Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(2): 211-217

Received: 15-01-2020
Accepted: 19-03-2020

R Prabakaran
Officer on Special Duty, Advanced Institute for Integrated Research on Livestock and Animal Sciences (AIIRLIVAS), Government of Tamil Nadu, India

S Ezhil Valavan
Professor, Poultry Research Station, TANUVAS, Chennai, Tamil Nadu, India

AK Thiruvenkadan
Professor, Department of AGB, VC&RI, TANUVAS, Namakkal, Tamil Nadu, India

Corresponding Author:
R Prabakaran
Officer on Special Duty, Advanced Institute for Integrated Research on Livestock and Animal Sciences (AIIRLIVAS), Government of Tamil Nadu, India

Diversified poultry production: An overview

R Prabakaran, S Ezhil Valavan and AK Thiruvenkadan

Abstract
Poultry is kept in a wide range of agro-ecological zones and production systems as well as under different economic regimes around the world. The global poultry sector is divided into two distinct subsectors: the commercial sub-sector dominated by international, well developed, vertically integrated companies, and the small-scale sub-sector that provides up to 90 per cent of total poultry production in some of the least developed countries. Remarkable growth of poultry sector in the Indian sub-continent has been essentially chicken dominated; dependent on intensive system of production involving high technology with high external inputs. The prevailing socio-agro-economic scenario of this sub-continent needs broad spectrum of poultry alternatives to meet the different local requirements. The availability of such diversification possibilities would maximize the returns from a given level of inputs and also minimize the risks and hazards to the environment.

Keywords: diversified poultry, Japanese quail, Turkey, duck, geese, guinea fowl, native chicken, squab, production

Introduction
Global meat production has risen by almost 20 percent over the last 10 years, a large part of which can be attributed to poultry. The poultry market outlook over the next decade remains mostly positive, according to FAO projections that show production of all meats expanding by 24 percent (FAO, 2017) [1]. By 2024, an additional 26 million metric tons of poultry will be produced worldwide, accounting for more than half of additional total meat production by 2024; total poultry meat production is forecast to reach about 133 million metric tons and will account for more than half of the world's additional total meat output over the next decade (Conway, 2015) [2].

India being in the tropical region of the world, the prevailing macro-climatic conditions is mostly congenial to poultry production. Among the many subsectors of agriculture, livestock sector is gaining momentum in India and within the livestock sector, poultry occupies a premium position. Poultry industry is contributing Rs.698.88 billion to the total national GDP of Rs.124,486 billion in 2015-16 (0.56%) (Anon, 2017) [3]. The organized sector of poultry industry is contributing 70% of its total output. India is ranked as the 3rd largest egg producer and the 4th largest meat producer in the world. Egg and poultry are the cheapest source of animal protein next only to milk. Poultry production can be taken up in limited land area and the Indian climate also suits it. National Sample Survey Organisation (NSSO, 2012) [4], in its 68th round report showed that, as per capita income increased the demand for food has shifted towards proteins, fruits and vegetables. In urban areas, the demand for milk, egg and chicken meat increased by 80, 34 and 9% to 84.9, 37.6 and 27% respectively during the last two decades while the demand for fish and prawn, and mutton decreased by 27.1 and 12.3% to 21 and 10% respectively. FAO also predicted that 42% of meat that will be consumed worldwide by 2020 will be chicken meat, overtaking pork and beef. Further increasing population, growing demand for convenient foods, awareness about inclusion of animal protein, rising per capita income are some of the factors propelling the growth surge of the industry (Kearney, 2010) [5].

The poultry sector in India witnessed a rapid growth from 1951 to 2019 and the percentage of growth observed during the census periods 1951-56, 1956-61, 1961-66, 1966-72, 1972-77, 1977-82, 1982-87, 1987-92, 1992-97, 97-2003, 2003-07, 2007-12 and 2012-19 were 28.98, 20.46, 1.05, 20.02, 14.95, 30.49, 32.53, 11.53, 13.20, 40.68, 32.68, 12.39 and 16.8 per cent respectively. As per the latest census (Anon, 2019) [6], the total poultry population is 851.81 million which indicates an increase of 16.81 per cent over the previous census period (i.e., 2012).

A total of 45.78 per cent increase in backyard poultry and 4.5 per cent increase in commercial poultry have been noticed during this period.

Diversified poultry farming

Diversified poultry includes ducks, turkeys, Japanese quail, guinea fowl, goose and pigeons. It may also include all poultry production systems other than commercial egg and broiler chicken production. Diversified poultry systems are now considered as the viable livelihood option for small and marginal farmers. Ducks account for 7 per cent of poultry population and are mostly found in coastal states of the country and in states with more lakes and rivers like West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, Kerala, Assam, Jammu and Kashmir and Tripura. Duck farming is still in primitive stage and indigenous ducks out number exotic ducks in spite of their inferior performance. Japanese quail farming is a low cost farming with increasing promise. Turkey, Guinea fowl and goose farming are still in their infant stage. Emu and ostrich farming have also been tried.

The Indian and world poultry population over the decades are presented in Table 1. Chicken alone contributes about 90 per cent of the total population in India as well as at world level and the population of ducks, geese, guinea fowl, pigeons and turkey are meagre.

Table 1: Diversified poultry population statistics

Year	India (Million)			World (Million)						Indian population over world population	
	Chicken	Ducks	Contribution of chicken (%)	Chicken	Ducks	Geese & guinea fowls	Turkeys	Pigeons & other birds	Contribution of chicken (%)	Chicken (%)	Ducks (%)
1961	107.60	6.70	91.59	3906.69	193.45	36.64	204.24	14.11	89.70	2.75	3.5
1966	105.70	9.70	93.50	4445.63	229.84	44.49	166.66	19.68	90.61	2.38	4.2
1972	129.50	9.00	93.66	5538.87	275.98	57.63	213.43	14.85	90.79	2.34	3.3
1977	149.30	10.10	91.07	6258.97	309.82	64.24	246.92	19.12	90.72	2.39	3.3
1982	180.50	17.70	91.44	7748.20	379.70	76.12	321.94	28.52	90.57	2.33	4.7
1987	251.00	23.49	92.79	9559.73	502.42	101.66	397.58	35.85	90.21	2.63	4.7
1992	284.02	22.08	91.07	11442.73	668.66	178.36	427.21	47.88	89.64	2.48	3.3
1997	315.43	30.92	93.85	14117.51	946.91	262.18	469.21	57.50	89.05	2.23	3.3
2003	457.40	29.96	95.72	16178.76	1020.40	286.05	454.95	32.92	90.02	2.83	2.9
2007	617.73	27.64	96.71	18300.49	1064.50	306.75	462.22	32.53	90.75	3.38	2.6
2012	692.65	23.54	97.69	20489.76	1129.28	352.41	462.51	32.33	91.20	3.38	2.1
2017	783.24	18.51	97.63	22847.06	1150.90	371.45	459.37	27.45	91.92	3.43	1.6

Source: Anon. (2012) [7]; Anon. (2017) [3]; FAOSTAT (2019) [8].

The egg production in India and world are presented in Table 2. The total egg production of India as of 2017 is about 6.22 per cent of the total egg production of the world. As of 2017, about 93 per cent of the total eggs produced around the world are from chicken and the remaining is from other birds.

Table 2: Egg production statistics

Year	India (Millions)		Contribution from ducks (%)	World (Millions)		Contribution from Chicken (%)
	Chicken	Ducks		Chicken	Other birds	
1961	3620*	-	-	269140	10668	96.2
1966	5000*	-	-	322994	11571	96.5
1972	6700*	-	-	381140	13658	96.5
1977	9840*	-	-	432195	16533	96.3
1982	11454*	-	-	501452	18754	96.4
1987	17795*	-	-	600479	29240	95.4
1992	22929*	-	-	683748	42011	94.2
1997	28689*	-	-	864529	56179	93.9
2003	38270	1490	3.75	1019369	68591	93.7
2007	51440	1516	2.86	1120098	74114	93.8
2012	65643	1927	2.85	1256024	87207	93.5
2017	88137*	-	-	1416675	109700	92.8

Source: Anon. (2012) [7]; Anon. (2017) [3]; FAOSTAT (2019) [8] *Total egg production

The meat production statistics of India and around world is presented in Table 3. The statistics indicates that the major contribution of the meat from poultry has also been obtained from the chicken which accounted for 99.31 per cent in India and 89.40 per cent around the world.

Table 3: Population of meat type birds and meat production

Year	India (in Million)		Meat contribution from chicken (%)	World (in Million)				Meat contribution from chicken (%)
	Chicken	Ducks		Chicken	Ducks	Goose and guinea fowl	Turkey	
1961	69.00	08.84	88.64	7555.90	335.92	149.76	898.08	84.52
1966	72.00	12.74	84.97	10565.24	433.90	200.19	1175.52	85.38
1972	84.00	11.83	87.65	14653.58	530.52	234.27	1405.26	87.1
1977	90.00	13.26	87.16	18677.90	621.92	254.80	1668.09	88.01

1982	130.05	23.40	84.75	25184.50	786.84	305.33	2174.97	88.52
1987	276.75	30.94	89.94	31468.68	1055.33	408.60	3016.52	87.54
1992	576.90	31.46	94.83	39876.03	1600.47	862.21	3669.11	86.67
1997	624.60	40.30	93.94	52266.36	2445.01	1638.17	4395.78	86.04
2003	1210.00	39.00	96.88	65840.53	3060.16	1898.59	5201.12	86.63
2007	1755.00	36.40	97.97	77030.23	3648.93	2246.08	5462.96	87.15
2012	2681.60	31.20	98.85	94086.89	4361.56	2667.06	5839.00	87.97
2017	3519.99	24.35	99.31	109056.18	4460.23	2522.20	5948.20	89.4

Source: Anon. (2012) [7]; Anon. (2017) [3]; FAOSTAT (2019) [8].

a. Japanese quail farming

The Japanese quail is a small, migratory, gallineous, ground dwelling game bird that belongs to the Pheasant family. They were first domesticated in Japan in 1595. There are two species of quail in India; the black-breasted quail found in jungle (*Coturnix Coromandelica*) and the brown colored Japanese quail (*Coturnix Coturnix Japonica*).

There are different breeds / varieties/ species of quail available in the world; some of the popular breeds / species are listed below in table 4.:

- Wild type (Pharaoh quail)
- British range
- ❖Tuxedo
- Manchurian golden
- ❖English white

Table 4: Different breeds / varieties/ species of quail available in the world

Bobwhite Quail (*Colinus virginianus*) / Northern Bobwhite / Virginia Quail	Blue Scale Quail (Callipepla squamata)
Mountain Quail (*Oreortyx pictus)* / Codorniz de mountana/ Painted quail/ Plumed quail / San Pedro quail	Mearns Quail (Cytonyx Montezuma)
Gambel's Quail (*Callipepla gambelii*) / Arizona / top-knot/ desert quail	California quail (*C. californica*) / Catalina quail/ Valley Quail
Asian Blue Quail or Button quail (*Coturnix chinensis)*	Blue Quail **(***Coturnix adansonii***)**
Brown Quail (*Coturnix ypsilophora*)/ swamp quail / swamp quail	Harlequin Quail (*Coturnix delegorguei*) / Montezuma Quail / Mearns' Quail / Fool's Quail
Himalayan Quail (*Ophrysia superciliosa*)	Japanese Quail (*Coturnix japonica*)
Jungle bush-quail (*Perdicula asiatica*)	Manipur bush-quail (*Perdicula manipurensis*)
New Zealand Quail (*Coturnix novaezelandiae*) / koreke quail	Rain Quail (*Coturnix coromandelica*)
Rock Bush-quail (*Perdicula argoondah*)	Snow Mountain Quail (*Anurophasis monorthonyx*)
Stubble Quail (*Coturnix pectoralis*)	Marbled Wood Quail, *Odontophorus gujanensis*
Spot-winged Wood Quail, *Odontophorus capueira*	Black-eared Wood Quail, *Odontophorus melanotis*
Rufous-fronted Wood Quail, *Odontophorus erythrops*	Black-fronted Wood Quail, *Odontophorus atrifrons*
Chestnut Wood Quail, *Odontophorus hyperythrus*	Dark-backed Wood Quail, *Odontophorus melanonotus*
Rufous-breasted Wood Quail, *Odontophorus speciosus*	Tacarcuna Wood Quail, *Odontophorus dialeucos*
Venezuelan Wood Quail, *Odontophorus columbianus*	Black-breasted Wood Quail, *Odontophorus leucolaemus*
Stripe-faced Wood Quail, *Odontophorus balliviani*	Starred Wood Quail, *Odontophorus stellatus*

During the year 1974, Central Avian Research Institute, Izatnagar imported Japanese quail from Davis, California for diversification in India. Commercial quail farming in India can be a great source of handsome income and employment opportunity. Along with its economic importance, quail farming is also very pleasuring and entertaining. Quail are very small sized poultry birds and their rearing system is very easy and simple. At present quail have become the third largest avian species in number only next to chickens and ducks in the country. Quail are very suitable for commercial production of both meat and eggs. Quail can adopt themselves with almost all types of climate and environment and Indian climate is very suitable for raising quails commercially. It requires less rearing space i.e., one sq. ft. floor space sufficient to rear five broiler quails as well as less fixed investment for housing and equipment. In quail rearing, there is a good return on investment in a short period of five weeks and they are more disease resistant than chicken and do not require any vaccination as of date. Their meat and egg have good bio-values (Prabakaran, 2012; 2014) [9, 10].

The ICAR-CARI has come out with few strains namely CARI UTTAM, CARI BROWN, CARI SUN-HERI, CARI UJJAWAL (White breasted quail), CARI SWETA (White feathered quail) and CARI PEARL (White egg shell line) (ICAR-CARI) [11]. Japanese quail was introduced in Tamil Nadu in the year 1983. The Poultry Research Station, Tamil Nadu Veterinary and Animal Sciences University, Chennai has released three meat type strains of Japanese quail *viz*: Nandanam Japanese quail –I, Nandanam Japanese quail –II, Nandanam Japanese quail –III, during 1993 - 2004 with gradually improved weight gain and feed efficiency and broiler type breeder quail in 2013. Veterinary College and Research Institute, TANUVAS, Namakkal, has released a meat-type Japanese quail hybrid strain, Namakkal quail –I and Namakkal gold quail for the benefit of farming community. GADVASU, Ludhiana released three strains of Japanese quail as Punjab – I, II and III while CPDO, Northern region and CPDO, Western region have also released new strains of Japanese quail. Japanese quail farming is making rapid strides in Tamil Nadu that meets the huge demand in South India. Japanese quail farming for eggs is popular in Kerala. About 30 million meat type broiler quail are produced in Tamil Nadu and 50 million Japanese quail eggs in Kerala annually (Prabakaran, 2014) [10].

b. Turkey Farming

Turkey *(Meleagris Gallopavo*) occupies an important position and is playing a significant role in augmenting the economic and nutritional status of varied population. They form almost two per cent of the total world poultry population. They are reared for meat only and its meat is the leanest among different domestic avian species. The standard varieties recognized by the American Poultry association are Bronze White, White Holland, Bourbon Red, Narragansett, Black and

Beltsville Small White (TNAU) [12]. The two varieties that are not recognized are Broad-Breasted Bronze, Broad-Breasted White (also called Large White). The most commonly raised commercial variety is the Large White. The Broad-Breasted Bronze, similar in size and conformation, is less popular because of a preference for white feathering. The major primary breeders of turkeys in the world are British United Turkeys, Hybrid Turkeys and Nicholas Turkey. They offer 10 parental strains named Big 6, Big-9, BUT-8, BUT-9, BUT-10, Hybrid converter, Hybrid Grade maker, Hybrid XL, Nicholas 900 and Nicholas 300.

Turkeys are mostly concentrated in and around cosmopolitan cities of India in small numbers. Indigenous and non-descript turkeys are found in good numbers in Kerala, Tamil Nadu, eastern districts of Uttar Pradesh and some other parts of India (Prabakaran,2014) [10]. Turkey farming is very popular in western countries and the major turkey producing countries are United States of America, Canada, Germany, France, Italy, Netherlands and the United Kingdom. Turkey is a large gallinaceous bird of poultry that is native of North America, domesticated in Europe and are now important source of food in many parts of the world. Turkey farming is in infancy in India. However, serious efforts are being made at Central Poultry Development Organisation (Southern Region), Hessarghatta, Bangalore to promote turkey farming. Kerala and Tamil Nadu are the leading states in turkey production and turkey meat is getting popular in southern regions. There are three varieties of turkey commonly available in India and they are Board breasted bronze, Broad breasted white and Beltsville small white. White turkeys seem to be more suitable for Indian conditions. 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 labourers, marginal and small farmers. Free-range turkey rearing method requires low investment in facilities and equipment and it is a viable and sustainable bird both for backyard and commercial venture from economic point of view. Turkeys are suitable birds for tropical climate of Indian sub continent (Prabakaran, 2014) [10]. The turkeys may be reared under intensive system also. The intensive rearing system is largely restricted to the Government / public sector. The intensive management is almost similar to that of chicken and is basically of deep litter type. Free range system of rearing is most popular for rearing the local stocks of turkey. They are natural foragers and scavengers and always range farther. Indeed, they thrive best where they can move about freely feeding on seeds, fresh grass, other herbage and insects which include locusts, cicadas, crickets, grasshoppers, worms, slugs and snails etc. The self-reliant 'local' stocks can do well with little management and can still fly short distances to avoid predators (Prabakaran, 2012, 2014; Anon., 2019) [9, 10, 6]. ICAR- CARI and TANUVAS have released CARI-VIRAT and Nandanam Turkey (1 and 2) strains respectively for the benefit of the small and marginal farmers.

c. Water fowl

1. Duck farming

Common ducks are believed to have originated from the wild Mallard (*Anas platyrhynchos*). Some of the better known breeds of common ducks include the Pekin, Aylesbury, Rouen, Call, Indian Runner, Khaki Campbell, Cayuga, Albio, Maya, and Tsaiya. In India, 90-95 percent of ducks are indigenous or non-descript types, which are hardy, with mediocre egg production and highly suitable for extensive system of rearing. The important indigenous or non-descript types are Sythet mete and Nageswari of Eastern region, Aarani ducks of Tamil Nadu, Chara and Chemballi of Kerala, desi breeds of West Bengal and other states (Prabakaran, 2014) [10]. Apart from these, distinct local varieties have also been identified. Deo, Cinahanh and Raj Hanh are local indigenous breeds found in Assam. Pati is the only indigenous duck breed recognized by ICAR-NBAGR [13].

Duck farming is a very lucrative business. Ducks are highly valuable birds around the world, reared for egg and meat production. Ducks occupy an important position next to chicken farming in India. They form about 10 per cent of the total poultry population and contribute about 2-3 per cent of total eggs produced in the country. The duck, till recently, was practically reared only by the small and marginal farmers and is characterized by nomadic and extensive rearing pattern. They are mostly reared in Southern and Eastern coastal areas, North-eastern India; the states of West Bengal, Assam, Bihar, Manipur, Kerala, Andhra Pradesh, Tamil Nadu, Orissa have a sizeable duck population. Ducks in India are mostly reared for eggs, but also consumed as meat. West Bengal is the largest producer of eggs by ducks in the country. Broiler duck rearing is popular in European countries and United Kingdom. White Pekin and Aylesbury are the popular broiler ducks. In India, broiler duck rearing and consumption is not popular except in Kerala (Prabakaran, 2014) [10]. The major advantages of duck farming are, it requires lesser attention and thrive well in scavenging conditions, lay more egg per bird per year than chicken and the size of the duck egg is larger than hen egg by about 15 to 20 g. They are quite hardy, more easily brooded as well as ducks lay 95 – 98 per cent of their eggs in the morning before 9.00 AM, thus saving a lot of time and labour (Prabakaran, 2012; 2014) [9, 10].

2. Geese production

Geese were one of the first animals (Buckland and Guy, 2002) [14] and bird species (Deffarges, 1973) [15] to be domesticated by man, though there are conflicting reports in literature about the era of their domestication. Historical and archaeological sources suggest that in the
13th and 14th century, goose husbandry was at its peak. Large flocks of birds were kept in the countryside by peasants, while occasionally individual birds would be reared in towns (Albarella, 2005) [16]. Some of the breeds of common goose include Toulouse, Emden, African, Chinese, Egyptian and Canada.

Geese are both popular backyard companions as well as produced commercially in specialized farms and are found all over the world, but at present goose farming is economically important only in Asia and Central Europe. Besides supplying nutritious meat, huge eggs and rich fat for cooking; they also provide soft feathers for bedding and clothing, which makes them particularly appropriate for providing farmers with a supplementary income and much needed animal protein for family. They are grass foragers and unlike chicken do not compete with humans for grains. The high juvenile growth rate (Hamadani *et al*., 2014) [17] and likable quality of meat (Hamadani *et al*., 2013) [18] of geese make this enterprise a promising one. At the same time goose production can provide alternatives both to the poultry producers as well as consumers. In spite of all these advantages, domestic geese have remained a neglected species in many countries including India. Lack of scientific knowledge on all aspects of

geese production and management are some of the major impediments in development of geese production. The geese-farming promises a good future in an area where water-bodies are available in plenty and rearing is carried out on a large scale (Hamadani *et al*., 2017) [19].

In general, domesticated waterfowl are more hardy, disease resistant and weather tolerant than chickens (Holderread, 1993) [20]. Because of their thick, well-oiled feathers and lack of exposed combs and wattles, most mature waterfowl are well suited to tolerate wet and cold weather. Waterfowl require only minimal shelter, primarily from sun and extreme cold, and limited supplemental feed due to their natural foraging abilities (Nelson, 2005) [21]. Kashmir Anz is the only indigenous geese recognized by ICAR-NBAGR [13].

d. Guinea Fowl Production

Guinea fowl (*Numida meleagris*) are native to the more arid areas of the west coast of sub-Saharan Africa. They derive name from the guinea coast of West Africa, where it originated. Many poultry farmers in Africa are doing Guinea Fowl farming business successfully, mainly for profit (Kondombo *et al*., 2003) [22]. Different varieties of guinea fowl in the world are pearl, white, lavender, buff, buff dundotte, coral blue, azure, royal purple, porcelain and slate. In India, three varities namely pearl, white and lavender are available.

The pearl variety is the most popular and typically the one that people recognize most readily.

The adults weigh over one kg. When about 35 weeks old, they start breeding in the spring with one male to five to eight females and are kept for up to three seasons or more. Average egg production is 55 to 100 per year, and each egg weighs 37 to 40 g. They are difficult to sex except by their call, but the adult male has larger helmet and wattles. They can be sold for meat at 14 weeks with a dressed weight of 800 g to well over one kg (Saina, 2005) [23].

GUNCARI is an improved Guinea fowl variety developed at Central Avian Research Institute, Izatnagar. Three GUNCARI varieties are Kadambari, Chitambari, and Swetambari, which have pearl, lavender and white plumages respectively and are mostly seasonal layers (ICAR-CARI) **[11]**. TANUVAS has released Nandanam Guinea Fowl – I which lays eggs round the year and so it is popular among South Indian farmers. It matures at 26 weeks and lay about 165 eggs in an year.

Guinea fowl may be raised in the modern intensive system characterized by high input, good husbandry and hygiene and supply of balanced feed (Marangon and Busani, 2006) [24]; however this system is confined largely to Government / public sector farms. The traditional extensive system of rearing is most popular in rural areas (Sonaiya, 1990) [25]. In semi-extensive system, birds are maintained in pens communicating with spacious well-fenced enclosures (Moreki, 2009) [26]. In the traditional rearing system, the nutritional requirements of voraciously omnivorous guinea fowl are met through its catholic feeding habits; birds accept fallen grains, leaves, weeds, root-bulbs, fruits, diversified insect, fauna and flora and even carrion. Supplementary feeding, if any, usually consist of waste grains, household waste and crop residues (Prabakaran, 2012; 2014; Anon., 2019) [9, 10, 6].

e. Native chicken

National Bureau of Animal Genetic Resources (ICAR-NBAGR) [13], Karnal, Haryana has recognized 19 district native breeds of chicken. They are Ankaleshwar, Aseel, Busra, Chittagong, Denki, Daothaiger, Ghagus, Harringhata, Kadaknath, Kalasthi, Kashmir Faverolla, Miri, Nicobari, Punjab brown, Tellicherry, Mewari, Kaunayen, Hansli and Uttara. There are also some more unrecognized breeds of native chicken like Dumasil, Kalahandi, Phulbani and Gujuri in Odisha. Native chicken constitutes rural poultry that offers many advantages and attracts the farming community, entrepreneurs, SHG, etc., Native chicken farming provides subsidiary income to the rural families, can be easily adopted even by resource poor facilities with very low investment, even illiterates can adopt it as it requires much less skill, native chicken are more sturdy and well adapted to local climatic conditions, can be sustained entirely in free range, both eggs and meat of native chicken fetch 100 to 150% more price compared to those of commercial hybrids, as they occupy specific market segment. Native chicken farming improves the nutritional status of rural poor; rural people have a traditional affinity towards native chicken and are well versed with its husbandry practices. Native chicken rearing is gaining momentum now among jobless youth, school dropouts, etc., in rural and semi-urban areas. Majority of the small farmers are keeping 10-15 non- descriptive native chicken under back yard rearing (Prabakaran, 2014) [10].

Few private players are involved in commercial native chicken farming and supply day old native chicken to the needy farmers. The commercial native chickens are reared under intensive conditions and contract farming. They are marketed 12-13 weeks of age, when they attain 1.0 - 1.1 kg body weight with a cumulative feed efficiency of 3.0 -3.2. Livability is about 90-94 per cent. The breeders of intensively reared native chicken are kept even upto 3 years for breeding with an average of 105-120 eggs produced per female per year. Sex ratio is maintained at 1 male: 8 female and hatchability is 76-80 per cent. The Government of Tamil Nadu is implementing the scheme on distribution of 25-50 native chicken to rural farmers all over the state since 2017-18 with a goal to improve the socio-economic status and curb unemployment problems (Anon, 2020) [27].

f. Squab production

Young pigeons which are bred for meat purpose are known as squab, that thrive on pigeon milk. Popular breeds of Pigeon are Homer, White King and Swiss Mondaines. Squab exceeds the normal adult weight at the time they are ready to leave the nest – at about 30 days of age (Bolla,2007) [28]. Squabs weigh around 400 to 500 g in about 26 to 30 days of age. Recent survey conducted indicates that there is a fair demand of squabs in large cities like Delhi, Mumbai, Kolkata, Hyderabad, Chennai and Bangaluru. Squab raising also has tremendous export potential to Dubai, Australia Thailand and Singapore. A pigeon is a tradition part of Middle Eastern diet. In China Pigeon meat is a popular restaurant dishes and there is good demand from Jewish community clubs all over the world. Pigeon racing requires a specific breed of pigeon bred for the sport, the Racing Homer. Competing pigeons are specially trained and conditioned for races that vary in distance from approximately 100 km to 1,000 km. However, squab is a delicacy and squab production cannot be recommended for poverty alleviation due to very low number of eggs laid by an adult female (Tavares, 2020) [29].

Comparative advantages

Every poultry species has unique adaptations or advantages.

Some birds are known for rapid growth and pest control while others are known for their ability to survive on forage and in extreme weather. When choosing a species and breed, most poultry growers recommend that you look for high-quality breeding stock and birds that are known for disease resistance and production/feed efficiency. The special qualities of the different species of poultry are mentioned in table 5.

Table 5: Special qualities of the different species of poultry

Species	Raisability	Disease resistance	Special adaptations
Chicken	Fair –Good	Fair –Good	Egg, meat, natural mothers, adopt to cages, houses or range
Turkey	Poor – Fair	Poor – Fair	Heavy meat production
Goose	Excellent	Excellent	Meat, feathers, lawn mowers, watchdogs, aquatic plant control, suited to cold and wet climates
Duck	Excellent	Excellent	Egg, meat, feathers, snail, slug, aquatic plant control, suited to cold and wet climates
Pigeon	Good	Good	Message carriers, meat production in limited space, quiet
Guinea fowl	Fair-Good	Excellent	Gamey- flavoured meat, insect control, alarm, thrive in hot climate
Coturnix quail	Good	Good	Egg and meat production in extremely limited space

Source: Holderread, 2001[30].

Conclusion

- Duck and geese farming require water resources under Indian conditions. Commercial duck production for eggs and meat with improved breeds has not been attempted on a larger scale and its scope depends on change in demand for specific duck eggs and duck meat as chicken egg and meat production costs are cheaper and management including health cover is easier.
- Turkeys offer limited scope. Change in consumption pattern with wider acceptance of frozen meat will usher in growth of turkey production in future. As the egg production performance of available germplasm does not support viable commercial production, the government institutions have to identify and import high performing small sized varieties to suit Indian conditions.
- Japanese quail production offers greater scope as the investment and land space required is less. Improved availability of Japanese quail meat needs to be planned to take advantage of available demand. Skill farming needs to be imparted to bring confidence in Japanese quail brooder management. Owing to their size, they can meet the demand of nuclear size families. However, on a broader scale, they may only share limited portion of total poultry meat requirement.
- Guinea fowl meat is preferred only by a few. It is reared in the back yard of farm houses only and any commercial venture will end up in meeting such a limited demand only.
- Commercial production of native chicken like Aseel offers greater scope as they increase premium price over broilers. Native chicken production can also be taken up to meet demand for organic products.
- Production of alternate poultry may not increase enough in the near future to compete with commercial chicken, but these birds could become a significant source of food for the masses as they offer attractive, alternate meal on the plate and hence be a source for substantial supplement income.
- To diversify poultry production, it is better to start with a market survey to determine the products most likely to sell and a technical feasibility study to ensure that production is possible in the area. Expertise from other regions where similar production has been successful can be of great help.

References

1. FAO. The future of food and agriculture trends and challenges 2017, 1-163.
2. Conway A. 10-year poultry market outlook positive, WATT Global Media., 2015. https://www.wattagnet.com/articles/25045--year-poultry-market-outlook-positive, 3 January 2020.
3. Anon. Basic Animal Husbandry Statitics. Ministry of Agriculture, Dairying and Fisheries, Government of India, New Delhi 2017.
4. NSSO-National Sample Survey Organization. Consumer Expenditure, 68th round Schedule 1.0 (Type 1) - Consumer Expenditure, https:// catalog. ihsn. org/ index.php/catalog/3281, 3 January 2020.
5. Kearney J. Food consumption trends and drivers Philosophical Transactions of the Royal Society B: Biological Sciences 2010;(27):2793-2807.
6. Anon. Basic Animal Husbandry Statitics. Animal Husbandry Statistics series 18. Ministry of Agriculture, Dairying and Fisheries, Government of India, New Delhi 2019.
7. Anon. 19th Livestock Census.. Ministry of Agriculture, Dairying and Fisheries, Government of India, New Delhi 2012.
8. FAOSTAT. 2019. www.faostat.org, 3 January 2020.
9. Prabakaran R. Overview Of Poultry Production In India *Vis-À-Vis* Global Scenario**.** Proceedings of the XXXI Annual Conference of India Poultry Association (IPSACON 2012) and National Symposium on Commercial and Rural Poultry Production: Novel Concept and Strategies to meet Growing Demand and Changing Consumer Needs. Project Directorate on Poultry, Rajendranagar, 5th to 7th December 2012, 3-20.
10. Prabakaran R. Current Status, Practical Challenges And Opportunities. Proceedings of the XXXI Annual Conference of India Poultry Association (IPSACON 2014) and National Symposium on Poultry Production for Global Trade. Veterinary College and Research Institute, Namakkal 16th to 18th October 2014, 1-14.
11. ICAR CARI; https://cari.icar.gov.in/varieties_deve.php, 3 January 2020.
12. TNAU Agritech portal- Animal husbandry, https:// agritech. tnau.ac.in / animal_husbandry / animhus_tur_breed.html, 3 January 2020.
13. ICAR-NBAGR - National Bureau of Animal Genetic Resources, Karnal, Haryana; https://nbagr.icar.gov.in, 3 January 2020.
14. Buckland R, Guy G. Goose Production, in: FAO Animal Production and Health Paper – 154, 2002, FAO Corporate Document Repository, Rome.

15. Deffarges H. *L'histoire du Foie Gras*. *Virmouneix, J.*, (Eds.), pp. 104. (cf: Worlds Poultry Science Journal 1973;60:211-222.
16. Albarella U. Alternate fortunes? The Role of Domestic Ducks and Geese from Roman to Medieval Times in Britain, in: Grupe, G., Peters, J. (Eds.), Documenta Archaeobiologiae III. Feathers, Grit and Symbolism, University of Sheffield, United Kingdom 2005, 249-58.
17. Hamadani H, Khan AA, Ganai TAS, Banday MT, Hamadani A. Growth and production traits of domestic geese (*Anser Anser Domesticus*) under local conditions of Kashmir, India. Indian Journal of Animal Sciences 2014;84(5):108–109.
18. Hamadani H, Khan AA, Salahudin M, Sofi AH, Banday MT. Slaughter and carcass characteristics, sensory attributes and consumer acceptability of geese meat. Indian Journal of Poultry Science 2013;48(2):223-227.
19. Hamadani H, Khan AA, Hamadani A, Banday MT, Ganai NA. Characteristics of Geese Production and Management in the Valley of Kashmir. Journal of Animal Research 2017;7:271-277.
20. Holderread D. The Book of Geese: A Complete Guide to Raising the Home Flock. Hen House Publishing Co., USA 1993.
21. Nelson B. Poultry your way- A Guide to Management Alternatives for the Upper Midwest. Minnesota Department of Agriculture, USA 2005.
22. Kondombo SR, Nianogo AJ, Kwakkel RP, Udo HMY, Slingerl M. Comparative analysis of village chicken production in two farming systems in Burkina Faso. Tropical Animal Health and Production 2003;35(6):563-574.
23. Saina H. Guinea fowl (*Numida meleagris*) production under smallholder farmer management in Guruve District, Zimbabwe, M.Phil., Thesis submitted to the University of Zimbabwe, Harare, Zimbabwe 2005.
24. Marangon S, Busani L. The use of vaccination in poultry production. Revue Scientifique et Technique-Office International des Epizooties 2006;26(1):265-274.
25. Sonaiya EB, Branckaert RDS, Gueye EF. Research and development options for family poultry. In First INFPD/FAO electronic Conference on family poultry FAO, Rome 1990.
26. Moreki JC. Guinea fowl production. Reach Publishers, Wandsbeck, South Africa 2009;3631:7-31.
27. Anon. Policy note. Animal Husbandry, Dairying and Fisheries Department, Government of Tamil Nadu 2020.
28. Bolla G. Squab raising 2007. https://www.doc-developpement-durable.org / file / Elevages / Pigeons /Squab-raising.pdf.
29. Tavares A. Advancing Into the World of Pigeon Farming 2020. https://backyardpoultry.iamcountryside.com/poultry-101/advancing-into-the-world-of-pigeon-farming.
30. Holderread D. Storey's Guide to Raising Ducks: Breeds, Care, Health. Storey Books. Available from your local library or from Storey Books, 210 MASS MoCA Way, North Adams, MA 01247. 2001;(800):441-5700. www.storey.com.