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Review Article

An overview of Poultry Breeding Plan in India

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Abstract

There are two major poultry sub-sectors in India, viz. Commercial organized sector, which is contributing nearly 77% of poultry production and backyard unorganised sector which contributes approximately 23% of poultry production. The major challenge of providing good source of protein to the increasing population requires the breeding plan to increase productivity. Besides, research is going on developing breeds/ strains having high immune competence for adaptability of future stocks to changing farming systems and climate. For smallholder systems, creep-upgrading or nucleus crossbreeding, community-based breeding programs and strategies to generate sustained replacement stocks in systems where crossbreds are the best option is being explored further.

This paper mainly gives an overview of country's poultry breeding plan currently going on, with pureline and grandparent operations primarily using improved strains in the commercial sector and low-input technology varieties developed for unorganized rural sector. The alternate species farming with ducks, geese, guinea fowl, turkey and farm-bred variety of Japanese quail alongwith information on registered indigenous breeds is also shared to give an overview of diversified poultry breeding and farming approach in the Country.

Keywords: Poultry Breeding; Low-Input Technology Chicken; Conservation; Alternate Poultry; Genetic Stock; Commercial and Backyard Poultry; Pureline; Grandparent Stocks.

Poultry sector in India is broadly divided into two sub-sectors – one with a highly organized commercial sector and the other being unorganized but responsible for supplementary income generation and family nutrition to the poorest of the poor. Further, small and medium farmers are mostly engaged in contract farming system under larger integrators. Needs of organized and unorganized sectors are very different. In breeding and genetics also we have different Plans for Commercial and Backyard Poultry breeding, which is briefly enumerated below.

Commercial Poultry Farming

Pureline Operations

Having a pureline base increase the self-sufficiency in operations with least dependence on imports. Of course, it is necessary, intermediately to inject lines with imported traits as per the market demand for which the pureline breeders have to fall back to their supplier.

Inheritance of Economic Traits

In case of Layer, the traits related to sexual maturity, intensity of laying, egg size, broodiness, fertility & hatchability, viability/mortality, body weight and feed consumption, sex linked dwarfism, shall quality & internal quality to meat requirement of consumers are but a few economic desires.

In case of Broiler, growth rate, feed efficiency, body confirmation & carcass quality, feathering, reproductive performance, overall biological efficiency & against skeletal defect, body fat (leaner meat), juvenile mortality etc. are considered for selection.

However, for successful sustenance of pureline breeding, the genotype x environmental x Nutrition x Disease resistance/ susceptibility studies need to be constantly made as the interaction between genotype, we know, is exotic and details of its performance are known, albeit in a different environment. Therefore, the selection of traits must be done very carefully using procedures in vogue.

Grand Parent Operations

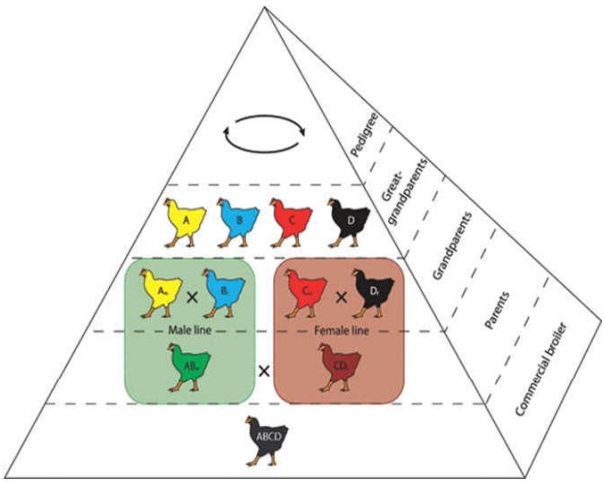
Now a days with global trade relatively easy the access to GP stocks with desired traits have become the preferred choice for GP firms. Further, with easy acquisition of instruments, though at a high cost at times environmentally controlled houses & mechanized operation are in vogue. The overall cost realized due to better FCR & production profiles make GP operations highly profitable particularly, if coupled with integration.

Advantage: High performance varieties give better returns and due to lesser inputs required compared to pureline operation the cost of production margins do not percolate down to the farmers level to that the extent, i.e. giving them better returns.

Day by day, the requirement of the market is increasing for higher yields in less time to compensate for other escalating components, of which feed is the major inputs .In case of pureline procedures it is not possible in a short time. However, GP operators can bring in the 'D; line, which is the main genetically variable base to augment their productivity, in relatively shorter period. The export of parent stocks have also escalated from the imports GP stocks.

The Indian market is nearly 97% wet & is primarily for live birds lock of processing & value addition in an integrated set up will not help realize the maximum potential to the GP importers & eventually to the farmers. If processing can be integrated into the system the realization will be much higher and the benefits will percolate down to the farmers. The same holds true for pureline procedure but since it is understood that the imported GP produces commercial stocks with higher yields (nearly claimed to be 2-4% higher) in dressing percentage the effect will be more evident for GP operators.

The pyramid of commercial poultry breeding is given below.



When producing poultry stock for developing countries, large global breeding companies tend to promote the strains that are used in developed countries, most of which have temperate climates, claiming that these strains are suitable for all environments. However, most of these strains have been selected for increased productivity and general robustness under relatively good management and nutrition conditions, generally without significant temperature stress. If they prove to be tolerant to suboptimal conditions it usually owes more to chance than to directed selection. To maximize performance, the companies often promote improved management standards and practices in the target countries.

Given the very wide range of nutritional factors that affect performance, large companies have not attempted to breed birds with tolerance to specific nutritional deficiencies, but a case could be made for selecting birds for increased tolerance to heat stress.

Genetic improvement can be achieved through cross-breeding, with or without genetic selection in the parent lines; through upgrading by repeated back-crossing to a superior parent breed; or through within-line selection. The cross-breeding approach normally involves a two-way cross between an improved exotic and a local breed, with the aim of combining the better production capacity of the former with the latter's adaptability to harsh environments. This system also maximizes the expression of heterosis, or hybrid vigour, in the cross,

normally reflected in improved fitness characteristics.

Central Avian Research Institutes' initiatives includes germplasm Development wherein the institute made significant strides in developing germplasm of diversified poultry species in the country and developed, improved and released the following germplasm. These are immensely popular in the poultry farming community across the country. Their production technologies have been disseminated not only to the private sector but also to CPDOs, SAUs/SVUs, KVKs, State AH departments and NGOs etc. which in turn have been providing the germplasm to the poultry farming community in their respective command areas. Besides, the institute has also recently introduced emus. The high performing improved indigenous fowls have very high demand in rural/tribal areas as they are highly suitable for the concept of 'production by masses' under sub-optimal input regime. The pure lines of various important breeds of diversified poultry species including chicken layers, broilers and desi fowls are available with the institute, apart from the parent lines of the abovementioned commercial seed material.

The sequencing of the chicken genome in 2004 catapulted the poultry breeding industry into the genomics field. Major poultry breeding companies are actively investigating the use of genomic information to enhance breeding programs and improve selection process. Genomic selection is becoming a new paradigm for breeding companies, and it will change the ways genetic evaluations and selection of elite populations will be performed. There is immense advantage in application of genomics as the accuracy of selection will be improved because phenotypic information, like reproduction, growth, feed conversion etc., impacted by environmental and genetic factors. Further, selection can be made for traits recorded in one sex or those not measured in all selection candidates, such as disease resistance along with better management of genetic variation within and between lines. The primary focus of poultry breeding companies is to provide affordable, high-quality sources of protein and the application of DNA-based technology will achieve this goal more rapidly and efficiently than relying solely on traditional selection methods based on measured phenotypes alone. Recent scientific advances have identified millions of genetic variants, and considerably reduced assay costs.

Considerable challenges remain before genome-based selection can be properly applied, although the major poultry breeding companies are currently vigorously investigating this technology.

High Yielding Breeding Stocks: India has the technical know-how in maintaining the high-yielding stocks and some companies have entered into franchisee agreement with pureline/ Grandparent stock providers. Commercial birds with laying capacity of around 315+ in case of layers and with Feed Conversion Ratio of less than 1.6 in 4-5 weeks of age are now common in this segment. Some of the stocks available are as follows:

Layers

Purelines: Babcock, CARI Gold layer

Grandparents: Bovans, Hyline, Lohmann

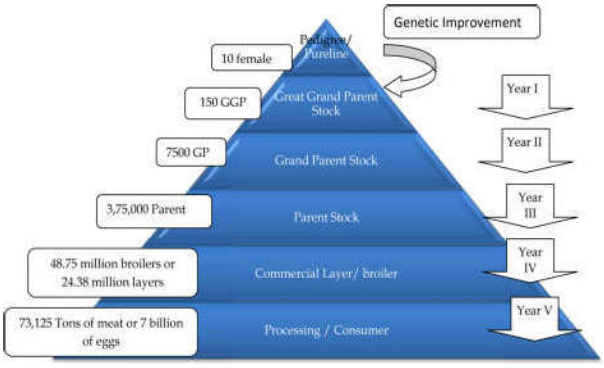
Broilers

Purelines: Cobb, Hubchicks, CARIbro, Indbro, Marshall

Grandparents: Ross, Hybro, Hubbard, Lohmann broiler

Most of the GP stocks are imported eg. Ross(UK), Hybro, Bovans(Netherlands), Hubbard, Hyline (USA/ Germany) etc. Major market share is of Babcock in layer segment and Cobb in broiler segment.

The schematic flow of germplasm from pedigree / pure line level to commercial stock and eventually to the consumer as meat or eggs is represented as follows:



Breeding for Low-Input Technology variety of Chickens

Unorganised sector generates additional income and improvement of nutritional status among the poorest of the poor. For poorest of the poor and farmers with minimal landholdings, major issues are food security and spreading of risk through subsidiary income, which are not addressed by private commercial sector. It is well known fact that a fairly significant proportion of landless and marginal farmers eke out their living from poultry and other

small ruminants. Backyard poultry, hardly requiring any infrastructure set-up, is a potent tool for amelioration of poorest of the poor. Besides income generation, rural backyard poultry provides nutrition supplementation in form of valuable animal protein and empowers women. It has also been noticed that demand for rural backyard poultry is quite high in tribal areas. Animal Husbandry Census has put around 28% of chickens in the backyard (or not in farms) at around 196 million. Further, the egg production from desi chickens is around 15 percent of the total egg production.

For all small-scale production systems in tropical developing countries, tolerance to high temperature is a key requisite in the birds. One of the most effective ways of improving heat tolerance / temperature modulation is through the incorporation of single genes that reduce or modify feathering, such as those for naked neck *(Na)*, frizzle *(F)* and scaleless *(Sc)*, as well as the autosomal and sex-linked dwarfism genes, which reduce body size. These genes are segregating in some indigenous populations, as there is natural selection for heat tolerance as an important component of reproductive fitness. There is also a good case for incorporating these genes into existing commercial lines, as the inputs and time required for this are minimal compared with those required to develop a high-producing, heat-tolerant line from a base population.

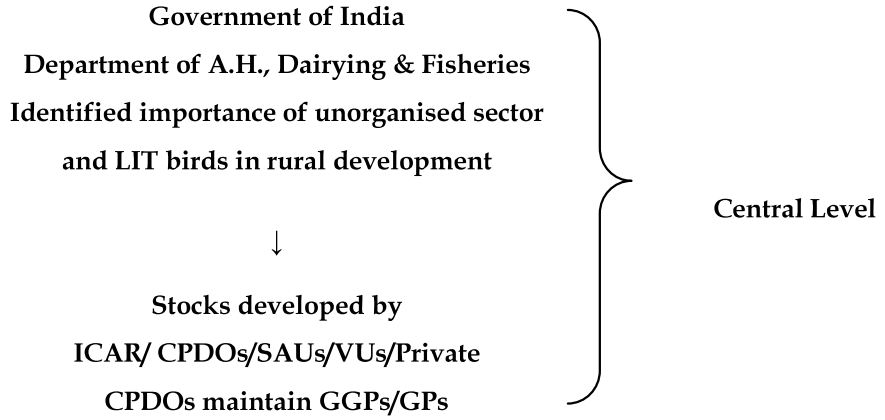
Low-Input Technology Breeding Stock

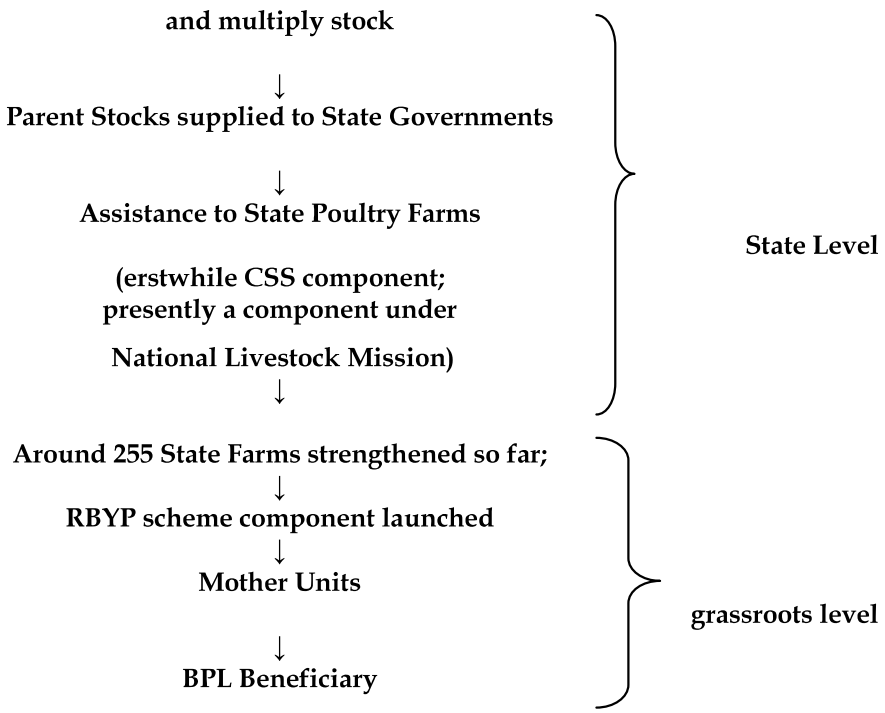
This segment of poultry gained its importance due to its role in rural poultry development, as village-hardy birds that can serve at the farmers' doorstep were needed. Private sector was initially least interested due to lack of commercial gain and the onus was entirely on the public sector and suitable stocks were developed & tested in the Government R&D institutes like Central Poultry Development Organizations – CPDOs located at Chandigarh (Northern Region), Bhubaneswar (Eastern Region), Mumbai (Western Region) and Hessarghatta (Southern Region) , Central Avian Research Institute and Directorate on Poultry Research, Hyderabad, many veterinary colleges/ universities are researching and field testing on these varieties.

One of the major breeding strategies in India is based on crossing Aseel breed males with CARI Red hens to produce crossbred CARI Nirbheek hens. The native breed Aseel is well adapted to tropical conditions and is known for its high majestic gait and dogged fighting qualities, which make it capable of protecting itself against predators; the female CARI Red has been selected for improved egg production capacity under tropical conditions. In the field, CARI Nirbheek hens receiving about 30 grams of supplementary feed per day were able to produce 163 eggs per year with a survival rate of 90-95 percent. Kadaknath is an indigenous breed whose flesh is black is considered not only a delicacy but also of medicinal value and their crosses like CARI-Shyama are also popular.

Some of the stocks developed for the purpose are Chabro, Kalinga Brown, Kaveri, Vanaraja, Gramapriya, CARI-Gold, Hitcari, Upcari, Cari-Debendra, Giriraja, Girirani, Krishipriya, Swarnadhara, Nandanam 99 and Rajasri. New varieties are also coming up like Srinidhi, Jharsim, Kamrupa and Pratapdhan.

Therefore, the activities of GOI at the apex level towards rural backyard poultry development can be summarised as follows:





A few private sector players like Keggfarms, New Dr. Yashwant Agritech Pvt Ltd, Jalgaon, Indbro Research and Breeding Pvt. Ltd., Shipra Hatcheries, Patna are also producing stocks like Kuroiler, Satpuda-desi, Rainbow Rooster and Shipra in this segment.

Accordingly, we have tentative bird allocations State-wise (which have to be validated by the States) as follows:

S.N.	States	Birds suitable for rearing in the backyard (To be validated by States)
1	Andhra Pradesh	Gramapriya, Vanaraja, Srinidhi, Rajashri, Indbro(pvt), Kuroiler (pvt)
2	Bihar	Jharsim, Shipra (pvt), Kuroiler (pvt)
3	Chhattisgarh	Gramapriya, Vanaraja, Srinidhi (new), Rajashri, Kuroiler (pvt), Indbro(pvt)
4	Himachal Pradesh	Chabro, Nirbheek, Kuroiler (pvt)
5	Jharkhand	Jharsim, Shipra (pvt)
6	Karnataka	Giriraja, Girirani, Swarnadhara
7	Kerala	Gramalakshmi, Gramashree, Krishipriya,
8	Madhya Pradesh	Narmadanidhi, Satpuda Desi (pvt), Chhabro
9	Maharashtra	Satpuda Desi (pvt), Chhabro
10	Odisha	Kalinga Brown
11	Rajasthan	Chabro, Nirbheek, Pratapdhan
12	Tamil Nadu	Nandanam 99
13	Telangana	Gramapriya, Vanaraja, Srinidhi, Rajashri
14	Uttarakhand	Chabro, Nirbheek,
15	Uttar Pradesh	Chabro, Nirbheek,
16	West Bengal	Kalinga Brown,
17	Assam	Kamarupa, Kalinga Brown

Conservation and Propagation of Indigenous Breeds

Need for Conservation: We know that the progenitor of modern-day chicken has been the Red Jungle Fowl and over the years breeds have been developed slowly for commercial purpose as layers and broilers. However we still have lot of indigenous birds which cannot be defined in either category.

Breeding Capabilities Vs Biodiversity Erosion: Presently only about 3-4 poultry breeding companies provide meat stocks for farms around the world. A similar number of companies supply birds for commercial egg production. As a result modern

animal industry now uses only a few breeds of any species. Of the many breeds once commonly seen on farms, many have declined sharply in numbers and others have disappeared almost completely. This may be one of the examples of erosion of livestock biodiversity.

Productivity Vs Conservation: On one hand, to increase productivity we want certain natural characters to be eliminated and on the other we talk of conserving the indigenous varieties, which sounds contradictory. However, we have evidence in certain cases that indigenous breeds may have advantage in terms of refractoriness to certain diseases, adaptability to certain environments or are simply liked by local population for taste, look or other qualities etc.

Disease Resistance and Consumer Preferences: In some cases of agriculture crops like rice, potato, etc. when they were destroyed in various countries at different times due to pests and diseases, near famine conditions were created. These situations were overcome by introducing some indigenous varieties which were resistant to those disease/ pest.

The rationale for conserving the indigenous varieties therefore lies in deriving some benefit out of the same later. For example research is underway for developing/ finding avian influenza resistant variety of poultry and may be some indigenous characters at genetic or molecular level come to the rescue in not only cases of avian influenza but other economically important diseases as well.

Reasons for conservation can be summarized from above as follows:

- Economic potential
- For research
- To overcome selection plateaus which occur when genetic variation is lost
- To take advantage of heterosis (hybrid vigour)
- For cultural and organoleptic reasons
- To provide a possible alternative for circumventing problems of:
  i. spread of disease
  ii. climate change
  iii. changing availability of feedstuffs
  iv. social change, such as issues of animal welfare and environmental sustainability
  v. selection errors

Some Registered Chicken Breeds of India

S.N.	Breed	Home Tract
1.	Ankaleshwar	Gujarat
2.	Aseel	Chhattisgarh, Orissa and Andhra Pradesh
3.	Busra	Gujarat and Maharashtra
4.	Chittagong	Meghalaya and Tripura
5.	Danki	Andhra Pradesh
6.	Daothigir	Assam
7.	Ghagus	Andhra Pradesh and Karnataka
8.	Harringhata Black	West Bengal
9.	Kadaknath	Madhya Pradesh
10.	Kalasthi	Andhra Pradesh
11.	Kashmir Faverolla	Jammu and Kashmir
12.	Miri	Assam
13.	Nicobari	Andaman & Nicobar
14.	Punjab Brown	Punjab and Haryana
15.	Tellichery	Kerala

Indigenous ducks mostly include Indian Runner, Nageshwari, Sythetemet, Kuttanadu Chara and Chemballi. Khaki Cambell and Muscovy varieties have been introduced to increase egg and meat production respectively.

Methods of Conservation

Ex situ preservation involves the conservation of plants or animals away from their normal habitat. It is used to refer to the collection and freezing in liquid nitrogen of animal genetic resources in the form of living semen, ova or embryos. It may also be the preservation of DNA segments in frozen blood or other tissues. The potential exists to use DNA and cloning to re-develop breeds, but the technology is still new and costs are high.

In situ conservation is the maintenance of live populations of animals in their adaptive environment or natural habitat, as close to it as is practically possible. For domestic species the conservation of live animals is normally taken to be synonymous

with *in situ* conservation.

This is expensive and unless the breed can be used for production is not likely to succeed. Development of niche marketing schemes emphasizing the traits of a particular breed can be successful.

Alternate Species Farming

Local native fowl and germplasms of indigenous and alternate poultry birds (viz. ducks, guinea fowl, geese, turkey. Japanese quail and pigeons) and ratites (Emus and Ostriches) are raised as per regional requirements. The choice of alternate poultry species depends on the resource specific regional suitability and adaptability to the prevailing eco-agro-climatic conditions.

Domestic Duck and Geese Farming in India

Domestic ducks (***Platyrhynchos domesticus***) are decedents of wild mallard ducks. These are the first major component of the alternate poultry segment. Duck production in India is largely traditional enterprise among farming community. Free range and backyard duck keeping is normal practice. Night shelter is provided in the household and ducks are allowed to scavenge for themselves in the open, especially paddy fields. This is the reason while undertaking vulnerability mapping for Avian Influenza, paddy growing areas were juxtaposed with duck density data.

Duck farming in the Central Poultry Development Organization & Training Institute (Southern Region) at Hessarghatta, Bangaluru is under closed high biosecurity system. This farm was developed in collaboration with United Kingdom in 1987 and is continuing with the selective duck breeding program maintaining Khaki Campbell ducks and Pekin ducks (Vigova Super M) purchased later from Vietnam in 1996. CPDO&TI is producing on an average of one lakh ducklings for distribution annually.

Local duck breeds Sythetmete, Nageswari, Pati, Deo-Hanh, Cina-Hanh, Raj Hanh and Kuttinad(Southern) varieties– Chara and Chemballi are very popular besides Indian Runner. Sythetemete is known to be an egg type native breed whose plumage is brown and bill yellow. On maturity it develops bluish colored feather around neck and head. It produces around 80-150 eggs. Nageshwari is also an egg type duck, heavier than Sythetmete with black plumage except breast and throat where it is white. Indian Runner was the top layer with 140-180 eggs until Campbell appeared. They are hardy and good foragers. Pati-duck are non-descript with mixed colored plumage found mostly across the Brahmaputra valley zone with low egg production of around 80 only. Raj Hahn is kept more for ornamental purpose. Cina Hahn has a unique tuft of feather on head. Deo Hahn meat is popular. Upgraded desi ducks after crossing with Khaki Campbell have shown increased production. The adaptability of local breeds to the hardy environment, which includes the ability to use local feeds and disease resistance, is important but specific research in these areas is still wanting. Among exotic breeds Khaki Campbell and White Pekin are common. Muscovy ducks are also available in India.

There is a vast scope in India for duck production and some of the natural advantages are demography, climate, and popularity among the rural poor and intimate relation with their livelihoods. India has a long coastline and extensive inland watershed areas where duck farming can be done. However requirement of water-bodies for growth of ducks is a myth. Nonetheless, living up to its waterfowl designation it is abundantly found in heavy rainfall areas, coastal regions and swampy delta regions of India. However, coastal areas of West Bengal, backwater areas of Kerala have shown duck farming as a popular activity. Ducks can be reared in marshy river side and low-lying water-logged areas where chicken or other livestock may not easily be kept.

However, ducks have also been kept, bred and well-maintained under captive conditions in the States of Tripura (North Eastern State), Gujarat and Karnataka (Hessarghatta) where the Central Poultry Development Organization & Training Institute (CPDO), Southern Region of Government of India as mentioned earlier is having one of the largest breeding farms in the country having breeding and commercial stocks. Under a scheme of Government of India 'Assistance to State Poultry Farms' (ASPF) many farms were assisted to suitably strengthen their infrastructure.

Geese were one of the first domesticated birds. However they continue to be neglected species in India. Geese are the fastest growing species commonly raised on green pasture. Domestic geese (*Anser anser*), the descendants of common wild geese found in Asia and Europe. These are raised mainly for meat production. Geese constitute almost 1.0 percent of poultry population. In spite of its good economic potentials geese production is neglected in the country. Local non-descript geese are commonly raised by geese farmers. Brown backed and white geese are the two varieties generally raised by small flock holders.

Geese, being excellent foragers / scavengers, can

find most all of their nutritional needs when put on succulent grass and other cheap components of crops. Geese are subject to relatively few of chicken and other water common ailments. Geese normally remain congregated in flock during free-range foraging on pastures. They have powerful bills with which grasses and underwater plants can be pulled up. They can reach over the soil and water for roots, bulbs and aquatic animals. They have long necks which help them adapt at cleaning weeds from hard to reach places in ditches and swampy areas. They can also manage on vegetable trimmings, garden and table leftovers, canning refuse and kitchen surplus. They can even pick up shattered grains of rice, wheat and other crops after harvest, which ultimately go into the waste of the fields.

Guinea Fowl Farming in India

Guinea fowl or helmeted guinea fowl (***Numida meleagris galeata***) is an important and economic alternate poultry species. One of the most ancient birds, the guinea fowl is considered to have originated from South Africa from where it spread all over the continent, excluding desert regions, up to the Mediterranean sea. For a long period of time, the guinea fowl, and its eggs, was one of the main dish of the Africans. It can explain why this bird is more resistant to hot weather than the chicken. Guinea fowl were possibly introduced into the Indian sub-continent during the slavery era of mediaeval centuries. Preliminary survey of guinea fowl showed its distinct popularity with marginal farmers and other vulnerable groups as small-scale poultry enterprise. The indigenous germplasm seems well adapted to the diversified agro-climatic conditions prevailing in semi-arid regions. Guinea fowl population rank third after chickens and ducks.

In recent years this alternate poultry species witnessed increasing emphasis for low-input grain-saving aviculture (LISA).It is hard to distinguish between the male and the female since they both have the same plumage. It is referred to by different regional names in this sub-continent 'Titari in northern plains; and 'Chittra' in the Majority of guinea fowl are raised in\ semi-arid pockets of Punjab,Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh, Maharashtra, Saurashtra, Karnataka, Andhra Pradesh, Orissa and Tamil Nadu. Present production status in this country is widely spread and highly fragmented without specific data.

Under a scheme of Government of India 'Assistance to State Poultry Farms' (ASPF) some farms have been assisted for guinea fowl stock production in the country. Central Poultry Development Organization (Eastern Region), Bhubaneshwar also maintains Guinea Fowls. Management guidelines are also available with the Organization.

The descriptions of guinea fowl breeds/ varieties are essentially based on the plumage colour variations. Pearl, Lavender and White are the three main varieties recognized world over. In India, Pearl guinea fowl are most common among village stocks and usually referred as the 'local' breed. Pearl individuals are characterized by dark-gray feathers with uniformly distributed white spots that present a pearl like appearance. Pearl plumage, colour is also regarded as the 'wild' mutant. Lavender birds are identified by their light gray distinctly spotted feathers. White variety possesses completely white plumage. 'GUNCARI' guinea fowl stocks developed at the Central Avian Research Institute, Izatnagar are selected for high early body weight and breed true to their plumage characteristics. Some minor plumage mutant varieties, viz. Violet, Lilac, White breasted pearl and White breasted lavender also available.

Turkey Farming in India

Domestic turkeys (***Melegris gallopavo***), the descendants of Central and South American regions were introduced in the country possibly by Christian Missionaries. This a species introduced with specific market demand wherein they are catered mostly during Thanksgiving and Christmas seasons. However the scope is increasing over the years.

Exotic germplasm viz. Beltsville – mini, medium and large are raised at research institutes, universities and government farms and some private organizations. Others like Bronze, White Holland, Bourbon Red, Narragansett, Black and Slate are also present but commercial production of broad-breasted white and Bronze alongwith Beltvile is more popular. Commonly raises stocks are non-descript native germplasm. Mainly raised for meat turkeys production is mostly carried in Tamil Nadu and Andhra Pradesh. In Uttar Pradesh turkey production is popular around Allahabad, Bareilly and Mirzapur regions. Earlier Turkey production failed to generate market demand but now it is no longer a festive food. Several states have well organized turkey production units e.g. Punjab, West Bengal, Tripura, Mizoram.

The commonly followed traditional extensive systems of rearing are very suitable for turkey production in dry hot climatic regions. Turkey poults are cared for four weeks under intensive

management. Subsequently, these are put free-range foraging / scavenging system of production, but these also need supplement feeds for proper growth. Turkey growers generally buy pullets during March to May so that bird attains their maturity by December when festive demands are high.

Central Poultry Development Organization & Training Institute (Southern Region), Hessarghatta maintained turkeys earlier which had to be depopulated due to avian influenza outbreak but now proposes re-introducing turkeys. Turkeys are prone to common fowl diseases and also some species specific ones like Turkey coryza, venereal disease, Arizonosis and blue-comb disease. The health coverage followed is also minimalistic with vaccinations against Newcastle Disease, Cholera and Pox.

Turkeys are suitable birds for tropical climate of Indian sub continent. There is considerable scope for turkey rearing in India, as turkey can be reared in free range or semi intensive systems especially in rural areas for economic enhancement of landless laborers, marginal and small farmers. Free-range turkey rearing method requires low investment in facilities and equipments and it is a viable and sustainable bird both for backyard and commercial venture in economic point of view.

Japanese Quail Farming in India

Japanese quail (***Coturnix coturnix var japonica***) are the domesticated version of wild migratory of quails. These are the smallest avian species farmed for meat and egg production. Quail probably the smallest avian species used for production of table eggs and meat. Because of prolific egg production and meat yield, it attains the status of viable commercial poultry enterprises. Quail has unique qualities of hardiness and adaptability to diversified agro-climatic condition. Several attributes of this species making it ideal for rural poultry production for creation of rural employment for solving gender issue in employment and to provide supplemental income and protein requirement to rural farmers.

Salient features of quail include low space requirement, short generation interval, fast growth, low feed consumption, early maturity, high rate of egg laying, low cost of production/ capital input, refractoriness to common diseases of chicken; meat and egg is a table delicacy, nutritious and most often pickled. Eggs are used for fresh and processed products.Under the scheme of Government of India 'Assistance to State Poultry Farms' (ASPF) some farms have been assisted for Japanese quail stock production in the country. Central Poultry Development Organization (Western Region), Mumbai and Central Poultry Development Organization (Northern Region), Chandigarh also maintains Japanese quails.

First raised by CARI, Izatnagar as experimental poultry birds and subsequently improved germplasm and technical know how was supplied to a franchise for commercial exploitation in the country. Popularization of Japanese quail is constrained due to Wild Life (Protection) Act 1972 to save indiscriminate hunting of Indian Rain quails, not much popularization of quail farming in rural and semi-rural areas was possible. The improved genetic varieties of quail for commercial adoption developed at CARI, Izatnager include CARI –Sweta (white feathered quail), CARI-Ujjwal (white breasted quail) , CARI-Uttam (broiler quail line) and CARI-Pearl(white egg shell line). Quail germplasm units are also being maintained by State Government and University farms and some franchises in private sector.

Earlier there was a requirement of license for Japanese quail farming but now as per Notification S.O. 3653(E) dated 6th December, 2013farm-bred variety of Japanese Quail has been excluded from the Wild Life (Protection) Act, 1972

Conclusion

Poultry production is highly dynamic in terms of structural and management changes. In today's business environment, faster the ability to adapt to the changing system requirement, faster is the growth. However sustainability often requires dependence on other sectors like feed/ingredient inputs and processing facilities.

In India, poultry sector growth may be attributed to many factors like rising incomes and a rapidly expanding middle class, together with the emergence of vertically integrated poultry producers that have reduced consumer prices by lowering production and marketing costs. Integrated production, market transition from live birds to chilled and frozen products, and policies that ensure supplies of competitively priced corn and soyabeans are keys to future poultry industry growth in India. Further, disease surveillance, monitoring and control will also decide the fate of this sector. Concurrently, India's unorganised and backyard poultry sector is also one of the potent tool for subsidiary income generation for many landless/ marginal farmers and also provides nutritional security to the rural poor.

Keeping in view the multifarious requirement of different organized, unorganized sectors, we need to pay attention to the breeding and farming aspects of all the areas viz. Commercial chicken, low-input technology fowl, indigenous breeds of chicken and ducks and alternate species like ducks, geese, guinea fowl, Japanese quails, turkeys etc.

As per vision 2050 of Central Avian Research Institute, the goal is to have need-based infusion of superior genetic stocks of diversified poultry species with strict enforcement of bio-security measures as and when required to improve the efficiency of the breeding programmes for developing elite poultry stocks with higher productivity, immuno competence/disease resistance and adaptability to diverse climates employing molecular and bio-technological approaches in conjunction with the conventional techniques

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