zealand whose industries are export-dependent to the extent of 60-90%.
- Although milk yields are low, they can be raised considerably even through incremental interventions in genetic breed improvements, better on-farm management and selective mechanization.
- There is further scope to raise the organized sector's share in milk handling, currently limited to less than a fifth of the country's production.

SUMMING UP

- 75% of organized milk procurement now takes place in western and southern India. The North and East, producing two-thirds of India's milk, have massive under-exploited dairy potential.
- Indian dairies, especially in the private sector, need to have more efficient systems for *direct sourcing* of milk from farmers as against procuring through a chain of village agents, bulk vendors and chilling-cum-transport contractors. The Amul/Hatsun model of vertical integration (as opposed to outsourcing) of procurement operations must be enforced across the industry.

SUMMING UP

- The main sources of weakness/threats to Indian dairying stem from labor and fodder costs, which are set to go up. Unless something is done on yield improvement and boosting domestic fodder cultivation, these could well erode the industry's long-term competitiveness.
- A strong rupee may worsen matters. Between March 2003 and March 2010, the domestic WPI has risen over 46%, whereas the dollar has turned 5% cheaper (Rs 45.14 versus Rs 47.5).
- The dairy sector also deserves greater policy support as was the case during Operation Flood.