Perspective: Women Farmers: In Search of an Identity

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Issues and Ideas for Indian Agriculture

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Ajay Vir Jakhar

Editorial Board
Prof. M.S. Swaminathan
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Editorial Support
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Design
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pealiduttagupta@pealidezine.com

Contact us/Subscription
ho@bks.org.in

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Night Without End for Indian Farmers

In the end it's only a passing thing, this shadow; even darkness must pass.

— JRR Tolkien

October 16 is celebrated as "World Food Day" and policy makers from across the world gathered at the Milan Expo 2015 in Italy. Despite being an invited panellist, one had to decline because this is hardly the time for an Indian farmer to celebrate, given the inexplicable insensitivity with which India treats the daily farmer suicides, which place the country in the same league as sub-Saharan Africa. The time was better spent with farmers in Odisha.

After nearly 70 years of Independence, the government is still trying to feed farmers cheap grain and failing at that as well. The permanent redistribution of resources is not a sound strategy. Rather than demand a seat at the Security Council or claim to rival China, it is time for the country to undergo a period of deep introspection because farmland suicides are not caused by natural calamities but rather are a man-made malady, a creation of policy; past and present.

Back-to-back droughts have negated all claims of progress; exposed all the false promises of politicians and policies. Travelling through Maharashtra for three days provides an opportunity to go on a pilgrimage to Papal, the village of the founder president of the Bharat Krishak Samaj, Dr Panjabrao Shamrao Deshmukhji, India's agriculture minister in the first cabinet of Pandit Jawaharlal Nehru in 1952. Regrettably, his home is in a state of utter neglect, just like his home state, Maharashtra, which is the epicentre of farmer suicides in the country.

Water is the scarcest commodity of all. Sugarcane farmers consume about half of Maharashtra's water but farm only six per cent of the land. Governments in the past have promoted such policies as political expediency has taken precedence over farmer lives. What is shocking is that farmers are taking their lives every day in a functioning democracy, not in a banana republic.

It is equally ironic that while farmers with assured means of irrigation supported by government programmes like input subsidies or purchase mechanisms like minimum support prices loudly complain about low prices, the majority of farmers in rain-fed farms, who do not get to avail of farm

FARMER SUICIDES ARE NOT CAUSED BY A NATURAL CALAMITY BUT A MANMADE MALADY; A CREATION OF POLICIES PAST AND PRESENT

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POLITICAL EXPEDIENCY TAKING PRECEDENCE OVER FARMER LIVES MUST BE BROUGHT TO A SWIFT END

subsidies nor receive an MSP for their produce, never raise their voice. The fear of losing something ignites more passion than the desire to attain something new.

At the other end of the spectrum from Maharashtra is my home state of Punjab, where farmers are protesting low prices of paddy and the decimation of 80 per cent of the state's cotton crop due to 'white fly' pest attack. The pest attack is widely attributed to spurious pesticides supplied by the government, purchased with funds received by the state government for cotton demonstration plots. The funds were to be used to demonstrate better practices to farmers in every cotton-growing village in the state.

Clearly, the farmers are held in a stranglehold by the powerful cartels. Agro-industrial conglomerates — whether they are fertilizer, seed and pesticide companies on the one hand and food-processing companies procuring and processing farm produce on the other — control the entire space and prices of agricultural produce as well.

To make things worse, international commodity markets are in a tailspin and no Indian economist or commodity trading house predicted the bloodbath. The crisis of falling prices underlines the inability of a government to control prices in a flat connected world. What is also apparent is the limited government role in controlling commodity prices in the short term. The Indian government probably purchases less than 10 per cent of the farm produce. Indian economists are exhorting the government to abandon its purchase programmes altogether.

Just as farmers do not fathom the adverse consequences of not being signatories to international trade agreements, government officers and policy makers do not realize the disastrous consequences of agreements they sign without understanding the long-term implications. The act of one generation or one government is often fatal for many generations of farmers. Agriculture is local but the consequences of subsidies in one nation are global. That is why India has to participate professionally in trade negotiations. Times are going to get more challenging if India does not manage to change the politics of food. ●

Ajay Vir Jakhar
Editor
twitter: *@ajayvirjakhar*
blog: *www.ajayvirjakhar.com*

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AGRICULTURE'S PLAN B: DEVELOPING DOWN THE DAIRY ROUTE

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To the Editor

Perilous plight

Sir, Apropos of your editorial "Death in the Time of Data Fudge" (*Farmers' Forum*, August-September, 2015) where you clearly turn the spotlight on farmer suicides in India, you touch a chord in my heart when you state that "if the farmer's opinion is an unwanted burden for government, India will always be a developing nation". How is it that pundits and politicians who run the country do not understand this simple truth? Why is it that every government neglects the voice of the farmer? How is it that a developing country like India permits such data fudge and gets away with it? Is it possible for the nation to feed its millions if the farmer who is growing the food perishes? Yet, governments come and governments go but the farmer's plight continues.

Sharad Verma,
New Delhi

Policy disconnect

I am happy that you organized a conference on "Rural Distress" (*Farmers' Forum*, August-September 2015, *Cover Story*: "Getting to the Roots of Rural Distress") and equally saddened by the contents of the speeches. Jaideep Hardikar added an extra dimension to the nature of India's rural distress when he said that "rural distress is not just about land and productivity and agriculture, it is all about a family unable to fulfil its aspirations". Add to this the contradictions between the needs at the grassroots and the mindsets of the policy makers where the overwhelming concern is about how not to spend even as the greatest anxiety at the grassroots is where the next meal will come from.

Lalit Singh,
Jhajjar, Haryana

People for Ganga

Dhrubajyoti Ghosh's "Mission Clean Ganga: the Case for Farm and Fishery-Led Intervention" (*Farmers' Forum*, August-September 2015) is the kind of writing that policy-makers should take note of. Indeed, the planners must ask why such a critical aspect of Indian life is so utterly devoid of professional management and so totally left in the hands of the politicians. A professionals and people led mission should cleanse India's holy river and only then will the Clean Ganga project "become a festival of the Indian masses, the farmers and the fisherfolk in the main".

Vijay Arya,
New Delhi

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A date with success

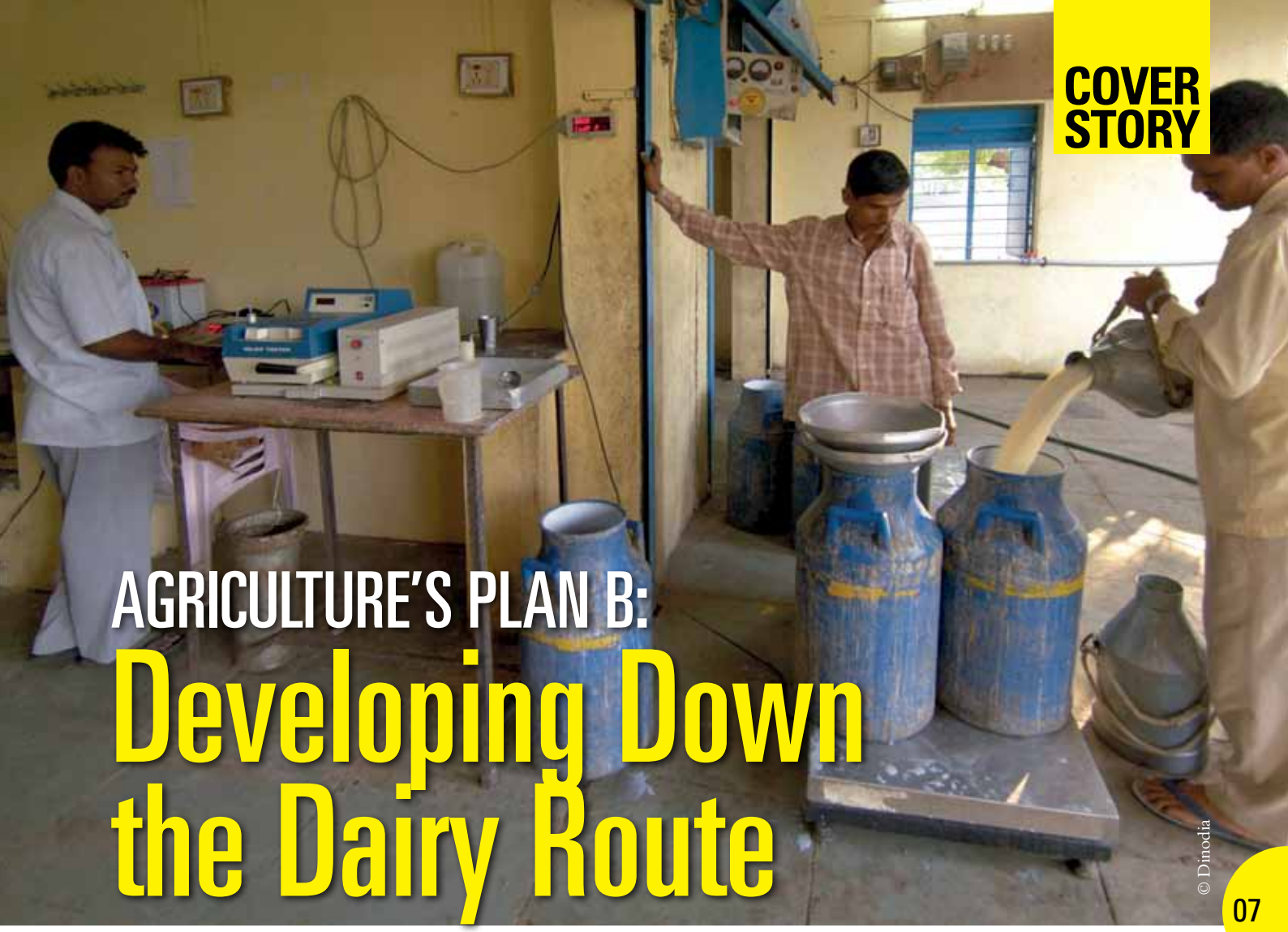
Mahesh Sharda's story under *Green Fingers*, "A Date with Dates" (*Farmers' Forum*, August-September 2015) is a very inspirational one. It is indeed the never-say-die spirit of our farmers that has kept India's farming flag flying and Shardaji's account of the many unsuccessful attempts before finally hitting the jackpot with dates is a lesson for any entrepreneur. I hope this helps other farmers trying to grow dates on their farms. There are so many takeouts from the account: no use to pesticides thus far; pollination by hand are only some examples. It is very important that you continue to share these stories of success to bring some cheer in an otherwise cheerless scenario. May the world wake up to many more such delightful new crops.

Rajender Bhatt,
Almora, Uttarakhand

Agriculture in curriculum

Taking forward Hannan Mollah's *Thought Leader*, "Why is Agriculture not Integral to Indian Education?" (*Farmers' Forum*, August-September 2015), it is imperative for agriculture to get primacy of place in the Indian education system if farming is to be treated at par with other professions. It is high time that policy-makers realized this fundamental truth.

Reethesh Arora,
Aurangabad, Maharashtra



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AGRICULTURE'S PLAN B: Developing Down the Dairy Route

The key to success in the farm sector in typically Indian circumstances — of small holdings and meagre incomes — is to balance the strictly agricultural activities of farmers with a string of farm-based, income-generating work, beginning with animal husbandry to crafts, pisciculture and dairy farming. The Planning Commission has for quite some time being saying that agriculture as the sole source of income for the farmers is a prescription for condemning the majority of them to poverty. Nor is the option of getting them to move out of their traditional moorings feasible at either a social or an economic level.

The only option is to supplement farm incomes through a diversifying exercise within the plant and livestock space through such activity as dairying, poultry, and horticulture while strengthening the Indian crafts sector that has deep and creative rural moorings. The Bharat Krishak Samaj and the National Dairy Development Board organized a conference on livestock-driven growth and dairying as a sustainable source of growth and path out of poverty for India's farm sector at the India International Centre, New Delhi, on August 28, 2015.

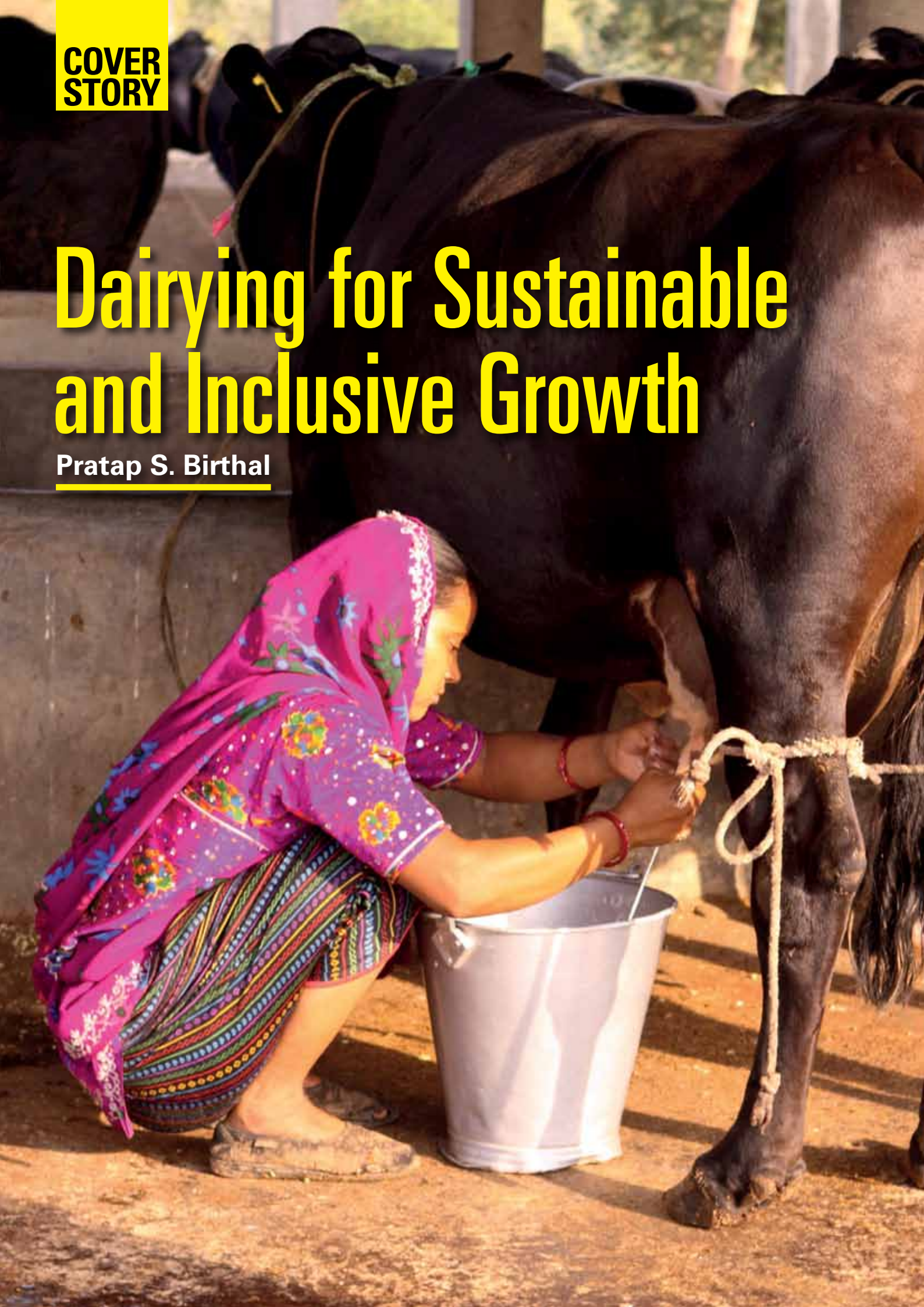
Flagging off the proceedings Pratap S. Birthal, principal scientist, National Centre for Agriculture Economics and Policy Research, said that since the 9th Five Year Plan, India has been targeting a four per cent growth rate for the agricultural sector that has remained out of bounds save in the 11th Five Year Plan that attained this target.

Examining the issue from various perspectives, were Manjit Singh Brar, managing director, Milkfed, Punjab, Sompal Shastri, former Union minister of state for agriculture, Ramesh Rawal, executive vice-president, BAIF Development Research Foundation, K. R. Trivedi, advisor, National Dairy Development Board (NDDB), A. K. Srivastava, director, National Dairy Research Institute, G. K. Sharma, National Dairy Development Board, M. R. Garg, general manager, NDDB, Harish Rai Dhanda, progressive dairy farmer, Ludhiana, Sunil Bakshi, deputy general manager, NDDB, Ashish Bahuguna, chairman, Food Safety and Standards Authority of India, B. S. Negi, director, Option Energy Pvt. Ltd. The conference was moderated by Ajay Vir Jakhar, chairman, Bharat Krishak Samaj and Editor, *Farmers' Forum*. ●

COVER STORY

Dairying for Sustainable and Inclusive Growth

Pratap S. Birthal



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PRATAP S. BIRTHAL
Principal Scientist,
National Centre
for Agriculture
Economics and
Policy Research

Amongst the most critically important sectors from a sustainability perspective, in the still predominantly agricultural Indian economy, is the livestock sector, the dairy industry in particular. For all the progress over the six decades and a half post-Independence, India has generally failed to breach the four per cent growth rate in the agricultural sector. Yet, all of India's pressing concerns — promoting agricultural growth to reduce poverty, improving food and nutrition security and female empowerment — can be addressed by this sector.

What makes the prospects for growth in the livestock and dairying sector so opportune? The answer lies in certain consumption trends. The share of dairy and animal products in the food expenditure has been increasing in rural and urban areas; significantly at the bottom end of the income. Apparently, farmers with improved incomes are consuming more eggs, milk, meat and other dairy produce. A recent study shows that by the year 2040 milk and milk products in the country will account for 45 per cent of the food expenditure, indicating the sector's commercial prospects.

The trend is confirmed by study by P. K. Joshi and P. Kumar that finds a similar trend in urban India too. If this pattern continues, the demand for milk and milk products will be 185 million tonnes by 2040. The demand for meat and eggs will also increase not just for domestic consumption but for exports as well.

Livestock products account for 10 per cent of the value of agricultural exports. Bovine meat, specifically buffalo meat, is driving the growth. Buffaloes are reared for milk with male used for meat. India has been the world's largest buffalo meat exporter in the last two or three years.

Though India accounts for just 0.2 per cent of global exports of dairy products, it has an advantage in the world market because of its competitive cost. The cost of production of cows milk is $310 per tonne and of buffalo is $410 per tonne. India's milk production has been growing fast at 4.5 per cent a year against a stagnating production in the European Union (EU) (for 15 years) and a negative -1.4 per cent growth in Australia. Indian needs to

increase its milk production substantially to meet its domestic demand and consolidate its share in the global market.

Milk is the largest agricultural commodity in India in value terms with a turnover of ₹300 billion a year in the last decade. This is more than the combined value of rice and wheat, formerly the largest agricultural commodities. Significantly, livestock generates agricultural growth, contributes 29 per cent to the agricultural GDP and has been growing faster than the crop sector. Livestock is also an important "insurance" for farmers against hard times. There is less deviation in the value of output in the livestock sector: when the crops fail, livestock still survives on the crop residues left in the field and helps stabilize income and consumption of the farmers.

No assessment of the role of livestock in poverty reduction is complete without examining the distribution of the livestock population and its concentration. The small farmers' share of land is 53 per cent while their share of most livestock species is much higher than that of the medium and large farmers. This group of farmers is consolidating its share in the livestock sector, which means the distribution in the livestock sector is more egalitarian than the distribution of land. This is what will help them to improve their income and livelihood and emerge from poverty.

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The small farmers' share of most livestock species is higher than that of medium and large farmers. Thus distribution in livestock sector is more egalitarian than of land

There is a correlation between presence of livestock and greater reduction in poverty. The effect of a growth in the livestock sector on poverty is 1.5 per cent larger than growth in the crop sector.

The other critical advantage of the sector is its impact on women, who are, by and large, the custodians of the livestock sector in India, with 75 per cent of the labour in the sector comprising women. Livestock thus becomes a tool for women's empowerment because it is not bound by property rights, as in the case of agricultural land, where only 10 per cent of women in the country have ownership. Women can, therefore, own livestock and generate income from it and livestock ownership is positively related to the number of adult females in the house.

Income from share of livestock is also positively related to the number of women in a household. This implies that if women can control the income generated from livestock they can improve their bargaining power in household decisions. Livestock, being a reproductive asset, can be used by women to build wealth and savings even as it serves as a regular stream of income. It is also easier to rear as it is raised on agricultural products and residues, making it less expensive to maintain.

What are the main concerns around this sector?

- Growth in milk production by cow species, vis-à-vis the production of cross-bred cows, for example, has grown at a rate of 7.7 per cent but the yield growth has decelerated to 0.6 per cent now from 1.6 per cent in the 1990s.
- Local cows and buffaloes show an acceleration in milk production but a stagnant growth in yield.
- Growth from yield improvements and

technological breakthrough is yet to happen. Indeed, there is a 40 per cent to 50 per cent yield gap for all species, implying that there is scope to improve the yield gap by providing better feed, nutrition and care to animals.

- Around 25 per cent of the breedable population is acquired through artificial insemination (AI) with poor success rates on account of poor infrastructure, particularly the semen storage facilities in the villages. The scientific evidence indicates that the milk yields for cross-bred cows, for up to four or five lactations, are as good as local cows.
- The question is, should there be cross-breeding, or should the focus remain on India's indigenous breeds that are very good at providing milk.
- Feed scarcity is a reality for India today that is short of grain fodder and concentric feed. There has been a qualitative and quantitative decline in common grazing lands. Farm mechanization has made matters worse.
- There is a declining trend in livestock population for the last 30 years, according to the current NSSO data, reversing the increasing trend, especially in the cattle population, in the early years of independence.
- Livestock is one of the largest sources of methane emission, calculated at 12 million tonnes. The solution would lie in a mixed livestock regime that reverses the trend in favour of the environment, depending on the agricultural by-products and residues.

The need of the hour is to emphasize the positive externalities: it would have required at least 40 million hectares of land to produce the energy generated by this sector, which also contributes to household energy needs through dung cakes. Substituting fuel wood with dung cake saves 1.6 million hectares and the use of dung as manure saves 1.2 million tonnes of NPK. Tractors required to substitute 55 million draught animals would cost ₹5.2 million. Besides, the animals save 13 million tonnes of diesel.

What are the main policy-related concerns?

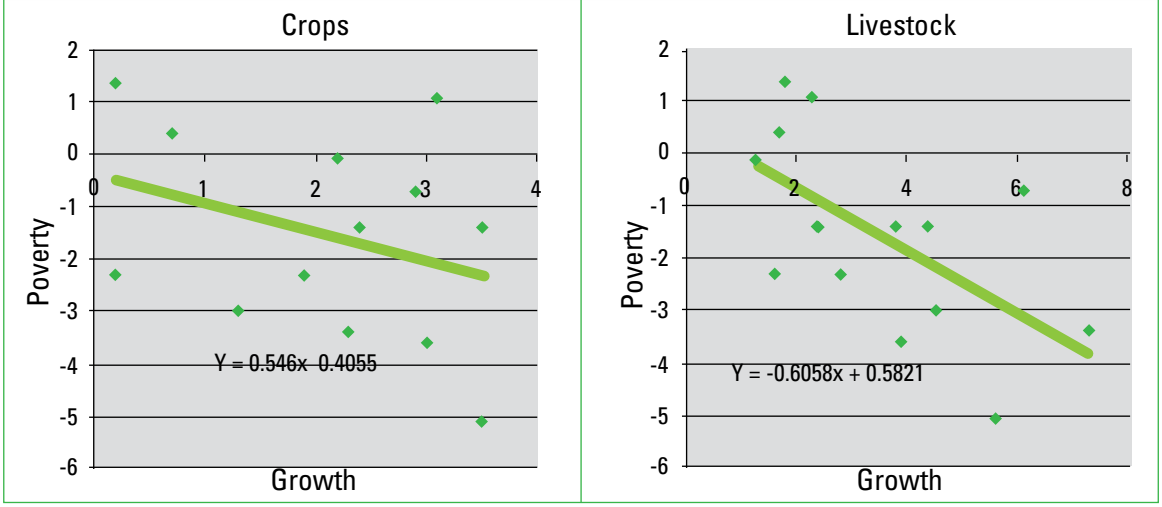
- The livestock sector has grown without much

government policy support. An examination of state finances shows that the growth in investment in the livestock sector shows a declining trend vis-à-vis the total agricultural sector, the share of livestock is declining; from 19 per cent in 2001-03 to 13 per cent currently. That requires some kind of policy intervention.

- The bulk of investment goes for the development of dairy co-operatives and to provide for animal health services. There is no livestock extension system and the research and extension spend is only three per cent of investment in the livestock sector.
- Fodder is the most critical input but accounts for no more than one per cent of the total expenditure of the state.
- Livestock contributes about 29 per cent to the agricultural GDP but its share in agricultural credit has hardly exceeded five per cent in the last 20 years. Moreover, credit to the livestock sector is treated as investment credit (not like crop loans for the farmers) and financial institutions still go by land-holding size when giving farmers credit.
- Only 30 million bovine heads are insured and their share in the breedable population is about 20 per cent. There is a bias in the insurance, particularly in the government policies, the assumption is that only the high-producing animals should be insured, not the other animals.
- Only five per cent of the dairy farmers in the country have access to any livestock related information.

There are other broad areas of concerns too. In 1974, the National Commission on Agriculture wanted one veterinarian to cater to 5,000 livestock units, but in India one veterinarian caters to 47 livestock units.

Livestock growth and rural poverty



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This is thanks to the rapid increase in the number of veterinarians. The delivery of services, however, is poor, leading to outbreak of diseases. India is focused on curing rather than preventing diseases.

Markets, a crucial link to farmers, are weak. Nearly 63 per cent of Indian farmers produce less than 1,000 litres of milk per annum. This is more (68 per cent) in the case of marginal farmers. Only 15 per cent farmers produce more than 2,000 litres of milk per annum. Such small production scales provide nutrition to the farming family but cannot contribute to the market surplus. There is need to incentivize upscaling to promote income and serve a social purpose.

The National Dairy Development Board (NDDB) has been doing both, with about 15 million households (about 20 per cent of the dairy farmers in the country) becoming members of village co-operative societies. In 2013, the NDDB procured about 12 million tonnes of milk, equivalent to 9.5 per cent of the total production.

Doorstep collection facilities reduce the farmer's marketing and transactional costs by nearly 90 per cent. His net income is 1.5 times higher than those who sell their milk directly to consumers

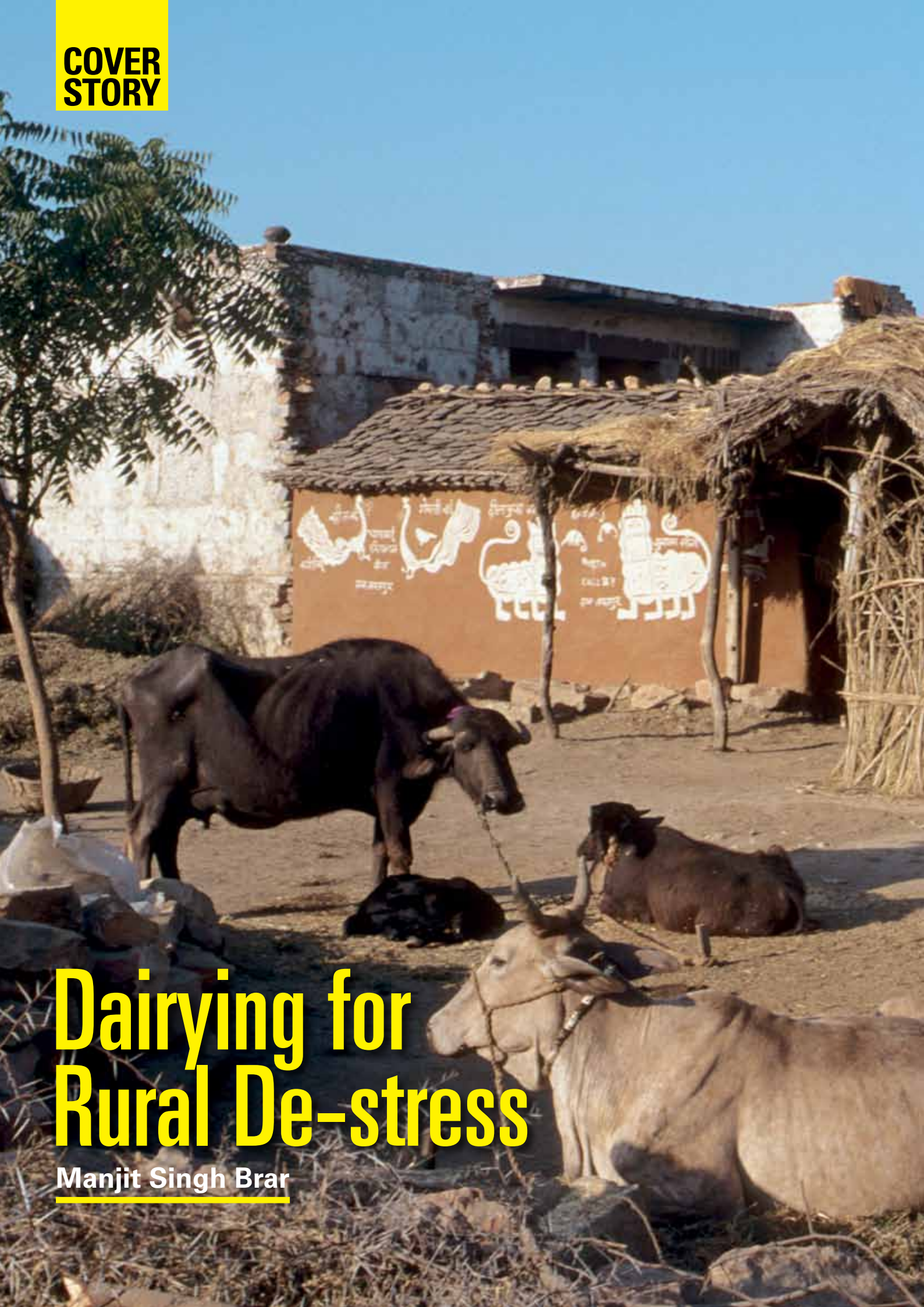
Since the economic reforms, the private sector has entered this space in a big way, especially in the processing sector. The private sector capacity has tripled in the last 15 years. More than 60 per cent of the processing capacity of the dairy industry is in the private sector that collects milk from the farmers, either through contract farming (for example, Nestle) or contact farming. Such doorstep facilities reduce the farmer's marketing and transactional costs by nearly 90 per cent and his net income becomes 1.5 times higher than those who sell their milk directly to their consumers.

There are, however, regional disparities in processing and marketing. Bihar, for example, contributes 5.2 per cent to the total milk production but has only 0.8 per cent of the processing capacity. Most of the processing capacity is in Maharashtra, Gujarat and Tamil Nadu.

The inherent dissonance in this space means that though India is the largest producer of milk, its self-sufficiency is fragile with imports exceeding exports. If India is to consolidate its share in the world market and exports, it has to cater to the entire domestic demand.

This means investing more in the livestock sector, prioritizing investment, improving farm facilities, ensuring more allocations for fodder, livestock research, improvement of yields, genetic enhancements, extension of the information system and improvement in the build capacities of women farmers. Generally dairying standards have to improve to global levels especially if India wishes to export to the EU or the USA. For this it must comply with the food standards there as well. ●

COVER STORY



Dairying for Rural De-stress

Manjit Singh Brar

MANJIT SINGH BRAR
Managing Director, Milkfed, Punjab

India's rural stress is well documented with the average income of the farmer decreasing along with the average farm size from 2.3 hectares in 1970 to the current 1.1 hectares. This is aggravated by other stress-enhancing pressures as price crashes. The recent fall in cash crop prices, of cotton and sugarcane and potatoes is telling. Even basmati prices are down, affecting Punjab farmers in particular. The only relatively safe haven is the dairy sector in India, even though, global, milk prices are down.

Dairying is the easiest start-up for the farmer for whom the cow or buffalo comprises a low-cost machine that converts non-edible products into edible products. This is what prompts state governments such as Punjab to promote dairying in a big way. A host of things must be done to invest this industry with the value that it merits, beginning with a focused plan to improve breeding infrastructure and enhance the delivery of dairy-related services.

A Punjab government initiative with breeding at integrated buffalo rearing centres is worthwhile. BAIF Development Research Foundation and the GK Trust have each been involved with running 100 centres to promote buffalo breeding — the need of the hour. Buffalo milk production has remained almost the same, while yields from cross-bred cows have gone down.

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Para-veterinarian medical staff is available for the farmers 24/7 because the unemployed youth from this area has been trained to provide these services

The centres improve the quality of buffaloes and ensure semen for breeding for a minimum of 4,000 litres per lactation period. Their other objectives were to ensure quality and low cost artificial insemination services round the clock, enhancing income levels of the rural landless workers engaged in buffalo breeding, minimizing infertility problems through adequate treatment, reducing the risk of calf mortality, amongst others.

Five-year targets were set, but with professional NGO participation and government backing the targets were achieved in 3.25 years. Around ₹26 crores was spent on the centres that are now self financing and otherwise running on their own. The model was studied by a team sent by the chairman, National Dairy Development Board (NDDB). Village clusters have been developed with one centre catering to all the villages. It provides artificial insemination (AI) services, cattle management assistance in terms of balanced feed and mineral supplements, animal healthcare, educating farmers on feeding practices and castration services for rough bulls to prevent them

from naturally servicing the buffaloes, vaccination services, deworming and, of course, first aid.

Significantly, para-veterinarian medical staff is available 24/7 to the farmers because the unemployed youth from this area has been trained to provide these services. An impact assessment of these centres shows that the AI success rate is between 47 per cent and 52 per cent; better than envisaged. AI in buffalo rearing has become very popular wherever it has been started and, funds permitting, this model can be replicated in the whole of Punjab. This is a distinct possibility.

Milk yield too has improved by 2.4 kilograms per day, which means that a poor farmer has been given an additional ₹150 purchasing power per day; a substantial sum for a poor farmer. Improvement in the breeding will further enhance the yield and this practice too can be replicated in other states provided the governments are keen.

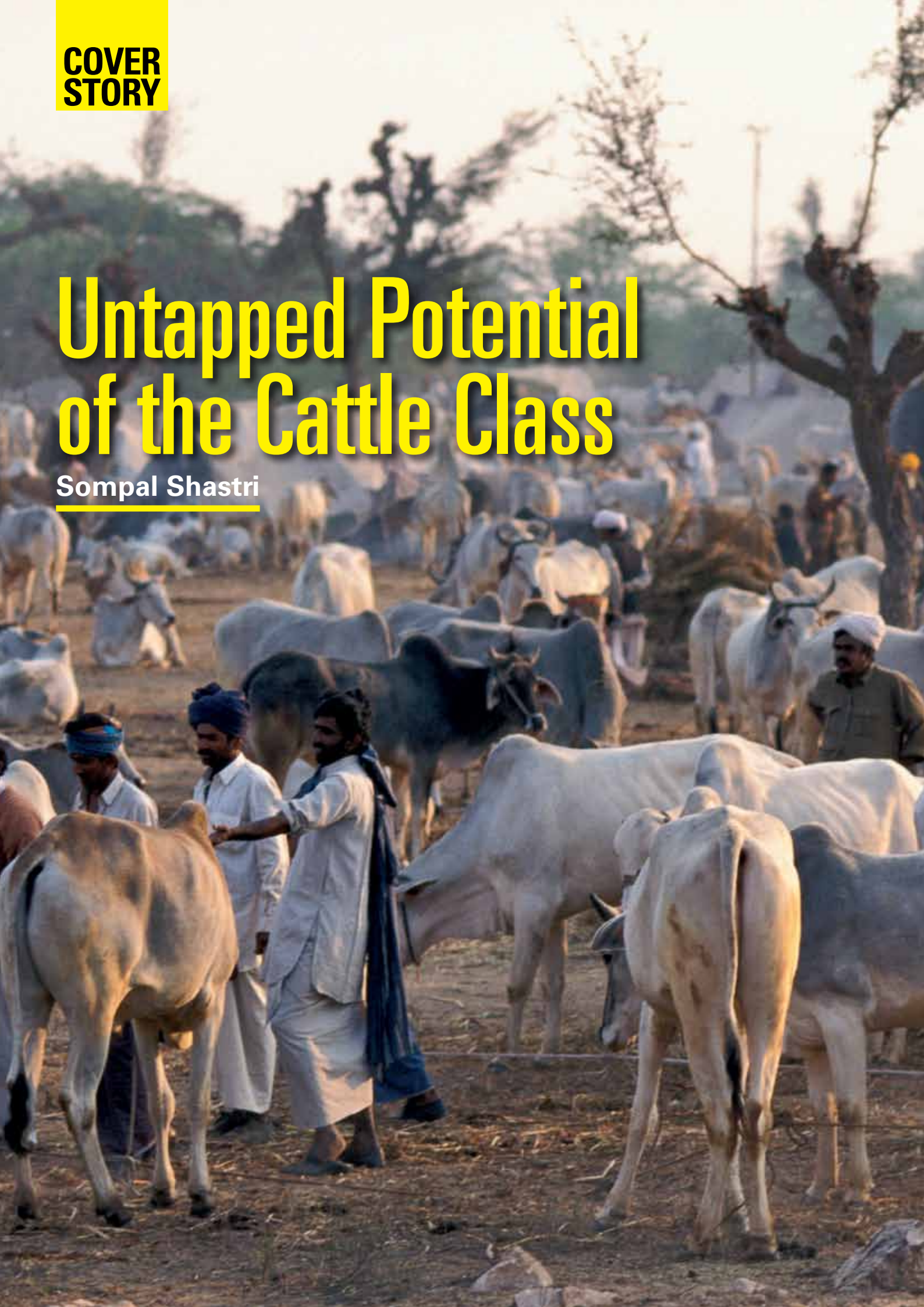
The other services envisaged included the delivery of veterinary services, which these centres provide and steps have been taken to improve breeding. Besides, there is door-to-door collection of milk. Milk federations should ensure that there is no loss in the milk quality because it is not the farmer who supplies bad milk but the drivers and the milk collectors that mishandle the collected milk. They need to be taught better.

The NDDB would do well to study this success story and replicate it in the rest of the country. It could add such other features to it as calf rearing that could easily be dovetailed into this project. ●

COVER STORY

Untapped Potential of the Cattle Class

Sompal Shastri



SOMPAL SHASTRI
Former Union Minister of State for Agriculture

Agriculture contributes less than 14 per cent to the national Gross Domestic Product (GDP) but animal husbandry contributes 4.4 per cent to the national GDP or about 30 per cent of the agriculture GDP. This is not, however, what makes animal husbandry special; it is because this activity, pursued by landless rural folks or those with marginal and small-holdings — who account for 83 per cent to 85 per cent of all Indian holdings — provides them with a reliable fall-back for income and nutrition.

Dairying and animal husbandry thus becomes a reliable plan B. The money saved by the household, that would otherwise have to purchase nutrition, should be reckoned as income. Indeed, the cattle class is a gold mine.

India is the world's largest producer of milk with 145 million tonnes, which is 18.1 per cent of world production and accounts for 2.2 per cent of the national GDP. It is valued higher than the combined value of rice and wheat and dairying would probably be the top achiever if productivity per person and productivity and yield per unit of land, dairy and husbandry were scored and its incremental capital output ratio taken into account. This is improved by such additional value sources like organic matter produced by the sector that has not been professionally valued thus far.

India is the world's largest producer of milk with 145 million tonnes, which is 18.1 per cent of world production and accounts for 2.2 per cent of the national GDP

In the USA, the GOA (General Accounting Office of America) conducts comprehensive surveys after every crop to determine the depletion of micro-nutrients in the soil and imputes a value to it. This is deducted from the value-added by agricultural production to arrive at the net GDP. India needs to start doing this because the loss in soil nutrients is not being accounted for at all, creating a serious gap in India's statistical and empirical studies.

The value generated by this sector becomes significant when one considers the fertilizer subsidy (around ₹67,000 crore last year), the bulk of it going to the urea segment. All it does is supply nitrogen. What needs to be assessed is its impact on human and environmental health and the microbial population that converts the micronutrients.

The impact of pesticides and chemical fertilizers on Punjab's Malwa belt has gained the region much notoriety because of the high incidence of cancer there. Matters could improve if animal urine, particularly cow urine, which provides a perfect substitute for urea were to be used. Especially when diluted to 10 per cent, it has the same beneficial impact without the adverse environmental effect.

This is the kind of value that can be extracted from the sector. There is, however, no systematic research into the damage being done to the soil, plant, human and environmental health. Only if this loss in value is deducted from the national GDP will a realistic figure on value addition by this sector be known.

There are three other very critical aspects:

- Draft power cultivates large tracts of land. In 1974-75, the draft figure was equivalent to about 44,000 megawatts of electricity. Clearly, this is one area that needs to be developed but there is no reliable R&D to develop good implements that can be drawn by the animals.
- The micro-economy of the dairy sector at the farm level also presents a sad story. There are only two types of dairy farming featuring animals reared by families and large farmers, who can directly market their product. The other farmers are in a shambles.
- There is also the huge mark-up — around ₹50 — by those who pick up the milk and sell it just five, 10 or 20 km away. This phenomenon should be examined by economists and a way should be found for a fair part of the high prices to flow back to the basic producer.

What is the big picture?

The greatest worry is that dairying is not even treated as an agricultural activity by any state. It needs adequate water, health and veterinary services. The picture becomes clear when one realizes that there is no X-ray machine for animals in Haryana, nor a mobile van. Processing facilities have improved but not enough to counter the slowdown in the rate of growth of yield.

Between 1984 and 1992, wheat prices moved

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between ₹85 and ₹375 per quintal while milk price, paid by the National Dairy Development Board (NDDB) to the farmer, moved from ₹4.20 to ₹5.60 only. The government policy was clearly harmful for the sector because it gave a monopoly to the NDDB and did not allow the private sector. The Milk and Milk Product Order was dismantled in 1998-1999 with my ministry intervening strongly. Currently, the NDDB, the government of Uttar Pradesh and Mother Dairy can lift 100,072 litres, with the rest left to the private sector.

On the one hand there is a big question around the sustainability of cross-bred animals in India and, on the other, making the most of the native breeds. These have good immunity, disease resistance, capacity to survive in Indian conditions and have a higher fat content. All these are the concerns that have to be addressed. Serious efforts must be made to improve the native breeds. Even Cuba has better native animals. Conservation is not enough, it has to be a systematic upgrade.

The Beta Casing issue is being overlooked in India. Scientists in New Zealand are pressurizing the government to ban Beta Casing A1 milk for children up to five years because it is responsible for such diseases as autism and heart problems. A2 helps in preventing diseases. The disposal of male cows is another problem with anti-social elements obstructing the movement of animals, including milking cows, which are not being taken for slaughter. Despite talk of a global market for dairying, there is not even an organized domestic market. ●

COVER STORY

From Dairy Farming to Dairy Enterprise

Ramesh Rawal

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The growing share of animal husbandry in India's Gross Domestic Product (GDP) and in particular, the agriculture GDP has prompted the increasing interest of farmers in this sector. This should be supported and incentivized by creating conditions and providing training to upgrade dairying from farming to enterprise. This would make the entire space productive and competitive and serve the evolving consumer needs more proficiently.

RAMESH RAWAL
Executive Vice-President and Trustee, BAIF Development Research Foundation

A better understanding of India's diverse agro-climatic conditions too would help bring about adjustments in agricultural practices. Obtaining a good mix of indigenous breeds crossbred cattle and buffaloes would increase dairy produce and incomes of small farmers who are faced with an opportunity courtesy urbanization, the growing market economy and the increasing income of the middle class that has meant increased demand for milk and milk products.

Dairy farming is integral to agriculture with livestock contributing 30 per cent of the agriculture GDP; dairy farming accounting for a major share. There has been a diversification in agricultural practices with a focus on dairy farming for its contribution to both the food and non-food spaces to address new market realities.

The sector also lends itself to inclusive development. Dairy cattle ownership is less skewed than land holdings and can be a tool for poverty reduction. More than 90 per cent of dairy farmers

Enhancing productivity through improved husbandry

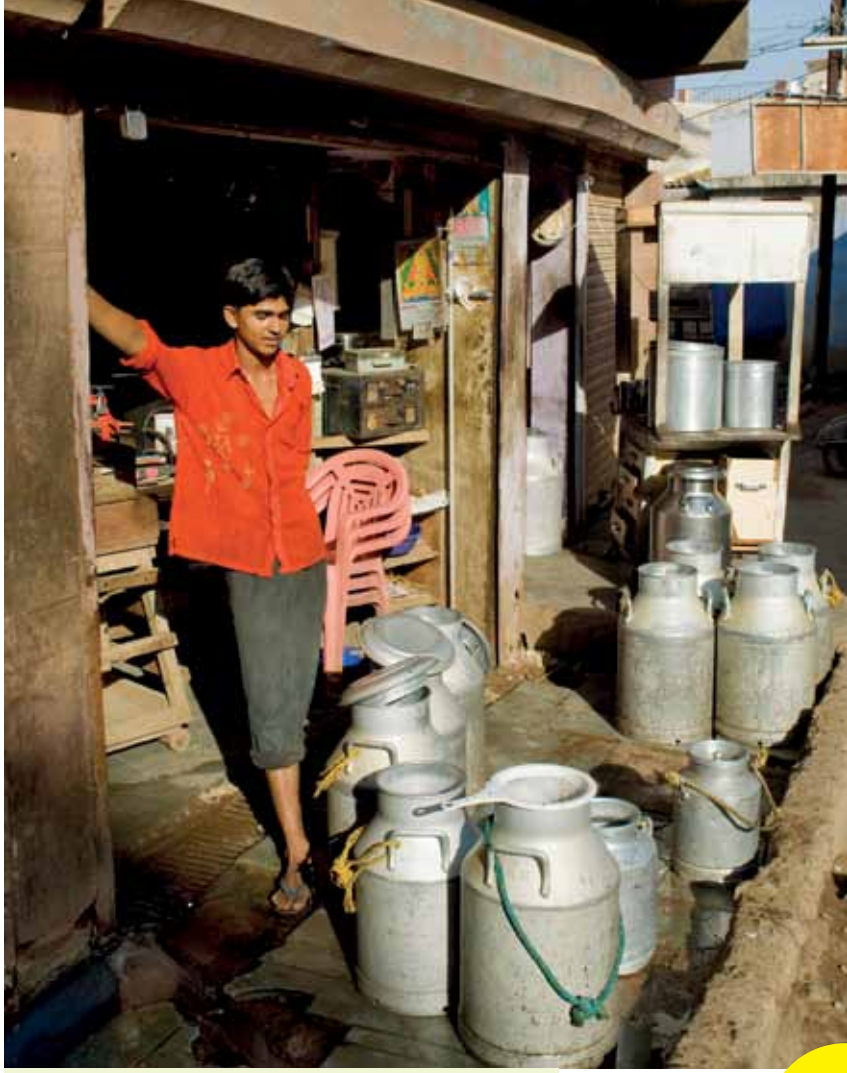
- Maintaining and using dairy production and reproduction records
- Using right breeding bull's semen
- Timely culling and stock replacement
- Economic feeding
- Training in livestock production management and economics of dairy enterprise.

Dairy enterprise

- Enhancing productivity per unit of animal per unit of time
- Reducing cost of milk production
- Realizing better price
- Using technology, management and financial concepts in operations
- Ensuring higher profits
- Maintaining proper records, information and education.

Feeding

- Optimzing feeding to reduce cost
- Feed is the single most important factor in cost of milk production
- Balanced feeding is essential along with focus on economical/optimum feeding
- In balance feeding: Crude protein is expensive and costs vary greatly depending on the source
- Need to reduce wastage of feed.



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Policy and governance issues

- Agriculture, animal husbandry are state issues; difficult to enforce appropriate policy decisions
- Appeasement; limitation of charging for services
- No control/monitoring/certified germplasm (free for all)
- No act to control artificial insemination delivery system/technicians
- Scarcity of quality bulls; no mechanism to produce, select and certify bulls and bull mothers
- Lack of identification, recording and testing system for bulls and bull mothers
- Developing characteristics of our own breeds.

The focus must shift from mass production to production by the masses through suitable field applications of the latest technology

own 1-3 milch animals and there is potential for large participation. Fodder production covers hardly five per cent of land area and offers scope of growth. There is need to pay greater attention to buffaloes that accounted for 53 per cent of the milk production. Feed resources and adaptability has to be improved for them.

The BAIF approach emphasizes the multiplication of assets rather than distribution and focuses on bio-resources, especially cattle and buffaloes. It recommends resource development through genetic improvement using a family-oriented approach rather than a programme oriented one that is both comprehensive and integrated. The focus must shift from mass production to production by the masses through appropriate field applications of the latest technological development. ●

Challenges with Sexed Semen Technology

K. R. Trivedi

The sperm contains an X or a Y chromosome and the ova contains only an X chromosome. X and Y sperms must be sorted in order to produce a calf of the desired sex. The X chromosome is larger and contains approximately 3.8 per cent more DNA than the Y chromosome. This property is used for sorting X and Y sperms.

Sexing Technology (ST), USA has IP (Intellectual Property) on Flow Cytometry Bovine Sperm Sorting (FC-BSS) and all semen stations across the world use ST-operated and owned FC-BSS. Flow Cytometry is the only reliable sexed semen technology available today. Where does that leave the use of sexed semen technology in India?

Current ST machines can produce about 10-14 doses of sexed semen of each sex per hour or about 300 doses per day or one lakh doses per year. The sorting machine costs about ₹2 crore. However, ST does not sell machines; it provides sperm sorting services. ST needs a minimum business of one lakh doses per machine to recover it costs of operation and charges between $12 and $15 per dose, which means it wants business of between ₹7 crore and ₹10 crore a year. These are the economics that determine the development of this sector.

K. R. TRIVEDI
Advisor, National Dairy Development Board

Challenges facing the sexed semen space in India emanate from the very low AI coverage of between 20 and 25 per cent and the poor conception rate with artificial insemination at between 25 per cent and 35 per cent. The conventional semen dose concentration is 20 million per dose compared to around two million in sexed semen. The biggest problem is that farmers cannot afford to pay ₹1,500-₹4,500 against the ₹10-₹50 that they pay for conventional semen doses. ●

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Conventional semen dose concentration is 20 million per dose, that is two million in sexed semen, but farmers cannot afford ₹1,500-₹4,500 against the ₹10-₹50 for the former

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Fertilization:

X-sperm + X-ova = XX female
Y-sperm + X-ova = XY male

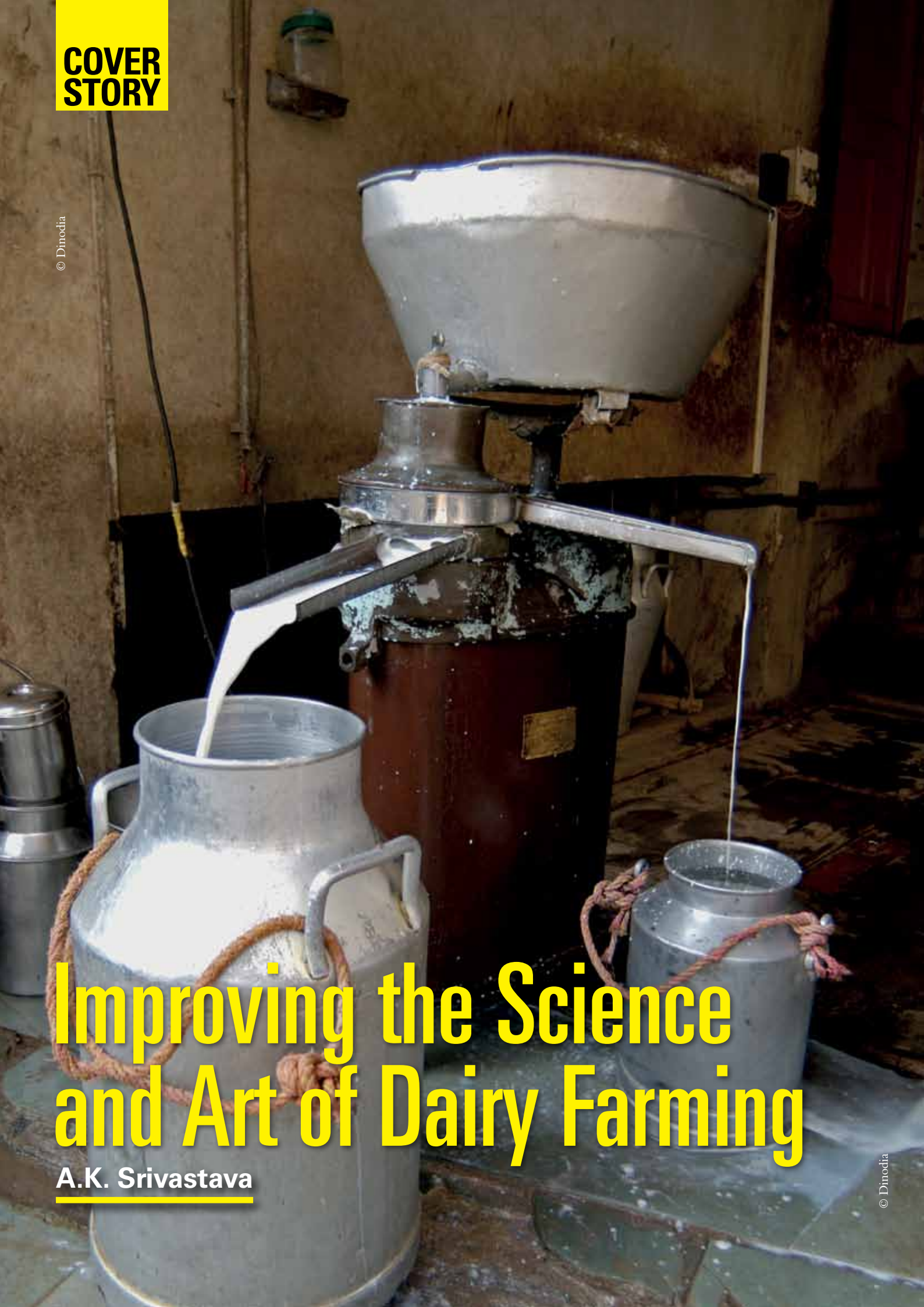
Recommendations for using sexed semen

- Use only in virgin heifers in well-managed herds.
- Inseminate 12 hours after heat is observed.
- Thaw using warm water at 35 to 37 degrees centigrade for a minimum of 30 seconds.
- Time of insemination, thawing temperature, hygiene and skill are important

Standard diseases control procedures

- Regular screening for tuberculosis, Johne's disease, brucellosis, bovine genital campylobacteriosis and trichomonosis and culling of reactors in two days
- Discarding semen doses of positive reactors from the last negative test
- Screening of personnel and their animals
- Proper disposal and utilization of animal waste
- Disinfection of premises
- Rodent and a pest control programmes.

COVER STORY



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Improving the Science and Art of Dairy Farming

A.K. Srivastava

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In the 1960s India produced 39 million tonnes of rice; today it produces 100 million tonnes. Milk production has seen a quantum leap from 17 million tonnes to 140 million tonnes; an 800 per cent increase, courtesy developments in science and technology. There has been a 23 per cent increase in the cattle population and 150 per cent increase in the buffalo population.

A. K. SRIVASTAVA
Director, National Dairy Research Institute

Prior to the White Revolution or cross-breeding programme, India's cattle productivity was less than two kilograms whereas today, the national average is seven kilograms for cows and five kilograms for buffaloes. Cross-breeding through exotic germplasm was introduced to meet the growing demands of milk in the country.

The four cross-bred species with high production potential are Karan Fries, Karan Swiss, Frieswal and Sunandini. Of these, Karan Fries and Karan Swiss have been developed by the National Dairy Research Institute (NDRI).

Artificial insemination (AI) and Semen Cryopreservation have successfully been used with wide spread application. Multiple ovulation and embryo transfer are restricted to some pockets and farms whereas cloning and transgenic technologies are restricted to laboratories. With the use of AI, the gap between the indigenous and cross-bred species is decreasing and second generation technology has enabled considerable and quick improvement in multiple ovulation (MO) and embryo transfer (ET) in terms of super-ovulation response and conception rates with ET. Use of ET is promising to meet the increasing demand for quality breeding bulls. However, the outreach has not gained the expected momentum.

Technology in dairy processing has led to incremental value realization. However, problems arise even at the basic level from villages, where there is surplus milk but no takers, for instance. The NDRI had started with pasteurized milk and graduated to producing butter, cheese, ice cream, paneer and dairy desserts. It now has a dairy foods operations and quality assurance kits to detect adulteration. The future of dairy farming lies in innovating with milk based nutraceuticals. ●

Prior to the White Revolution or cross-breeding programme, India's cattle productivity was less than 2. Today, the national average is 7 for cows and 5 kg for buffaloes

Science for Indian dairying for the next 25 years

- Tests for diagnosis of and sub-clinical mastitis and early pregnancy in cows
- Development of "electronic nose" for estrus detection
- Reducing puberty age of both males and females
- Technologies for sexed semen and sexed embryos
- Reducing the gap between demand and availability of male germ plasm
- Prediction of fertility of bull at calfhood level
- Increasing shelf life of milk and milk products
- Milk for pharma industry: exploiting milk as a therapeutic
- Exploring the health attributes of non-bovine milk

Quality assurance of milk and milk products through technology

- Rapid detection of all possible adulterants in milk and milk products
- Kits for detection of antibiotic and pesticides residues in milk and milk products
- Kit for rapid detection of detergent in milk
- Kit for detection of pathogens in milk and milk products
- Rapid detection of A1/A2 milk and cow/buffalo milk

Reproductive biotechnology can be divided into four generations:

1. Artificial Insemination and Semen Cryopreservation
2. Synchronization, multiple ovulation (MO), embryo transfer (ET)
3. In vitro embryo production
4. Nuclear transfer, transgenic, stem cell biology

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ANIMAL HEALTH: Prevention is Better than Cure

G. K. Sharma

G. K. SHARMA
General Manager
(Animal Health)
NDDB, Anand

Dairying success largely depends on the quality of animals and much depends on where they have been sourced from. The new animals brought to the farm should be disease free and whether the animal is brought from a farmer or market could influence its health. Farmer-owned animals are generally cleaner and market animals often carry diseases. These animals should be tested before being purchased and there must be regular testing for disease at the farms too. If the animal has not been tested prior to purchase it should be quarantined before it is allowed to mix with other animals.

Vaccination is very important for animal health and it is suggested that it is administered when the animal is three months of age. Vaccines are available for foot-and-mouth disease, haemorrhagic septicaemia, black quarter, theileriosis, anthrax, brucellosis and infectious bovine rhinotracheitis.

The four week quarantine process means:

- Isolation from other animals
- Testing for diseases during this period
- Feeding, watering, milking to be carried out after handling other animals

The critical factors in effective vaccination are cold chain, high vaccination coverage for herd immunity, one needle one animal, adhering to vaccination schedules, following instructions carefully (shake well, correct dose), disposal of left over vaccine, if possible, de-worming two to three weeks before vaccination, maintaining record of vaccine batch, date of expiry, vaccinator details as well vaccination date. De-worming is suggested within ten to fourteen days of birth and repeated monthly up to six months. The National Dairy Development Board has developed a computer software, INAPH — Information Network for Animal Productivity & Health — a desktop/netbook /android tablet-based field information technology application that captures real time reliable data on breeding, nutrition and health services delivery at the farmer's doorstep. ●

BALANCING FEED: Training Local Resources

M. R. Garg

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The quality and quantity of milk is often affected by the feed consumed by the cattle. The lack of uniformity in feed and the lack of adaptability as per seasons, requirements and availability of resources, leads to fluctuating milk production. Feeding accounts for more than 70 per cent of the cost of milk production. The challenges in determining a balanced feed are many.

Compound cattle feed is not enough for all animals at all stages. The nutrients required by the animal at the calfing stage may be different from those that are taken care of by the usual feed. Traditional feeding does not provide all the essential nutrients and often, farmers are unaware of the nutritional requirement of the animals and the nutrient composition of feed and fodder. There is a pressing need for judicious use of the available feed resources.

M. R. GARG
General Manager (Animal Nutrition Group), NDDB, Anand

The National Dairy Development Board has a programme to help tackle the balanced feeding issue called the Ration Balancing Advisory Programme, that allots local representatives — trained in nutritional and health knowledge — to milk producers. They suggest a balanced ration using locally available feed resources and area specific mineral mixture. A 'Feed and Fodder Chemical Composition Data Library' has been created for this purpose along with a master document on nutrient requirement for various categories of animals. Computer software has been developed to assess the nutrient status and to work out a least-cost ration, according to the productivity and physiological status of the cattle.

Local resource persons (LRPs) are selected and trained so that they can provide sound advice to farmers in the local language. They undertake such responsibilities as tagging cattle, recording feed ingredients, daily yield and preparing animal profiles to come up with a suitable ration balancing programme for each farmer. Regular meetings are conducted to update villagers on cattle feed requirements, thus helping them follow a more customized programme to increase milk productivity and quality. ●

Compound cattle feed is not enough for all animals at all stages. Nutrients required at the calfing stage may be different from those that are taken care of by the usual feed

COVER STORY

Cattle Health is Cattle Wealth

Harish Rai Dhandha

The dairy farming business faces multiple challenges from finance to feed. Feed formulation is expensive because of the speculative prices that obviate buying in bulk and storage, especially for small businesses. Of equal concern is animal health with a number of vaccinations necessary to maintain cattle health. Then comes the question of finance.

HARISH RAI DHANDHA
Progressive Dairy Farmer, Ludhiana

Farms find it difficult to receive subsidized funds, since commercial banks do not know dairy farming. They do not understand that the loan is not an industrial loan. The dairy farming industry receives no subsidies except when buying machinery. Yet it is is an expensive proposition with animals demanding a lot of care.

Starting with de-worming every month for six months, the cattle are also vaccinated against many diseases. Formate dehydrogenase is administered at two months, followed by a booster dose after 21 days. This is followed by theileria at three months, haemorrhagic septicimea and black quarter vaccines at four months and brisula at six months, after testing. The cattle soon moves on to the adult schedule that is duly followed.

A very important aspect of animal health is proper hygiene through practices such as periodical sprays (depending on climatic conditions), periodic shifting of material and a thorough cleaning of all areas. The use of material such as lime is helpful in cleaning.

At a personal level, my main thrust is on disease prevention and a number of tests are regularly done for brisulisis and mastitis. The somatic count for each cow is checked on a fortnightly basis, as is the milk lot. The incidence of mastitis is less than two per cent at our farm and the somatic cell count of the milk lot varies from 90,000 to 200,000.

We purchased 170 calves of which 10-15 were culled. As of now, the cattle head is 400 and calves inseminated at our place have begun calfing. No new cattle is purchased at the farm.

The fat content in the milk produced varies from 4.1 per cent to 4.7 per cent across the lean period

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to the stress period. The SFS is 8.1 to 8.9. This is due to proper feeding, differentiated as per the cattle's need and health. As many as seven different formulations are used in the feeding process. The feed for the calf is dependent on its age and is varied almost every three months.

There are different formulations for calves/cows at different stages: in the first three months, in the following three months, before confirmation of pregnancy, during pregnancy, after calfing and such other stages. The feed is also different for low, medium and high yielders. The farm has a scanning machine to keep a tab on pregnancy that gets detected within 25 days. Chronic cows are periodically checked even after the cycle is over.

Cows are tagged and microchips are installed to track their movements. A computer software is used to keep a tab on the milk production, diseases and health of each calf and the milk produced from those taking medication is discarded.

As far as fodder is concerned, it takes about three weeks, once a year, to make a silage. An average yield of 240 quintals was recorded this year on 150 acres. It took 21 days to make sufficient silage for the entire year. The use of wheat straw is minimal and need-based.

Quality of cattle in India being a problem for farm owners, there is a need for calf banks, especially for new entrepreneurs. The bank can take calves back as remuneration from these entrepreneurs as well

Housing of the cattle is another major problem. Often certain costs are hidden in during the planning stage. It is a struggle to determine a good area to keep the cattle in and maintain hygiene at the milking place. When the cattle is taken for milking, the udders are given a shampoo dip and cleaned with a tissue. After the milking process, cows are not allowed to sit. This is done by timing the feeding process in such a manner to ensure that they do not sit.

In the later stages, milk handling is very important. Milk should be properly pasteurized, packed and dispatched. The farm sells 60 per cent of its produce directly to people's houses. This 60 per cent is the lean period yield and the rest goes to bulk sales.

Quality of cattle in India being a problem for farm owners, there is a need for calf banks, especially for new entrepreneurs. The bank can take calves back as remuneration from these entrepreneurs as well. Due to the lack of a common purchasing place, there are no herds with uniform breeds; all are mixed. Semen is also not always easily available.

Another major challenge faced by farmers is the poor access to pathology laboratories to get tests conducted. Farms can even hire full time doctors but not having access to laboratories limits the scope for diagnosis.

A uniform standardization mark or certificate might be helpful in recognizing farms that produce quality milk products. Just like the Woolmark that identifies high quality wool, Milkmark may be a good way to identify quality production that may be branded. These tests should be conducted at the unit not at the market so as to avoid corruption and bribery. ●

COVER STORY

Benchmarking Dairy Products to Global Standards

Sunil Bakshi

SUNIL BAKSHI
Deputy General Manager, National Dairy Development Board

There are different determinants of product quality depending on the needs of the consumer and regulators. Implied needs are the needs of a customer or processor. Stated needs refer to the rules and regulations that govern the quality of the food product, as well as what is stated on the label.

There are thus various dimensions to the quality of milk products including safety aspects, compositional quality, organoleptic qualities and the shelf life of the milk product. Quality includes food safety, which is considered a standard in itself. Safety could be from physical, chemical or microbiological adulteration. Compositional aspects like the fat and SNF (Solid Not Fat) percentage and organoleptic indicators like colour, smell and taste are additional indicators of the quality of the milk product.

There are basic needs for maintaining the quality of milk and milk products primarily around safeguarding the consumer's health. The additional reasons are to retain the wholesomeness and taste of milk and milk products offered to consumers, to improve keeping quality and increase shelf life.

There are certain technological requirements too, such as UHT (ultra-heat treatment) requiring a low initial bacterial count in raw milk and efficient processing operations at the dairy plant. Quality raw milk has low initial bacterial load and results in the reduction of energy costs while improving operational efficiency of the processing unit.

With increasing consumer awareness and incomes, there are greater chances of a consumer shifting purchase preferences. Given the increasingly globalized circumstances and international trade, one must abide by global standards for quality.

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Organizations such as the Codex Alimentarius Commission and the World Organization for Animal Health (OIE) sets international benchmark standards. They are listed under the SPS (Sanitary and Phytosanitary Measures) Agreement of the World Trade Organization.

There is an emphasis on the harmonization of domestic standards with international standards, given the increasingly competitive international market and Indian producers must fall in line vis-a-vis harmonization with global standards.

The Food Safety and Standards Authority of India is the driver for improving the quality and safety of products by the industry. It ensures that domestic production and imported products meet international norms, which in turn empower Indian producers to export competitively. A uniform high standard for domestic and export-oriented production would ensure that there is no need to manufacture products separately for domestic and export markets.

The dairy sector works in a chain that starts from milk production, goes through collection and processing centres and eventually ends up with the consumers. The entire chain must follow high standards to keep the milk potable and of high quality right from the early stage of milk procurement. At the milk collection level, it is essential to measure and maintain an acceptable microbial quality of raw milk at the dairy dock. Additionally, the milk should be kept free of adulteration and contaminants such as heavy metals or Aflatoxin. Animals on medication should be allowed to undergo a withdrawal period before their milk is sold.

At the processing level, care must be taken to maintain initial quality and to ensure that no hazard is introduced into the product. At the marketing level, a cold chain must be maintained to prevent the milk from going bad. Correct milk and product handling at the market level and by the consumer are essential.

Efforts to ensure food safety thus begin at the milk production stage through top class standards of hygiene. Processing merely prevents or inhibits further deterioration, brings about desired changes and improves the shelf life of the milk product. However, it cannot offset the harmful effects of the deterioration of raw material that has already taken place. Therefore, utmost care must be taken to prevent deterioration in the quality of raw milk reaching dairy plant as that is the base for any milk product, including processed liquid milk, which should not have toxins and microbes that processing cannot reduce. Processing prevents deterioration, brings about desired changes and improves the shelf life but cannot offset the harmful effects of the deterioration of raw material that has taken place ●

COVER STORY

Time for a Premium on Quality

Ashish Bahuguna

That quality of milk is important, largely driven by concerns of public health and public welfare is well understood. What is not clear is that while government and private sector initiatives have effectively increased milk production and productivity and India has run a Clean Milk campaign for some 15 years, there are no tangible benefits to show for it, probably because one does not put a premium on the milk quality in India.

ASHISH BAHUGUNA
Chairman,
Food Safety
and Standards
Authority of India

Unless quality fetches a premium for the farmer, one will be not be able to resolve this question. A premium is often paid in the extremely informal sector, where the *gwalas* (milkmen) supply the milk directly to the households and sometimes get very good prices or in the organized space — the co-operative sector or private enterprises — by building in systems of traceability. At the time of procurement, the milkman can encash the 'milk quality' and secure a premium. This is something that needs to be focused on by policy-makers and the private sector.

The government pays ₹22 a litre for cow's milk to the farmer and sold at higher prices in the market after processing. The benefits of value addition in the processing stage accrue to the processor or big companies rather than the farmer. Unless farmers are incentivized to supply quality milk and inter-farmer competition is increased, it may be difficult to better the quality of milk. Therefore, the organized and the co-operative sectors must introduce traceability in their procurement systems and procure only at levels that meet the appropriate quality.

One cannot improve the milk quality through processing that can, at best, help maintain quality and prevent deterioration. Therefore the need for the best quality milk comes from the producer.

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It is necessary to develop brand consciousness amongst the consumers and intermediate consumers, incentivize use of quality milk and for intermediaries to maintain quality

The mandate of the Food Safety and Standards Authority of India (FSSAI) only runs on the output of the milk sector and does not look at the processes. In fact, the Act under which the FSSAI functions specifically prohibits it from looking at the primary production, whether it is of crops, milk or fisheries, even though, in certain sectors, the quality of the product depends on the processes and good agricultural practices followed in the manufacturing and the production sectors.

This is something that the parent ministries and people in positions of importance in such sectors have to address. Otherwise there will be headlines saying that samples of X company or brand are failing. There is a massive deterioration of the quality of milk and milk products, especially in the holiday season, for instance, when milk output stays constant but demand significantly increases.

The National Dairy Research Institute and certain other entrepreneurs have developed certain machines and mechanisms to measure several aspects of milk quality. In Delhi for example, major consumers of milk (like sweet shop owners) will be asked to have their milk tested at FSSAI facilities to be put up at central locations. The intention is to develop a brand consciousness amongst the consumers and intermediate consumers for the need to use quality milk and for intermediaries to maintain quality. ●

BIOGAS: A Win-Win Option for All

B. S. Negi

Biogas is the digested organic material under anaerobic conditions. Substrates such as manure, sewage, sludge, municipal solid waste, biodegradable wastes or animal feedstock are transformed into methane and carbon dioxide. Biogas is renewable, sustainable and carbon neutral and it reduces the dependence on imported fossil fuels. Rural households using biogas become fully energy self-sufficient.

B. S. NEGI
Director, Option Energy Pvt Ltd (Unit of Govardhan Gas Pvt Ltd)

There are several factors affecting yield and production of biogas such as the quantity (of feed/ volume) volume, nature of substrate matter, the flow and dilution of material, the temperature, time for fermentation, acidity and alkanity (pH value) of substrate and circulation inside digester.

Developed by Utah State University, USA, Option Energy's plant in Hansi, Haryana can be used to generate electricity and Bio CNG with the use of organic wastes such as cattle dung, food waste, agro-waste, industrial and municipal waste. The retention time (time to extract biogas) is only five days for the anaerobic digestion process as compared to 15-25 days for other imported technologies.

It can scale up the bio-methane production up to 95 per cent. It is a computerized and automated operation that makes it sustainable and lowers maintenance cost. It is suitable for *gaushalas* (cow shelters), dairies,

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Seven types of biogas plant with MNRE recognition:

1. The floating-drum plant with a cylindrical digester (KVIC model)
2. The fixed-dome plant with a brick reinforced, module dome (Janata model)
3. The floating-drum plant with a hemisphere digester (Pragati model)
4. The fixed-dome plant with a hemisphere digester (Deenbandhu model)
5. The floating-drum plant made of angular steel and plastic foil (Ganesh model)
6. The floating-drum plant made of pre-fabricated reinforced concrete compound units
7. The floating-drum plant made of fibre-glass reinforced polyester

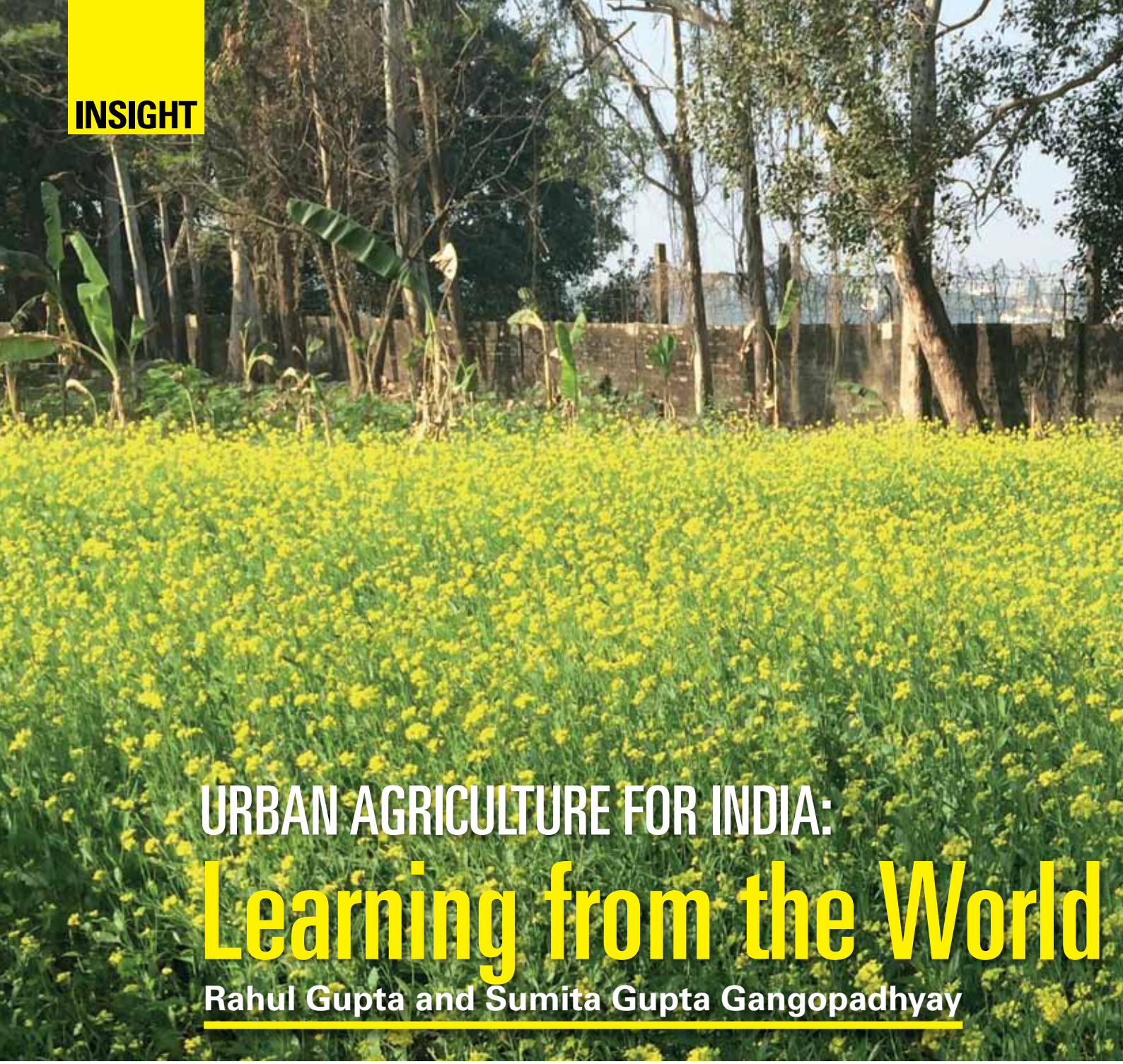
Economics of a biogas plant

Cost of cow dung for 20,000 kg
@ ₹125 per tonne : ₹2,500 per day
Per month production cost
₹2,500 X 30 : ₹75,000 per month
Per month cost of production for bioCNG, bio-manure, liquid manure including packing, salary, consumables, stores, repair and maintenance and depreciation:
₹300,000 (estimated)

Biogas offers environmental benefits by reducing methane emission; establishing a decentralized energy supply; providing high quality fertilizers; strengthening regional economies; and fostering energy independence

municipalities, mega-city developers, fruit and vegetable markets, sugar mills and such others.

Apart from these, biogas offers environmental benefits by reducing the emission of methane that is also a green house gas; establishing decentralized energy supply; providing high quality fertilizers; reducing unpleasant local odours; strengthening regional economies, adding value and fostering energy independence. ●



URBAN AGRICULTURE FOR INDIA: Learning from the World

Rahul Gupta and Sumita Gupta Gangopadhyay

The spectre of urban hunger could be more severe than what was experienced in Latin America during its urban growth. The density of population, being far more adverse in India, will multiply the problems. Making matters worse is the continuous migration of people engaged in the farm sector into urban sprawls. Rural development initiatives to make farming more attractive, retain farmers in rural areas and free them from the atrocities of middlemen are conspicuous by their absence.

RAHUL GUPTA
Agricultural Engineer, Post Graduate in Agricultural Economics (Rutgers) and Marketing (IIM-A)

SUMITA GUPTA GANGOPADHYAY
Architect & Urban Planner, Fellow, Indian Institute of Town Planners; Associate Member, Indian Institute of Architects

That urban growth is resulting in the loss of agricultural land is not disputed, with more and more fertile rural land being engulfed within the outer limits of cities. Clearly, the output from rural land will not be able to feed the urban mass comprising large numbers of displaced agriculture-based workforce migrating to the cities and towns. Such policy shortsightedness is

Photo : Organic Mandi, Kolkata

inexplicable in a country dependent on the sector, with the the 2011 Agricultural Census highlighting clear signs of an agricultural crisis.

- Agriculture is the principal source of livelihood for about 56 per cent of India's population
- 44 per of India's cultivated land consists of marginal (less than a hectare) and small (one to two hectares) farms
- 85 per cent of the farmers belongs to this marginal and small category
- An estimated 80 per cent of these marginal and small farmers is in the clutches of usurious middlemen
- They have inadequate market participation, are unaware of minimum support price and this adds to their indebtedness to the intermediaries.
- Farming for them is increasingly becoming economically unviable
- About 45 per cent of the farmers interviewed by the NSSO expressed a desire to quit farming
- As per the latest census, there are 7.7 million less farmers compared to 2001 with about 2,035 farmers losing the status of 'main cultivator' per day
- Farmers are increasingly migrating to cities and towns in search of alternative livelihood, which urban centres are unable to provide, escalating urban poverty.

Yet, thanks to the lack of effective policy intervention, incidence of poverty, hunger and malnutrition is becoming wide-spread in the fast

expanding urban areas. India's urban population is increasing at a much faster rate than the overall population growth; from 11.4 per cent (1901 Census), to 28.53 per cent (2001 Census) and 31.16 per cent (2011 Census).

The U.N. State of World Population report says that 40.76 per cent of India's population will reside in urban areas by 2030. By 2050, an estimated 1.7 billion Indians will account for 17 per cent of the global population but with only two per cent of the land and four per cent of the water resources. Urban dwellers numbering a billion — 60 per cent of the population — will far outnumber their rural counterparts. The question is about feeding this rising urban population, much of which will be rural migrants.

There is an uninformed belief in the minds of Indians, policy-makers included, that agriculture is only to be practised in rural areas. The urban population explosion necessitates a change in mindset. A significant portion of the urban food requirement has to be generated within or close to the urban centres; in intra-urban and peri-urban regions. Rapid urbanization would mean increased demand for enhanced quantity and quality of food — particularly high-value food like fruits, vegetables, milk, egg, and meat — from limited urban resources with shrinking land, scarce water and limited biodiversity.

India's urban population is increasing much faster than the overall population; from a growth rate of 11.4 per cent (1901 census) to 31.16 per cent (2011 census)

Globally, there are examples of foodgrain production taking place in the country side, while fruit, vegetable, fish and even livestock are grown or reared in and around cities. Urban and peri-urban agriculture (UPA) is focused on the food production system and the food value chain in and around urban centres, catering to the needs of urban dwellers. Indian policy-makers should recognize this and include it in the broader agricultural production, distribution and marketing perspective.

Yet national, regional as well as local policy-making agencies have failed to recognize the potential that this rural-peri-urban-urban interface has in building up a resilient food system while investing the much needed eco-friendly green environment into the cities and their surroundings. The challenge is to provide urban food security, mitigate urban hunger and reduce urban unemployment due to the influx of rural migrants that are making Indian cities increasingly unsustainable and pushing them to the brink of collapse.

Urban agriculture, if implemented judiciously can provide relief from such urban decay. Consider the example of the Argentinian city of Rosario, which transformed itself from a poverty-striken, rebellious, looting slum to a green city in two years. The local government launched an urban agricultural programme with the assistance of two key partners: the national Pro-Huerta (Pro-Garden) Programme (established in 1990 to promote small scale production of fresh food in low-income urban and peri-urban areas) and the Centre for Agro-Ecological Production Studies (CEPAR), a Rosario-based non-governmental organization promoting vegetable gardening in the slums since 1987. Initially targetted towards 20 gardening groups by providing tools and seeds, the city soon witnessed large-scale requests for similar assistance. In about two years, there were 800 community gardens, producing vegetables for about 40,000 people.

There are also inspiring stories from Curitiba and Sao Paulo in Brazil. Curitiba is known as the best place to live in Brazil. In 2010, it was awarded the Global Sustainable City award.

What can India learn from these cities if it has to feed a billion people in urban conglomerates by 2050? Surely, it is high time that the government as well as the agricultural policy-makers and urban planners recognize the need to promote UPA to feed the growing cities and provide employment to some of the millions of rural migrants.

There is little doubt that UPA practitioners have enhanced urban food security through access to a diverse nutritional diet. At the outset, urban agriculture might appear to be a simple phenomenon consisting of arranging garden plots in the city or plants in pots on rooftops and getting the residents to start gardening. To really ensure the upscaling of UPA, cities must ensure measures like zoning ordinances, comprehensive plans and even state legislation, because increasing green areas in and around cities through the UPA has many benefits:

- Improves environmental sustainability
- Controls the urban heat island

Photo : Organic Mandi, Kolkata

- Checks storm water runoff
- Improves quality of air
- Reduces transportation costs with locally-grown produce bringing down food mileage, cutting on fuel cost and auto emission
- Most importantly it provides employment to the rural migrants who outnumber the scope of employment offered by the city based non-agricultural industrial sector.

Urban areas are confronted by soaring food prices to which the urban poor, who are net food buyers, depending on market supply for meeting their needs, are most susceptible. While providing a cushion against such price shocks and guaranteeing food security, UPA also provides access to a variety of nutritionally enhanced food like fruits, vegetables, dairy products, fish and other animal protein. Most importantly, it empowers women.

UPA engages a large number of women who work in farms close to their homes, allowing mothers to spend more time caring for the children at home as compared to non-agricultural occupations that are likely to be located further away. It has other benefits too:

- Using urban residents as labour, urban organic solid waste as compost and urban waste water as a source of irrigation, UPA establishes a direct link with consumers, eliminating the large number of intermediaries who eat into the margins of the farmers.
- UPA also competes for land with other urban activities, in the process impacting on urban economic, food and ecological systems.
- It has been seen that as the city grows, so does the practice of UPA along with associated activities such as creation of farmers' market (linkages), food processing and animal health services, all capable of generating employment.
- Besides, it represents putting to use available

Photo : Organic Mandi, Kolkata

Urban agriculture initiatives such as Mumbai's vegetable cultivation along the Western Railway tracks, using urban waste water, is noteworthy

knowledge and resident skills. Rural migrants carry with them the traditional and indigenous knowledge of farming and recycling techniques that can find ready application in urban farming.

It is not that urban agriculture is not practiced in India. The East Kolkata wetlands is a much celebrated example but what exists in many cities and towns are piece-meal operations that must become widespread and industry-like. There are examples of vegetable cultivation and marketing in and around Delhi, urban farming in Bangalore and in the Hubli-Darwad urban centre in Karnataka, farming of vegetables within the concrete jungle of Mumbai and the new culture of UPA that is catching up around Hyderabad. They all involve minimal initiative on the part of the state.

In Mumbai and Bangalore, individuals like Padmasree Dr R. T. Doshi and Dr B. N. Viswanath respectively, drive the urban agriculture initiatives. Mumbai's vegetable cultivation along the Western Railway tracks, using urban waste water, is noteworthy. The once extensive aquaculture and agricultural cultivation on the eastern fringes of Kolkata has witnessed a gradual shrinking of the wetland area due to urban development and encroachment, over the years. However, it has been declared protected under the Ramsar Convention and will hopefully continue to serve as the lungs of congested Kolkata.

In Delhi, vegetables have been cultivated on the banks of river Yamuna by farmers for several generations. They are not recent migrants from rural areas but get little support from the Delhi administration and are constantly threatened with eviction due to urban development. This threat is more pronounced after the construction of metro stations along the river bank and possibilities of further development. There is little effort to sustain these farming activities.

The growing trend of urban agriculture in Hyderabad has seen more than 4,000 families in the outskirts of the city achieving self-reliance for their vegetable requirement. The state horticulture department has come forward with the distribution

The Story of Rosario City

Rosario on the river Parana, some 300 km north of Buenos Aires has demonstrated how urban agriculture can be integrated to urban development. The third largest urban agglomeration and the most prosperous city in Argentina today, back in 2001 Rosario was a decaying industrial city with its steel, chemical and paper factories shut and one-third of its workforce unemployed. Some 60 per cent of its population had incomes below poverty level with 30 per cent living in abject poverty. Staple food prices had multiplied fourfold due to inflation. Hungry slum dwellers erupted, looting supermarkets for food and stung the government into action in 2002. The municipal government started an urban agricultural programme with two partners:

- The 1990 national Pro-Huerta (Pro-Garden) Programme, to promote the small-scale production of fresh food in low income urban and peri-urban areas (UPA) and
- The Centre for Agro-Ecological Production Studies (CEPAR), which primarily promoted vegetable gardening in the slums since 1987.

It began by supporting 20 gardening groups with tools and seeds. The city soon saw 800 such community gardens, producing vegetables for about 40,000 people.

A survey under the aegis of the National University of Rosario revealed that 36 per cent of the municipal area was vacant, including space along railway tracks and highways, low-lying flood prone peri-urban land and areas earmarked for green belts, yet to be developed. The municipal authority had the clear vision to establish urban agriculture as a permanent activity in the city, though the short-term need was to pacify the unemployed slum dwellers. The secretariat of Municipal Planning drafted proposals to integrate agriculture into the urban development plan. The process of granting vacant urban land to residents was speeded up through an ordinance approved by the city mayor in 2004.

Photo: www.city.samondeo.com

The plan also built in a marketing link to deliver the produce to the consumers and saw multiple farmers' markets coming up. The success of the urban agriculture initiatives won Rosario the UN-HABITAT International award for best practices in urban development in 2004. Some 10,000 low- income families engaged in gardening earned up to $150 per month through the sale of their produce, after their personal consumption had been taken care of.

The UPA programme was consolidated over the decade. The factors that were key to this success were securing land, arranging for infrastructure for sustained cultivation on a larger scale, optimizing market linkages through the establishment of farmers' markets, setting up agro-industries, conversion of brown fields and dump sites to green belts through promotion of organic horticulture leading to enhanced supply of organically grown produce.

The city authority took care of the commercial gardeners by enrolling them in the National Registry of Family Farmers and provided them with assistance and training, social benefits as well as old age pension. In a short time Rosario included agriculture in its land use planning. Under its 10-year Metropolitan Strategic Plan (2008-18) it made provision for setting up a 'green circuit' around and through the city, comprising commercial vegetable gardens and orchards, parks, family and community gardens.

Peripheries of rail tracks and highways were included in the green circuits along with degraded land apparently unsuitable for farming and converted to gardens through a variety of agro-ecological techniques like planting legumes and grass and using compost and manure. Urban agriculture was made an integral part of public housing and slum up-gradation. In 2014, the green circuit included over 30 hectares of vegetables, fruits and medicinal/aromatic plant gardens. Garden plots with irrigation facilities and greenhouses have been established for even local school children to introduce them to the concept while they are young.

Garden plots were assigned to gardeners coming from nearby low-income neighbourhood comprising ex-factory workers and rural migrants, who bring with them the valuable knowhow of agro-ecological and intensive crop production techniques. They guarantee crops throughout the year against the land allocated to them. Such social inclusion of the underprivileged has paid rich dividends and inspired many South American cities to look at urban agriculture.

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Urban agriculture in Hyderabad has seen more than 4,000 families in the outskirts of the city achieving self-reliance for their vegetables requirement

of subsidy kits that have been gainfully used by residents of Uppal, Dilsukhnagar, LB Nagar and Vanastalipuram. The department plans to increase the number of subsidy packages. These are all simple and win-win situations for the country but scaling up UPAs would need:

- Integrating UPA in the urban development plan, with UPA recognized as legitimate land use. In a mature, built-up city, it is difficult to find land for agriculture. Suitable policies at the national, state and local (municipal) level should be adopted to provide land for agriculture at the conceptual stages of the new town/expansion and to identify derelict or unbuildable land in the city, government-owned land, land around public and institutional buildings, land adjoining railway tracks, highways and canal/river banks for farming in existing cities.
- Budgetary and financial allocation through the state annual budget is important and the government should include financial allocation to support UPA initiatives.
- Judicious waste management is necessary because cities are short of water even if land is made available. Urban India generates over 26 million litres of waste water per day. Waste water can be used for irrigation (food and non-food crop), aquaculture, ground water recharge and industry. Water conservation irrigation techniques such as drip or sprinkler irrigation should be adopted.
- Judicious solid waste management, through the segregation of organic solid waste and subsequent composting also provides valuable organic fertilizer to revitalize the soil for growing organic vegetables that are sold at a premium in city markets.
- Perhaps the most underrated role of UPA is revitalizing the city soil. City land tends to be starved as its life is leached away due to dust and pollution. Even street leaves are collected and hauled away whereas this practice can be easily replaced by the production of vermicompost,

The Curitiba Transformation

Curitiba, the Global Sustainable City awardee, is a story of transformation to a healthy and sustainable urban environment, thanks to the vision of Jaime Lerner, architect-urban planner and the city's former mayor for three decades. Lerner said that "A sustainable city can feed itself with minimal reliance on the surrounding country side and power itself with renewable sources of energy. The crux of this is to create smallest possible ecological footprint and to produce the lowest quality of pollution possible, to efficiently use land, compost and used material, recycle and convert waste to energy and thus the cities overall climate change will be minimal if such practices are adhered to".

The practice and propagation of urban agriculture was one reason for Curitiba's success. The others were political willingness and vision, waste recycling and eco-friendly traffic and transportation measures. The introduction of urban agriculture had a double-edged advantage. The implementation of a 'Twin-Track Strategy' strengthened the social safety nets and put food on the table for the people who needed it the most. Attacking the causes of hunger with initiatives to stimulate food production, increased employment and reduced poverty.

These measures also improved the average growth in agricultural production. Urban agriculture, along with waste recycling or the Green Exchange Programme, were identified for the social inclusion of the rural migrants and supported by urban land management. The rural migrants had indigenous skills that were used for urban agriculture. The overall food availability, especially food assistance to the needy, was achieved by practising local food production by the local people.

In 2005, the Curitiba Food Supply Department and the municipal secretariat had estimated that approximately 3,000 tons of food would be harvested from its urban agricultural projects covering over 280 hectares, the main agricultural products being herbs, leafy vegetables, medicinal plants, corn, beans, okra and such others. Under the 'Hunger-Zero' programme, municipal governments adopting urban agriculture programmes received various kinds support from the federal government. The urban agriculture department and the municipal government were involved in:

- Using municipal mechanisms for identifying public land for urban agriculture
- Providing technical assistance with inputs, seeds, seedlings, fertilizer and such others.
- Providing basic education on preparing the soil, planting and providing free education on environment
- Monitoring project implementation for one year.

About 6,900 persons are involved in Curitiba's environmental programmes. One of the most successful environmental projects is the commercial planting project or 'Plantios Communitarios', in which the Environment Education Department supports plantation of mostly native fruit trees by the locals. Whenever any suitable land area is found, the department contacts the local representatives and organizes plantations under its guidance. The areas being designated for planting are always public areas, usually threatened by erosion or inundation.

Photo: www.alancaviagens.com

Curitiba has steep slopes and riparian zones that are gainfully used for the purpose of urban agriculture. The local representatives are trained with knowledge of tree and shrub species to be planted. These activities are not concentrated in the city alone but focussed on the periphery too.

Curitiba is considered to be the ecological capital of Brazil. In the 1970s, the city had less than a square meter of green space per person. With the political will and vision of Jamie Lerner the situation has changed dramatically over the past few decades: citizens have planted more than 1.5 million trees and construction companies are rewarded with tax breaks if they include green projects. Curitiba has added 28 parks and wooded areas as well as 52 square metres of green space for each person. To solve the problems of dangerous flooding, the flood waters are diverted into new lakes in the parks. The U.S. magazine 'Grist' ranked Curitiba seventh among the 15 Green Cities of the world.

which can be used as organic fertilizer.

- City generated waste water can meet the requirements for UPA being rich in organic nutrients, after partial treatment.
- Stakeholder co-operation is essential for UPA production systems. The network of stakeholders consists of farmers, farmers' organizations, university agricultural extension services, NGOs, government (national, state and municipal) and private sector agencies, banks and the people themselves, who should work together. State horticulture boards and university researchers should provide information to farmers on the selection and cultivation of high-value crops.
- Access to high-priced land is important. An urban farmer, whose livelihood is urban agriculture, may be forced to take up land through illegal occupation as he does not possess land. The local and state government may intervene by allocating government land (such as land within the premises of government buildings/jails/ educational institutions and such others) to these people against a guarantee to farm as per agreed terms. Offering tax rebates on vacant land used for farming can prompt owners to let such land out for agriculture.

The economics of UPA is clear evident from the success of Rosario and Curitiba. Social inclusion of the poor and underprivileged has helped in re-orienting their energies into constructive, positive output. Local food production helps in keeping more money circulating within communities. Urban agriculture creates local jobs because there are farming off shoots in carpentry, electric work, plumbing, masonry, canning, pickling, cooking, animal husbandry and such others.

As reported, 45 per cent of Indian farmers have expressed their desire to quit farming but cannot be accommodated in cities and towns. Ad hoc urban planning and adoption of capital intensive projects will not help to sustain the endangered cities and towns. Low-cost, citizen centric and innovative urban planning will. Social inclusion of the rural migrants and the urban poor — and not keep them out of the development loop, thus increasing the rich-poor divide — is the way ahead. Propagation of UPA in growing cities can be one solution to achieve this goal. There are several global examples.

Instead of being apathetic towards UPA, the centre and state governments should address the concerns of the urban farmers and guide and

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support them as they prepare urban India to face the challenges of urban food, economic and ecological security. University agricultural extension services and public and private research and development outfits should get over their myopia of looking only at the rural agriculture and extend their services in popularizing UPA, through farmers' education, training in sustainable techniques like organic farming, optimal irrigation practices, soil and pest management, post-harvest handling/management, food processing and such others.

In 2011-12, schemes launched by the Government of India (National Horticulture Board and Indian Institute of Horticulture Research), named 'Vegetable Initiatives in Urban Clusters' initiated a cycle of production and income for farmers and availability of the produce for consumption. Besides ensuring production

Since 1999, the global FAO project, 'Growing Greener Cities' has been promoting urban and per-urban the Asian nations of Cambodia, Mongolia and Philippines

and income to farmers, the scheme encourages the setting up of efficient supply chains and also promotes, develops and disseminates technologies for enhanced production, value addition and processing and such others, leading to further employment opportunities.

This scheme, launched during the 11th Five Year Plan, needs to be taken forward by the state and municipal governments as in Argentina and Brazil. The FAO Committee on Agriculture has mandated it to consider UPA as an integral part of the agricultural system in order to feed and green cities. The FAO has been implementing a global project entitled 'Growing Greener Cities' since 1999 and is working with several Asian member countries like Cambodia, Mongolia and Philippines in promoting UPA.

Its main aims are: (a) ensuring political and institutional commitments (b) availing of land and water for UPA (c) ensuring product quality and protecting the environment (d) ensuring participation of all stakeholders and (e) setting up forward market linkage for the produce. India needs to do these in order to fight the big challenge that it will face in the wake of massive urbanization in the coming decades. ●

PERSPECTIVE

WOMEN FARMERS: In Search of an Identity

Bharat Dogra

Asha Singh is a 40-year-old farmer from Gahabra village in the Banda district of Uttar Pradesh. She has three children and cultivates about 13 bighas of land with the help of her husband. Her day begins at 3 am, when she fetches water, feeds and milks the two cows and a buffalo, prepares breakfast — all essential chores to be completed by 7 am when she leaves for the fields.

BHARAT DOGRA
Senior Journalist

She works in her farm till about 12 noon, the nature of the work depending on the season. She returns home for a bath, cooks lunch, gives water to animals and attends to her children. She badly needs some rest but normally does not get any time to rest in the afternoon.

At around 4 pm, she is back in the fields where she works till 7 pm. Back home there is the livestock to feed and tend, dinner to be cooked, utensils to be cleaned and numerous other household chores. Bed time is rarely before midnight. A normal day's sleep is thus no more than three hours; a normal day's farm and animal husbandry work is around 10 hours and there is a household to run.

Semiya in the same village may be a little luckier because her daughter-in-law, Prema Devi, helps her. Both women have a heavy cross to bear because the male members in the family suffer from serious health problems. Semiya is up at 4 am, attends to three animals and cooks a modest breakfast for the children. She returns home at 12 noon to cook, attend to farm animals and take care of other chores. She comes back to the field for a couple of hours going home at around 6 pm and wraps up the day's work only by 11:30 pm.

Heriya, a Dalit woman, has a much smaller piece of land of just 3 bighas to farm but this does not mean a lighter workload. To make ends meet she works on other fields and this doubles her burden as she is up between 3 am and 4 am and turns in for the night only around midnight. She has two children and worries about getting her daughter married.

What is common in these tales of hardship is that though these ladies toil for around nine hours in the fields and tend the livestock they are not recognized as farmers. In this rural region, if someone wants to meet a group of farmers, it is very likely that only male farmers will come to the meeting. The work may be back-breaking, with planting of paddy seedlings, weeding, harvesting, threshing, caring for farm animals, composting — the list is endless. There is virtually zero recognition of women as members of the farming community or as farmers.

Raja Bhaiya, a leading social activist of this area, says: "Women do about 70 per cent of the agriculture and animal husbandry work. However, the male-dominated society does not recognize the true contribution of women farmers and they have to face injustice on many fronts. Decisions relating to farming such as the choice of technology, cropping pattern and seeds are mostly taken by the male farmers. If women are better consulted, the chances of organic farming are likely to increase and better use will be made of local resources including composting".

These hard-working women have a weak constitution. Random weights and heights of twenty women collected from a clutch of adjacent villages and routine tests revealed high levels of malnutrition. Maya, a social activist working in these villages of Bundelkhand, says: "Women often eat after everyone else, the male and children, have eaten. This means that, particularly during a general shortage of food during the lean months, their intake of nutrition often falls short of the requirements".

Women often eat after everyone else has. During a general food shortage – in the lean months – their intake of nutrition often falls short of the requirements

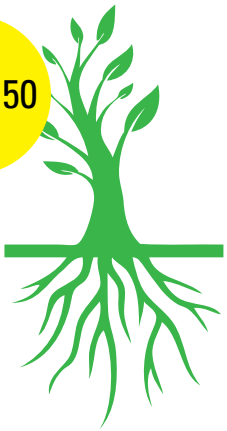
There are lean months every year. This year the period is expected to last longer. There have been heavy crop losses due to the excessive unseasonal rains and hailstorms from February to April. Farmers of Gahabra village and several neighbouring villages have experienced 70 per cent to 100 per cent crop loss. They have received meagre compensation that is quite inadequate to deal with the losses. Those farmers who cultivated lands of others on the basis of share cropping or other local arrangements have not received even this meagre payment.

Asha says: "Month after month, we work hard hoping just to feed our families properly but when even that is denied, by sudden changes in weather

or other calamity, our hearts break". Most farmers of this village are indebted and much of the land is either hypothecated to banks or mortgaged to private moneylenders. The burden of heavy repayments is a constant source of tension and depression for farmers, accentuated from time to time by factors like adverse weather.

Maya explains: "Since the heavy crop loss, most women are extremely depressed and wonder how they will survive. All hope seems to have been lost". Adds Raja Bhaiya: "When women in farm families commit suicide, it is not recognized as a case of farmer suicide. The fact that women farmers are distressed is not recognized at all even though it is a fact that the distress of women farmers is higher as they face so many other injustices as well, including violence, apart from being forced to accept many unjust restrictions. Many of them have health problems untreated for too long and several of them toil despite their frail health".

In a large part of the country, health hazards faced by women have increased in recent years due to the excessive exposure to chemical pesticides and other poisons. In the Gura village of Kotra block (Udaipur district, Rajasthan), women say that now most families are using these agro-chemicals to grow Bt Cotton seeds. This is very labour-intensive work and even children work alongside the men to meet the rigorous requirements of the seed companies.



With land hypothecated to banks or mortgaged to moneylenders, repayments are a source of tension and depression for farmers, accentuated by adverse weather conditions

Indira, one such farmer of Gura, engaged in Bt seed production, says: "As these poisons are so readily accessible, sometimes in a fit of rage or hopelessness, people consume them, only to regret their act later. Within my extended family, there have been two such cases. Discarded cans of these poisons are used to take water while going to toilet or these are bartered by children to buy water melons".

Pinki, a school girl from this village, says: "I feel giddy and nauseated when using these chemicals in the fields. My studies are adversely affected too". What affects them even worse is that sometimes their seeds are declared to have 'failed' and payment is denied to them by companies. Indira says: "Such failure decisions have been inflicted on us twice". One-time failure meant that nearly eight months of our hard work went entirely unpaid for".

Mirdi Bai of Palesar village has an even more disturbing story. She says: "When our seeds were declared to have failed, we faced hunger and destitution. To buy food and fodder we had to work on the fields of others. If this was not bad enough, the agent of the company demanded ₹10,000 for the costly pesticides and fertilizers supplied to us".

Kotra women reveal a different facet of this pitiful story vis-à-vis the exploitative conditions imposed by the new modernized farming practices. These mean new forms of oppression and deprivation; plunder and loot. A system in which eight months of labour goes entirely unpaid for on the basis of an extremely one-sided decision, over which the farmer has no say, will surely increase the problems and tension of farmers.

Another oppressive situation that women farmers frequently face relates to the increasing threat to land rights. This increases the problems of all farmers including women farmers. In the Kishangarh (Salora) block of Ajmer district, farmers of Rathoran Ki Dhani have struggled hard to save their land from acquisition for an airport that will find little use in this rural area.

Suraj Kanwar, a Rajput woman here explains: "This village could have easily been left out of land acquisition but we have been treated very shabbily to benefit powerful persons. The alternative land we have been given is so poor that we women will not be able to continue even with animal husbandry and dairying work, let alone farming. We worked hard on our land to earn a satisfactory livelihood but now we are doomed".

In the Dungarpur district (Rajasthan), many *adivasi* women farmers have been at the forefront of a struggle to demand secure land rights. Nearly 3,200 families, about 90 per cent of them tribals, are involved in this struggle with women playing a leading role. These women say that they and their ancestors toiled day and night to make this land productive and cultivable. Instead of rewarding them, the government has been imposing penalties on them.

Varsha Bai shows documents provided by the *Patwari* of the ruler of Dungarpur that clearly show that the land was given to her husband's

grandfather. Despite toiling here for three generations, removing huge boulders and filling up ditches, Varsha Bai's family has not got secure land rights from the government and is denied various development benefits, including crop loans.

Recently other women like her have played an important role in organizing a *mahaparaav* or a huge sit-in demonstration for eleven days in Dungarpur town. Varsha Bai points out: "You can see how difficult it is for me to leave my children, my cattle, my fields even for one day. We went for 11 days because we are determined to get our land rights". Increasingly, more women farmers are drawn into the struggle for protecting land or land rights.

In addition, many women farmers, while continuing to cling to their precarious base of small land holdings, have to go out in search of additional work, as due to slow rural development or adverse weather conditions, their farming is unable to support them throughout the year.

In Sumerpur city of Rajasthan, Valiki Bai and Mali Bai, two farmers of Loharka village (Udaipur district), had come on their own (without their men folk accompanying them) to work at construction sites. Denied even essential sanitation facilities, these women work in highly uncertain and insecure conditions to earn meagre wages that are in any case, lower than what the men get.

Widows and other single women, including the widows of farmers committing suicide, suffer greater woes. Studies and reports on these suicides recount heart-rending stories of extreme distress. In some cases two or more members of a single family have committed suicide. In others one suicide led to conditions prompting another suicide. In yet others, failed suicide attempt have meant hospitalization with costs that push the family deeper into debt that had prompted the suicide in the first place. Women in families with suicide cases suffer in particular, as pointed out by R.S. Sidhu and others in their paper (2011) in the context of Punjab:

"The after-effects of suicide in these families were catastrophic and rehabilitation measures were largely missing. Most of the families lost their breadwinners and were fighting poverty. The children had dropped out from schools, land and other assets sold for living, marriage of daughters postponed and family members suffered depression in a large number of cases. There was almost no state or social support for such families. These families wanted one time financial support in the form of a lumpsum of money or continuous support in the form of pensions or jobs for the next of kin of the deceased farmers, besides free access to educational and health facilities".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The extreme distress suffered by families of suicide and attempted suicide victims also comes out very vividly and tragically in the interviews conducted by Ranjana Padhi in Punjab. Her interviews of 136 respondents from such families revealed that over 70 per cent had consumed pesticides; loan repayment woes were reported by 79 per cent of the respondents as the major cause of suicide; harassment by the loan agency (*arhtiya* and bank recovery agents) was highlighted by 48 per cent of the respondents. Non-payment for crops by the *arthiyas* was mentioned by 14 per cent of respondents as a cause of suicides.

This study revealed the worsening landholding situation of the families of suicide victims. Their landholdings are small and many are landless while others have been forced to sell their land. The burden of all this is borne by surviving women farmers.

In Sijahri village of Kabrai block (Mahoba district, Uttar Pradesh) a physically-disabled widow, Uma Devi, is facing a highly unjust situation. Her husband Rai Bahadur of Bilkhi village died due to the trauma caused by a massive loss of crops. She and her father, Ram Sahodar Rajput, explained that Uma with her two small children was thrown out of her husband's house by his elder brother who wants to grab her land with the help of some influential local people. Unless the administration comes to the timely help of Uma Devi, she may lose whatever land assets she has to bring up her children.

Suman Raigwar's husband, Chanchal Raigwar, died in Pirpa village (Chattarpur district, Madhya Pradesh), unable to bear the shock of crop loss. Excess rain and hailstorm have damaged her house badly. A big chunk of her land has passed into the hands of moneylenders. Her survival and that of her children are at stake.

While continuing to cling to their precarious base of small land holdings, women farmers have to go out in search of additional work. Farming is unable to support them throughout the year

Given the critical role women play in the countryside and the severity of the problems they face, women farmers deserve much more attention. Despite this, there is an overwhelming tendency to ignore reality and continue to treat farming as the preserve of male farmers.

Such a distorted view of farming and related activities has serious implications. When those who are performing important agricultural tasks are not even being considered or kept in mind by policy makers, very critical gaps appear in policies that become distorted. The needs and viewpoints of women farmers seldom get the attention they deserve.

The Gorakhpur Environment Action Group (GEAG), a leading voluntary organization of eastern Uttar Pradesh, has tried to correct this imbalance by keeping women farmers at the centre of all its agricultural development work around promoting sustainable farming practices. This is of particular importance in the context of the widely-debated crisis of farmers and farming in India.

The GEAG's work has given a new hope to the

farming community, particularly small and marginal farmers, that it is possible to find a way out of the economic crisis and never-ending debts. This work has emphasised scientific use of local resources, reduced dependence on costly market-purchased inputs like chemical fertilizers and pesticides, protection of the environment (particularly soil health), and encouraged the innovation and creativity of farming communities to develop farming (and related) technologies most suitable to them.

This approach was first implemented in several villages of Sardarnagar and Compereganj blocks of Gorakhpur district, where the GEAG works more intensively, and later with the help of sister organizations taken to other parts of eastern Uttar Pradesh. A recent survey of several such villages shows encouraging results on the whole in terms of reduced costs, maintenance or increase of production, improvement in the quality of produce, improvement in income, reduced burden of debt and so on.

In all this work, special efforts have been made to accord adequate importance to women farmers. Although self-help groups in some of these villages have included a few groups of men too, the overwhelming majority of these groups comprise women members. With their help, women have reduced or in many cases altogether removed their dependence on private moneylenders. They have been able to improve their farming, leased extra land, purchased more livestock or taken up other activities to improve their incomes. Apart from improving their economic conditions, this has also increased the confidence of women farmers and provided them a bigger say in farming work. The empowerment of women farmers has also been helped by a wider, state-level campaign called 'Aaroh' in which the GEAG has been a leading

partner. This campaign emphasized the important role and equal rights of women farmers, including the need to have land records in the names of husband and wife, jointly.

Aaroh also campaigned for the equal participation of women farmers in government and other programmes for agriculture (and related) development with some amount of success in terms of placing more women farmers in the management committees for a government programme like ATMA (Agriculture Technology Management Agency).

This is particularly relevant in the context of an area with a high migration rate of rural men as in eastern Uttar Pradesh. If land records are in the names of rural men only, it becomes difficult for the women, who are left at home to handle affairs of the farm, to deal with the government, pursue various schemes that help farmers or even to get bank loans.

The GEAG experience in several villages shows that women whose husbands have migrated feel terribly disempowered and this situation is mitigated with the efforts of self-help groups of which they are now becoming members.

It is heart warming that widows have played a leading role in farm improvement and mobilization work. A widow, Meera Chowdhary, is a shining example. She has had a very satisfying experience of the village group helping her as she has, in turn, helped others because she has proved to be a very competent woman!

Several women have become trainers and motivators. Some have travelled far and wide to provide training on organic farming practices or related issues to other farmers, while others have gone to receive training or participated in

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gatherings for wider mobilization. This travel and training exposure has also increased their confidence, while enhancing their comprehension of wider issues.

The GEAG had found women farmers self-assured around the technology choices they have made (mainly in favour of organic farming practices). They articulate their thoughts well and do so confidently because it is not just learnt knowledge but something that they practise. The confidence that they demonstrate is particularly pronounced in areas where the GEAG has worked for more than five years. Indeed, these women are now placed to play a larger and wider role in strengthening the position of women in farming as well as in the spread of sustainable farming practices.

Another organization, the Alliance of Small and Marginal Farmers (Laghu Seemant Krishak Morcha), works closely with the GEAG in the women's empowerment space. The Laghu Seemaant Krishak Morcha's has worked in the Jalaun district in very close co-operation with Samarpan, a voluntary organization headed by Radhekrishna.

This area is notorious because it is infested with dacoits and has a deeply entrenched feudal culture. Samarpan and Morcha have given a remarkable account of themselves here. They have worked on land rights, women's equality and other sensitive issues in a peaceful way without getting into any serious problems thanks to their inherent understanding of local sensitivities.

This is testimony to their appreciation of how the village community works and how a broader understanding on critical issues can be created within the community. Radhekrishna says that a deliberate choice was made to work in the more difficult, ravine-affected villages rather than in plains and roadside villages.

If land records are in the names of the men, it becomes difficult for the women, left at home to handle affairs of the farm, to deal with the government, pursue schemes that help farmers or even get bank loans

Visiting some of the Morcha's areas of work is a pleasing experience. The most remarkable and visible aspect is the increasing assertiveness of the role and identity of women farmers. It is not that these women farmers were not working hard before; today they assert their role and identity as they interact with agencies that advocate sustainable practices.

Women farmers are inherently more inclined towards sustainable farming practices and are also willing to work harder. With a better defined role in decision they create conducive conditions to spread concepts of sustainable farming practices.

Radhekrishna talks of the early days of the training programmes, when the women were asked to name three farmers in their village. Despite the training that they were receiving, they almost never mentioned the names of women farmers or even their own names. Even when they mentioned the

names of male farmers, they would usually name the bigger and influential farmers.

From this meagre consciousness of their identity as women small farmers, they now demonstrate a sense of identity not just as farmers but also as change makers. They have the belief that they are capable of exploring various avenues of improvement, taking decisions regarding this and overcoming hindrances in the perceived path of betterment.

Women farmers in Daangkhaujri talked about their 'experiences and aspirations'. They dominated the discussion even where male members of the community were present and took the initiative of giving visitors a tour of their fields when they wanted to explain their circumstances, what was needed to change them and what kind of help would really matter.

A lady named Bitoli, in particular, appeared to be a natural leader. She had a clear sense of priorities and knew how to present them well before outsiders so as to get the right kind of help. The manner in which they find solutions is most heartwarming. Self-help solutions include checking wastage of water from overflowing artesian wells, for instance.

This is remarkable, for the women have calculated that a billion litres of water could be saved in this way in a year in a single village. Several women farmers have overcome serious personal problems to play a more assertive social role. Rekha of Byonaa Raja village is almost blind but plays an active and important social role.

As the land provided to the new allottees (landless or near landless) is generally very poor, it needs urgent improvement. Samarpan has taken up the work of land bunding in such a way that 40 per cent of it is accomplished through *shramdaan* (voluntary labour) of the land allottees. The system ensures people's participation, quality and transparency, with payments made by village representatives themselves. Saline land has also been reclaimed in Byonna Raja village.

In areas where Samarpan and the Morcha have been active for several years, organic and sustainable farming practices have spread well. Radhekrishna says: "Women organic farmers here have taught us some important lessons. In the beginning, we were cautious while advocating organic farming practices because we apprehended an initial loss of yield. We were surprised when several organic farmers informed us that they are not only reducing expenses but also increasing yield".

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Women are natural leaders with clear priorities, and present their ideas well while pitching for help. They have self-help solutions, including checking wastage of water from overflowing artesian wells

The group met several women organic farmers who had done so while even improving the quality of their produce. These women appreciate the quality of the work that they do because they know that they are producing more nourishing produce that will fetch them better prices. "We heard happy anecdotes of traders coming to villages and willingly offering a better rate for organically grown peas and other crops", says Radhekrishna.

Yet another voluntary organization of Bundelkhand is the Akhil Bharatiya Samaj Sewa Sansthan, whose director, Bhagwat Prasad, says: "We have implemented several watershed projects in Bundelkhand region. Our experience has been that wherever women farmers have an important role in decision making, the possibility of improving yields and reducing expenses have improved".

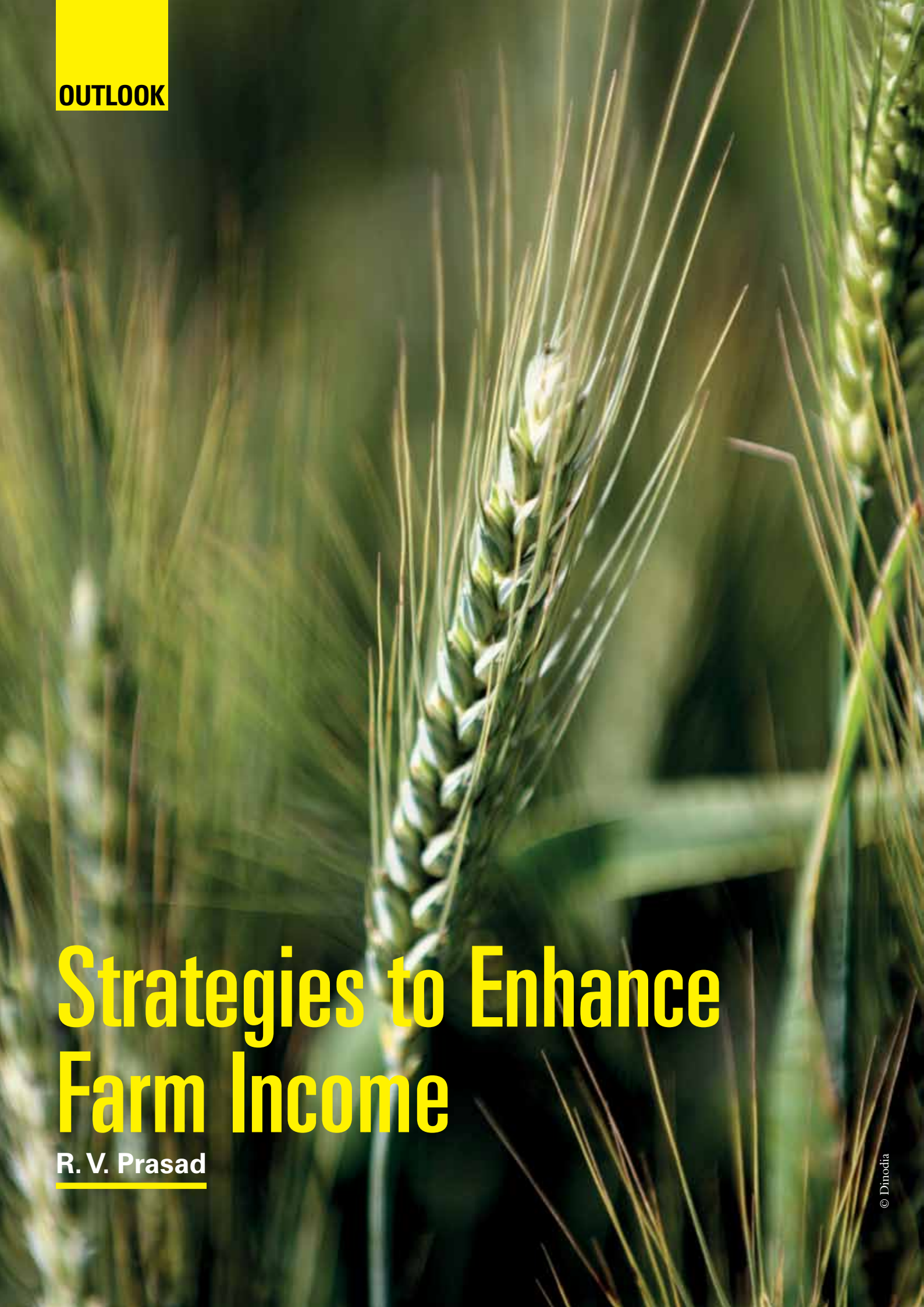
This makes the fact that their contribution is ignored "really tragic", says Prasad. "Despite such great understanding and dedicated work, women farmers and their great contribution are not recognized. If the number of hours devoted to farming is calculated, the contribution of women farmers is much higher than that of the men. Day after day they go to their fields, which may be 3–4 km away. While coming back they carry fodder for their animals". In certain areas, as in some Himalayan areas, the contribution of women to agriculture and animal husbandry may be even higher.

There needs to be sustained engagement of these women by professionals and experts so that they focus their attention on the art and science of farming and come up with innovative solutions that will bring economic and ecological benefitsThis will also lead to the long overdue recognition of the role that they play in farming communities and the greater potential that must now be realized so that farming becomes a truly sustainable proposition. ●

OUTLOOK

Strategies to Enhance Farm Income

R. V. Prasad



Agriculture remains the primary occupation of rural India, despite its stagnating growth rates and decreasing share in the GDP. The recent past has seen a clear shift in the villages from crop-based agriculture to other allied agricultural activities. Stagnation in agricultural productivity, the depletion of natural resources, frequent natural calamities, better opportunities in other sectors and urbanization have tempted farmers to discontinue farming. The migration of rural people to urban areas in search of employment is increasing.

R. V. PRASAD
Chief Manager,
State Bank
Institute of Rural
Development,
Hyderabad.

Farmer suicides are on the rise and farming has become a stigma in the minds of rural youth. Farming is not a profitable venture for them and they cannot assist themselves commercially because they do not possess the adequate entrepreneurial qualities or infrastructure. Farmers could adopt strategies to improve their farm incomes and make farming more profitable. This requires better entrepreneurial, technical and management strategies.

Diversification, cost control, expanding the business, value-addition, specializing, product differentiation and backward and forward integration are established strategies

Diversification, cost control, expansion of the business, value-addition to the enterprise, specialization, product differentiation and backward and forward integration are well-established techniques to transform the farm sector.

Diversification involves increasing the number of products being sold and growing unconventional crops. Indian farmers traditionally tend not to grow these, perhaps because of small land holdings, the subsistence-level knowledge required to grow them, scarce knowledge about the other crops and a low risk-taking ability. Diversification increases the sources of income and spreads the risk of loss. It entails a look at underutilized resources on the farm and the competence of the farmer to identify and produce additional products. Consider some examples:

- Shifting to oilseed crops or pulses in place of paddy during delayed monsoons
- Converting agricultural land for aquaculture (as in coastal Andhra Pradesh)
- Utilizing a portion of land for allied agricultural activities like dairy
- Sale of milk products like butter, ghee or milk sweets by a dairy farmer
- Shifting to high-value crops (like cardamom in Kerala, floriculture in Karnataka)
- Shifting from subsistence farming to market-oriented farming
- Replacing cow farming with buffalo farming ('buffaloization')

Given that the farmer does not enjoy the benefit of pricing for his product himself, the best that he can do to maximize profits is to reduce the cost of production. This is the most commonly used strategy in farming. It involves locating less expensive resources and inputs and using more efficient production systems. Increasing volumes will also reduce the per-unit cost. At a lowcost of production, the farmer can sell at lower/competitive prices and earn a good margin. Consider some examples:

- Poultry farmers using their own grinder-cum-mixer to produce feed
- Using locally available construction materials to construct farm buildings
- Using family labour instead of hiring
- Dairy farmers selling agricultural wastes or by-products like cow dung, male calves
- Dairy farmers growing green fodder for milch animals
- Farmers employing high-yielding crop varieties or livestock breeds to produce more
- Farmers reducing labour cost through mechanization
- Farmers preventing wastage.

Expanding the size of the business is possible only when the farm is profitable and competitive. It includes enhancing the sales volume and turnover and increasing the physical and financial assets of the farm. Expansion is possible by enlarging the capacity, allowing replication and modernization. The idea is to take advantage of economies of scale. Consider some examples:

- Converting a deep litter system in poultries to

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Adding value to the enterprise to increase income means assessing buyer needs and meeting them by diversifying along the value chain as well as developing 'niche' products

the cage system under which vertical growth is possible as it accommodates a bigger flock size in a limited area

- Expanding the size of the unit by taking additional land on lease to multiply the activity
- Upgrading a tractor to increase its horsepower
- Increasing the number of animals in any livestock activity
- High density mango plantation
- Automating to increase volume and address labour constraints.

Adding value to the enterprise to increase income depends on assessing buyer needs and supplying them by diversifying along the value chain and developing 'niche' products. Value addition requires careful analyses of ways to improve the existing produce. By adding value, farmers can target different buyers with different needs and market demands. Milk is a good example, as it has the flexibility to be converted into hundreds of other products. Value addition can involve:

- A paddy farmer owning a rice mill
- Primary and secondary processing of any agricultural products at the farm level
- A lemon grower making pickles
- Producing different milk products after analysing market demands and product mix combinations
- Selling dressed chicken through poultry farmers
- Grading, labelling and packing farm produce to add value.

Specialization involves reducing the number of activities in the farm to just a few and focussing on them in order to cater to a specific market need or address specific demands of customers. The farmer can then expand the business, deploying capacity expansion, replication and modernization. Examples of these processes are as follows:

- A poultry hatchery producing only day-old chicks
- Tissue culture to produce banana saplings

As a collective, farmers can benefit from greater bargaining power, additional economies of scale and value addition to their produce. Individually they lack the punch

- Manufacturing poultry cages/egg trays
- Arranging for a fruit ripening unit
- Supplying organic pesticides
- Arranging for a tobacco curing unit
- Arranging for a seed processing unit
- An export-oriented unit producing gherkins.

Product differentiation is the art of making a product different from and superior to that produced by the competitor. The farmer creates unique perceptions about his products among buyers and consumers and deploys different marketing processes that ensure that the buyers get exactly what they want. For this, the farmer charges a premium. The market for product differentiation may, however, be rather slim for the small scale farmer in India. Differentiation is created by:

- The nature of the product
- The information farmers have about their buyers
- The way the product is presented
- The way it is distributed.

Consider some examples of differentiation:

- Farmer producing and selling eggs from country chicken
- Farmer converting sugarcane into country jaggery instead of selling to sugar mill
- Producing organic vegetables/pulses
- Supplying milk in tetra-pak containers
- Producing designer milk/low cholesterol eggs.

The farmer can also go in for backward and forward integration to improve profit margins and remove the constraints in production and/or the marketing process. Integration can be horizontal or vertical. Vertical integration is where the farm controls or owns one or more linkages in the value chain. Horizontal integration is where the farm joins other farms to produce the same product. Both types of integration are necessary to link to modern value chains. More food processing

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greater collective bargaining power and can benefit from economies of scale and value addition to its produce. Organizations have better legal structure and protection and the farmer benefits from bonding cohesively with others. Production, pooling, storage, processing and marketing are well integrated and handled by a single organization. To consider some examples:

- Small/marginal farmers with similar interests or investments forming a joint liability group (JLG)
- Farmers forming a co-operative society
- Farmers integrating their resources and expertise into a producer company (under Part IX A of the Companies Act, 1956).

Such strategies or tweaking existing farm models are only indicative and not exhaustive ideas on what can be done. No farmer can adopt any single strategy, as they tend to overlap. Implementing these strategies involves the deployment of additional capital. The net incremental income (NII) generated should be sufficient to compensate for the additional capital deployed. The strategies have inherent risks and therefore the farmer should equip himself with the required knowledge, skills set and entrepreneurial qualities.

Horizontal Integration	Vertical Integration
1. Milk producers' cooperative unions	1. Broiler integration
2. Fruit growers' association	2. Amul pattern dairies
3. Fodder banks	3. Producer companies
4. Farmer groups	

Backward Integration	Forward Integration
1. A dairy farmer growing fodder crops	1. A dairy farmer establishing a milk processing unit
2. Rearing heifer calves to produce good quality milch animals	2. A fruit grower linked to a fruit processing plant
3. A poultry farmer producing poultry feed	3. A farmer establishing a godown
4. A farmer producing seeds for his next crop	

industries are displaying an interest in integration and contract farming. The farm may integrate 'forward' by processing products, or 'backwards' in to supplying inputs.

A serious problem in Indian farming is the lack of organization, because of which farmers are continuously exploited by the middlemen who market the highly perishable produce. Individual farmers lack the bargaining power and are poor at problem resolution. A group of farmers has

These models also provide new opportunities for the banks to extend investment credit to the farmers. As the return on investments is likely to be higher, the chances of slippages to non-performing assets are very small. The extension agencies and NGOs working in the rural areas should aim efforts to facilitate the farmers, firstly by identifying their problems and secondly, by suggesting new farm model(s) so that the farm enterprises becomes economically viable. ●

Wheat Harvest, Vincent Van Gogh

Amsterdam Dankjewel

Ajay Vir Jakhar

An invitation to a World Economic Forum workshop in Amsterdam becomes doubly exciting when one gets to venture out of the hotel. At such conferences, a typical day starts at eight in the morning and finishes post-dinner; around ten at night. Normally, the same hotel hosts the conference and the delegates, leaving no scope to check out the sights. Most participants, having travelled across many time zones, do not get over their jet lag in an airport-hotel-airport schedule.

After having attented conferences from Addis Ababa to Kathmandu (where I have reached in the morning, participated in a full day's session and taken the flight back home in the evening, not even spending a night in the foreign country) I have promised myself not to rush back home once the conference ends. Such promises are easier to make than stick to because there is pressing work back home. As a farmer I am committed to spending at least a couple of weeks on the farm, for that is what farmers do — farm.

Yet the allure of undertaking strenuous travels is compelling: meeting people with diverse backgrounds, deliberating on agriculture, receiving fresh insights to old problems and understanding new issues. Even the thought is beguiling; the opportunity to learn is vast. Some thoughts get contradicted while others get validated in an opening of the mind.

The Netherlands is the second largest exporter of agri-food products in the world contributing an €48 billion value addition to the Dutch economy. On the first night, dinner is served on the premises of an old Tabaco trading house, reminiscent of Holland's magnificent trading empire like no other. On day two, we managed to squeeze in time for other activities.

We are close to the Bloemenveiling Aalsmeer (VBA) in Aalsmeer market – the flower auction market. At

In the unique "Dutch auction" the clock goes from a high to low price. The first person to press a button wins the bid

5:30 in the morning, nudged by my friend Vijay Sardana and accompanied by an ever-smiling Gene Moses of the International Finance Corporation, we walk out hoping to cover 5 kms in an hour. First, we encounter large, black wild rabbits by the dozens on the lawns outside before it starts to drizzle and we come scurrying back to the hotel to take a taxi to the centre. The rabbits remind us of stray dogs on Indian roads, just better looking and, thankfully, shy.

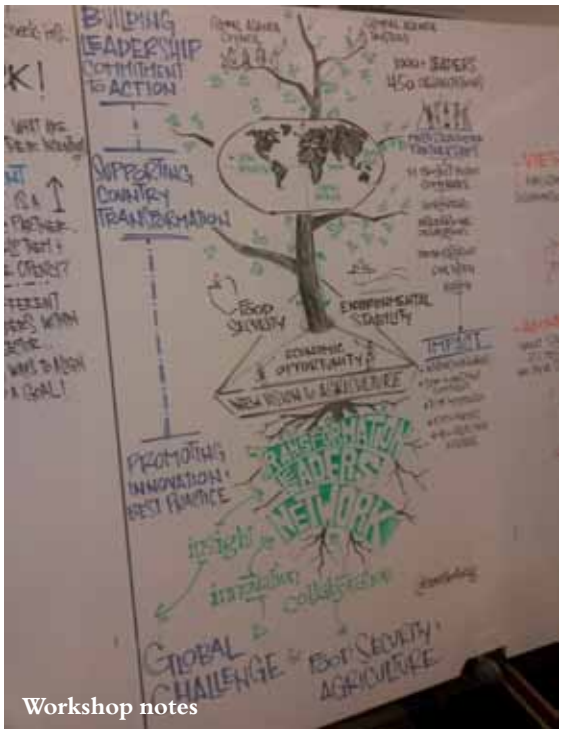
This is the venue for the world's largest flower auction and flower market with 12.5 billion flowers and plants sold year. There are more than 100,000 transactions a day amounting to an annual €4.4 billion turnover. The total area of the building is equal to 220 football fields that includes 55,000 square metre of cold storage. The scale is humungous. The entry to the auction centre costs €6 each.

The building has a walkway about 15 feet above the floor. On the floor below us thousands of small mechanized carts are pulling trollies stacked with pallets of flower crates. The activity appears like an animated movie or a video game. It takes more an hour to walk leisurely around the circuit, leaning over the railing or reading posts on the walkway explaining things and simply enjoying the faint whiff of a million flowers.

The auction process is connected worldwide; its clock is a circle numbered from one to hundred, around which a red lamp moves. These numbers correspond to the price offered. This is the Dutch system of auctioning where bids go from a high to a low price. The auctioneer starts the lamp at a high number (high price) and lets it go down. If a buyer wants to bid on a lot, he presses a button. If he is the first one to do so, the lamp stops and the number at which it has stopped is the winning bid price.

On the third day, we visit the Wageningen UR (University & Research), an epicentre of knowledge and learning. It has 10,000 students from more than 100 countries, 6,500 employees with a turnover of €700 million. We have a full day of workshops and I first attend the workshop on "GIS Mapping and Remote Sensing" learning about GIS, drones and satellite technology use in agriculture.

Indians captivated with drone strikes on militants and terrorists in Pakistan and Middle-East are excited about the technology and have concluded that the drones are the answer to crop estimation and crop damage assessment. I come out a sober person; drones are only of use once there is comprehensive mapping of all essential data like soil profile, historic crop patterns, yields along with updated weather and land records. Until such time as we collect all data efficiently, they are just toys for boys.



Workshop notes

World Soil Health Museum

Flower auction centre

"Those that do not sign the TTIP will be left to fend for themselves and Indian farm exports to the TTIP member states will suffer"

After lunch in the student's canteen, we are rushed to the post-lunch workshop where I have chosen "Agricultural Economics & Rural Policy". Things get more exciting, a two-hour free flowing discussion on the world agriculture economy, including the European agricultural policy, Transatlantic Trade and Investment Partnership (TTIP) and Indian fertilizer subsidies leaves one wanting the session to be extended by another two hours.

My fears are validated at the premier world institute by the fantastic Hon'ble Prof. Hans Van Meiji: "Those that do not sign the TTIP will be left to fend for themselves and Indian farm exports to the TTIP member states will suffer". It is, however, the response to a question on the quantum of European farm subsidies, that boggled the mind: €40 billion. Converted to rupees, the figure is a string of zeros: about ₹300,000 crores. In Europe, a lot of farm subsidies are delivered in the form of environment protection programmes, making it difficult to assess their actual magnitude.

We realize that the World Soil museum is just across the road. Skipping the conversations after the workshop, we hurry there to find it closed. The attendant is nice enough to open the premises for us. The magnitude of knowledge on exhibition more than compensates for the small space. The world below our feet is literally exposed on the walls. Holland is full of exciting and fun surprises.

I have half a day free before my flight at 1 pm. I do what I have wanted to do for some years. I visit the Van Gogh museum. Van Gogh was an eccentric artist who loved painting rural landscapes and ordinary people. He believed that to express true peasant feelings in his art, he had to live with them.

I extend that belief to the broader picture of farm advocacy. Those advocating on behalf of farmers must either be practising farmers or be living with them to understand their issues and feelings. With those thoughts, I hop on to my bus to the airport to leave for warmer weather at home to sell my bitter gourd, check my carrots and plant my potatoes.

As I said, there is always work back home. ●

इफको

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Cochin Office: CC29/1288 E, 1st floor, vyttila, Ernakulam, Cochin – 682019, Tel: 0484-2307642, Mob: 9446363742, 09446504333.