



Kurukshetra

A JOURNAL ON RURAL DEVELOPMENT

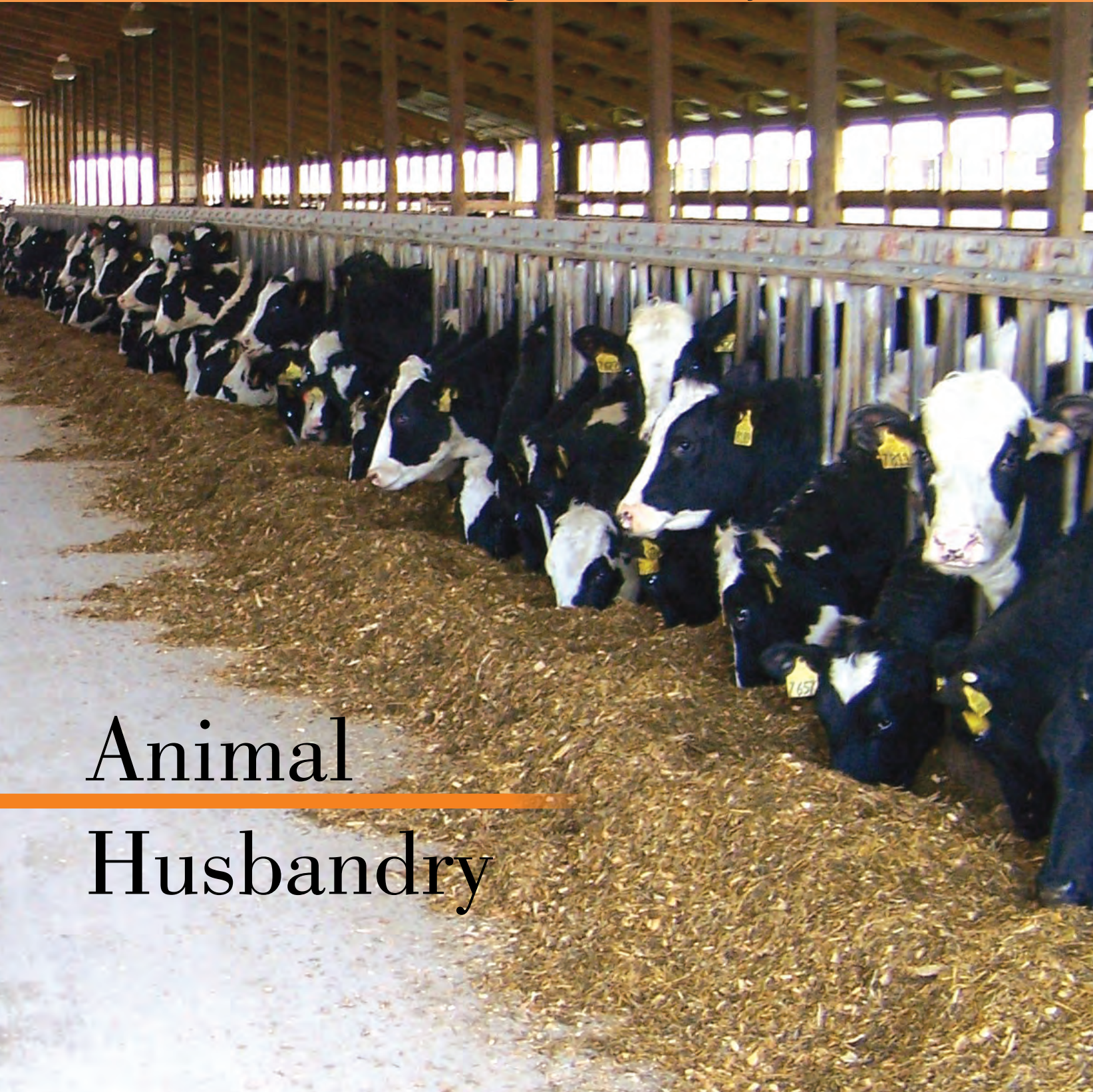
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Animal
Husbandry

E-PASHUHAAT PORTAL LAUNCHED

E-pashuhaat portal (www.epashuhaat.gov.in) was launched by the Union Agriculture & Farmers Welfare Minister, Shri Radha Mohan Singh on the occasion of National Milk Day. It was the first time in the world, under the scheme National Mission on Bovine Productivity, 'e-pashuhaat' portal has been developed for connecting breeders and farmers regarding availability of bovine germplasm. Through this portal, the breeder and farmers can sell and purchase breeding stock. All the information about all forms of germplasm including semen, embryos and live animals with all the agencies and stake holders in the country has been uploaded on the portal. The portal will also inform the farmers about the availability of quality, disease free bovine germplasm with different agencies in the country.



India has the largest bovine population in the world. At 199m cattle, it has 14 per cent of the world cattle population and with 105m buffaloes, it has 53 per cent of the world buffalo population, of which 79 per cent of the cattle are Indigenous and 21 per cent are Exotic and Crossbred varieties.

80 per cent of the Indigenous cattle are Non-descript and 20 per cent belong to 37 breeds recognised by National Bureau of Animal Genetic Resources. (NBAGR) with 13 breeds of Water buffaloes.

The Indigenous bovine breeds are sturdy, endowed with the quality of heat tolerance, resistance to diseases and ticks with the ability to thrive under extreme climatic conditions and survive with low inputs. However, most of the indigenous have low genetic potential for milk production and are suited for draught animal power. But, some breeds have the potential to be highly productive under optimal nutrition and farm management conditions along with selective genetic breeding.

Aims and Objectives:

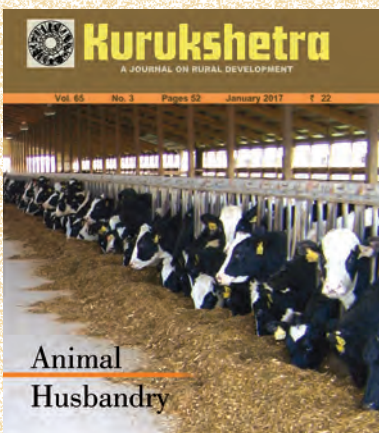
- E-Trading Market portal for livestock germplasm and additional related services.
- Will connect farmers with breeders - Central, State, Co-operative, Milk Federations, and private agencies.

Shortcomings in Animals Trade Market

- No authentic organized market.
- Difficult to get quality- disease free high genetic merit germplasm.
- Misleading valuation due to lack of traceability and tracking.
- Other malpractices include Horns removed & Teeth filed to mislead for their age.

Present Scenario:

- The bovine population in India is owned by 60m marginal, small and medium farmer households with an average herd size of 2-3 milch animals.
- The figures of high milk production are reflective of the large numbers of bovine population rather than that of high productivity and resource efficiency.
- Dairying activity is a major supplementary source of income for these farmers. However, the Indian Farm Management System is typically a Low Input, Low Output system with low productivity.
- The Hon'ble Prime Minister's vision for doubling the farmers incomes by 2022, makes the adoption of the strategy to enhance the share of income from animal rearing imperative.



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Editorial

Animal Husbandry in India has always been a very important aspect of Indian rural agricultural scenario through its indispensable contribution to the economy be it rural or overall national economy at large. Since time immemorial, the animals have been an integral part of all the day to day activities of the humans in every way possible.

Ever since the humans came into existence, the animals have been a friend and a companion to humans in myriads ways in the most extreme survival situations. He had been domesticating animals for his own good by training and using them for their various uses and supporting every day work like hunting, gathering, ploughing fields, transporting weights for long distances or on rough terrains like the hilly regions and providing a rich source protein for himself. Apart from this, the animal skin, hide, feathers, fat, leather, fur etc were and still, are extensively used for various purposes.

Since then if we compare now, we still continue to be as dependent on animals. Despite so much of advancement in technologies and production, we still have dependence on animals for milk, eggs, meat, etc. In a country where the majority of the population of rural households and economically weaker sections of the society still depend upon agriculture to make their ends meet, the role of cattle, livestock like cows, buffaloes, pigs, goats, sheeps, ducks, hens, donkeys, ponies, mules and camels etc becomes indispensable. The animal husbandry, also referred to as animal agriculture has become central to the economic development of the rural populace., who otherwise depend upon the monsoon for their employment, which accounts to roughly 180 man days of work in a year, to earn a decent income for their families. In such an unpredictable scenario, the economic dependence of these people on the livestock and dairy activities becomes all the more inevitable.

The livestock situation in India, though alarming, has lately been improving in the last few years. The livestock population has been increasing owing to access to improved veterinary technologies and advancement. This is proving to be a positive step towards the betterment of cattle, poultry, piggery and the related economical farming activities in India, notable among them are silkworm rearing, mulberry cultivation, lac insect cultivation, fish farming and bee keeping. Among these, the silk and the lac cultivation have given India a unique name in the world with India being the largest producer of Silk and the only country to produce all five kinds of silk as well as the only country to produce lac production for the world export.

Realising the potential of Animal Husbandry sector to strengthen our rural economy, the budgetary allocations have witnessed a rise through its various schemes and initiatives like National Livestock Mission, National Dairy Plan, National Programme for Bovine Breeding and Dairy Development, National Kamdhenu Breeding Centres etc to get improved germplasm, semen selection for cross breeding, cattle breeding technologies to create more sturdy, resilient and productive progeny of cattle to enhance the production of eggs, milk, silk and other animal products. The Blue Revolution to restructure all the existing schemes in the Fisheries Sector is a highly appreciable step to give impetus to fisheries and is expected to play a pivotal role in the mass production of seafood in the country.

To conclude, the Indian Livestock scenario is slowly and steadily moving on the roadmap for development. Being low cost, economical and available in their backyard, it is the most important and reliable source of income for the poor and economically backward, tribal and the women. With a little more efforts and focus, this can prove to be the key to the livelihood for millions residing in villages in their development, economic empowerment and prosperity.

ANIMAL HUSBANDRY: A BREATHING DILIGENCE OF CULTURAL HERITAGE

Dr. Prashant H. Pawar

Livestock sector has been renowned as a back bone of Indian agriculture. Apart from the supply of consumable milk, meat, eggs as a protein source for ever increasing Indian human population, animals not only been contributing to concrete the animal based industries by producing hide, fibre, wool, bone meal, blood meal, but also been boosting Indian traditional art and crafts by providing feathers, hooves, horns etc. and many other things.

Animal husbandry is an art of breeding and rearing animals for the benefit of human society. The word 'Animal Husbandry' applies primarily to cattle or dairy cows, buffalo, chickens, goats, pigs, horses and sheep. Today, even animals like donkeys, mules, rabbits and insects such as bees are being raised as part of it. In fact, rearing of animals is an age old practice of Indian culture. During different phases of cultural revolutions, animals have embossed their importance through their of contribution in human livelihood. Many ancient historical monuments and the findings at excavations of old civilizations have proved the intense relations of animals with human since before the beginning of its written documentations. The ancient symbols of prestige and power had mostly decorated in the form of animal sculptures, which undoubtedly denotes the cultural worth of animals in India. Consumption of varieties of animal flesh has been documented as a common practice in various ancient literatures.



The multidimensional potential of various animals has been an ever attracting feature that has created an inevitable bond of relation with Indian economy. Livestock sector has been renowned as a back bone of Indian agriculture. Apart from the supply of consumable milk, meat, eggs as a protein source for ever increasing Indian human population, animals not only been contributing to concrete the animal based industries by producing hide, fibre, wool, bone meal, blood meal, but also been boosting Indian traditional art and crafts by providing feathers, hooves, horns etc. The drought power, Bio-gas, dung cakes utilised in rural India, have their own landmarks by saving considerable amount of fuel and electricity and thereby contributes in pollution control up to some extent.

However, over the centuries together, the animals in India have been suffering due to devastation of natural pastures, inferior quality fodders, deforestation, ever increasing competition with human for food, changing environment, changing customs, industrialization, urbanization, mechanization and several other factors.

Scenario of Indian Animal Wealth:

India is enriched with one of the largest diversity of animal wealth in the world. At present, there are 37 recognized breeds of cow, 13 of buffaloes, 39 of sheep, 24 of goats, 6 of horses, 8 of camels, 2 of pigs 1 of donkeys and 15 of poultry in India. The livestock census in India is carried out once every five years. The 19th Livestock Census was carried out in 2012 and encompassed all States and Union Territories covering all villages, towns and wards in the country.

Livestock Population (Livestock Census 2012)

No.	Species	Number (Millions)	World Rank Status
1.	Cattle	191.00	Second
2.	Buffaloes	109.00	First
Total (Including Mithun & Yak)		300.00	First
3.	Sheep	65.00	Third
4.	Goat	135.20	Second
5.	Pigs	10.30	
6.	Other	01.70	
Total Livestock		512.20	
7.	Total Poultry	729.20	Seventh

As compared to the 18th Livestock Census, there has been an overall decline of 3.33 per cent in the total livestock population in the country. The total livestock population including cattle, buffaloes, sheep, goat, pigs, horses and ponies, mules, donkeys, camels, mithun and yaks, was 512.20 million in 2012. The total poultry population, including fowls, ducks, turkeys and others, was 729.20 million.

While there has been an overall decline in the total livestock population in the country, some States have recorded substantial increases in livestock numbers as follows:

No.	State	Per Cent Increase
01.	Gujarat	15.36
02.	Uttar Pradesh	14.01
03.	Assam	10.77
04.	Punjab	09.57
05.	Bihar	08.56
06.	Sikkim	07.96
07.	Meghalaya	07.41
08.	Chhattisgarh	04.34

The total Bovine (cattle, buffalo, mithun and yak) population shows a decline of 1.57 per cent as compared to the 2007 census. However, the milch animals (in-milk and dry) in cows and buffaloes have increased by 6.75 per cent. At the same time, the numbers of female cows and buffaloes have increased by 6.52 per cent and 7.99 per cent respectively. The total buffalo population has shown

a growth of 3.19 per cent and milch buffaloes by 4.95 per cent. The exotic/crossbred milch cattle have shown a substantial increase of 34.78 per cent. In comparison, the indigenous milch cattle have increased only marginally by 0.17 per cent.

While the population of Mithun, Yak, horses, mules has increased, the population of camel, pigs, donkeys and sheep has decreased.

Goats constitute 26.40 per cent of the total livestock population. The total number of households and household enterprises, both rural and urban, which rear/own sheep are 4,552,119 and goat are 33,014,087. Similarly, non-household enterprises and institutions which rear/own sheep are 8,010 and goats are 25,189.

Three categories are included in Poultry, namely, Fowls, Ducks and Turkey and others. The number of households and household enterprises rearing backyard poultry are 30,316,024 and in poultry farms/hatcheries are 20,023,244. Similarly, number of non-household enterprises and institutions rearing poultry in farms and hatcheries are 2,429,256.

Production Status of Livestock in India (2013-14)

No.	Animal Produce	Quantity	World Ranking Status
01.	Milk (Million Tons)	137.70	First
02.	Eggs (Billions)	74.75	Third
03.	Meat (Million Tons)	8.89	N.A.
04.	Wool (Million Kgs)	47.90	N.A.

Animal Husbandry in India:

In India, different systems have been adopted by the farmers at different corners of the country. But broadly considering, rearing animals can be classified in three different systems as follows:

Mixed Livestock Farming: Widely spread and highly popularized among the Indian farmers, this method actually involves agriculture and animals together as the principle of co-existence, where animals are used for tillage, providing manure to

agriculture and in returns animals can get crop residues as feed, care and shelter by owner. According to the availability of resources, the farmers may hold 5-6 animals and maintain them with the agriculture remnants. Usually, animals are managed on coarse type of fodder for most of the duration but a farmer can get drought power, milk, dung etc at a very reasonable cost.

Migratory Livestock Farming: This is an ancient system of livestock rearing. In this system, the natural resources in form of pastures and grass lands are used to feed the animals. Animals always need to move in search of fodder and water. But due to devastation of natural grasslands and limited monsoon, this method of animal rearing is declining day by day. For small ruminants like sheep and goat it proved itself as the economic method of rearing.

Organized Livestock Farming: This is a modern method of animal rearing where animals are reared with a specialized purpose. All the amenities required for the well-being of animals are provided in a scientific manner and with the help of veterinary care. Animals are managed in intensive or semi intensive housing and are provided with balanced ration to encourage its maximum production. Although, capital investment in this system is more, still it is popular for rearing of dairy animals near urban area and rearing of poultry.

Animal Husbandry: Challenges

Land is are only common resource acting as the platform for the development of human and animals. Ever increasing competition among them for food security has been creating nuisance in their relation. Being the most dominant species on planet, being has got first priority to implement his ideas leading to less concern towards animals as compared with industrialization. Apart from this many more issues have been alarming as problems in Indian animal husbandry, which include huge animal population, low production potential of indigenous animals, non producing and aged animals, devastating natural pastures, fluctuating monsoon and reluctant droughts, lack of infrastructure facilities at rural areas, deficient Feed and Fodder, indiscriminate Breeding, lack of awareness for scientific animal management, lack of credit facilities for animals owners and environmental pollution.



Animal Husbandry:

To get rid of the challenges and the problems of Indian animal husbandry way forward different corners of the fate should be checked with intensive solutions by means of suitable policies as a future prospect for its desired development. The following are the few keys to design and implement future policies of Indian animal husbandry.

- a) **Culling of Burdening Animals:** According to Singh (2015), Non-productive, disowned, over aged animals are estimated about 7.45 per cent of the livestock population in India. This group of animals have been creating excess burden on the natural resources. Removal of such useless animals from the population will be surely helpful to mitigate fodder crisis in livestock. A special policy should be designed to deal with such animals.
- b) **Licensing for Animal Keeping:** Animals should be reared by farmers who are liable to manage them, for that he should have proper resources to maintain the animal. The animal holding pattern should be governed by certain licensing policy. Depending upon the capability of the farmer, estimated number of animals should be permitted for rearing. The strength of any particular area may be considered to design such policy.
- c) **Rejuvenation of Natural Pastures and Grasslands:** By means of overgrazing, less rainfall, deteriorated soil quality, natural pastures have been destroyed in many parts of the country. Rejuvenation of such landscapes with improved varieties of fodders, manuring,

provision of microirrigation with solar energy and management of grazing will surely boost up the natural resources for fodder. NGO's may also be involved in such activities.

- d) Smooth Credit Facilities to Animal Owners:** Easy credit facilities should be made available to the animal owners to create basic infrastructural or other essential facilities required for animal management. The animal itself may be considered as an asset to sanction the smooth loans to farmers, provided that, the animals should be insured with any legal agency.
- e) Ceiling of Cross Breeding:** After the implementation of National programmes of Cross breeding, undoubtedly, the production potential of indigenous animals have been improved by means of up-gradation, but there should be a regular check for permissible exotic blood level in indigenous animals, as the cross bred population are more prone to diseases in Indian conditions. There should be ceiling for cross breeding. Conservation of elite herds of pure germplasm will definitely be a milestone in future animal husbandry.
- f) Supply of Concentrate Feed on Subsidy:** Every registered and licensed animal owner should be provided with animal ration card. Under such scheme, concentrated feed may be made available for animals at a subsidized rate.
- g) Maintenance of Animal Health Cards:** Usually verbal information provided by the owner serves as a base for veterinarians. So to avoid such complications and to streamline the data recording up to date, maintenance of Animal health cards should be made mandatory for each animal owner.
- h) Rigorous Veterinary Extension Education:** Improved skills and latest technologies for animal management should reach at the farmers door step shortly. As prevention is better than cure, occurrence of any complications in animals can be avoided by means of proper scientific care and management.
- i) Research for Organic Livestock Farming:** The future theme of human livelihood has been coined with an attractive prefix, 'Organic'. Considering it as an appeal of next generation,

animal husbandry should also turn towards path of Organic. Perhaps, it will need efforts and sufficient time to bring the desired change, but we will have to move towards soon. To create a concrete platform for such a broad vision, we will have to engage ourselves for required research for future organic animal husbandry.

- j) Establishment of SEZ (Special Economic Zone):** Special emphasis needs to be laid towards animal husbandry practices around urban areas. In spite of having large capital potential in urban areas, due to lack of proper land, livestock industry is being hampered. Hence, there should be demarcation of sufficient land nearby to the urban area, as Special Economic Zone for animal husbandry. Such specialized SEZ's will be the milestone for industrialization of livestock sector in forthcoming era of modern generation.
- k) Pricing Policy:** Regular fluctuations in the market prices of animal produce severely shocks livestock sector. Somehow, poultry industry has its well settled pricing policy, but for other products, there are heavy fluctuations in their market prices. There should be a monitoring agency, which will declare base price for all animal produces, this will help to measure production potential of animals appropriately.
- l) Separate Budgetary Provision for Animal Husbandry Sector:** Considering Animal husbandry as a separate sector for development, it should be separated from agriculture sector, where it usually gets next priority for fund allocation. Individual budgetary head should be incorporated in planning and sufficient funds should be made available for the strengthening of animal husbandry sector.

Animal husbandry is our inevitable culture with a great potential for changing rural India. There is no doubt that, appropriate implementation of scientifically designed future prospect will surely be a milestone in transforming India. It will need some smart approaches great with broad vision and obvious compassion for our animals.

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SUSTAINABLE DEVELOPMENT OF INDIGENOUS DAIRY CATTLE IN INDIA

Dr. A K Chakravarty

Indigenous dairy cattle are known for more heat tolerant, comparatively resistant to many diseases, low maintenance cost and higher feed conversion efficiency. Of late, the indigenous cattle are also getting importance due to presence of A2 allele in milk. Therefore, it is required to improve the production capacity of our indigenous cattle in a sustainable manner.

The dairy cattle are part of the society since their domestication. In India, about 58 per cent of the population is engaged in agriculture and rearing of livestock. According to 19th Livestock Census (2012), Govt. of India, the total livestock population in India was estimated as 512.05 million of which, 190.90 million are cattle, constituting about 37.28 per cent of total livestock population. Of the total cattle population, 151.17 million (79.19 per cent) are indigenous cattle and 39.73 million (20.81 per cent) are crossbred cattle. The indigenous cattle population in the country has been broadly classified into two groups. About 113.25 million (74.92 per cent) indigenous cattle are defined as non-descript cattle while 37.91 million (25.06 per cent) indigenous cattle are known as descript cattle. Till today, 40 indigenous cattle breeds whose breed characteristics are well defined have been listed as descript cattle in the country. The growth trend in cattle population (1992-2012), shows that the indigenous cattle declined from 93 per cent to 79 per cent where as the exotic/crossbred cattle increased from 7 per cent to 21 per cent during the same period though the indigenous cattle are more sustainable in comparison to crossbred cattle. Indigenous dairy cattle are known for more heat tolerant, comparatively resistant to many diseases, low maintenance cost and higher feed conversion efficiency. Of late, the indigenous cattle are also getting importance due to presence of A2 allele in milk. Therefore, it is required to improve the production capacity of our indigenous cattle in a sustainable manner.

Goal of Animal Improvement:

In India, the conventional breeding goal for genetic improvements of high yielding animals and the evaluation of bulls over the decades is for milk production only. With rapid increase in global human population and looking into the demand of milk and milk products, the major goal for improvement of dairy animals and evaluation of breeding bulls in many countries was only to improve the milk production and milk quality.

The demand of milk and milk products is increasing to cope up the continuous growing human population, increasing income over the years, changing lifestyles including food habits of people in our country. Analysis of trend of milk production over six decades shows that the milk production increased more than eight times from 17.0 million tonnes in 1950-51 to 146 million tonnes in 2014-15 and the country was recognized as the largest producer of milk in the world. The



Sahiwal Cow

country has laid down the projected demand of milk production about 240 million tonnes by 2025. At present, the milk production has increased to more than 150 million tonnes and the per capita availability of milk in India increased to about 337 g/day, though the per capita availability of milk varies dynamically from state to state mainly due to different food habits of human population.

The huge increase of milk production in the country is mostly due to the higher adoption of artificial insemination over natural service, awareness about quality male germplasm for selection of breeding bulls, balancing of ration for dairy animals, performance recording of dairy animals which were initiated by the Govt. of India and various dairy development agencies through various projects implemented in the country.

It has been observed that milk yield per lactating dairy animal has been more than doubled due to rapid improvement in genetics and management of dairy animals in many countries including India.

Alarming Situation:

The intense selection of dairy animals for higher milk production and milk quality has shown the decline on reproductive performance including fertility of dairy animals in almost all countries. The trend of deterioration of reproductive performance including fertility was found more in high producing animals irrespective of breed. Fertility defines the ability of the female to become

pregnant and produce a living calf. Fertility is one of the most efficient measures of reproduction, being influenced by genes and environment but negatively related with milk yield and milk quality. The unfavorable negative genetic correlation mostly indicates that selection of dairy animals for higher milk yield and quality would lead to poorer fertility. Globally, it is reported that under artificial insemination programme, dairy bulls selected for milk yield only, increases more genetic gain in milk yield but accompanied with a severe decline in reproductive performance. Fertility is usually assessed through conception rate, pregnancy rate, service period (interval between calving to date of successful service) or the calving interval (interval between two calving).

It is reported that in countries that used American Holsteins animals extensively, the use of breeding bulls, selected mainly for increased milk production without giving importance to reproductive traits, has led to a significant decline in reproduction performance. The level of fertility has been very low indicating a major problem for milk production management. The impact of increased milk production also reflected in reducing the duration of length of estrus, a key parameter for successful artificial insemination.

The dairy stakeholders in India always demand more milk from defined indigenous dairy breeds but are not much aware about its negative impact on fertility. As a result, good indigenous dairy breeds like Sahiwal, Gir, Kankrej, Rathi, Tharparkar, Red Sindhi are more prone to becoming infertile naturally after four or fifth lactation. We observe that people define such condition mostly as repeat breeders, despite taking care of all interventions related to breeding management. The result leads to unsustainability of indigenous dairy breeds in India.

Sustainable Goal for Dairy Development:

The economics of any dairy cattle herd is influenced by the production, reproduction and health status of the livestock. Lifetime performance and longevity of breeds is a highly desirable characteristic that immensely



Red Sindhi

influences the overall profitability of a dairy animal. It has been observed that genetic improvement for higher milk production decreases the reproduction performance and dairy animals are often associated with increased susceptibility to mastitis and other milk related metabolic diseases. The increased disease incidence that accompanies genetic improvement for milk yield is therefore increasing the cost of milk production. To make dairying a successful and profitable business, the indigenous breeds should not only be high producing, but also sound in reproduction and healthy. The time has come to take urgent measures for the multiplication and development of indigenous breeds in more sustainable manner.



Gir-Cow

The strategy for sustaining milk production and reproductive performance in high-producing indigenous dairy breeds will be unique as besides selection for milk production, the other traits are to be improved. Thus, there is a need to develop short, medium and long-term strategies for sustaining the performance in high-producing indigenous dairy cattle breeds in the country.

Short-Term Strategies:

- (i) **Manipulation of Ovulation:** Manipulation of ovulation is a good short-term strategy as it is quick and needs hormonal manipulation. This strategy is adoptable in different breeds and for that, skill and infrastructure are to be improved. The Ministry of Agriculture and Farmers Welfare, Government of India has taken initiative to implement Multiple Ovulation and Embryo Transfer on a large scale for multiplication of superior germplasm of different indigenous dairy breeds in the country.
- (ii) **Management of Dry Period:** The dry period is the interval between the date of drying of animal in a particular lactation to the next date of calving. Shortening the dry period may be considered as another short-term strategy for quickly enhancing fertility in dairy animals. However, the adoption of this strategy may lead to negative effects on udder health and total milk yield of animal in next lactation.

Medium-Term Strategies:

- (i) **High-fertility Bulls in A.I. programme:** The use of quality semen of breeding bulls under A.I. programme is the medium strategy. The strategy is easy however; it demands to incorporate fertility traits along with higher milk production in order to select dairy bulls for breeding programme. Many countries have incorporated fertility trait like Pregnancy Rate (PR) for genetic evaluation of their male and female animals. Pregnancy rate is defined as the percentage of non pregnant cows that become pregnant during each estrous cycle. The higher pregnancy rates will reduce the usage of frozen semen.
- (ii) **Grading up of Non-descript Indigenous Dairy Cattle:** The adoption of grading up for genetic improvement of low producing non-descript indigenous dairy cattle using quality semen of descript indigenous dairy breeds should be a very good medium-strategy for balancing milk production and fertility.

Long-Term Strategies: Future Prospects

- (i) **Assigning Appropriate Weightage to Traits**
This should be one of the important long-term strategies for the existing genetic evaluation programme of indigenous dairy breeds in the country. The breeding goal should be reoriented assigning the relative weightage/importance for milk production, reproduction, longevity and health for the selection of high producing animals and breeding bulls of indigenous dairy

breeds. The rationale behind the strategy is that despite the low heritability of fertility and health traits, there is yet a significant genetic variation and thus, a chance to balance the genetic gain for production and reproduction. Several countries in the world, of late, have adopted and developed their national genetic evaluation assigning the relative importance for production, reproduction and longevity and health. This long-term strategy has proven very much successful in dairy development of the Nordic countries.

- (ii) **Genetic Selection Strategy:** Over the past decades, several genetic markers for milk production, milk quality, health and fertility traits have been identified. Genomic selection strategy should be developed and standardized using identified genetic markers for production, health and fertility traits, so that conventional long duration breeding programme like progeny testing, be gradually replaced for selection of high genetic merit young dairy animals particularly young breeding bulls (which do not have any phenotypic records). The strategy will help to reduce substantially the cost of selection of animals for breeding and ensuring sustained milk production and fertility of dairy animals in India. The Ministry of Agriculture and Farmers Welfare, Government of India has taken initiative to develop the genetic selection strategy for the selection of indigenous dairy breeds for higher milk productivity and other performance traits in sustainable manner.

Conclusion:

Indigenous dairy cattle are more sustainable in comparison to crossbred cattle as Indigenous cattle are known for more heat tolerance, resistant to many diseases, low maintenance cost and higher feed conversion efficiency. Of late, the indigenous cattle are also getting importance due to presence of A2 allele in milk. It is required to improve the potential of our indigenous cattle in sustainable manner. Analysis of trend of milk production shows that India, for many years, is the largest producer of milk in the world. The country has also laid down the projected demand of milk production about 240 million tonnes by 2025. As the demand for milk and milk products increased, the breeding policy and programme have focused globally for the genetic improvement of dairy animals for milk yield and milk quality and particularly for milk yield in India. The continuous selection pressure under breeding programme in most of the countries including India was applied for increasing the milk yield only which leads to the deterioration of reproductive performance of high producing dairy animals due to the negative genetic associations between milk yield with fertility, mastitis and other diseases. The dairy stakeholders in India always demand more milk from defined indigenous dairy breeds but are not much aware about its negative impact on fertility.

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Two New National Kamdhenu Breeding Centres set up

Government is undertaking establishment of two National Kamdhenu Breeding Centres in the Country at Itarsi, Hoshangabad in Madhya Pradesh in Northern region of India, for which an amount of Rs.25 Crore has been released. Another one will be set up in the Southern region of India at Chintala devi, Nellore in Andhra Pradesh Under Rashtriya Gokul Mission with a sum of Rs 25 crore.

Kurukshetra

FORTHCOMING ISSUE

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: Food Security

ENHANCING MILK PRODUCTIVITY & QUALITY IN INDIA

Dr Amrit Patel

To become globally competitive, India will need to create an efficient supply chain network through significant investment in infrastructure and human resources. R&D efforts need to be intensified for sustaining the cost of production, increasing milk yield per animal and its quality, fodder productivity and risk mitigation. This requires developing innovative farming models and motivating a large number of small milk producers to adopt them.

Milk is a lacteal secretion obtained by complete milking of one or more healthy milch animals. For a healthy diet, milk is important as it provides all the beneficial health nutrients like carbohydrates, proteins, fats, minerals, enzymes and vitamins required for the human body. India observed 16th World Milk Day on June 1, 2016, third National Milk Day on November 26, 2016 and a decade of the integrated food law [Food Safety and Standards Act 2006]. The observance should be relevant to substantially improve milk yield per animal and its quality and wholesomeness. India as the leading global milk producer needs to ensure the availability of clean, pure and nutritious milk to all citizens, attractive returns to milk producers and an efficient and well-functioning dairy chain, be it in matters of production, processing or marketing.

India needs to create significant awareness among all stakeholders to increase the production of milk & milk products to address country's nutritional security and livelihood of 80 to 90 million farm families. The need is to double the milk yield per animal and significantly improve the milk quality to conform to international standards. The dairy farming should become economically viable and financially bankable for small and marginal farmers [S&MFs] including agricultural labourers and internationally competitive.

Milk Output:

India has the largest cattle population of 191 million in the world. Milk production was just 17 million ton [MT] in 1950 with annual growth rate

of only 1.2 per cent during 1950s and 1960s, which increased to 4.3 per cent, propelling India to be the largest milk producer in the world since 1998. A national milk grid is established where annually, over 13 million tons of milk is procured. In 2015-16, milk output is estimated to have increased to 160.35 MT and procurement of 42.162 million Kg per day.

India is also one of the largest consumers of milk and milk products in the world and the industry size is estimated at Rs.430 billion. During three decades (1982 to 2012), average milk yield of cattle and buffalo per day has grown from 1.9 kg to 3.9 kg and 3.7kg to 6.2 kg respectively. Although, the milk yield of cross bred cattle is 7.10 kg/day, it is also significantly lower than that in UK [25.6], USA [32.8] & Israel [36.6]. This can be attributed largely to factors, viz. (i) quite a large number of S&MFs, rural women and landless actively pursuing dairy farming have inadequate resources, technical know-how and low level of capability to manage cattle efficiently (ii) both



Milk output [Million Ton] and Procurement [Million Kg/day] during 2008-09 to 2015-16

Year	Output	Procurement	Year	Output	Procurement
2008-09	112.18	25.156	2013-14	137.69	34.102
2009-10	116.43	25.864	2014-15	146.31	37.834
2010-11	121.85	26.202	2015-16	160.35	42.162
2011-12	127.90	28.706	% increase	42.94	67.60
2012-13	132.43	33.507	CAGR %	5.24	7.66

(Source: Express India dated 15-07-2016, harishdamodran@expressindia.com)

intrinsic (low genetic potential) and extrinsic (poor nutrition/feed management, inferior farm management practices, inadequate veterinary and extension services and inefficient implementation of breed improvement programs) (iii) inadequate investment & efforts in arresting the declining key natural grazing resources in particular.

Milk consumption is growing at around 6 per cent annually against 4 per cent rate of production. The per capita milk availability has increased from 120 gm/day in 1960 to 307 grams in 2013-14 and further to 359 grams in 2014-15. The National Dairy Development Board has projected the demand for milk at 200 MT by 2021-22. Government has invested Rs.22.42 billion to help meet a national demand of 150 million tons of milk by 2016-17.

National Dairy Plan:

On 19th April 2012, the NDDDB launched a 15-year perspective National Dairy Plan [NDP] envisaging an outlay of Rs.173 billion which aims at increasing the productivity of milch animals by adopting focused scientific and systematic processes and help rural milk producers greater access to the organized milk processing sector. It will cover about 1.2 million milk producers in 23,800 villages and aims at increasing milk procurement by cooperatives from current level of 30 per cent to 65 per cent in next 15 years. The NDDDB will implement through its end Implementing Agencies located in each of the 14 major milk producing States.

Strategic Action Plan:

To become globally competitive, India will need to create an efficient supply chain network through significant investment in infrastructure and human

resources. R&D efforts need to be intensified for sustaining the cost of production, increasing milk yield per animal and its quality, fodder productivity and risk mitigation. This requires developing innovative farming models and motivating a large number of small milk producers to adopt them. Linking the production system to the consumer demand and processing units requires a robust value chain, wide research and technology introduction. Strategic action plan should, therefore, focus on following aspects:

Equal Status: Dairy farming now deserves to be given equal status on par with agriculture, rather than its subsidiary status, in view of its share in agricultural GDP and employment. Village-level milk producing units should be brought in the organized sector and promoted in a systematic manner to convert existing individual sustenance dairy farms and traditional family farms into collective, community and commercial farms operating as business farms. This needs training and capacity building of dairy farmers [human resources] with focus on business-like operations, financial and marketing management.

Data Base: India should develop a system to compete with developed countries where every milch animal is tagged with a number and every drop of milk processed, value added, marketed and instantly recorded.

Safety Standards: The share of the supply or production should conform to the domestic, if not global food safety standards to check adulteration, lack of awareness and rigorous enforcement of Food Safety Standards and inadequate infrastructure comprising technology and trained manpower.

Milk Production Environment: The FSSAI has now launched a fresh nationwide Milk Surveillance in 2016 covering 29 States and eight Union Territories. This may be one of the key reasons for India's 0.4 per cent share in global export despite India accounts for 17 per cent of the global milk output. To tackle the situation, purchasing of electronic milk-testing machines, electronic weighing systems as well as chilling and transportation equipment is needed. If this is accomplished, the quality of milk collected directly from farmers will be better, unadulterated and relatively cheaper. The environment under which the milk is produced, collected, transported, processed and distributed should be fully conducive and that animal raising practices related to sanitation, quality of drinking water, feed and fodder, type the quality of pipelines etc. must ensure healthy milk. Farmers need to be trained/ guided to display high degree of hygiene and know-how of animal health care and nutrition.

Organized Sector: The organized dairy sector [comprising cooperatives and private sector] will have to progressively and systematically plan to expand their coverage of milk producers, penetrate into interior villages and improve their current share of marketable surplus from 30 per cent to 65 per cent by 2021-22. This would, in turn, make, available larger volumes of good quality milk at competitive prices to consumers.

Strength of Cooperatives: For 900 million people residing in 6,40,867 villages in India, dairying is not only just a large economic activity, but also an integral part of India's social and cultural heritage. Its uniqueness lies in its unifying power as no other industry touches lives of millions of farmers of which 70 per cent are landless. Dairy cooperatives as the peoples' institutions are the result of dairy farmers' entrepreneurship to exploit the potential of dairy markets in India. The need is to nurture dairy entrepreneurs through effective training of rural youths at the village level coupled with dedicated leadership and professional management of farmers' institutions/organizations.

Cross-Breeding: History records that a crossbred cow Jill (a combination of Irish bull and Haryana cow) gave 65 litres of milk per day in 1927 at National Dairy Research Institute, Bengaluru. This shows the extent of milk yield potential that

can be harnessed through scientific cross-breeding techniques. Cross breeding has been one of the most promising options, but not the only one. A more realistic approach can be to undertake systematic breeding and genetic upgradation of India's finest indigenous cattle, viz. Sahiwal, Red Sindhi, Gir, Kankrej and Rathi which are, in fact, good milk producers. An organised effort to conserve and propagate elite germplasm from nucleus breeding herds will facilitate poor farmers to rear *desi* cattle more economically.



Artificial Insemination: At present, there are 51 semen stations in India with a production capacity of 81 million doses /year against the current demand of 100 million doses for bovine semen and 150 million doses in the next few years. Most of the semen stations cater to the demand for buffalo semen and germplasm of exotic and cross bred cattle. The country needs to increase trained manpower including veterinary personnel to provide quick services, provide quality equipment and appropriate training .

Feed Management: Application of technology to produce large scale feed blocks, feed enzymes and other innovative feed resources, needs to be deployed. Effective implementation of the Ration Balancing Programme of NDDB and Accelerated Fodder Development Programme of the Government can ensure better feed availability and improved nutrition.

Veterinary Services: An authentic, updated database for diseases is required for identification, onward prevention and control. Infrastructure of vaccine and diagnostic production units, semen stations and breeding farms that are largely owned by the government can take help from private sector.

Market Access: Dairy industry's potential for inclusive/equitable growth and income distribution in villages can be harnessed by enhancing market access and offering stable and remunerative prices to farmers. Integrating dairying and crop farming

with value chain system can be a better source of sustainable livelihood of rural poor and most vulnerable families.

Export: India contributes about 17 per cent of the global milk output but its share in global export is insignificant at 0.4 per cent. A large quantity of milk still remains unprocessed. India is surrounded by countries and regions that are milk-deficient viz. Bangladesh, China, Singapore, Thailand, Malaysia, Philippines, Japan, the UAE, Oman and other gulf countries all of which, are located close to India. India, therefore, needs to have a systematic research and feasibility studies under Public-Private-Partnership mode to explore these hitherto unexploited international markets and initiate specific policy and programs on lines of Agricultural Products Export Development Authority in consultation with Union Commerce Ministry, Indian Institute of Foreign Trade and Indian embassies in these countries. Rich experience of the Gujarat Cooperative Milk Marketing Federation can be fruitfully utilized in the area of export of milk and milk products.

Best Practices: Resourceful farmers in India can be motivated and incentivized to learn best and successful practices being followed in other countries. For example, Super Cows in Israel produce 12,000 litres milk a year because of superior breeding techniques, balanced nutrition, and management practices including better health care.

Surplus Milk Production in Developed Countries: Liberal subsidies, accompanied by

application of science and technology, have been instrumental to make the few resourceful farmers in developed countries capable to produce surplus milk. For the first time, the ministerial conference of the WTO in December 2015 in Nairobi had legally bound the member countries to remove subsidies and promote free trade in farm produce. Withdrawal of subsidy obviously would limit the surplus milk production and arrest the fall in international prices.

Not only the surplus milk production in the EU the US, New Zealand and Australia have already caused decrease in milk prices but under the provision of Free Trade Agreement [FTA], these major nations producing surplus milk will exert sufficient pressure to allow them duty-free exports of their products to India. If this happens, it would be unfavorable to the interest of 80 to 90 million families to sustain their livelihoods, leave alone making a decent living. World Trade Organization, on one hand has opened up the opportunities in international trade by increased market access and worldwide reduction in import tariffs. However, in practice, these are being used as potent tools by developed countries to not only obstruct entry of dairy and other agricultural products from developing countries, but also distort the free and fair operation in the international markets.

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National Milk Day celebrated on the birth anniversary of Dr. Verghese Kurien, the Father of White Revolution

National Milk Day was celebrated in India on the birth anniversary of Dr. Verghese Kurien, the Father of White Revolution. Dr. Kurien's contribution in organizing the dairy farmers in the form of cooperatives is very well known. The Union Minister for Agriculture stated that, the milk production has recorded a growth rate of 6.28 per cent during last two years 2014-15 and 2015-16, which is much higher than the growth rate of around 4 per cent in the previous years. Also, the per capita availability of milk increased from 307 gram per day in 2013-14 to 340 grams per day in 2015-16, a growth of 5%. India is world leader in milk production since last 15 year and credit of making India as world leader in milk production goes to small producers. Still, a lot of work is to be done in the sector in order to make available sufficient nutrition and milk to every child in the country. To meet the ever growing demand of milk and to make milk production more remunerative to the farmers, Government has also initiated new scheme National Mission on Bovine Productivity with an allocation of Rs 825.00 crores.



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ANIMAL HUSBANDRY: SCOPE AND CHALLENGES FOR ENTREPRENEURSHIP

Dr. T.P. Sethumadhavan

The need of the hour is increase in production, productivity and improvement in the marketing channel. In the case of failure in agriculture, livestock sector forms the source of income and gives insurance to any intervals of agriculture failure. With regard to production and consumption of milk, it is a golden era in the dairy sector.

Animal husbandry sector is emerging as one of the important farming areas which can create more employment and address food security issues in the country. Govt of India during the Budget 2016-17 announced that farmer's income will be doubled by 2022. Growth in Agriculture allied sector especially Dairying and Poultry production in India during the last 10 years had increased from 4-12 per cent. Of the total income Indians spend 40 per cent of daily income for food. Gross capital formation is high in livestock and fisheries sector. There is a huge opportunity for Entrepreneurship in livestock sector within the high value agriculture. In order to prevent protein malnutrition, there are opportunities for animal protein sources production in the Country. Livestock sector can facilitate livelihood, employment, entrepreneurship and protein security in the State. Livestock sector plays an important role in rural livelihood, employment and income generation. Major livestock products like milk and milk products, meat and eggs contribute around one-sixth of the calories and one-third of the proteins in the per capita food supplies of the world.

Livestock for Livelihood:

Animal husbandry is the second largest economic activity of rural India. In Arid and semi arid regions, livestock sector ranks first in earnings to skilled, semi skilled and unskilled populations. Animal husbandry is a growth engine and annual growth rate in dairying is 5 per cent and in poultry, it is 10 per cent and will alleviate rural poverty and uplift the rural farmers. **If the country has to sustain economically, livestock sector has to be strengthened.** The availability of per capita animal protein in the country is 10.8g whereas the requirement as per world average is 25g. National sample survey reports that 70-75 per cent of their food budget is for milk and milk products. The need of the hour is increase in production, productivity and improvement in the marketing channel. In the case of failure in agriculture, livestock sector forms the source of income and gives insurance to any intervals of agriculture failure. With regard to production and consumption of milk, it is a golden era in the dairy sector. Organized sector grows



more than 10 per cent per annum. Milk production is increasing in Asia and India and increasing prices are favourable to developing countries. International Farm Comparison Network (IFCN), Germany reported that India has lowest cost of milk production when compared to developed countries.

Productivity and Quality:

According to recent reports, 70 per cent of Indian cows and 60 per cent buffaloes have very low productivity. Average milk yield from local cows is about 3 to 3.5 litres, of buffalo 3.96 to 5.39 litres and of cross bred cow between 5.82 to 7.80 litres per day which is significantly lower than the productivity in developed countries. According to the Economic Survey, productivity in agriculture sector is far below global standards; India has around 300 million numbers of cows and buffalos in dairy production and is the global leader in milk production: about 135 million tonnes a year. But productivity per cattle is comparatively less. The best run farms in the world produce 1.6 kg of milk for every kg of feed, in India it's less than a kg. Scientific breeding, feeding and management practices along with quality inputs and extension support services are required for achieving better productivity. There exists a wide deficit in the supply of feeds and fodders countrywide. Strategic programmes are required for reaching out among small holder population for facilitating technology transfer and extension support.

Demand-Supply Mismatch:

Among various livestock products, there exists a huge gap between production and consumption. While buffalo meat is the major item of Indian meat export, accounting for 59 per cent, share of Indian meat in the world market is less than two per cent. Linking quality production of livestock products with lucrative incentives and popularization of traditional products technology can facilitate quantum jump in this industry. Since meat sector provides livelihood to 40 million people, most meats sold in the domestic market needs proper sanitary inspection by the veterinarians. This sector need total restructuring according to Food Safety and Standards Act 2006 to provide quality meat and meat products to the consumers. Divisibility, value addition and export of meat and meat products need to be strengthened for generating more employment as well as trade benefits. With improved domestic production and

marketing efficiency, better access to expanding global market, India has the potential to become more competitive in the export of milk and milk products. Indigenous milk products have great potential which are becoming more popular with the ethnic population spread all over the world. Indian dairy industry needs appropriate production, marketing, trade policy and its periodic revival to keep the pace with the rest of the world and remain competitive to grab opportunities through international trade.

Market Centred Production:

In majority of livestock production enterprises, emphasis was given to production aspects like Scientific breeding, feeding, management and disease control but the marketing of the livestock products were not given due attention. When the issue of sustainability in the production of livestock enterprise arises, the marketing cannot be treated as a separate entity which is an integral component of the production activity. Livestock products, with the exception of around 18 per cent of the milk, produced are mainly marketed through unorganized sector which results in non-remunerative price to the producer and unreasonably cost to the consumer. In order to explore the rural market for livestock products, production strategy must be oriented towards marketing of the produce. It should be regulated with local, regional and international market while producing the commodity. Production of traditional livestock products, which fetches good price, should be promoted by exhibiting its inherent strengths and proper branding strategies. Changes in the extension approaches, market forecasting system, value addition, awareness on diseases affecting trade of livestock products, changes in the consumer behaviour, production of livestock products based on the demographic characteristics of the population, good manufacturing and retail practices, best production practices and implementation of



food safety norms, branding, etc needs to be given more importance. Hence addition of value to the livestock products should be based on consumer needs, taste and preferences like fat free milk for cardiac patients, chocolates for children, quality cheese while considering for international market, etc.

Challenges:

Increasing density of population, small and fragmented land, increasing cost of production, decreasing productivity, monsoon and climatic issues, lack of mechanization, poor use of online marketing and e-platform for livestock products are some of the challenges existing in this sector. Other challenges include land and soil degradation, inefficient use of water, availability of quality inputs, stagnation in productivity, slow diversification process, inadequate R&D and integration, inadequate extension, non adoption of special methods, regional imbalances, huge investments, poor co-ordination among stakeholders and institutions, remunerative price for farm produce, critical gap between pre and post harvest infrastructure, post harvest losses, natural disasters, vagaries of monsoon and drought, low insurance coverage, supply demand mismatch of livestock products, inadequate small industries and farm oriented agro and food processing industries and weak linkage between appropriate stakeholders and institutions.

Innovation Incubation:

There are systems in which Irrigation, dispersion of nutrients and fertilizers are being done by drones which are emerging as third dimension mode of transportation. Improving productivity, quality of crops and value addition of agriculture produce would boost farm incomes and promote agribusiness industries which can provide gainful employment to rural youth. Innovative technologies will help to improve farm productivity. Today youth is emerging as job creators rather than job seekers. In India services sector supersedes all other sectors. Now there are no services available in India without ICT or online commerce market in India is expected to double to 34 billion US dollars by 2020.

Skill Development and Value Addition:

There are huge prospects for organic and safe to eat products in Agriculture, Dairying, livestock and allied sectors. Recently, consumers realised the

deleterious effects of foods with excess antibiotics and pesticides. It has been projected to double the income of farmers by 2022 which will facilitate technologies. Irrigation, soil health and water conservation were given due coverage in the recent budget. Organic farming has been identified as one of the key areas for sustainable agriculture. Value addition, connectivity to market and e commerce are some of the recommendations in the budget which facilitates market led production. 100 per cent foreign direct investment has been allowed in e commerce and food processing sector.

Extension and Entrepreneurship:

Comprehensive Extension and Entrepreneurship development programmes are required to tackle the critical production and skill gap in livestock sector in the country. Veterinary Extension and advisory services are transitioning from a focus on technology transfer to a focus on facilitating a range of interventions in complex contexts. It is a connecting link in complex agricultural innovation systems. Entrepreneurship, innovation, skill development and capacity building are emerging as potential areas of focus in Veterinary extension. At a time when the growth in services sector supersedes primary and secondary sectors veterinary services sector requires more attention. Obviously promotion of appropriate extension can facilitate 40 per cent increase in production. Knowledge can be considered as production. Percolating appropriate knowledge among the potential stake holders is the need of the hour. The entire alternate extension paradigm like print and electronic media, information and communication technologies, social media and mobile connectivity can be very effectively used for this purpose. It has been projected that by 2020 number of internet users will reach 70 Crores in India. Of which 75 per cent may be from rural areas. So appropriate knowledge transfer through mobile, social, cloud and analytics platforms will facilitate production.

The need of the hour is to improve production, productivity and to reduce cost of production with the use of appropriate technologies. Linkage of different sectors and institutions must be given adequate importance. At a time market centred production is acquiring momentum across the country value addition, e marketing, food safety, good production practices, GAP and good retail practices and export play a key role in increasing the profitability through farming. Cost reduction,

extension, market intervention, value chain system infrastructure and R&D are the pre requisites for making livestock production system sustainable. **Reduced cost of production, increase income and to reduce risk created resilience are the three mantras for promotion of livestock sector in the State.**

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Three Books on Rashtrapati Bhavan Released

Three books on Rashtrapati Bhavan 'Life at Rashtrapati Bhavan'; 'Indradhanush – Volume II' and 'Rashtrapati Bhavan: From Raj to Swaraj' were released at a function held at Rashtrapati Bhavan on December 11, 2016 by the President of India, Shri Pranab Mukherjee, Vice President of India, and the Prime Minister, respectively. All these three books have been published by Publications Division of the Ministry of Information and Broadcasting, Govt. of India.



The book 'Rashtrapati Bhavan: From Raj to Swaraj' is a book for children which recreates the story of Rashtrapati Bhavan from its inception as Government House, a symbol of imperial might, to the present day.

The book 'Life at Rashtrapati Bhavan' is an attempt to record the human history of the residents living in the President's Estate. This documents the period under the colonial state right up to the current presidency and brings in the perspectives of past and present residents of the estate, the permanent staff of the household and secretariat, as well as the officials who have served under different presidencies.

The book 'Indradhanush Volume-II' is a compendium of music, dance, theatre and cinematic presentations organized at Rashtrapati Bhavan from mid 2014 to September 2016.



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ANIMAL HUSBANDRY: AN ECONOMIC ASSESSMENT

Dr. K. Baby

The livestock sector is an important source of foreign exchange too and is performing well in the manner of production, value addition and export of dairy, fishery, wool, poultry and other products. These sectors also play a significant role in supplementing family incomes and generating gainful employment in the rural sector, particularly, among the landless laborers, small and marginal farmers and women, besides providing cheap nutritional food to millions of people. Livestock are the best insurance against the disasters of nature like drought, famine and other natural calamities.

Animal Husbandry sector plays a significant role in the welfare of India's rural population as it employs a major section of the country's labour force and also provides a large share of draft power being used to cultivate crop land. India's livestock sector is one of the largest in the world with a holding of 11.6 per cent of world livestock population. Contribution of livestock and fisheries sectors to the national economy in terms of Gross Domestic Product (GDP) is 4.1 and 0.8 per cent, respectively. Agriculture and allied sector contributed about 15.1 per cent to the total GDP. Out of the total agricultural GDP, livestock sector contribute about 27.25 per cent during 2014-15 (GOI, 2014). The livestock sector is an important source of foreign exchange too and is performing well in the manner of production, value addition and export of dairy, fishery, wool, poultry and other products. These sectors also play a significant role in supplementing family incomes and generating gainful employment in the rural sector, particularly, among the landless laborers, small and marginal farmers and women, besides providing cheap nutritional food to millions of people. Livestock are the best insurance against the disasters of nature like drought, famine and other natural calamities.

Livestock Economy:

Livestock plays an important role in Indian economy. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16 per cent to the income of small farm households as against an average of 14 per cent for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8 per cent of the population in India (GOI, 2014). India has vast livestock resources. India is

- ❖ First in the total buffalo population in the world.
- ❖ Second in the population of cattle and goats.
- ❖ Third in the population of sheep (72 millions).
- ❖ Fifth in the population of ducks and chicken.
- ❖ Tenth in camel population in the world.

Animal Husbandry : Economic Aspects

Humans depend upon animals for food and associated by-products, work and a variety of other uses. Animal Husbandry, Dairying and Fisheries sectors greatly contribute in the national economy and in the socio-economic development of the country. These sectors also support in enhancing



Dimensions of Animal Husbandry

family incomes and generating profitable occupation in the rural sector, mainly, among the landless laborers, small and marginal farmers and women, besides providing cheap nutritional food to millions of people.

Livestock Uses

Commodity	Food	By-products and other Uses
Dairy	Fluid and dried milk, butter, cheese and curd, casein, evaporated milk, cream, yoghurt and other fermented milk, ice cream	Male calves and old cows sold into the cattle commodity market, milk as an industrial feedstock of carbohydrates proteins and fats.
Cattle, buffalo, sheep	Meat, edible tallow	Hides and skins bone meal, religious objects, pet food, tallow and grease fat, blood meal
Poultry	Meat, eggs, duck eggs (in India)	Feathers and down, manure, leather, fat, offal, flightless bird oil (carrier for dermal path pharmaceuticals), weed control
Pig	Meat	Hides and skins, hair, lard, manure, offal
Fish (aquaculture)	Meat	Fishmeal oil, shell, aquarium pets
Horse, other equines	Meat, blood, milk	Recreation (riding, racing), work (riding, traction), glue, dog feed, hair
Micro-livestock (rabbit, guinea pig), dog, cat	Meat	Pets, furs and skins, guard dogs, seeing eye dogs, hunting dogs, experimentation, sheep herding, rodent control
Bulls		Recreation (bull fighting, rodeo riding), semen
Insects and other invertebrates (e.g. vermiculture, apiculture)	Honey, 500 species (grubs, grasshoppers, ants, crickets, termites, locusts, beetle larvae, wasps, and bees, moth caterpillars)	Beeswax, silk, predatory insects

(Source: DeFoliart 1992)

Poverty and Livestock Management:

Livestock area supports 25 per cent of gross value added in the agriculture sector. It provides self-employment to millions of people. Fast growth of this sector can be even more democratic and comprehensive than growth of the crop sector because those engaged in it are mainly small holders and the landless. Livestock products comprised 32 per cent of the total value of agriculture and allied activities in 2014-15. From equity and livelihood standpoints, livestock rearing must be central to the poverty lessening programmes. It has been seen that livestock provide essential food products, draught power, manure, employment, household income and export incomes. Thus, when assessing the inclusive growth, it should be considered that from equity and livelihood perspectives, livestock rearing is significant in poverty alleviation programmes.

Empowerment of Women:

There are two other important aspects. Firstly, livestock rearing at the household level is mainly a women-led activity, and therefore, income from livestock rearing and decisions related to management of livestock within the household are principally taken by women. Support for livestock rearing has contributed significantly to the empowerment of women and an increasing role in decision making at both the household and village level.

A global analysis of the livestock sector by the U.N. Food and Agriculture Organisation (FAO) was done recently and it showed that there are three overarching messages with reference to India:

1. Food Security and Poverty Reduction:

First, although livestock products make important contributions to food security and poverty reduction for many low-income rural families, the policy and institutional framework in many countries has been unsuccessful to serve the needs of these poorest households and include them in development.

2. Natural Resource Degradation:

Second, livestock producers, including traditional pastoralists and smallholders, are both victims of natural resource degradation and contributors

Production of Livestock in India: 2013-14

Sl. No.	Product	Quantity	Ranking in the world production
01	Milk in Million Tonnes	137.7	First
02	Eggs in Billions (Nos)	74.75	Third
03	Meat Million Tonnes	8.89	NA
04	Wool in Million Kgs.	47.9	NA
05	Fish in Lakh Tonnes	95.79	Second

Source: Annual Report 2014-15, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture and Farmers Welfare, Govt. of India.

to it. Remedial action most likely lies in a mix of public goods related to environmental protection, ecosystem services and through incentives for private investment to improve animal productivity, particularly in remote regions.

3. Human Health Risks:

Third, animal health services not only combat animal diseases that cause mortality and reduce animal productivity, they also shield human health because of the risk of animal to human disease transmission. Animal health systems have been ignored in various sections of the world and this has led to institutional flaws that in turn, lead to poor delivery of animal health services and higher risks to livelihoods and human health.

Environmental Impact:

Animal agriculture is responsible for 20-33 per cent of all fresh water consumption in the world today. Livestock or livestock feed occupies 1/3 of the earth's ice-free land. Animal agriculture is the leading cause of species extinction, ocean dead zones, water pollution, and habitat destruction. Animal agriculture contributes to species extinction in many ways. In addition to the monumental habitat destruction caused by clearing forests and converting land to grow feed crops and for animal grazing, predators and "competition" species are frequently targeted and hunted because of a perceived threat to livestock profits.

Climate Change:

Due to significant contribution of agriculture to

the emissions of non-CO₂ greenhouse gases, such as methane and nitrous oxide, the relationship between humans and livestock is being analyzed for its potential to help mitigate climate change. Strategies for the mitigation include optimizing the use of



gas produced from manure for energy production (biogas). Livestock and their by products account for at least 32,000 million tons of carbon dioxide (CO₂) per year, or 51 per cent of all worldwide greenhouse gas emissions. Livestock is responsible for 65 per cent of all human-related emissions of nitrous oxide – a greenhouse gas with 296 times the global warming potential of carbon dioxide, and which stays in the atmosphere for 150 years.

National Livestock Mission:

The National Livestock Mission (NLM) was started in 2014-15 to cover all the activities required to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders. The Mission targets improvement of livestock productivity and support projects and initiatives required for that purpose subject.

Conclusion:

Indian livestock industry makes up for a significant amount of world's livestock resources. Both the national economy as well as socio-economic growth of country is backed by the livestock sector. Besides offering great potential and outstanding contribution in agricultural sector over the past years, livestock sector is performing well in the manner of production, value addition and export of dairy, fishery, wool, poultry and other products. Apart from its performance, there are some threats like social taboo, unorganized livestock market etc. But we need to correct it and take the global market opportunities.

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284 TOILETS BUILT IN 48 HOURS IN SALONIPALLY VILLAGE

To mark World Toilet Day, on November 19th, the district administration of Mahabubnagar district in Telangana decided to ensure access to sanitation facilities for all residents of the very backward Salonipally village. The village which is home to 386 households, had just 52 toilets, a mere 7.4 per cent toilet coverage.

“We realized we had to create awareness about good sanitation practices in a big way. Setting a target to build the required number of toilets in 48 hours seemed a good idea,” said District Collector (DC), Ronald Rose.

Convincing so many people to build toilets was a challenge in itself. However, with careful planning, awareness building exercises and interpersonal communications, the community was persuaded. Ten days prior to the launch of the campaign, the DC met with district and block officers as well as tahsildars and chalked out an action plan. Thereafter, accompanied by the local MLA and public figures, the team went from village to village motivating and building awareness among villagers including school children of the benefits of good sanitation practices. Mass pledges were taken and intensive CLTS training and related activities were carried out. Further, during the 10-day preparation period, they organized the supply chain and finalized the rate for material from wholesalers.

In addition, they involved the whole community, ensuring they committed to the plan. Their support was enlisted to help with carrying material, digging of pits and fixing fittings. On their part, students convinced their parents and other elders.

All families decided to go for a 6X4 structure of a bath cum toilet with the help of the Rs 12,000 incentive provided by the government. Also, with the rate finalized for the whole district, any Sarpanch could call a supplier to order material and be assured of the same price.



Salonipally was divided into 26 sections, each assigned to a team comprising a district level officer, a tahsildar and a MPDO. Each team was given a target of constructing toilets for 16 households in 48 hours. Besides motivating people by visiting every home in their section, they marked the location of toilet and in certain cases, advised how to make room for the toilet. They also had to organize masons and supervise digging of pits and laying foundation by the people themselves, while the superstructure was done by trained masons.

Significantly, all people took a break from their regular work to support this campaign. In the end, about 5-6 households had only women folk, so they needed support from the administration. People from all these homes have been convinced to use toilets at others' homes, so that they can declare the village ODF on November 25, 2016.

“We are happy as also the entire village community,” the District Collector said. “We are keen to make Sallonipally a model ‘Open Defecation Free’ village, and to show the people that if the villagers, officials and the district administration work together, they can achieve any kind of development in no time.”



Narendra Modi
Prime Minister

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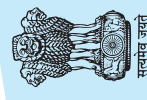
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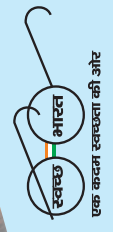
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POULTRY DEVELOPMENT INDUSTRY IN RURAL INDIA

Dr. S. Ganesan

As the Poultry Industry is among the fastest growing in the world, it needs greater integration, better cost-effectiveness and improvement in the distribution. More retail outlets, mass gathering and creating awareness home to home about the nutrient values of chicken and eggs Poultry industry in India needs good branding system in order to increase the consumption of chicken. The poultry companies have to encourage direct procurement of maize from the farmers by using contract farming, models that are currently use in oilseeds and wheat.

Poultry is one of the fastest growing segments of the agricultural sector in India today. India is now the world's third largest egg producer and the fifth largest producer of broilers. Broiler production in 2016 is around 42 million tons which is approx. 8 per cent more than last year. The demand for processed chicken meat is growing between 15 to 20 per cent per year. Egg production in 2016 is approximately 80 billion eggs, upto 5per cent more than last year. While the production of agricultural crops has been rising at a rate of 1.5 to 2 per cent per annum, eggs and broilers has been rising at a rate of 8 to 10 per cent per annum. The four southern states - Andhra Pradesh, Karnataka, Kerala and Tamil Nadu - account for about 45 per cent of the country's egg production, with a per capita consumption of 57 eggs and 0.5 kg of broiler meat. The eastern and central regions of India account for about 20 per cent of egg production, with a per capita consumption of 18 eggs and 0.13 kg of broiler meat.

Rise of Rural Backyard Poultry in India:

- Transformation from a Backyard Activity to a Major Commercial Activity.
- Good investments in breeding, hatching, rearing and processing.
- Rearing of descript hybrids such as is Hyaline, Shaver II, Babcock etc.
- More entry of private enterprise and increased scale of operation.
- Minimal government intervention.
- Considerable support from the complementary veterinary health, poultry feed, poultry equipment, and poultry processing sectors.
- Growing Production of Eggs and Broilers.
- Increase in manufacture of egg powder and frozen, processed broiler meat essentially to cater to export markets and markets in the metropolitan areas of India.



- Exports of poultry products from India comprise table eggs, meat, live birds and value-added products such as egg powder and frozen yolk.
- At least 80 per cent of employment in the poultry sector is generated directly, while 20 per cent is engaged in feed, pharmaceuticals, equipment and other services required by the poultry sector million people
- Source of cheap source of nutrition thereby healthy living.

Present Scenario:

Poultry is the most organised sector in animal agriculture, worth rupees one lakh crores. The growth is 6-8 per cent in layers and 10-12 per cent in broilers per year against the growth of agriculture as a whole which is around 2.5 per cent. Eggs and chicken are accepted by all communities and are available at the most reasonable prices. There is scope for enhancing the production. Production is getting more organized and moving ahead of consumption is resulting in optimum prices and with minimum profits. More than 100 million people are employed in this industry. It accounts about 3 per cent of the total GNP and 10 per cent of the total GNP attributed to livestock products. This sector is growing rapidly at the rate of 15 to 20 per cent and it is about Rs 65 billion-mega industry. It accounts for a turnover of more than Rs 95 billion at the retail level.

Present Consumption:

In the domestic market, the consumption of poultry meat has been low due to many reasons. The main reason is the low purchasing power of people. Only 25 per cent of the population living in urban areas consumes about 75-80 per cent of eggs and poultry meat. The per capita consumption of egg is 100 and poultry meat is 1.2 Kg per person per annum in urban areas. But in rural areas, it is only 15 eggs and 0.15 Kg poultry meat.

Different Sectors

1. Layer Industry:

- Large units with million birds and 100,000 birds in one house are coming up.

- 70 per cent of the layer birds were in the states of Andhra Pradesh, Tamil Nadu, Maharashtra & Karnataka in South and only Punjab in the North.
- More production units are coming up in Uttar Pradesh, West Bengal, Bihar and North-Eastern states to get fresh eggs at more reasonable costs saving time and money on transport.
- Social issues around the large farm units like manure handling, labour availability and environment pollution are putting a limit on expansions.

Table 1: Growth of the Layer Industry in 25 years

S.No	Parameter	1990	2015
1.	Layer birds (crore)	10	24
2.	Layer feed price (Rs)	12	22
3.	Egg price (Rs)	1.5	2.90
4.	Eggs per head/ year	20	68
5.	Eggs per hen	260	310
6.	Average layer farm size	20000	200000
7.	Separate brooding	10 per cent	80 per cent
8.	Feed automation	10 per cent	80 per cent
9.	Small eggs discount	Nil	Discounted
10.	Eggs cleaning & packing	No	Imp

2. Broiler Industry:

- The commercial broiler chicks ready in 60 days with tender meat started coming after 1975.
- The breeding operations started in Delhi and later shifted to South India. Movement of parent stock, hatching eggs, day-old chicks initiated the broiler growing everywhere.
- The broiler growing period has gradually come down to less than 40 days from 60 days due to huge technical work in the fields of genetics, nutrition, breeder management, hatchery management, housing and disease management.
- "All-in-All-out" rearing is giving excellent results. 2 kg broilers produced on 36 days with 1.5 kg

feed per kg chicken with less than 3 per cent mortality are being achieved on low- cost open houses reared by ordinary farmers.

Table 2: Growth of Broiler Industry in 25 Years

S.No	Parameters	1990	2015
1.	Broiler parents housed (cr)	0.7	3.5
2.	Broilers/month (crore)	5	25
3.	Broiler feed price (Rs/kg)	20	30
4.	Chick-en per head (kg)	0.4	2.5
5.	Broiler price/kg live (Rs)	25	65
6.	Broiler integration	0 per cent	60 per cent
7.	Broiler FCR	2.2	1.65
8.	Days to slaughter (2 kg)	48	38
9.	Multi-age group farms	90 per cent	10 per cent
10.	Chicken processing	1 per cent	7 per cent
	Antibiotics issue	Nil	50 per cent

Eggs and Chicken: Backyard Production

India has 60 per cent rural population depending on agriculture. Poultry has been there in the backyards of most of the houses since ages, forming a part of nutrition and family income so government has started encouraging the backyard poultry. Improved varieties “Low technology input birds” are bred for this purpose, which are genetically more efficient in production compared to “Native chicken.” The birds grow faster than native chicken reaching 1.5 kg weight in 45 days but can withstand variable feed qualities and also supplement themselves by scavenging.

The low technology input birds are mostly dual purpose. “Mother Units” are being encouraged to take care of the brooding & vaccination in the early part of growing (first four weeks) before they are distributed to ensures disease security. “Cluster farming” in rural areas is possible with

these chicken for enhancing the meat production on the lines of broiler farming in which group of 8 to 10 farmers or educated youth can form a cluster and grow the birds in groups of 500 to 1,000 birds in low-cost houses as “organic chicken” by making their own low-cost feeds without chemicals and antibiotics.

Strengths in Poultry Industry:

- Fresh, chilled chicken availability in every form from whole, cut-ups, de-boned or in processed, ready to cook, ready to eat form.
- More successes in end product distribution.
- Rationalized pricing of breeder and commercial stock.
- Live chicken sales at retail level will continue to thrive and succeed
- Feed Manufacturing mills have increased in number and quality.
- Feed raw materials will be purchased with ease.
- Better breeding of the birds leading to better stock performance.
- Superior, cleaner and hygienically-maintained live bird outlets to give good quality broilers.
- Emergence of competition in the breeder and commercial layer markets.
- Stabilisation in egg product exports
- Marketing of branded eggs would bring value addition and promote consumption Important role of integrators and corporates in promoting live and fresh chilled chicken sales at retail and institutional levels will give more strength to the industry.

Opportunities of Growth:

- Government policies relating to investments in poultry and related industries, taxation, import duties, excise duties are favourable.
- Increase in income generation in the rural poor and marginal farmers.
- Consumer awareness and acceptability of eggs and chicken as good source of protein and healthy food is increasing.

- The National Egg Coordination Committee has plans to raise the per capita consumption of eggs in India to 180 by 2015.
- The country has developed strong development network to provide necessary support by building CPDO's (Central Poultry Development Organization) in different regions of India
- The Indian Council of Agricultural Research is the nodal organization for agricultural research in the country is playing vital role. It undertakes research in its own institutes Central Avian Research Institute, Izatnagar and Project Directorate on Poultry Hyderabad and also in state agricultural universities through All India Coordinated Research Projects and Cess Fund Projects.
- Many countries, which are non-traditional poultry growers, are giving incentives to their poultry industry thus the global demand is increasing.
- Concept of organic chicken – as in India chicken is traditionally raised in backyards and is called "free range birds" is growing.
- Indian eggs are cheapest in the world market (50cents a Kg).



Challenges in Poultry Development:

- Poor infrastructure for export is hindering the export of poultry products.
- Competition from international players on opening up duty-free imports, lifting of trade barriers.
- Increasing propaganda and demonstrations by organizations on promoting vegetarianism and Animal rights.
- Occurrence of Salmonella and other diseases in poultry meat.
- Many countries are dumping their poultry products i.e. exporting eggs at prices lower than production cost.

- Many countries are protecting their poultry industry from foreign competition by protective measures like restricting imports, keeping egg prices at lower level etc.
- Stiff competition from Sri Lanka, Pakistan, Brazil and France, all these countries provide subsidies, export incentives to exporters, and keep their price low.

Rural Backyard Poultry Development : Government Initiatives

- Objective-** To encourage poultry farming activity and to provide employment opportunities in backward areas.
- Implementing bodies-** Gol, Ministry of Agriculture, Deptt. Of Animal Husbandry, Dairy and Fisheries
- Eligibility/norms/coverage-** Farmers, individual entrepreneurs, NGOs, companies, cooperatives, Self Help Groups (SHGs), Joint Liability Groups (JLGs) etc.
- Nature of support-** 25 per cent subsidy in normal case and 33.33 per cent in case of SC/ST, subject to a maximum ceiling depending upon the schemes component.

Centrally Sponsored Scheme for Establishing Poultry Estates and Mother Units For Rural Backyard Poultry (**Funded by NABARD**)-The scheme has following three components namely, (i) Assistance to State Poultry Farms, (ii) Rural Backyard Poultry and (iii) Poultry Estates.

- i) **Assistance to State Poultry Farms :** Under this component, 100 per cent financial assistance would be provided for strengthening the existing State Poultry Farms. This assistance would be 100 per cent centrally funded for North Eastern States and for other States, the expenditure would be shared between Centre and State on 80:20 basis
- ii) **Rural Backyard Poultry Development :** Under this component, mother units with a unit size of 1500 chicks would be established for rearing one day old chicks of low input birds upto 4 weeks, after which the birds would be supplied to beneficiary families. The mother units will be eligible for a subsidy amount of Rs.0.20 lakh per unit which would be directly routed by the State Department of Animal Husbandry to the financing bank. The mother units will also be eligible for Interest Free loan of Rs.0.36 lakh per unit which will be routed through the financing banks by NABARD.
- iii) **Poultry Estates :** This component will be implemented on pilot basis and only two poultry estates in low commercial activity States/region like Bihar, Chhattisgarh, Jharkhand, Gujarat, Madhya Pradesh, Orissa, Uttarakhand, some districts of Uttar Pradesh and West Bengal, Vidarbha Region of Maharashtra and North Eastern States are expected to be established at this stage. While grant for infrastructure development will be provided to States in the ratio of 75:25 (Center to State), for other components 100 per cent grant assistance will be provided through NABARD. The scheme envisages establishment of a maximum of 100 broiler or layer units of 2000 birds each, per poultry estate, which will be eligible for Interest Free Loan @ 50 per cent of total financial outlay (TFO) of the project. Feed manufacturing units that are set up in poultry estates will also be eligible for Interest free loan @ 50 per cent of the outlay.

National Livestock Mission: Various departmental poultry farms will be strengthened in a phased manner. The chicks of low input technology type are being produced at the departmental

hatcheries. These chicks are reared for 2-3 weeks at different government poultry farms/ extension centres prior their distribution in the field. In case, there is demand for day old chicks, then the same are also provided to the farmers.

The Central Poultry Development Organization, Govt. of India, Ministry of Agriculture, Department of Animal Husbandry Dairying and Fisheries, is serving as single window to meet out all the technical requirements of the poultry farmers of the northern region of India and working for the development of the poultry in India. Now it has been renamed as Chandigarh Rangeen (CHABRO) from the year 2007 as one of the Low input bird identified found suitable for rural Poultry. Rural Development through poultry farming is one of the modern as well as multidimensional activities which divide income generation employment opportunity and expert potential etc. Government of India gives special emphasis on rural poultry because rural poultry is pro poor and pro women in nature and also a special tool for women empowerment.

Conclusion:

As the poultry industry is among the fastest growing in the world, it needs greater integration, better cost-effectiveness and improvement in the distribution. More retail outlets, mass gathering and creating awareness home to home about the nutrient values of chicken and eggs Poultry industry in India needs good branding system in order to increase the consumption of chicken. The poultry companies have to encourage direct procurement of maize from the farmers by using contract farming, models that are currently use in oilseeds and wheat. The feed cost can be reduced by integration and even small reduction per Kg of feed can make the difference in the net realization. Also , the collection of reliable, updated statistics are necessary for immediate and long term planning and thereby helping in preventing shortages. Developing efficient, independent, authority for disease monitoring, biological quality control and biosecurity measures.

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BEEKEEPING FOR YOUTHS: PERSPECTIVES AND OPPORTUNITIES

Dr. B.L. Sarswat

Honey bees play a very important role in pollinating various agricultural and horticultural crops and increase their yield and improve the quality of produce. It is being increasingly realized that bees could be less expensive input for promoting sustainable and eco-friendly agriculture and enhancing crop productivity.

Beekeeping is an agro-based activity which is being undertaken by farmers/landless labours in rural areas as an integrated farming practice. Beekeeping supplements income generation and nutritional intake of rural population. Though, the honeybees are best known for the honey they produce, their economic role in nature is to pollinate hundreds and thousands of flowering plants and assure setting of seed or fruit. Honeybees have been offering services to the society through ensured pollination in cross-pollinated crops as well as by providing honey and a variety of beehive products. Honey Bees have their vital role in sustaining plants bio-diversity resulting in environmental stability.

Beekeeping: Importance in Rural Development:

Till mid-20th century, honeybees were equated with the production of honey and beeswax only. But since past 3-4 decades, utilizing honeybees to pollinate large number of agricultural and horticultural crops to increase per acre yield has become a routine practice in many developed countries. According to Agricultural Scientists value of additional yield obtained by pollination service rendered by honeybees **alone is about 15-20 times more** than the value of all the hive products put together (Dr. Kaloo, 2004).

Honey bees play a very important role in pollinating various agricultural and

horticultural crops and increase their yield and improve the quality of produce. It is being increasingly realized that bees could be less expensive input for promoting sustainable and eco-friendly agriculture and enhancing crop productivity.

Beekeeping industry has quadruple benefits: 1) providing self employment to rural and forest based population; 2) production of honey, pollen and beeswax, venom, royal jelly, etc.; 3) providing employment to rural educated youths in collecting, processing and marketing of bee/ beehive-products and the most important; and 4) cross-pollination of various agricultural and horticultural crops and improving their quality and increasing yields. This way, beekeeping plays a vital role in sustainable agriculture and rural development.



Main species of Honeybees :

Species	Nature	Foraging range (km)	Avg. Honey yield (kg/yr)
Indian bee, <i>Apis cerana</i> (<i>cerana, himalaya, indica</i>)	Domesticated	0.8-1.0	10-12 /hive
Western bee, <i>Apis mellifera</i> (<i>ligustica, carnica</i>)	Domesticated	1.0-2.0	50-60 /hive
<i>Apis dorsata</i>	Wild	-	50 /hive
Little bee, <i>Apis florea</i>	Wild	-	0.25 /hive
Trigona (can survive in high temperature)	Stingless		Few grams/ Colony

Government Initiatives/Programmes:

After independence, Govt. of India took policy decision to revive various traditional village industries and an All India Khadi and Village Industries Board (KVIB) was formed in 1954. Through coordinated efforts of well-knit organizations like Khadi and Village Industries Commissions (KVIC), State KVIBs, Beekeepers' Co-operatives, Public Institutions, etc. the beekeeping industry came on the map of village industries of India within two decades. In 1981, an All India Coordinated Research Project on Honeybee Research and Training was launched by Indian Council of Agricultural Research (ICAR) involving State Agricultural Universities (SAUs).

In 1994-95, the Ministry of Agriculture, renamed as Ministry of Agriculture and Farmers Welfare, took initiative of launching a Central Sector Scheme entitled "Development of Beekeeping for Improving Crop Productivity", during the VIII Plan. A Beekeeping Development Board also functioned under the Chairpersonship of Secretary (A & C) to coordinate the beekeeping activities. The Scheme was approved for continuation during the IX Plan. However, the scheme got subsumed under the Macro Management Scheme, with effect from October, 2000. The focus on beekeeping also got diminished under such an arrangement.



The Department facilitated efforts by forming the National Bee Board in 2000. With effect from May, 2005, beekeeping has been included as an activity under National Horticulture Mission (NHM), which has now been merged in Mission for Integrated Development of Horticulture (MIDH), for promoting cross pollination of Horticultural Crops.

The Mission (MIDH) has been in implementation in all parts of the country. Under MIDH, among others, assistance for following components for promoting Scientific Beekeeping under the component of 'Pollination Support through Beekeeping' is available and Mission/ Scheme is being implemented by the State Departments of Horticulture/Agriculture in the field:

National Bee Board (NBB) and its Role:

The National Bee Board (NBB) was reconstituted in June, 2006 by the Department of Agriculture, Cooperation and Farmers Welfare. The main objective of the National Bee Board (NBB) is overall development of Beekeeping by promoting Scientific Beekeeping in the country to increase the productivity of crops through pollination and increase honey production for increasing income of the Beekeepers/Farmers.

As per aims and objectives of the National Bee Board, the Board act as a Nodal Agency for formulation, implementation, execution, supervision & monitoring of projects/programmes in the field of beekeeping and also an appraisal agency for appraising the Annual Action Plan/ Schemes/Projects to be implemented by the

State Governments/UTs, International Agencies, private sector and other Agencies/Organizations for development of scientific beekeeping in the country.

Beekeeping Industry in India:

At present, there are about 30 lakhs bee colonies in India, with estimated annual production of around 89000 metric tonnes of Honey (2015-16) including honey from wild honey bees. India is one of the honey exporting countries. The major markets for Indian honey are Germany, USA, UK, Japan, France, Italy, Spain etc.

India produces two types of honey viz; apiary honey (of domesticated bees) and squeezed honey (of wild bees). *Apis cerana* and *Apis mellifera* are two types of bees which are being domesticated and kept in hives. In India, honey is not used in the form of food as its per capita per year consumption is about 10.00 gms.

Beekeeping World Scenario :

Millions of honey bee colonies, mostly, *Apis mellifera*, are maintained all over the world. The world production of honey has been ranging between 14 to 15 lakh Mt. Tons per year. There are 15 countries in the world which account for the 90 per cent of the world honey production. The per capita consumption of honey in world, on an average, is 250-300 gms. Whereas in Asia, Japan



Shri Narendra Modi, Hon'ble PM (then CM, Gujarat) understanding process of honey extraction.

has the highest per capita honey consumption i.e. about 600 gms. The honey consumption in some of the countries where it is considered as a food, for example, in Germany, is > 2000 gms. per capita per annum.

Beekeeping: Benefits

The main benefits of beekeeping are summarized as under:

- Bees help in cross pollination thus they increase the productivity of crops;
- Honeybee produces:
 - i) **Honey:** Nutritious whole food with medicinal property;
 - ii) **Bees wax:** More valuable, used in candle, pharmaceutical and cosmetic industry;
 - iii) **Bee venom:** Used for treatment of arthritis, rheumatic and pains (Apitherapy);
 - iv) **Royal jelly:** Nutritious, increase vigour and vitality/fertility;
 - v) **Propolis:** Resinous substance uses as gum;
 - vi) **Honey and hive products:** Source of income to the rural people and also generate employment;
- Unemployed youth can start this business with minimal funds;
- Generates 3.75 lakhs man-days to maintain 10,000 Bee colonies in Bee hives;
- Proper utilization of natural resources;
- Different sectors and trades benefit from a strong beekeeping industry;
- Beekeeping encourages ecological awareness;
- Beekeeping helps in increasing National income;
- Income from 100 Bee colonies is around Rs. 2.50-3.00 lakhs per annum;
- It helps in rural development and promotes small village industry;
- Beekeeping is benign: Beekeeping generates income without destroying habitat.
- Encouraging beekeeping encourages biodiversity.

Beekeeping: Challenges

Major Constraints conflicting Beekeeping are lack of a) Lack of : Scientific data on choice of Honey Bee species for commercial Beekeeping and for promoting cross pollination; genetically superior queen bee for supply to beekeepers; technical knowledge for efficient management of bee colonies for higher yield of honey & other bee hive products; infrastructure at grass root level and national level for promoting beekeeping; awareness about yield increase in crops by Beekeeping through pollination; laboratories for disease diagnosis /prevention, control and



Prevailing Market Prices of Honey & other Beehive Products & Price of Bee Colonies

S.N	Items	Rate/per Unit cost (in Rs.)	Total cost (in Rs.)
A.	One time cost for establishment/ Fixed cost		
1	50 Beehives with supers & tools, etc.	2000/-per set	100000.00
2	50 bee colonies each of 8 frames @ Rs. 250/- frame.	2000/-colony	100000.00
3	50 iron stands	100/-each	5000.00
4.	Honey Extractor (SS) & other equipments, FGP containers, honey extr. net, etc.	-	20000.00
	Sub total of A	-	225000.00
B.	Recurring cost/working capital per year		
1	Comb foundation sheets (Wax Sheets) 100kg for one unit	250 per kg	25000.00
2	250 kg sugar for feeding in dearth period	40 per kg	10000.00
3	Interest on fixed capital	12%/ annum	27000.00
4	Depreciation on fixed capital	20%/annum	45000.00
5	Misc. exp. including labour, migration cost, etc. / annum	-	150000.00
	Sub total of B.		257000.00
C.	Per year income from 50 colonies in beehives		
1	Honey production @ 40 kg/colony Total 2000kg.	80 per kg	160000.00
2	Sale price of B.Cs. of 8 frames each multiplied in a year i.e. 50 colonies (50x250x8) of 8 frames.	2000/- colony	100000.00
3	Production of Bee pollen (250 kg) @ 5 kg/colony	400 per kg	100000.00
4	Income from production of other bee hive products like propolis, bees wax etc.		20000.00
	Total Income (C)		380000.00
D.	Net income per year (C-B)		123000.00

(Note: Economics is directly linked with market prices of honey & other beehive products & price of bee colonies, bee hive, equipments etc., which fluctuate time to time).

analysis; adequate laboratories for quality control of beehive products; institutional support for beekeeping in terms of bank loans, etc; consumer awareness of honey and its products; b) Poor quality control for production of honey and other beehive products; c) More emphasis for production of honey instead of other bee products; d) A non-traditional newly introduced industry; e) Tribals and illiterates from forests and remote rural areas are generally involved; f) An interaction of two living materials-honeybees and living plants; g) Flowering of plants, secretion of nectar and production of pollen – sole food of honeybees, is influenced by climatic conditions; h) Behaviour and life cycle of honeybees depend completely on climatic & floristic conditions, which vary from place to place; i) De-forestation; j) Wild fires; k) water and air Pollution ; l) Mono-Cropping culture; m) Indiscriminate use of insecticides, pesticides, weedicides etc.; and n) Global warming & unforeseen changes in climatic conditions.

Opportunities in Beekeeping:

India has vast potential for Beekeeping. The diversity in flora and fauna provides more opportunities for the development of beekeeping industry. The National Commission on Agriculture had visualized the need for deploying about 150 million Bee colonies for pollinating the agricultural crops in the country. This industry does not need any sophisticated technology, high capital investment or infrastructure. There is thus great potential and opportunities for the development of beekeeping industry in India.

Beekeeping industry has great self-help potential for the rural people, tribals, marginal and small farmers, land-less labourers, etc. The great potential and opportunities in beekeeping are given as under:

- As per the cropped area under the major insects pollinated crops, **about 200 million** bee colonies are required in the country to enhance the yield levels of these crops at par with the yield levels of developed countries. It will provide **jobs to about 215 lakh persons**.
- Honey has great food value and provides cash income;

- Beeswax which is twice as much costly as honey is in great demand;
- Other products, viz., bee-collected pollen, propolis, bee-venom and royal jelly are several times costlier than honey and beeswax;
- Providing bee pollination service to farmers for increasing crop production & quality and productivity of honeybees is a double benefit service;
- Maintenance of biodiversity by pollination of flowering plants;
- Apitherapy medicine using bees' products;
- Processing and value added products of beehive products; etc. Few resources are needed and Land ownership not essential.

Beekeeping as a Source of Livelihood:

Beekeeping may be a source of livelihood for rural and tribal population. The activity may be adopted by anybody and helpful in generating income and employment. Beekeeping has vast potential in employment generation and according to estimates 3,00,000 man-days are generated for maintaining 10,000 bee colonies. Besides, it also creates employment opportunities in appliances and equipment manufacturing sector. It is estimated that around 75,000 man-days are created for manufacturing enough appliances for 10,000 bee colonies.

As per economics worked out for beekeeping, the net income **from 100 bee colonies** varies from **Rs. 2,50,000/- to Rs. 3,00,000/-** annually, which is directly linked with the prevailing market prices of honey & other beehive products and Beekeeping equipments.

It may be remembered that all the bee products are used either as food or in pharmaceutical and cosmetic industries. For this reason, hygienic collection, handling, processing, storage, etc. and maintaining National and International purity standards are of prime importance.

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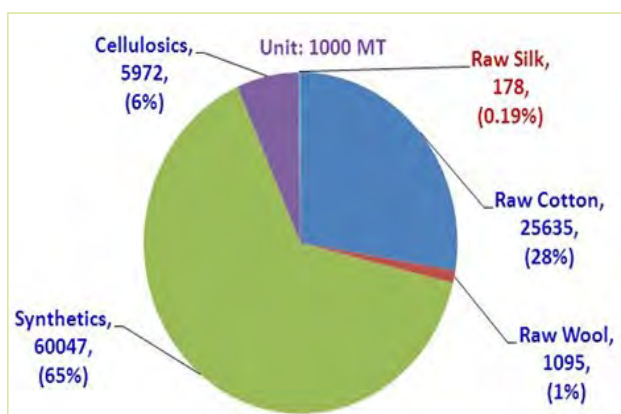
SERICULTURE IN INDIA : CULTIVATION AND ECONOMICS

Dr. B.S.Angadi

Considering the merits of mulberry silk industry, ever increasing demand for silk, abundant availability of natural resources and manpower, development of suitable package of practices for mulberry cultivation and silkworm rearing, wide scope exists for the horizontal and vertical expansion of this textile sector, both in the traditional and non-traditional areas of our country.

Silk, a mystic and mythical fibre produced by *Bombyx mori* L. has been enticing the mankind since time immemorial. This wonder fibre which not only withstood the test of time, but also emerged stronger amongst the various textile fibres, competed with synthetic fibres to retain its unique position. Despite, a miniscule 0.2 per cent of the textile production worldwide in 2014 (**Fig. 1**), silk continues to dominate from the socio-economic viewpoint.

Fig 1: Share of Silk in the Global Textile Production



Sericulture activity in general refers to the mass-scale rearing of sericigenous insects in order to obtain silk and has four components like Cultivation of silkworm food plants, rearing of silkworms for the production of cocoons, reeling the cocoons for unwinding the silk filament and other post-cocoon processes such as twisting, dyeing, weaving, printing and finishing .

Types of Silks:

The five commercially traded varieties of natural silks (**Table 1**) are, Mulberry, Tropical Tasar, Oak Tasar, Eri and Muga. Silks other than mulberry are all grouped together and called as 'Vanya Silks'

Mulberry Silk:

Mulberry silk is the product of silkworm, *Bombyxmori* L. which solely feeds on the leaves of mulberry plant. These silkworms are completely domesticated and reared indoors. The mulberry silkworms are further classified and identified as Japanese, Chinese, European or Indian origin based on their geographical distribution, or as univoltine, bivoltine and multivoltine depending on the number generations in a year under natural conditions. Univoltine silkworms have long life cycle and their larvae and cocoons are large. The life cycle of bivoltine silkworms is shorter than univoltines. Compared to univoltine silkworms, the bivoltine silkworms are stronger. Multivoltine silkworms with tropical origin, although robust compared to both univoltine and bivoltine silkworms, produce qualitatively inferior raw silk. The mulberry sector continues to be predominantly rural and small farmer-based, with post cocoon activities in the cottage and small industry sector.

Status of Indian Silk Production:

While India is the 2nd largest producer of Silk in the world after China, it is also the largest consumer of silk in the world. And India is the only country in the world that produces all 5 varieties of silk on commercial scale and holds the global monopoly for production of the famed golden 'Muga' silk. Almost all the Indian States, except Gujarat and Rajasthan are involved in the production of one or the other variety of silk.

The major mulberry silk producing States are Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu and Jammu & Kashmir which together account for 96 per cent of country's total mulberry raw silk production. Non-traditional States like Uttar Pradesh and Madhya Pradesh are also producing

Table 1 :Types of Silk, Silkworm names and Food Plants

Types of silk	Silkworm name	Food plant	Common name of Food plant
Mulberry	<i>Bombyxmori</i>	<i>Morus spp.</i>	Mulberry
Tropical Tasar	<i>Antheraeap-erni</i> <i>Antheraeam-ylitta</i>	<i>Shorearobusta</i> <i>Terminaliator-mentosa</i> <i>Terminalaar-juna</i>	Sal Asan Arjun
Oak Tasar	<i>Antherae-aproylei</i>	<i>Quercusincana</i> <i>Quercusserreta</i> <i>Quercushimala-yana</i>	Oak
Eri	<i>Philosomiari-cini</i>	<i>Ricinuscom-munis</i> <i>Manihotutills-sima</i> <i>Heteropanax-fragrans</i>	Castor Tapioca Kesseru
Muga	<i>Antherae-aassama</i>	<i>Litseapolyantha</i> <i>Machilusbom-bycina</i>	Som Soalu

considerable quantities of mulberry silk. Tasar silk is mainly produced in the States of Jharkhand, Chhattisgarh and Odissa, besides Madhya Pradesh, Maharashtra, West Bengal, Uttar Pradesh and Andhra Pradesh. Tasar culture is the main stay for many a tribal community in India. Oak tasar is produced in the Sub-Himalayan belt of India covering the States of Manipur, Nagaland and Uttaranchal. Eri culture is practiced mainly in the North-Eastern States and Assam is the largest producer. It is also getting popularized in Bihar, West Bengal, Odisha, Andhra Pradesh, Uttaranchal, Uttar Pradesh and Tamil Nadu. Muga culture is specific to the State of Assam and is an integral part of the tradition and culture of that State. However, the Muga culture is getting popularized in other States like, Arunachal Pradesh, West Bengal, Meghalaya and Nagaland due to the availability of Som and Soalu plants in the nature.

Indian Silk Production: Progress

Sericulture in India has proved to be an ideal vocation for inclusive development of rural

population especially the weaker sections of the society through equity distribution from urban rich to rural poor. With its eco-friendly production process and high potential for poverty alleviation, it has been an ideal tool for women and tribal empowerment. Country's raw silk production has grown from 1211 MT during 1949-50 to 28,523 MT in 2015-16. The progress of Indian silk production over the plan periods is depicted in Fig 2.

Fig- 2:Progress of Indian raw silk production (all the five varieties together) over plan periods



Mulberry Silk Production in India :

The mulberry silk production has improved in the post-independence era owing to the concerted efforts through 5 year plans. The country's mulberry silk production has grown by an impressive 29 per cent to reach 20478 MT in 2015-16 (Fig. 3). Mulberry sericulture dominates the field of sericulture in many aspects like, quality of production, quantity and popularity.

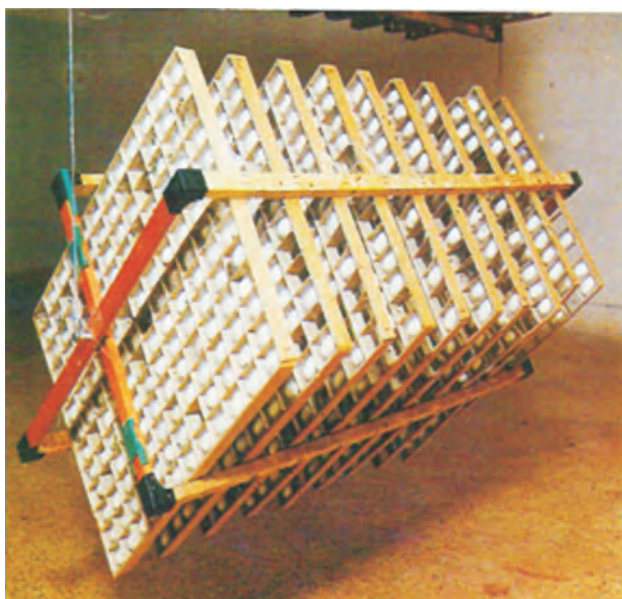
Fig 3: Mulberry Silk Production over the years



Activities of Mulberry Silk Production:

Mulberry silk production involves a series of both on-farm and non-farm activities. The success of mulberry cocoon crop depends on the productivity levels of breed, quality of the mulberry leaf, production and supply of disease free layings

Fig. 4: Rotary Mountages for Better Quality Cocoons

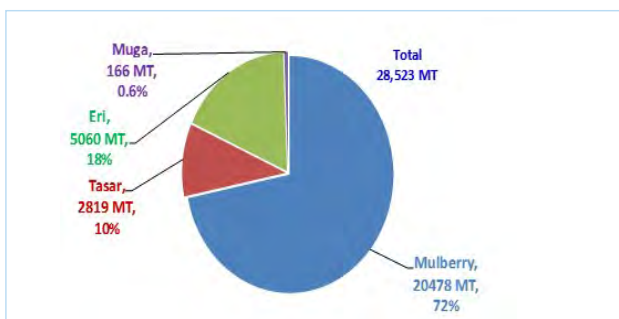


(dfIs), adoption of advanced rearing technologies and climatic conditions.

Mulberry Cultivation:

The quality of mulberry leaf and the cultivation technologies adopted greatly influence the health of silkworm larvae and in turn the quality and quantity of reeling cocoons produced by the farmers. The recommended varieties of mulberry for Southern, East & North Eastern and North Western States, are V1, S1635 and S140 respectively.

Fig. 5: Share of different silk production in India



V-1 is the most popular mulberry variety in the States of Karnataka, Andhra Pradesh, Tamil Nadu, Maharashtra, Kerala, Madhya Pradesh and Uttar Pradesh. This variety is suitable for both young age and adult silkworm rearing.

Fig 6: Import substitute Bivoltine Raw Silk Production in India



Silkworm Rearing:

Rearing of silkworms which is done domestically under controlled conditions is an important component of sericulture and throughout the rearing period, silkworms have to be taken care of properly and nourished with good quality mulberry leaves. Beginning from hatching of the larvae from eggs, up to their maturation, silkworm larvae pass through 5 instars (stages) and change their skin (called as moulting or ecdysis) 4 times. As the young age, silkworms are very delicate, susceptible to diseases they have to be reared scientifically under the close supervision of experienced technicians. Under the irrigated conditions in tropics, every year, 5-6 cocoon crops can be taken as the mulberry leaf will be available throughout the year.

Economics of Mulberry Silkworm Rearing:

Sericulture is considered as an effective tool for poverty alleviation. The labour participation rate in sericulture is highest in comparison to similar rural occupations. The industry provides job opportunities to all family members, especially, women and elderly persons. It has the unique nature of converting family labour into useful income to the family. Hence, this occupation could bring significant revenue to the households, thereby helping several poverty stricken families in the rural areas, especially the marginalized population and forest dwellers. Sericulture industry in India employs 8.2 million people. Cultivation of one acre of mulberry can generate 1530 man-days of employment throughout the year, considering both the on-farm and non-farm activities from soil to silk.

Fig 8: Paired Row System of Mulberry Plantation



Sericulture is one of the most potential agricultural vocation with low capital investment and high returns. Mulberry sericulture has a smaller gestation period and provides returns at regular intervals (5-6 times in a year). Silk is produced by the rural farmers belonging to economically weaker section and is purchased by the rich and the people. Thus, it is an excellent media for transfer of wealth from affluent society to the poor. It is interesting to note that around 57 per cent of the sale value goes to the primary producer (farmer).

The economics of mulberry sericulture depends on the bio-mass yield (leaf yield) per unit area, quantity of disease free layings (dfles, seed or eggs) reared per year, average cocoon yield per 100 dfls and the quality of cocoons harvested. A well maintained mulberry plantation of one acre in the southern region, with average 5-6 crops a year earns a net profit of Rs 75,000 to 1.00 lakh with a cost benefit ratio of 1 : 1.45.

Global Silk Scenario:

Global silk production scenario has undergone sea changes over the last 3-4 decades. While the global mulberry silk production has increased from 56,500 MT in 1938 to 2,02,073 MT in 2015, primary silk producing countries like Japan, France, Italy and Spain have virtually disappeared from the silk production scene. Considering the fact that the demand for silk is growing by 2-3 per cent per annum, the onus of producing and meeting the demand lies on China and India, which have emerged as the major silk producing countries with a current (2015) production of 1,70,000 MT and 28,523 MT,

Popular Silkworm Breeds



PM X CSR2



FC1 X FC2



CSR2 X CSR4

respectively. China and India account for more than 98 per cent of the global silk production. The other important silk producing countries are Uzbekistan, Thailand, Brazil, Vietnam, North Korea and Iran. Few other countries like Kenya, Botswana, Nigeria, Zambia, Zimbabwe, Bangladesh, Colombia, Egypt, Japan, Nepal, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia etc., also engaged in sericulture produce a very small quantity of silk. All these countries together contribute less than 2 per cent.

Conclusion:

Considering the merits of mulberry silk industry, ever increasing demand for silk, abundant availability of natural resources and manpower, development of suitable package of practices for mulberry cultivation and silkworm rearing, wide scope exists for the horizontal and vertical expansion of this textile sector, both in the traditional and non-traditional areas of our country.

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LAC INSECTS : A SOURCE OF INCOME FOR FOREST AND SUB-FOREST DWELLERS

Ayashaa Ahmad and Debjani Dey

Cultivation of lac forms an important source of livelihood for the forest and sub-forest dwellers in different states of India. It also forms the source of employment for the dwellers of the forest regions in the states of Jharkhand, West Bengal, Odisha Chhattisgarh, Madhya Pradesh, Maharashtra, and also parts of Uttar Pradesh, Andhra Pradesh, Gujarat and NEH regions. Five Indian states contribute about 95 per cent of the national lac production, viz., Jharkhand (58 per cent) being the 1st followed by Chhattisgarh (16.1 per cent), Madhya Pradesh (11.9 per cent), Maharashtra (5.6 per cent) and Odisha (3.2 per cent). The lac production has increased about 7.3 per cent for year 2013-14, along with overall production of 21,008 tons than earlier production of 19,577 tons.

India with a diverse tropical climate has an area of about 21.23 per cent covered by the forests. The forests forms an important sector contributing towards the economy of the country with the products falling under two categories as wood and non-wood forest products (NWFP). These NWFP includes natural resins, gums and exudates, turpentine, perfumery oils, stumps and fruits of various tree species and are also the natural source of spices, medicines, dyes and tannins. These NWFP generate employment for a large number of people in India and forms the export currency earner. Most of the NWFP collection occurs around the tribal belt of the country and these form suitable small scale industries. More than half of the employment in forestry sector through NFWP sector, with India holding a monopoly in the world trade for natural resins and gums (NRGs) as lac (insect resin by *Kerria lacca* Kerr), *karaya* gum (plant gum by *Sterculia urens* Roxb.) and *guar* gum (plant gum by *Cyamopsis tetragonoloba* L. Taub) (Yogi *et al.*, 2014b). Majority of the international market supply of NRGs is contributed by India (18.6 per cent) followed by France, Sudan, Thailand, USA with 15.7 per cent, 14.4 per cent, 5.0 per cent, 4.9 per cent, respectively.

Lac is a highly remunerative crop and pays high returns to the farmers and also adds to the foreign exchange of the country through its export (Yogi *et al.*, 2014a). Cultivation of lac forms an important source of livelihood for the forest and sub-forest dwellers in different states of India. It also forms the source of employment for the dwellers of the forest regions in the states of Jharkhand, West Bengal, Odisha Chhattisgarh, Madhya Pradesh, Maharashtra, and also parts of Uttar Pradesh, Andhra Pradesh, Gujarat and NEH regions. Five Indian states contribute about 95 per cent of the national lac production, viz., Jharkhand (58 per cent) being the 1st followed by Chhattisgarh (16.1 per cent), Madhya Pradesh (11.9



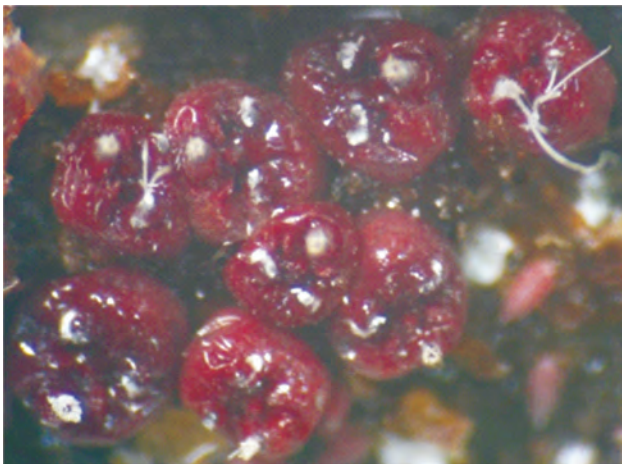


Figure 1. Mature Adult Female Lac insect

per cent), Maharashtra (5.6 per cent) and Odisha (3.2 per cent). The lac production has increased about 7.3 per cent for year 2013-14, along with overall production of 21,008 tons than earlier production of



Figure 2. Twig encrusted with Lac

19,577 tons. According to Shellac and Forest Products Export Promotion Council (SHEFEXIL), Kolkata, total export of lac and its value added products for the year 2013-14 was 8153.10 tons valuing about ₹ 568.53 crores (Yogi *et al.*, 2014b).

Lac, a scarlet resinous secretion of tiny insects referred to as lac insects (Fig. 1), is the only resin of animal origin. The word "lac" has been derived from the Sanskrit word "*laksha*" meaning hundred thousand or 1,00,000, probably due to the enormous number of lac insects which together produce this resinous secretion (Fig. 2). Lac insects like the honey bees and ants, finds reference in our ancient *Vedic* texts. Its medicinal uses are also highlighted in the *Atharva veda*.

The antiquity of this resin is also proved through its numerous age-old uses *viz.*, for dyeing fabrics, filling of gold and silver ornaments, bangle making, wood polishing, in tanneries for dyeing of leathery, cosmetics etc. Lac is valued in India for the resin, wax and dye at different periods. The early export of lac to Europe dates back to 1607, and by nineteenth century, it had become one of the major items in country's export trade. The products of lac insects are commercially valued and have major applications in a wide range of industries due to their unique properties along with their environmental safety.

The lac insects produce a gum-like or resinous secretion which forms a hard cover over their body. These are phytophagous phloem feeding insects that thrive well on tender twigs of certain plant species known as lac hosts such as Palas (*Butea monosperma*), Kusum (*Schleichera oleosa*) and Ber (*Zizyphus mauritiana*) which are commonly employed for lac cultivation throughout India. There are other species of trees which are used in particular regions like *Crewia* sp., *Leea* sp. and *Cajanus cajan* in Brahmaputra valley, *Ficus* sp. in parts of Assam, U.P. and Punjab and *Shorea talura* in Karnataka and Salem area of Tamil Nadu. Lac is mainly produced in India, Thailand, Indonesia, parts of China, Myanmar, Philippines, Vietnam, Cambodia etc. with India as the largest producer of lac in the world.

Lac insects are ovoviviparous in nature (laying nymphs instead of eggs). The life cycle takes about

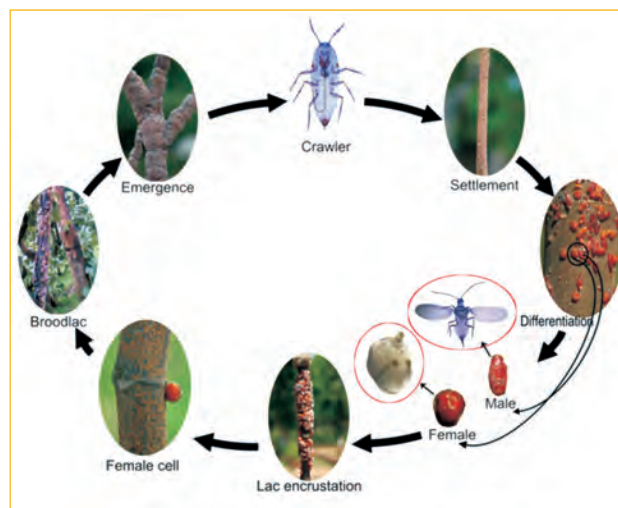


Figure 3. Life cycle of the lac insect



six months with stages of eggs, nymphs (crawlers), instars and adults (Fig.3). The first instars settle on suitable host by piercing into the barks through their stylets. After settlement, the instar starts secreting lac from all over the body except from mouthparts, brachia and anal plates. The insect gets encased inside lac cell and it increases with the increase in the size of insect. Three moulting occurs prior to maturity; duration of each instar depends on various biotic and abiotic factors as host plants, temperature, humidity etc. Sexual dimorphism becomes more evident post first moulting and the instars lose their legs, antennae and eyes.

The female post-fertilization, secretes lac at a faster rate and increases in size. This continues for varying number of weeks depending on host, season etc. During the process of lac secretion, they also secrete honeydew as waste. Honeydew falling on the leaves attracts the growth of sooty mould and ants to the place.

There are two infrasubspecific forms of common Indian lac insect- *Kerria lacca* based on the preference for specific host plants as *kusumi* and *rangeeni*, the latter thriving on *Butea monosperma* (Fabaceae) but not on *Schleichera oleosa* (Sapindaceae), which is a preferred host of *kusumi*. Each form completes the life-cycle twice a year but the duration and maturity differs for both. The *rangeeni* crop is harvested twice as *Baisakhi* and *Katki* from Oct-Nov to June-July and June-July to Jan-Feb, respectively. The *kusumi* crops are

Aghani and *Jethwi* harvested from June-July to Oct- Nov and Jan-Feb to June- July, respectively. The production of *rangeeni* lac is six to eight times more than that of *kusumi* due to limited distribution of the host *kusumi* tree. However, the *kusumi* lac resin is of superior quality and sells at a higher price (Kapur, 1962).

Lac has been valued in India either for its resin or dye during different historic periods. Lac assumed commercial significance only during the seventeenth century with the first recorded export to Europe in 1607. However, it was only in the nineteenth century that exports of lac became important, but surprisingly only as a dye. By 1873–74, the dye export trade declined due to competition with the cheaper synthetic dyes and by 1902, lac ceased to be an item for export. Fortunately, for India, the utility of the resin was realized and export of shellac became significant.

With the issues of violent price fluctuations and adulteration, the then Government of India constituted the Lindsay- Harlow Committee in 1920, to look into all aspects of the country's lac trade and its development. On its recommendation, the Indian Lac Association for Research was formed which laid the foundation of Indian Lac Research Institute (ILRI) at Namkum, Ranchi on September 20, 1924. The Indian Lac Association for research on the recommendation of the Royal Commission on Agriculture was replaced by the Indian Lac Cess Committee (ILCC), which took over the reins of the ILRI on August 1, 1931. The mandate of the Indian Lac Research Institute was expanded in the year 2007 to include important issues related to all natural resins & gums of Indian origin. Accordingly, ILRI was renamed as Indian Institute of Natural Resins and Gums since Sept.20, 2007 (<http://ilri.ernet.in/>). The Indian Institute of Natural Resins and Gums is functioning as a nodal Institute at national level for research and development on all aspects of lac and other natural gums & resins.

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SWACHHTA PAKHWADA UPDATE

Swachh Bharat Mission (SBM) was launched by Hon'ble Prime Minister of India on 2nd October, 2014 as a mass movement to achieve the target of clean India by the 150th Birth Anniversary of Mahatma Gandhi in 2019. As a part of the process, the Ministry of the Drinking Water and Sanitation assigned first Fortnight of November, 2016 (1-15th November, 2016) for undertaking cleanliness activities. The Department and PSUs are fully geared up to undertake a number of activities to carry forward the mission of cleanliness during the Swachh Pakhwara. The Pakhwara was extended to 20th November, 2016 to factor in the Airtel Marathon on 20.11.2016 which also specially featured Swachh and spreading awareness about it.

The Department of Telecommunications and its PSUs viz. Bharat Sanchar-Nigam Limited (BSNL), Mahanagar Telecom Nigam Limited (MTNL), Indian Telephone Industries Limited (ITI Ltd.), Telecom Consultants India Limited (TCIL), and Centre for Development of Telematics (C-DoT) took active part in Swachhta Campaign and carried out cleanliness not only in the office premises and nearby, but also took up cleanliness in other locations of the cities of their location. The cleanliness was focused on office chambers, equipment, library, canteen, unwanted records, pathways, corridors, toilets, etc. As a result of the involvement of all officers and staff, the standard of cleanliness has considerably gone up and would be continued so that the gaps are bridged and the standard of cleanliness is maintained.

The Telephone Exchange of BSNL and MTNL (27,600) were specifically identified for cleanliness apart from the inspection quarters and guest houses. These Exchanges and facilities were considerably cleaned in terms of their entrances and equipment. This process will continue. A number of locations throughout the country were covered for cleanliness; namely:

- i. Telephone Exchanges at Silvasa, Daman, Gangtok, Jabalpur, Goa, Mumbai and various other locations.
- ii. Marina Beach at Chennai.
- iii. Immambara at Lucknow.
- iv. Ganga Sagar at Lucknow.
- v. Gateway of India at Mumbai.
- vi. Krishnrajpuram Vegetable Market at Bangalore.
- vii. Ashoka Road, Nehru Place underpass and Kalkaji at Delhi.
- viii. Juhu Beach at Mumbai.
- ix. Jetty at Daman.

Some of the Telephone Service Providers (TSPs) also contributed to the cause of Swachhta. M/s Bharti Airtel organised Marathon on 20.11.2016 which especially featured Swachhta. M/s Reliance Jio, M/s Reliance Communications Limited, M/s Tata Teleservices and M/s Idea Cellular Limited undertook cleaning of their offices premises and undertook pledges on Swachhta, Shram Daan and various other outreach activities on cleanliness.

The Department of Telecommunications will continue to undertake such cleanliness drive throughout the year.

BLUE REVOLUTION: THE NEW HORIZON OF INDIAN FISHERIES

Dr. Ansuman Das

Considering the limited scope of the capture fisheries from coastal waters and natural inland waters like rivers and estuaries, emphasis on aquaculture and culture based fisheries from reservoirs and floodplain wetlands to meet the targeted fish requirement of 8.3 million tons by 2020 is appropriate considering the availability of vast water resources, rich cultivable species diversity, sound technological know how and strong human resource.

Fisheries in India is a very important economic activity and a flourishing sector with varied resources and potential, engaging over 14.50 million people at the primary level. (Table-1). The vibrancy of the sector can be visualized by the transformation of the fisheries sector from traditional to commercial scale which has led to 11-fold increase that India achieved in fish production in just six decades, i.e. from 7.5 lakh tonne in 1950-51 to 107.95 lakh tonne during 2015-16 (Table-2). The sector registered an overall annual growth rate of about 4 per cent during the 11th Five Year Plan. It has contributed about 0.91 per cent to the National Gross Domestic Production (GDP) and 5.23 per cent to the **agricultural GDP** (2014-15). Besides meeting the national protein demand and livelihood, fisheries also earn foreign exchange to the tune of US\$ 5.51 billion (2014-15) (Table-4). This justifies the importance of the sector on the country's food, economy and livelihood security. Constituting about 6.30 per cent of the global fish production and 5 per cent of global trade, India has attained the second largest fish producing and second largest aquaculture producing nation in the world.

Holding the challenges, and realizing the high potential in the sector, the Hon'ble Prime Minister has called for "a revolution" in the fisheries sector and has named it as "**Blue revolution**" (**Neel Kranti Mission**), with the vision "*Creating an enabling environment for integrated development of the full potential of fisheries of the country, along with substantially improvement in the income status of fishers and fish farmers keeping in view the sustainability, bio-security and environmental concerns.*"

Objectives:

- (i) To fully tap the total fish potential of the country both in the inland and the marine sector and triple the production by 2020.
- (ii) To transform the fisheries sector as a modern industry with special focus on new technologies and processes.
- (iii) To double the income of the fishers and fish farmers with special focus on increasing productivity and better marketing, post-harvest infrastructure including e-commerce and other technologies and global best innovations.
- (iv) To ensure inclusive participation of the fishers and fish farmers in the income enhancement
- (v) To triple the export earnings by 2020 with focus on benefits flow to the fishers and fish farmers including through institutional mechanisms in the co-operative, producer companies and other structures.



**Table: 1 - Fishermen population
(As per Livestock Census, 2003)**

a) Number of family members		
i	Males	4,696,158
ii	Females	4,033,963
iii	Children	5,755,233
	Total	14,485,354
b) Engaged in fishing operations		
i	Full time	933,124
ii	Part time	1,072,079
c) Engaged in fishing related activities other than actual fishing		
i	Marketing of fish	391,000
ii	Repair of fishing nets	245,100
iii	Processing of fish	46,200
iv	Other activities	334,700

(vi) To enhance food and nutritional security of the country.

Strategy: Central Sector Assistance Schemes

The Ministry of Agriculture and Farmers Welfare, Department of Animal Husbandry, Dairying & Fisheries has accordingly restructured the scheme by merging all the ongoing schemes under an umbrella of **Blue Revolution**. To provides focused development and management of fisheries, covering inland fisheries, aquaculture and marine fisheries including deep sea fishing, mariculture and

all activities undertaken by the National Fisheries Development Board (NFDB). The restructured Plan Scheme on "**Blue Revolution: Integrated Development and Management of Fisheries**" has been approved at a total central outlay of ₹ 3,000 crore for implementation during a period of five years (2015-16 to 2019-20) with the following components:

- (i) National Fisheries Development Board (NFDB) and its activities,
- (ii) Development of Inland Fisheries and Aquaculture,
- (iii) Development of Marine Fisheries, Infrastructure and Post-Harvest operations.
- (iv) Strengthening of Database & Geographical Information System of the Fisheries Sector.
- (v) Institutional Arrangement for Fisheries Sector.
- (vi) Monitoring, Control and Surveillance (MCS) and other need-based Interventions.
- (vii) National Scheme of Welfare of Fishermen.

Convergence:

The scheme provides convergence with the following :

- (a) "*Sagarmala Project*" of the Ministry of Shipping.
- (b) Mahatma Gandhi National Rural Employment Guarantee Scheme (**MGNAREGA**).
- (c) Rashtriya Krishi Vikas Yojana (**RKVY**)

Table 2: Fish production (2010-11 to 2014-15)

Year	Inland Fish Production		Marine Fish Production		Total Fish Production		Fish seeds Produced In million fry
	Inland (lakh MT)	Growth rate (per cent)	Marine (lakh MT)	Growth rate (per cent)	Total production (lakh MT)	Growth rate (per cent)	
2010-11	49.81	1.78	32.50	4.70	82.31	2.91	34110.83
2011-12	52.95	6.29	33.71	3.76	86.66	5.29	36566.43
2012-13	57.20	8.03	33.20	-1.51	90.40	4.32	34921.80
2013-14 (P)	61.36	7.28	34.43	3.68	95.79	5.96	41450.00
2014-15 (P)	65.77	7.30	34.91	1.40	100.69	5.2	43390.62

*(P)...stands for provisional estimate.

Table:3 - Contribution of Fisheries sector to GDP (at current Prices) (₹in crores)

Year	Total GDP	GDP from Agri, Forestry & Fisheries	GDP from Fisheries	GDP from Fisheries as per cent of	
				Total GDP	GDP from Agri, Forestry & Fisheries
2009-10	6108903	1083514	50370	0.82	4.65
2010-11	7266967	1306942	57369	0.79	4.39
2011-12	8353495	1465753	65541	0.78	4.47
2012-13	9252051	1668676	78053	0.83	4.75
2013-14	10477140	1881152	96824	0.92	5.58

(d) National Rural Livelihoods Mission (NRLM) etc.

Indian Fisheries at a Glance:

India is bestowed with varied potential resources in the form of rivers and canals (1.95 lakh km), floodplain lakes (7.98 lakh hec.), ponds and tanks (24.33 lakh hec.), reservoirs (29.26 lakh hec.) and brackish water (11.55 lakh hec.). The marine fisheries resources are estimated at 4.41 million metric tonne and their activities spread along the country's long coastline of 8118 km contributed by 9 coastal states, Andaman & Nicobar, Lakshadweep islands with 2.02 million square km Exclusive Economic Zone (EEZ) after declaration of the EEZ in 1976 and the continental shelf area of 0.53 million sq.km.

Marine Fisheries (Capture Fishery) :

With sovereign rights on the EEZ, India has also acquired the responsibility to conserve, develop and optimally harness the marine living resources within this area. The average marine fish catch during the last 4 years (2012-13 to 2015-16) is 3.499mMT, whereas in 2015-16, it was 3.583 mMT (P). While the fisheries resources from the near-shore waters are fully utilized, the deep sea and oceanic waters offer

opportunities of increasing the catch. According to the National Marine Fisheries Census 2010, the marine fishermen population in India is estimated at 4.0 million (Table-1), of which 0.99 million are active fishermen. Among the active fishermen, 33 per cent are employed in the mechanised sector, 62 per cent in the motorised sector and 5 per cent in the artisanal sector. Of the total marine fish production, 75 per cent comes from mechanised sector, 23 per cent from motorised sector and 2 per cent from artisanal sector. Mechanised trawl fishery is now the most important among various fishing methods and contributes about 55 per cent to the total marine fish production in the country.

In terms of revenue, some of the high value species such as Tunas that occur in the oceanic waters are yet to be optimally harvested.

The marine fisheries development has its major thrust areas on research on biology of commercially important species and monitoring their stocks for proper management; judicious exploitation and conservation; conducting exploratory surveys and mapping of the productive fishing grounds, locating new areas and resource through the application of remote sensing and carrying out environmental studies related to fisheries, better harvesting technologies including the design of various fishing crafts, gears, fishing techniques, methods of handlings and post-harvest processing and utilization.

Further, the use of mechanical fishing accessories, ancillary fishing equipment and electronic testing devices of practical value in fishing operation were added to improve the catch per unit effort (CPUE).

Table:4 - Export of Fisheries Products

Year	Quantity ('000 MT)	Value (₹in Crores)
2009-10	678.436	10048.53
2010-11	813.091	12901.47
2011-12	862.021	16597.23
2012-13	928.21	18856.26
2013-14	983.75	30213.26

To ensure the health and ecological integrity of the marine living resources through sustainable harvests for the benefit of present and future generations of the nation, Govt. of India has set up a Committee for formulation of the **National Policy on Marine Fisheries, 2016** (NPMF), 2016 recommends the following :

NPMF - 2016 (3rd Draft)

The overall strategy of the NPMF, 2016 will be based on the five pillars of **sustainable development, principle of subsidiarity, partnerships, inter-generational equity and precautionary approach**. These five pillars will guide the actions of various stakeholders in meeting the vision and mission of NPMF. While fishers will be at the core of this Policy, actions will also be guided by the 'Public Trust Doctrine': It is expected that through the implementation of NPMF, 2016, the marine fisheries sector in India will become a sustainable and well-managed entity, ensuring enhanced utilization of the harvest for human consumption; employment, gender equity and livelihoods; equity and equality, provision of food security and nutrition.

Freshwater Aquaculture: Freshwater aquaculture forms a major share of the Indian fisheries production. It is only the three Indian major carps, which share as much as 1.6 million MT. With technological inputs, entrepreneurial initiatives and financial investments, Freshwater aquaculture has gone up from 500-600 kg/ha/yr to over 2000 kg/ha/yr. Besides IMC other species like catfishes, freshwater prawns and molluscs for pearl culture have also been brought into the culture systems.



In addition, a range of non-conventional culture systems, like sewage-fed fish culture, integrated farming systems, cage and pen culture, running water fish culture have made freshwater aquaculture a growing activity across the country.

Grow-out Carp Culture : Research and development efforts in the last five decades have greatly improved average fish yields in the country making carp culture an important economic activity. Indian Major Carps (**IMC**) Rohu (*Labeo rohito*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*) were the principal species cultured in ponds since ages. Species like *Labeo calbasu*, *L. gonius*, *L. bata*, *Puntius pulchellus*, *P. sarana*, *P. kolus* and *Cirrhinus cirrhosa* are considered to be important candidate species due to their production potential, consumer preference and high market price.

Catfish Culture: Catfishes has great commercial importance. Magur (*Clarias batrachus*) and Singhi (*Hetero-pneustes fossilis*) are the two air-breathing candidate species for culture. Several other non-air breathing catfishes like *Mystus seenghala*, *Pungasius*

Table: 5 - Funds released during 12th Five Year Plan Period under the CSS & CS Schemes:

Name of Schemes	12 th Plan(₹ in lakhs)			
	2012- 13	2013-14	2014-15	2015-16 (Allocated)
Development of Inland fisheries & Aquaculture	3141.64	3103.87	2632.17	3665.00
Development of Marine Fisheries, Infrastructure & Post Harvest Operations.	7457.73	6375.68	9285.08	7000.00
National Scheme of Welfare of Fishermen.	3938.47	5214.73	5204.25	4349.00
Strengthening of Database & Geographic Information System for Fisheries Sector.	379.02	551.79	750.00	495.00
National Fisheries Development Board (NFDB)	10681.00	12316.00	13750.00	15786.00



pungasius, Wallago attu, Ompak pabda are also being cultured in view of the high consumer preference.

Freshwater Prawn Culture: The giant freshwater prawn, (*Macrobrachium rosenbergii*) is the largest and fastest growing species among freshwater prawns. The development of hatchery technology for *M. rosenbergii* and later, for Indian river prawn, *M. malcolmsonii* has opened up new possibilities freshwater aquaculture.

Freshwater Pearl Culture: Freshwater Pearl Culture research in past decades have not only led to development of the base technology of pearl production from freshwater mussel species, viz., *Lamellidens marginalis, L.corrianus* and *Parreysia corrugata*, but also standardized the different steps involved for its production.

Integrated Fish Culture : Integrated fish farming is the combination of two or more separate farming systems where the waste from one subsystem is utilized for sustenance of the other. For example, fish-pig /poultry/duck farming. The system provides considerable potential and scope for augmenting production, and also offers an enormous scope for employment generation and rural economy.

Sewage-fed Fish Culture : Sewage-fed fish culture in *Bheries* of West Bengal is an age-old practice. Area of about 5,700ha is still utilized for growing fish by intake of raw sewage into the system and as much as 7000 MT of fish, mainly contributed by carps, are produced annually from these water bodies.

Ornamental Fish Culture : Ornamental fish form an important commercial component of fisheries with world trade of over US\$ 7 billion. India has over one hundred varieties of indigenous and exotic species that are bred in captivity. The export of ornamental fishes from the country is about ₹10 million, whereas the potential has been estimated to be US\$ 30 million. Establishment of commercial breeding and culture farms can help in its growth.

Coldwater Fisheries Development : The country possesses significant water bodies both in Himalayan region and western ghats, which hold large populations of both indigenous and exotic

Table 6: Fishing Harbours (FHs) & Fish Landing Centers (FLCs)

FH at major port	Minor FH		FLCs	
	Commissioned	Under construction	Commissioned	Under construction
7	50	25	180	16

Table 7: Classification of Marine Fisheries

Realm-wise	Broad resource group-wise	Major species-wise	Vessel-wise	Gear-wise
Pelagic fisheries	Finfish	Oil sardine	Non-mechanised	Trawl
Demersal fisheries	Crustacean	Croakers	Motorised	Seining
	Molluscan	Bombay duck	Mechanised	Gillnets
		Threadfin breams		Hooks and lines
		Carangids		Bag nets
		Non-penaeid shrimp		Artisanal
		Mackerel		
		Penaeid shrimp		
		Cephalopods		
		Ribbonfish		

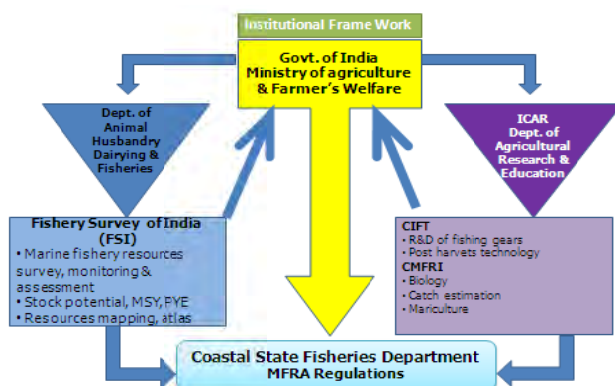


Fig.-1: Institutional frame work of Govt. of India for implementation of "Blue revolution"

cultivable and non-cultivable cold water fish species. Important food fishes in the region are Mahaseers and Schizothoracids among the indigenous species and Trouts among the exotic varieties.

Brackish Water Aquaculture : The country possesses huge brackish water resources of over 1.2 million hectares suitable for farming. But the total area under cultivation is just 13 per cent of the potential water area. Shrimp contributes almost the total production of the sector. Black tiger prawn (*Penaeus monodon*) contributes the lion's share. Culture of crab species like *Scylla serrata* and *S. tranquebarica* has also been taken up.

Semi-Intensive Shrimp Culture: This culture practice mainly with black tiger prawn has shown production levels of 4-6 MT/ha in a crop of 4-5 months. The high return of shrimp farming in the country led to a multi-billion dollar industry. Further, Mulletts and milkfish are important cultivable brackishwater herbivorous fish, with a high growth potential. Seed production technology of seabass (*Lates calcarifer*) has already been commercialised.

Mariculture (Cage & Pen Culture) : Mariculture has the potential to augment production and incomes through coastal as well as open sea farming. It is only an emerging sector. The potential cultivable candidate fin fishes are groupers, cobia, sea bass, pompano, snappers and sea bream. In recent years, open sea cage farming is expanding on a global basis. In India, the sea bass was farmed in cages off Balasore, Odisha. Pens are usually constructed in shallow margins of reservoirs, tanks and ox-bow lakes. The system has great potential considering

the availability of large extent of the water resources in terms of reservoirs, swamps and ox-bow lakes in the country.

Mussel Culture : Green mussel, *Perna viridis* and brown mussel, *Perna indica* are the two important mussel species available in the country. Mussel farming is carried out either in rafts or by long line methods.

Edible Oyster Culture: The technique of oyster farming consists of two items, collection of spat and growing the spat to adult stage. *Crassostrea madrasensis* is the only species that is found to be important for commercial farming. The species reach harvestable size (80 mm) in a culture period of 7-8 months and production levels of 8-10 MT of shell on oysters/ha are obtained.

Pearl Culture : The success of marine pearl culture in India was achieved in 1973. Raft culture techniques are followed for culture of pearl oysters and the important species being *Pinctada fucata*.

Seaweed Culture: Seaweed forms an important component of the marine living resources, available largely in shallow seas. *Agar agar* and algin are two principal industrial products of seaweeds. Seaweed is also used as food, fodder, fertilizers and in several other industrial and pharmaceutical products. The seaweed culture technologies have been standardized achieving a production rate of 120 MT/ha/year.

Conclusion : Possessing 2.4 per cent of the global land area, India sustains 16 per cent of the world population. Increasing per capita fish availability from the present level of only 8 kg to 11 kg (as recommended by World Health Organization) is the primary challenge before the country. Considering the limited scope of the capture fisheries from coastal waters and natural inland waters like rivers and estuaries, emphasis on aquaculture and culture based fisheries from reservoirs and floodplain wetlands to meet the targeted fish requirement of 8.3 million tons by 2020 is appropriate considering the availability of vast water resources, rich cultivable species diversity, sound technological know how and strong human resource.

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India moves towards
Cashless Transactions
to fight Black Money & Corruption



SPECIAL INCENTIVES
to Encourage Digital Payments

Go Digital, Get Benefits



Discount of 0.75% on digital payment at Central Government Petroleum PSUs



10% discount for toll payment on National Highways using RFID card/Fast Tags in 2016-17.



Discount of 0.5% for monthly or seasonal tickets on digital payments from 1st Jan 2017 on suburban railway network

Free accidental insurance upto Rs 10 lakh on buying online ticket in Railways



No service tax on digital transaction charges/MDR upto Rs.2000 per transaction



Discount or credit of upto 10% on the insurance premium sold through the customer portals of public sector insurance companies on digital payment.



Rural Regional Banks and Cooperative Banks to issue "Rupay Kisan Cards" to 4.32 crore Kisan Credit Card holders. Government will support this through NABARD.



2 POS devices will be deployed in 1 Lakh villages with population of less than 10,000. Government through NABARD will extend financial support.



Central Government Departments & PSUs to bear transactions fee/MDR charges on digital payments. State Governments being advised to do the same.

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5 easy ways to go cashless...



Cards, PoS



Aadhaar Enabled Payment System



UPI Do payments through UPI App of your bank



e-Wallet



USSD Easy to do transactions using Feature Phones

My Mobile...My Bank...My Wallet

More convenience, More savings

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