

Can Crop-livestock interaction is the way forward for disadvantaged Regions and People?

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Abstract: *The agrarian crisis emerging from the natural calamities and small size of the farms, it needs to search the available unexplored opportunities and to benefit our farmers in general and specifically to the disadvantageous farmers who are living in the fragile backward regions in India. The central issue is the low viability and high volatility of the farm sector. Low viability comes from small size of average holding in India (only 1.15 ha), with 85 percent of holdings being less than 2 ha in size. Low productivity adds to this low viability. More than half the land cultivated is rain-fed. But even an irrigated plot of 2 ha, with two crops a year and reasonably high productivity, appears insufficient to give the farmer ample income to feed a family of five. In fact, our past experience has clearly evinced that the income from cropping alone is hardly sufficient to sustain the farmers' needs. For this a change in mind-set towards a new mode of farming practice becomes imperative. The integrated farming systems approach is considered to be the most powerful tool for enhancing farm income and profitability of farming systems, especially for small and marginal farm-holders who are in the disadvantageous group to make them bountiful. Our Agricultural Scientists are more tuned towards tonnage or productivity centric than farmer-centric. This attitude needs to change in order to go ahead for sustainable growth process where inclusive growth of the rural masses will be focal point. The policymakers need address the central question: Is it acceptable to have overall growth of 7-9% in the economy, with less than 2% growth in agriculture? The present paper studied, how we can explore changes within the farm sector taking into account the linkages between farm sector and livestock in order to go ahead towards the road to sustainable growth where inclusive growth of the rural masses will be focal point.*

1. INTRODUCTION

The agrarian crisis needs to be converted into an opportunity for change, and to benefit our farmers.

What has caused farm distress and what could be its possible solutions? Although one can spell out several factors that have been causing farm distress from time to time, the central issue is low viability and high volatility of the farm sector. Low viability comes from small size of average holding in India (only 1.15 ha), with 85% of holdings being less than 2 ha in size. Low productivity adds to this low viability. More than half the land cultivated is rain-fed. But even an irrigated plot of 2 ha, with two crops a year and reasonably high productivity, will not be sufficient to give the farmer ample income to feed a family of five, unless high-value crops, like grapes, etc, are being grown. That is why almost half the income in rural households comes from non-farm sources today.

Our policy makers have to answer a central question: Is it acceptable to have overall growth of 7-9% in the economy, with less than 2% growth in agriculture? If the answer is 'yes', then there is a deeper problem in the model of development. But if the answer is 'no', there is still hope and high time a serious and sustained effort is made to reform agriculture, to make it economically viable and reduce its exposure to risks. The current agrarian crisis needs to be converted into an opportunity for change, and for the benefit of millions of our farmers.

Ensuring sustainable, enriched environment, improved quality of life and good human values may be the major task in welfare economics. Assured food security, safe drinking water, good health, gender equity, low child mortality, literacy, high moral values and clean environment. Gandhi advocated for small, local and predominantly village-based technology to help India's villages become self-reliant. He disagreed with the idea of technology that benefited a minority of people at the expense of the majority or that put people out of work to increase profit. China also implemented development policies based on the idea of "walking on

two legs" advocated the development of both large-scale factories and small-scale village industries.

With enhanced consumerism in rural areas, farmers' requirements for cash have also increased to improve their standard of living. This is especially true in case of small and marginal farmers. Therefore, farmers' income and food requirements would have to be augmented and supplemented by adoption of efficient secondary/ tertiary enterprises like animal husbandry, horticulture (vegetables/ fruits/ flowers/ medicinal and aromatic plants), apiary, mushroom cultivation, fisheries etc. However, these integrated farming systems will be required to be tailor-made and designed in such a manner that they lead to substantial improvement in energy efficiencies at the farm and help in maximum exploitation of synergies. Since, technological challenges are becoming more complex than before as demand for food is increasing, land holding size is decreasing and natural resource base is shrinking and/or deteriorating. For this a change in mindset towards farming systems research is needed. The prevailing farming situation in India calls for an integrated effort to address the emerging issues/problems. The integrated farming systems approach is considered to be the most powerful tool for enhancing profitability of farming systems, especially for small and marginal farm-holders to make them bountiful. In fact, our past experience has clearly evinced that the income from cropping alone is hardly sufficient to sustain the farmers' needs.

2. DATA AND METHODOLOGY

The study is based on secondary data collected from different reports of National Sample Survey Organization (NSSO). To answer the different policy issues related to farming system and crop-livestock interaction were collected from different studies, survey and reports.

3. RESULTS AND DISCUSSION

Brief Scenario of Indian Agriculture

Land is the major resource in India, which provides livelihood to the rural population. In India, the share of marginal and small farmers accounted for around 85% of operational holdings in 2012-13 as compared to about 62% in 1960-61. Similarly, the area operated by small and marginal farmers has increased from about 19% to 53% during the same period. The small holding character of Indian

agriculture is much more prominent today than even before. The average size of holdings in India declined from 2.3 ha in 1970-71 to 0.91 ha in 2012-13. It may be noted that 83% of land holdings belong to landless and marginal farmers with less than 1 ha.

The average size of marginal holdings is only 0.24 at all India level. The average size of small holdings is 1.39 ha shows average size of holdings by farm size. It can be seen that the average area owned per household is generally increasing with the increase in size of category of land holdings as the number of household decreases with increase in the size of category of land holdings. For 'large' land holdings, the average area owned per household is the highest at 14.45 hectares, which is concentrated in the hands of only 0.24% of the total households? The 'marginal' holdings which had the highest percentage of total households has accounted for only 29.75% of the total area owned.

Water is another critical input for crop production but grossly neglected by the community. Major sources of water supply are rainfall, lakes, rivers, snowy mountains and underground storage. Except wells and small tanks, the other sources of water are collectively owned by the community. However, the powerful lobbies and vested interests have been taking advantage of these water resources for their own benefits, while the poor have no means of utilising their share. This has been accelerating the economic imbalance between the small and large landholders. Due to excessive use of water for irrigation, over 9.00 million ha fertile lands have turned into sodic and saline wastelands, thereby posing a serious threat not only to food security and employment generation but also to community health, biodiversity and the environment. Out of the total arable area of 169 million ha, only 28% area is under irrigation and the rest is dependent on rains, where hardly one crop can be grown in a year. About 40% of the cropping area is located in low rainfall regions where the employment opportunity is hardly for 40 to 50 days in a year. The World Bank data shows that only 35% of India's agricultural land is irrigated (artificial application of water to land or soil). This means that a huge 65% of farming depends on rain, something on which the government has no control.

Table: 1 Land distribution pattern in India (2012-13)

Characteristics	Category of holdings						Total
	Landless	Marginal	Small	Semi-medium	Medium	Large	
Estimated no. of households (00)	115580	1176805	156029	78220	30082	3714	1560430
Estimated area owned (000 ha)	5	27483	21739	20384	17393	5365	92369
Percentage of households	7.41	75.42	10	5.01	1.93	0.24	100
Percentage area of land owned	0.01	29.75	23.54	22.07	18.83	5.81	100
Average area (ha) owned per household	0.000	0.234	1.393	2.61	5.78	14.44	0.592

Source: 70th NSS round on Land and Livestock Holdings in India

Livestock is another important natural resource owned by the poor. Generally the rural families keep 1-2 cows or buffaloes for milk, a pair of bullocks for farming and a few sheep, goats and poultry for supplementary income. Although fodder is in scarcity, most of the poor families maintain large herds and let them graze on common lands. Dairy husbandry has good scope, as there is good demand for milk. However, most of the important breeds of cattle and buffaloes are genetically eroded (due to lack of visionary of our policy makers) and about 80-85% of the livestock are low productive due to under feeding and cause undue pressure on forest resources while the rural poor are unable to take advantage of these animals. Thus most of our natural resources like land, water, forests and livestock are denuded and underutilised. Pastures and common lands owned by the government and community are also being used in many ways, particularly for fuel and fodder collection. The Government has reserved about 10% of the total land in each village for livestock grazing. The ownership of this land is with the Village Panchayat (Local Government) and all the members of the community have free access. The Panchayat has no control over the use while the community does not consider it to be their responsibility to manage the pasture. Lack of futuristic outlook of the Panchayat leaders, resulted in over-exploitation and denudation of the pastures. The same situation prevailed on village

woodlots and community forests. Thus, in spite of land scarcity, over 50% of the total land is either idle or under-utilised. Management of these wastelands to improve the productivity can revive the supply of fodder and fuel, facilitate the percolation of rainwater and improve the agricultural production. It is feasible to make sustainable use of these natural resources through application of appropriate technologies.

Broadly, agricultural development policies over time can be divided into four sets of policy packages: (a) institutional reforms; (b) public investment policies; (c) incentive policies; and (d) reforms and globalization policies. The relative importance of the first three sets has varied over time.

In order to advocates for the small and marginalised group, it is strongly advocates that a strategy for marginal and small farmers must focus on group approaches in order to benefit from the economies of scale. A focused approach can be used to incentivize the formation of farmer's groups and apex organizations and government and other can facilitate in finding solutions to problems of irrigation, inputs, procurement, markets and risk. The Commission has considered four important models for group approach in the country. These are: Co-operatives, Producer's Companies, Farmers' groups such as those in Andhra Pradesh and SEWA (Self Employed Women's Association) Farmers' model.

Crop-Livestock Interaction and Its Impact on Rural Masses

It is well known that India is the world's largest milk producer, has been starting to make its presence felt globally. With a 17% share of global milk production, the Indian dairy sector is undergoing change as its organised players have only about 18% of the market. Cooperatives are the central players in the formal dairy sector. However the following hurdles are looming – climate change and tightening of natural resources (water and land), unplanned urbanisation reducing cultivable land resulting in major fodder shortages, issues over the compound feed market, availability of medicines and vaccines, a high scattered population of underfed and mismanaged animals and the non-availability of formal milk collections in many areas.

Since breeding, feeding & management is the key parameters for the success of livestock keeping activities, let us assess the this activates in the context of Indian farmers who are small, marginal and land less

as their contribution is more than single specialised entrepreneurs in this field. It is well established that the role of small farms in development and poverty reduction is well recognized (Lipton, 2006). The global experience of growth and poverty reduction shows that GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture (WDR, 2008). Small holdings play important role in raising agricultural development and poverty reduction.

Lessons for Dairy Development programme from Developed countries

In New Zealand and Australia milk production was based on pasture based grassland systems (just like in Ireland-EU). This made it possible to produce milk at a low cost price. With the higher milk prices after 2011, farmers invested in giving more maize and meal to the cows for a higher milk production. This resulted in higher production costs. At the end of 2014, a discussion started to go back to the grass based systems to decrease costs (and milk production). Worldwide there is a shortage of cows.

In case of China milk production is boosted by the government support because of the high cost price of quality milk, caused by, high feed prices, import of heifers as well as whey protein used in the feed and also high construction costs of infrastructure. In New Zealand and Australia milk production depends on grassland based pastures (just like in EU). This made it possible to produce milk at a low cost price which is required for their dairy industry to do the business on profitable ground. Where as in India (here no support or incentive to the dairy farmers), with the higher milk prices after 2011, farmers have started investing in better feed to the HF cows for higher milk production. This resulted in higher production costs of milk in some states like Punjab and Haryana. However, the growth of economy in India is falling due to global developments. The fact that cow milk prices in Maharashtra have dropped to Rs 20-21 per liter at the dairy and Rs 18-19 at the farm-gate as against their respective levels of Rs 29-30 and Rs 26-27/liter a year ago, shows the extent of pressure. Private and corporate dairies have passed on their burden to farmers by simply lowering procurement prices. But there are no such pressures in liquid milk sales. Toned milk with 3 per cent fat and 8.5 per cent SNF is retailing at Rs 38 per liter in Delhi and Mumbai. This price hasn't changed despite the procurement cost of cow milk (having 0.5 per cent extra fat) at the dairy falling to Rs

20-21/liter. Even after adding other expenses Re 1 each towards processing and packaging, 50 paise each for local transport and administration-cum-marketing, and Rs. 2 of trade margin the total cost incurred on sale of toned liquid milk will not exceed Rs 26 per liter. Some dairies in the hinterland may spend an additional Rs 1.5-2/liter or so for transporting milk over 400-500 km. But even after that, there is a profit of Rs 10 from every liter sold. Selling liquid milk can be profitable, but it involves high overheads towards brand-building, marketing and distribution. We need to have sufficient volumes to bring down overhead costs per liter, which takes time. Secondly, we cannot raise retail prices of liquid milk easily, which is not the case with bulk commodities like powder and ghee. Global SMP and fat prices are destined to remain low, with dismantling of milk production quotas by the European Union and a weak euro only adding to low price. The farm gate milk prices are shrinking so fast that it causes liquidity problems at farm level. But Indian farmers who are attached with regional cooperatives are not under pressure to reduce prices of milk. On the other side Indian dairy cooperatives like *Amul* can take more advantage in the present scenario by branding new products and capturing both internal and external demand of their products through competitive lower prices. *Amul* believes product innovation is essential to cater to the emerging needs of Indian consumers and also to create a vibrant portfolio for the future.

If we look the dairy Industrial point of view, most of the industry preferred to produce the product where their profit margin is more. Studies from DESM, NDRI, Karnal show that *dahi, toned milk, lashi, ice cream* is more value added product from the industrial point of view than to make *paneer, ghee* etc.

The consumers are now prepared to pay higher prices of regionally and locally produced dairy products like *aam dahi (Dahi with mango)* than *misti dahi* in the eastern part of India as it has better taste and better nutritional value than earlier one. Other aspect of increase in milk demand is due to increase of cheese consumption mainly its use with pizzas and for other 'ready to eat food' products due to the increase in the income of middle income group. This clearly indicates that till there is a lot of scope to absorb fresh milk in Indian market if we relook the value added products at a low cost feeding of the dairy animals.

Increase in the food prices, will result in outfall of demand for milk as such. Use of milk in food products

(like ice-cream) will also be replaced by non milk products, further higher cost of milk will lead to the situation where milk would be replaced by other products like soy milk and this will further cause a significant decrease in global demand for milk and its products. However, positive signals are coming from North America and the EU, as there is change from traditional products to value added products and this is not related to the brand products but more to regionally produced foods.

Other countries can learn from the Indian *Amul Dairy cooperative* how it is dominated by smallholders, and contracting with a large number of them involves transaction costs for the processors. The processors do not have much choice but to take milk from smallholder producers. The problem of the higher cost of contracting with small producers is overcome by contracting with a single person in the village often an agent who acts as an intermediary between the processor and producers. National Dairy Development Board covers 1,40,227 village level societies and 14 million farm families of which 4 million are women. *Amul* Pattern of dairy cooperatives has contributed immensely to the fact that India has progressed from a milk-deficit country to emerge as the largest milk-producing nation in the world. In the process, they have generated millions of days of employment for the rural poor and improved their socio-economic condition.

Another example of rural livelihood security were shown through seed production by the Bihar farmers were highlighted by the effort taken by IGFRI, Jhansi who is working on rangeland development, range grasses and legumes for the development of livestock, grazing lands, pastures which are all linked with the upliftment of poor and under privileged farmers, rural women, nomadic tribes and graziers. Appraisal of the Farming System Research of IGFRI revealed that suitable technological options through participatory approach for intensification, diversification and value addition with emphasis on crop-livestock production has favorable results in cluster villages. Enhanced productivity (Kharif crops 40-100% & Rabi 80-150%) of cereals, pulses, oilseeds, vegetables and fodder crops was obtained due to adoption of improved varieties and practices.

IGFRI, Jhansi has supplied 24 quintal of breeder seed of oat (JHO-822) during the rabi 2012-13 to Mithila Milk Cooperative Union, Samastipur and distributed among farmers with buyback guarantee by the cooperative.

The farmers were advised by different means about good seed production package and practices. The cooperative selected the farmers for seed production. After seed production, seed was purchased back from farmers at Rs 23 per kg. IGFRI also provided technical support for seed production to these farmers through milk cooperative.

The regular demand for fodder crop of oat (JHO-822) has encouraged the cooperative to grow the seed over the farmers' fields to reduce the cost of transportation and time loss. The farmers have adopted the oat seed production with great enthusiasm and grown the seed in about 39 hectares in three villages of Chhohri and Raghuni dehat and Tiruhat of Madhubani district of Bihar. The average seed yield was 16 quintal per hectare. The yield was reduced due to high winter rains. The cost of production is less in oat as compared to other crops but the return is comparatively more. During 2013 -14 also the Milk Union has procured 60 q of breeder seed of JHO 822 from IGFRI. This shows the popularity of the variety developed by this institute as well as confidence of the milk union on IGFRI Seed.

Plant-Animal relationship division of IGFRI, Jhansi established that indigenous breed like Tharparkar, Gir and Sahiwa provided more average lactation yield in the tune of 1722, 1338 and 2007 kg, respectively in organic system of farming than under inorganic system of production (1592, 1246 and 1864 kg, respectively). Field visit in Bhuj area of Gujarat and peri-urban area of Ahmadabad clearly shows that how the small and marginal farmers with *Kankraj* and *Gir* breeds with organic ways of feed and fodder helps them to take 10-15 litre milk per day from their local breeds and also reported that neither they face any fertility problems nor they face to sell their milk rather it is surprise to note that in Ahmadabad based peri urban farmers sell its milk with huge premium prices in the tune Rs 100-120 per litre.

Small and marginal farmers also entered in the fodder market at peri-urban areas. In peri-urban areas of Kolkata initial trends of green fodder markets reveals that about 42% of price paid by consumer was received by the producer. About 42% consumer price goes to commission agent and about 16% received by whole seller. As in case of dry fodder markets about 45% are being sold through wholesalers cum retailers to consumer, 44% through Village trader cum retailer to Consumer. Only 11% was sold directly to Commission Agent.

At Meerut peri-urban areas, the following marketing channels are observed for green fodder: About 35% produce of sugarcane top are being sale directly from producer to consumer in or around the production point. About 45% producers sale to the sugarcane top chopping machine owners-cum-wholesalers-cum-retailers and they sale it to buyers both in small or large quantity. While 20% was sold through wholesalers cum retailers to consumer.

A large number of small farmers who were struggling to meet their own requirement of fodder for their animals have achieved a level of sustained production of fodder through adoption of new fodder varieties in institutional collaboration and achieved a increased milk production and higher monetary returns over a period of time in the Dhawar region of Maharashtra.

In rainfed condition of central India, fodder sorghum + cowpea-wheat is cropping system among farmers maintaining 2-4 livestock. Perennial guinea grass based cropping system provided scope for round the year fodder supply of 140-160 t/ha. It had positive impact on soil organic carbon restoration compared to seasonal crop based system in Typic Haplusteps of Central India.

Grassland improvements were made with available community lands/ wastelands in village through on farm spread of technologies by supplied live materials, interventions and exhibition and trainings. It also is implemented with forest department under joint forest management scheme and forest management with state government forest department. It has been implemented by farmer's community to develop their available waste/ degraded lands as well as available community land as well as through collaborative works with state forest department. The technology is gaining acceptance among rainfed farmers in Bundelkhand and Karnataka region and there is increasing area in fruit particularly ber, aonla and guava, sapota etc. This technology has given a new dimension to make use of otherwise utilized/ under-utilized field bunds, which occupy 6-10 percent of cultivated area. The adoption rate is quite encouraging in Karnataka and Andhra Pradesh. It is also being implemented through forest management with different states forest department.

4. PATHS & APPROACH FOR WAY FORWARD

The development programme should identify the problems and options to solve these problems, based on the available resources and technologies. The

agricultural development programme should identify the availability of resources such as quality of the land, quantity of water, weather conditions and select suitable crops which are most productive.

Diversification is one of the options for rural livelihood and eradication of poverty. But it needs a competitive environment. The main arguments in favour of diversification of agriculture is to increase the income; to generate additional employment; to stabilize farm income over the seasons and overtime; and to conserve natural resources. But the shift to other crops or economic activities, however, has not been an easy task particularly for small farmers. Government assistance in terms of more supportive policies and better infrastructure has played a critical role in the promotion of diversification programs. With globalization however, expanded trade has brought with it increased competition, and hence the need to focus diversification programs on agricultural activities with competitive advantages. Indian agriculture has been diversifying away from cereals and towards high value crop and livestock products since the early 1990s. To meet the challenge, the production strategy should be to encourage diversification of the production system without sacrificing the basic obligation of ensuring food security. It has been well documented that such a diversification generates greater employment opportunities, particularly for women, and higher incomes for farm households. The area shift from cereals to vegetables, in particular, has enhanced employment opportunities in rural areas. However, the combination of a large number of small farmers, poor rural infrastructure, and fragmented and underdeveloped markets complicates establishment of efficient and equitable links between farmers and the diverse, emerging domestic market. Indian agriculture, in general and Eastern India in particular, facing the complex challenge of the new economic regime besides the usual problems of rising population, unemployment and poverty, declining investment in the agriculture sector and degradation of natural resources. What about items such as fruits and vegetables that, typically, the central government does not procure? Farmers have the option of taking these products to nearby government-designated mandis. So that farmers get a fair price and are not exploited, the Agricultural Produce Market Committee (APMC) Act was enacted. In reality, middlemen facilitating procurement through APMC form a cartel, and at the time of auction offer a substantially lower price to farmers. Many states do not

want to bring in reforms to the APMC Act because such reforms will derail many of the middlemen who also happen to be full-time state-level party workers. Diversification of agriculture may help to overcome these overriding problems in a more competitive environment.

Shiv Raj Singh *et al.* in their article on 'Policy Intervention in West Bengal Agriculture: Role of Diversification' observed that farming in West Bengal is individual driven and unorganized. The average size of holding is only 0.82 ha which is much less than the national average (1.33 ha). Small and marginal farmers also do not have access to institutional credit. Most of them depend on village traders, who are also moneylenders, giving them crop loans and pre-harvest consumption loans. The superior bargaining power of village traders and the middlemen means that the prices received by farmers are low. Individual farmer have very small marketable surplus of produce to sell in the market, while he has to pay market price for all farm inputs and other basic utilities and consumable items. Thus, market access is not going to help majority of the farmers. There is, therefore, a need to organize West Bengal farmers on the model that helps the leadership to addresses the issue of organizing a vastly unorganized farming community, which help the farming community to gain from the market economy.

BAIF Development Research Foundation a Gandhian organisation, based at Urulikanchan near Pune has demonstrated the feasibility of using low-producing cattle and degraded lands for rehabilitation of the rural poor. BAIF has established to show that how through breeding, feeding and management of indigenous cattle, buffaloes, sheep, goats, poultry and pigs for milk, meat, eggs, wool and processing of these products has good potential for providing gainful self-employment on a sustainable basis.

Sustainable development programme needs to cover the following factors:

1. Social acceptability of the participants;
2. Availability of natural resource and external inputs;
3. Skills to operate the programme without depending too much on external technology;
4. Ability of the participants to operate at low risk;
5. Easy marketability of the produce;
6. Economic viability and higher profitability;

7. Short gestation period;
8. Year-round employment.

For sustainable development, 'cluster mapping' along with above mentioned factors calls to remodel the structure of India's economic federalism. Such geographic localisation of economic activity (often across contiguous states) influence and facilitate the development of a network of firms, related economic actors and institutions on regional lines, allowing individual firms to benefit from 'economies of agglomeration'. Agglomeration benefits—accruing from labour market pooling, proximity to input and output markets, and knowledge spillovers between firms 'clustered' together-unleash powerful synergies and efficiencies among such firms.

Other lesson which has been learned from the BAIF Development model that most frequently we have mentioned the constraints even after a decade experiments in the seed breeding programme, the Centre highlighted that quality seed production is not cost effective. Local market decides *the cost to produce* seeds is an ambiguous argument and does not corroborate with technological back up with fodder seed production. What kind of trained manpower in forage production is needed has not been highlighted. Product differentiated at feed & fodder, rapid development of peri urban dairy, organisational change like consolidation in the farming activities, Institutional changes like contract farming, value added products and recycling process of crop-livestock interaction is the best example and should be taken care instead to continue the breeding programme. No need to fit 'one size for all'. The model should evolve '*together we produce-together we market*'.

5. FARMING SYSTEM FOR RURAL LIVELIHOOD

Based on Farming system research by several researchers it has been established that only by integrating more than one enterprise will certainly leads to greater dividends than single enterprise based farming, especially for small and marginal farmers. It also leads to improvement in nutritional quality of daily diet of farmers. The scattered ad-hoc studies at the national level have revealed that the diversification of farming system through integration of enterprises in varied farming situations of the country enabled to enhance total production in terms of rice equivalent yield ranging from 9.19% in Eastern Himalayan Region to as high as 366% in Western Plain & Ghat Region

when compared to prevailing farming systems of the region. Even a simple intervention of replacing indigenous breed of milch animals by crossbred cows and/or buffaloes in Gujarat Plain & Hill Region and changing the pattern of cultivation of fish and rice in rice+ fish system in Western Plain & Ghat Region brought about a radical change in productivity and profitability. Survey on Farming Systems in the country as a whole also revealed that milch animals (cows and buffaloes), irrespective of breed & productivity, is the first choice of the farmers as an integral part of their farming system. However, from economic point of view, vegetables and fruits (mango and banana in many parts of the country) followed by fish cultivation was the most enterprising components of any of the farming systems prevailed in the country. A number of success stories on integrated farming system models in different parts of the country suggest that farmers' income can be increased 3-4 fold by way of integration of enterprises in a farming system mode.

6. MARKET LED DAIRY DEVELOPMENT

Operation Flood Programme emphasis on developing smallholder-based dairy sector in the pre-liberalised era is justified on the ground that it realised the needs of the production base by the masses. Value addition in milk is unavoidable if one has to enhance sector profitability, the same does not seem feasible unless the organized sector improves its penetration. Because, it is the involvement of the organized sector that will drive the growth by resorting to value addition in basic product and harnessing the consumer market. The mechanics of the organized sector penetration could be agency-specific as also area-specific.

It essential to transform traditional supply chains from linear, sequential processes into adaptive supply chain networks in which communities of customer-centric, demand-driven, intelligently adapt to changing market conditions, and proactively respond to shorter, less-predictable life cycles. In the last 15 years, the share of milk producers has declined from 52% to 38% in USA and from 56% to 36% in UK. As compared to that, Indian milk producers get more than 70% on an average and the milk producers affiliated to co-operatives get more than 80% share of consumers' rupee. Key question is whether the organized retail trade would be able to operate at low margins as practiced by Amul and other co-operatives, failing which they would not be able to maintain the farmer's share in consumer price. Neither do our farmers

receive fair price for their produce, nor do consumers benefit from low prices. The issue is not just about converting our farmers from price-takers to price-makers, but to balance the need of different interest groups by addressing the root causes of anti-competitive practices, which are rampant all over the country. Need of the day is to provide quality of efficient input and output support services as provided by the co-operatives (Amul model at Gujarat, Nandani Milk Federation at Karnataka Model), private sector (Nestlé) and contract dairy farming. In the liberalised economy, the replication and scaling up of these models largely depends on the governance, institutional support and market forces.

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