



Backyard Poultry Production Systems in SAARC Member States

Edited by : Nure Alam Siddiky



SAARC Agriculture Centre (SAC)
South Asian Association for Regional Cooperation

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Regional Expert Consultation on Backyard Poultry Production Systems in SAARC Member States held on 11 July 2017 at SAARC Agriculture Centre, Dhaka, Bangladesh

Edited by

Nure Alam Siddiky
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2017

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BARC Complex, New Airport Road
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Foreword

Poultry farming is now considered to be one of the most integral and dynamic component of the worldwide food production. The poultry farming is seemingly in the phase of rapid expansion. The poultry farms in SAARC region have made a significant contribution towards the enhancement of food production strategies and measures. Since time immemorial backyard poultry farming has played an important role to meet the domestic as well as socio-cultural needs of the rural people. However, the traditional poultry farming in villages, which was the primary source of animal protein, and supplementary income for more than 50 percent of the population of the region, has suffered in the wake of commercialization. Backyard poultry production system is the integral part of poultry farming. One must remember that the cheapest egg and poultry is one which is produced in the backyard or semi-scavenging system. Traditional free range poultry has a great importance in rural production systems in small communities throughout the SAARC region. Backyard poultry provides high quality nutrition and is a wonderful tool for creating employment opportunities for the rural poor throughout the year. It also generates some cash income when sold in the market, also a means for ensuring additional earnings to rural disadvantaged and destitute women. Rural poultry production system can easily be converted to organic farming, which is gaining its popularity due to increased consumer awareness on food safety and environmental concerns. It is evident that free range backyard poultry production will continue to thrive to help poor and destitute women for increasing their income and employment.



Backyard poultry farming is a very familiar activity among rural women in many countries. Women have been considered to be the predominant owners of rural poultry. Most women in the rural areas rear the indigenous types of domestic fowl in extensive system of poultry production. Backyard poultry production serves as a small scale business for generating income controlled by women. The enterprise provides regular income using little inputs and the production can be solely managed by women in the household. Although rural poultry production cannot contribute any large income, it represents a very familiar skill to most of the poor women and it can help them in moving into a positive spiral of events that may lead them for elevation of their socio-economic status. As most of the poor and marginal farmers have very limited capital assets and they mostly depend on poultry farming for their

livelihoods, growth of the rural poultry sector can definitely contribute to poverty alleviation.

This is the compilation of the country status reports has been presented by focal point experts from SAARC Member States in a consultation meeting through video conferencing organized by SAARC Agriculture Centre, Dhaka, Bangladesh on 11 July 2017. The expert consultation also generated a good number of recommendations under different thematic areas through intensive discussion. This books contains the information of backyard genetic resources, production performances, production systems, nutrition, housing, disease managements and marketing of indigenous chickens and ducks from each of the SAARC Member States which would help extension workers and researchers for adopting production system, which is most suitable for their countries. This would also help enriching germplasm banks for backyard poultry through arranging exchange program between the interested countries.

I would like to acknowledge the contribution made by the focal point experts of SAARC Member States in preparing a comprehensive and informative country paper and participating in the expert consultation meeting. The contribution of Dr. Md. Nure Alam Siddiky, Senior Program Officer, SAARC Agriculture Centre to the conceptualization, technical guidance, inputs, reviewing and editing of this publication is duly acknowledged. I personally hope that this publication would provide detail and comprehensive information on backyard poultry production system existing in SAARC Member States. I would appreciate to receiving feedback, comments and suggestions from users for our future endeavors.

S. M. Bokhtiar
Director, SAC

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Abbreviations

A&N	Andaman and Nikobor
AICRP	All India Coordinated Research Project
ANDS	Afghanistan National Development Strategy
AVI	Avian Influenza
BBS	Bangladesh Bureau of Statistics
BDT	Bangladeshi Taka
BLDU	Balkh Livestock Development Union
BPR	Barred Plymouth Rock
BYP	Backyard Poultry
CARD-F	Comprehensive Agriculture and Rural Development Facility
CDC	Community Development Committee
CPEC	China Pak Economic Corridor
CRD	Chronic Respiratory Disease
DAIL	Department of Agriculture, Irrigation and Livestock
DLS	Department of Livestock Services
DPR	Directorate of Poultry Research
EDS	Egg Drop Syndrome
FAO	Food and Agriculture Organization
FCR	Feed Conversion Ratio
FFPS	Female-Family Poultry School
FFS	Farmer Field School
FP	Fowl Pox
GDLAH	General Directorate of Livestock and Animal Health
GDP	Gross Domestic Product
HLP	Horticulture and Livestock Project
IB	Infectious Bronchitis
IBD	Infectious Bronchitis Disease

IFAD	International Fund for Agriculture Development
IP	Implementing Partner
J&K	Jammu and Kashmir
KPK	Khyber Pakhtun khwa
L&DD	Livestock and Dairy Development Departments
LBM	Live Bird Market
MAIL	Ministry of Agriculture, Irrigation and Livestock
ME	Metabolizable Energy
MFI	Microfinance Institutions
MISFA	Microfinance Investment Facility for Afghanistan
MMT	Million Metric Tons
ND	Newcastle Diseases
NEH	North Eastern Himmalayan
NHLP	National Horticulture and Livestock Project
NPA	National Poultry Advisor
PTs	Poultry Trainers
RIR	Rhode Island Red
RLH	Rural Leghorn
RMLSP	Rural Microfinance and Livestock Support Program
SDG	Sustainable Development Goal
SP	Service Provider
UNDP	United Nations Development Program
VFUs	Veterinary Field Units
VGL	Village Group Leader
VPDAs	Village Poultry Development Associations
VPDCs	Village Poultry Development Centers
VPPG	Village Poultry Producer Group
WB	World Bank
WW	White Wyandotte

Chapter 1

Backyard Poultry Production System in Afghanistan

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1. Introduction

The economic status of Afghanistan has been badly affected due to prolonged war and internal conflict over the past three and half decades. Economic indicators at the beginning of interim government were alarming. According to the National Risk Vulnerability Assessment report (NRVA) 2007, 36 percent of the population live below the poverty line and 20 percent are above the line but vulnerable to poverty. Fifty percent of children below the age of five suffer from chronic malnutrition and up to 70 percent of Afghans are food insecure.

Afghanistan imports huge quantity of chicken meat and eggs, imports of poultry products are continuing to rise, from 2008 to 2012, as poultry meat (US\$ 16.9 million to US\$ 85 million), eggs (US\$ 17.5 to US\$ 29.6) and live chicken (US\$ 5.00). The total imports value in 2008 show increase of US\$ 34.4 million in 2012. This huge increase may due to 2.8 % annual population growth in the country (Ministry of Commerce, Trade Data, 2012). The country therefore remains a substantial net importer of poultry products.

Egg consumption approximates 34 eggs/person/year, while the chicken meat consumption approximates 24.48 kg/person/year (NRVA 07/08). The data of last 10 months of 2013 shows 34.49 million birds and 2000 to 2500 metric tons (MT) poultry feed imported only from Pakistan via Torkhem border. These figures can be double or triple, because there is no any data of illegally importation via other than Torkhem entrance (Afghan Custom Data, 2013).

In response to this alarming status, the Ministry of Agriculture, Irrigation and Livestock (MAIL) of Afghanistan defined its priorities and developed related policies and strategies to reduce the poverty in rural parts of the country in line with the Afghanistan National Development Strategy (ANDS, 2008), National Priority Program Two (NPP2) and national comprehensive agriculture production and market development (2012). In particular, the Ministry's mandate is to improve the food security by increasing agriculture and livestock productivity. Livestock is a major

component of the agricultural sector and an important source of food and income for Afghan farmers and prominent in most of the farming systems.

Among small animals, poultry production in Afghanistan makes significant contribution to the rural and national economy. There are two major poultry production systems in Afghanistan, i.e. the intensive and extensive systems. The intensive system is a high investment system aiming at profit maximization. Meat and eggs from large flocks of broilers and layers are destined for lucrative markets in towns. On the other hand, the extensive system is a low investment system with small flock size of chickens kept for both economic and social purposes and women above 90 percent of these chickens. In addition, this production system is relatively organic producing cheap and high quality proteins. Most importantly, the backyard chickens are a liquid asset and allow owners to easily convert them into cash. Therefore, the extensive poultry production has the potential to improve food security and alleviate poverty in Afghanistan at large.

The estimated poultry (chicken) population in Afghanistan is above 12 million (FAO, 2003) and most of them are reared extensively in small family flocks (4-15) and mostly native and golden crossbreeds. Other poultry species raised and reared under backyard, scavenging and semi-scavenging systems are turkey, ducks, quails, pigeons and guinea fowls. However, these birds are not playing very important role in economy of rural farming systems. Most of them are raised for decoration, games, entertainment and etc.

In Afghanistan small-scale poultry production has a number of comparative advantages, namely:

- It needs less capital investment compared to other species and land ownership is not a requirement.
- Short reproductive cycles ensure quick financial returns.
- Village women can manage and benefit directly from household poultry.
- While feed supplementation is a major variable cost, part of the daily nutritional requirements can be obtained from scavenging, kitchen waste and spent/spoilt grains.
- Provide employment opportunity to the rural small scale and marginal farmers.
- Provide additional and complementary income to the rural households.
- Aids in enhancing the soil fertility in backyard (15 layers produce 1-1.2 kg of manure per day).
- Products from rural poultry farming fetches high prices compare to those from intensive poultry farming.

- Provides eggs and meat with no or very less investment in free range system.
- Easily provide high value protein for male nutrition for susceptible groups like pregnant women, feeding mothers and children.

High risk of poultry diseases, poor feed availability and quality, poor management, inadequate shelter and low productivity of the indigenous birds and low technical knowledge are some of constraints related to backyard poultry farming in Afghanistan.

The government of Afghanistan through the MAIL is promoting small holder poultry production as a means of poverty alleviation and food security as part of the global strategy.

To do so, in 1999 the backyard poultry model was developed and introduced for the first time in Badakhshan province by FAO supported by UNDP to improve village poultry production and is being implemented by a range of NGOs and donor agencies throughout Afghanistan. Yet today, 1000s of rural farming families' (women) benefited, provide visible confirmation of the BYP program importance to rehabilitation of village poultry production across the country and showed that the additional income generated through the sale of eggs has immediate positive impacts for the rural women that are practicing the improved system. With the help of improved family poultry production they are able to sell their products and generate extra income that is often used for domestic needs and mostly for the education of their children. The additional technical knowledge that women gain through the technical training is a good basis to further develop semi- commercial poultry production system.

The backyard poultry model developed by FAO and being implemented by a range of NGOs and donor agencies throughout Afghanistan was very effective in rehabilitation of the seriously damaged poultry sub-sector in the country. However, there are some concerns on the long-term sustainability of the model, which needs some modifications to ensure the long-term sustainability of the approach on village level. Accordingly, the change in training methodology to FFFS approach, change in poultry coop design to simple one and inexpensive poultry shelter, access to young stock by natural hatching, in-kind support to the VGLs, and the formation of VPPAs and VPDCs as legal rural registered institutions are good examples for modifications and can be recommended for future programs. However, the assessment of various BYP models is supposed to be done by the national horticulture and livestock program of MAIL to identify the most effective and sustained model of backyard poultry production in Afghanistan.

2. Current Profile of Industrial and Backyard Poultry

Indigenous/native breeds of chickens are playing an important role in rural economies in most parts Afghanistan. They play a major role for the rural poor and marginalized section of the people with respect to their subsidiary income and also provide them with nutritious chicken egg and meat for their own consumption.

Over the past decade, poultry population has grown throughout the Afghanistan. This increase is primarily due to the development of industrial or commercial production. Afghanistan poultry industry has been developing over the past 10 years. The numbers of intensive units have been increasing at a great rate, mainly due to the introduction of new hybrid birds, better management systems, vaccination against various diseases and other disease control interventions and the technical advances from other countries. However, indigenous chickens still persist, mainly in rural areas. Indigenous chickens always play an important role in supplying fresh animal protein sources of food in Afghanistan and especially in rural areas.

Despite increases in domestic production, poultry imports are expected to continue on the upward trend in 2013 and 2014 since domestic poultry production does not meet rising demand. According to exporter data, poultry imports are estimated at a total of 37,499 MT in 2012. The United States is the dominant supplier to Afghanistan accounting for approximately 75-80 percent of the imports (volume basis). Imported frozen chicken dominates the urban market place in Afghanistan because of its low prices. It is cheaper than other meats in the market place. Consumers prefer live chickens to frozen chicken because of taste preferences and are most concerned about quality and slaughtering procedures. Total US poultry exports to Afghanistan were valued at US\$ 32.3 million in 2012, a four percent increase in value from the previous year.

Currently Afghanistan is importing more than US\$ 100 million worth of poultry products per year from neighboring countries and from far distances (like Brazil, USA). The Afghan poultry sector is currently unable to respond to the high local demand. At present, there are few facilities in Afghanistan (breeder farms and hatcheries, which are not sufficient to supply enough inputs to broiler and layer farms). Furthermore, there is a lack of sufficient support services to assure the success of the poultry sector in Afghanistan. As a result, there is a high volume of poultry imports having low quality, high mortality rates, and sub-standard breeds with low production potential and not suitable to the climatic conditions of Afghanistan. Based on Comprehensive Agriculture and Rural Development Facility (CARD-F) research, consultation and analysis, CARD-F proposed investment in the

poultry sector that comprised: establishment of 4 breeder farms, 4 hatcheries, 50 new and 48 expanded broiler farms, and 813 new household layer farms. The CARD-F support also includes services that are crucial to the viability and sustainability of the aforementioned interventions. These will include training services in management and poultry husbandry, veterinary services and cost sharing incentives.

Status of development of commercial poultry production in Afghanistan is as bellow:

- Number of commercial poultry farms is 8910 out of which 7928 broiler and 982 layer.
- Production of small day old chicks per year is above 82 million.
- Chicken meat processing per year is 509.4 MT.
- Poultry feed production per year is above 60000 MT and the number of poultry feed processing mills is 7 with capacity of 3 MT/hour.
- Number of registered Poultry Associations is 9 having 9780 poultry farms as their members.
- Number of poultry feed processing mills is 7 with capacity of 3 MT/hour.
- Number of poultry slaughter houses is 5. (Data from GDAHP/MAIL, 2017).

Due to deteriorating security situation of the country, escalation of the prices of inputs, difficulty in obtaining quality inputs, fluctuation of end product prices (eggs and meat) in the market etc are the main constraints in front of industrial poultry production which causes frequent irregularity in further development of private poultry sector in Afghanistan, leads to huge imports in this sector.

The extensive system is a low investment system with small flock size of chickens kept for both economic and social purposes and women own 95 percent of these chickens. In addition, this production system is relatively organic producing cheap and high quality proteins. Most importantly, the chickens are a liquid asset and allow owners to easily convert them into cash. Therefore, the extensive poultry production has the potential to improve food security and alleviate poverty in Afghanistan at large. The extensive system is mainly based on the local indigenous chicken types and on a scavenging feeding system with very low production potentials. Besides the lower productivity, these indigenous breeds are normally kept under traditional systems and village women have limited technical knowledge. High risk of poultry diseases, poor feed availability and quality, poor management, inadequate shelter and low productivity of the indigenous birds and low technical knowledge are some of constraints related to poultry farming in Afghanistan. Mortality rates of the birds can be extreme due to the locally

prevailing diseases (ND in particular) and lack of any regular vaccination programs.

The indigenous breeds have very low production potentials. Crossbred chickens have proven to produce three times more eggs under the village conditions, compared to the indigenous birds besides the lower productivity of these indigenous breeds, the birds are normally kept under traditional systems and village women have limited technical knowledge.

The Government of Afghanistan through the Ministry of Agriculture, Irrigation and Livestock (MAIL) is promoting small holder poultry production as a means of poverty alleviation and food security and gives special emphasis to disadvantaged groups and less favored areas.

Smallholder poultry as a tool for poverty alleviation has been developed and widely applied in Afghanistan. The RMLSP-BYP-model was successfully and effectively implemented through the IFAD funded backyard poultry development project of RMLSP/MAIL in Balkh and Jauzjan provinces of north Afghanistan, while it is being replicated in a number of new locations of backyard poultry development project of CLAP/MAIL with financial support from IFAD. The RMLSP-BYP-model indicated that the project beneficiaries have benefited positively in terms of income, consumption, nutrition and empowerment of women.

3. Backyard Poultry Genetic Resources

The genetic diversity of Afghanistan native poultry needs to be understood in order to develop a suitable conservation strategy for these birds. There is no any study or research done on indigenous poultry to identify their genotypic and phenotypic features of different species and breeds. However, local known names are used for chicken and other poultry species such as turkey, ducks, quails, pigeons and guinea fowls as presented bellow with their estimated production traits:

3.1 Chicken

Four locally known breeds are Kulangi, Khasaki, Naked Neck and Sabzwari as presented below:

3.1.1 Kulangi

The Kulangi is mainly kept as game birds and it is meat type producing 20-30 eggs in a year with an estimated live body weight 1.5 to 2.5 kg. The eggs are used for hatching and reproduction, rarely for home consumption or sale. The birds are mostly used for games, hobby, and entertainment or fighting.

Some people earn good amount of cash from winning the games. The loser birds are used for meat. These fighting birds are mostly kept in cages of single birds and special feeds are given, such as almond, butter, wheat, corn, pea and barely. While the hens are mostly kept on scavenging feeding with some grains as supplementary feed. The cost of Kulangi hens and cockerels is very high and even reaches to thousands Afghanis. The aged cockerel and hens are used for meat. Crossing of Kulangi with exotic broiler breeds can give good meat type chicken, which can be reared under rural backyard conditions for meat production.



Figure 1. Indigenous breed of backyard poultry (Kulangi)

3.1.2 Sabzwari

This is layer type, mostly reared for egg production and rarely for meat. The annual egg production is 50-100. They have small body with live body weight 0.8 to 1.0 kg. The feathers color pattern is different, but mostly gray to greenish. The term Sabzwari means greenish. The reproduction is mostly through natural hatching. It is kept under fully scavenging system of feeding. The price of mature hen and cockerel is Afs.250 to Afs.350. The color of eggs is light brown and price is Afs.8/egg in the farm gate. While in the urban markets it is Afs.10.



Figure 2. Indigenous breed of backyard poultry (Sabzwari)

3.1.3 Khasaki

This is also layer type, produce 70-100 egg per annum(estimated). The live body weight is similar to that of Sabzwari. The feathers color pattern is different types, golden/red, black, white, brown, blue and etc. The live birds and eggs prices are also similar with that of Sabzwari.



Figure 3. Indigenous breed of backyard poultry (Khasaki)

3.1.4 Naked Neck

Naked neck chickens have fewer feathers than any other chicken breeds but they're still able to live in almost any climate and lay over 120 eggs a year. It is dual purpose birds and rarely reared, body size is estimated at 1.2 to 2.0 kg (larger than Sabzwari and Khasaki and smaller than Kulangi).



Figure 4. Indigenous breed of backyard poultry (Naked neck)

Broodiness is common among all Afghani indigenous chicken after laying 10-20 eggs, due to this they are mostly used for natural hatching, with 40-60 % hatching under the traditional practices. However, this percentage was increased up to 90-95 under the improved natural hatching practices introduced through RMLSP BYP project.



Figure 5. Improved natural hatching with 90-95% hatching (RMLSP-BYP-project)



Figure 6. Traditional hatching practices with 40-60 % hatching

The indigenous breeds have low production potential, but are well adapted to the local environment. Performance of native fowl can be improved by change in husbandry, feeding, and better health cover. However, genetic improvement may be made either through selection and crossbreeding or by utilization of both selection and crossbreeding.

3.2 Golden crossbred

Since the past 15 years a new layer-type breed (“Golden” Crossbred) has been introduced through the backyard development program by FAO and became popular among rural poultry producers; the breed has a higher production than that of the indigenous breeds (average 200 egg/year) and adapts well to the local situation. These offer an alternative to pure exotic breed (highly productive but require constant high level inputs and less adapted) and indigenous poultry (extremely well adapted but with low productivity). The average live body weight of adult bird is above 1.5 kg.



Figure 7. Golden crossbred improved backyard farm

There is need to develop other new alternative crossbred through crossing the native layers with improved exotic layer types; Sabzwari and Khasaki with Leghorn, Golden or other exotic layer or dual purpose breeds. Even triple crosses also can be developed.

Presently there is no any poultry breeding/research stations to focus on poultry breeding in the country.

3.3 Turkey

Turkey farming has achieved very little progress as well popularity in Afghanistan. Possibly high cost of production, long generation interval and less market demand are the main reasons for its low popularity.

The Afghan Turkey breeds are not yet identified, the few breed available may be originated from India or Pakistan e.g. Bronze, White Holland Bourbon Red, Narangansett, Black, Slate and Beltsville Small White (BSW) are the standard breeds found in India and Pakistan. Domestic turkey maintained at private small-scale units scattered throughout the country are mainly kept under scavenging feeding system in rural areas. Commercial scale turkey production is not common in Afghanistan. The total turkey population is also not known. The traditionally raised turkey ensure reasonable returns at insignificant cash inputs, clear understanding of the basics of domestication; disease control, nutrition and genetics and as well the present and future importance of this alternate poultry germplasm resources available in the country has not been studied.

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 do well with little management and can still fly short distances to avoid predators.

The birds were domesticated mainly for, using its meat and eggs as major sources of protein and employing its feathers extensively for decorative purposes. The eggs are large and about 80-100 g and live weight of male is around 2.5-3.0 kg.



Figure 8. Turkey and its breeding

3.4 Ducks

These birds are adapted to an aquatic existence with webbed feet, flattened bills, and feathers that are excellent at shedding water due to an oily coating. In Afghanistan, ducks are mostly kept in areas where a variety of food sources such as grasses, aquatic plants, fish, insects, small amphibians, worms, and small mollusks are available. Ducks have many economic uses, being farmed for their meat, eggs. They are also kept and bred for displaying in parks and zoos. The origin is not known and no any research or study has been conducted on ducks rearing and farming. Domesticated ducks are rarely raised under scavenging system for meat and eggs in rural areas where river, water streams, lakes and ponds are available.

Seasonal migration of wild ducks is common once in a year in hot season may be from Indian Ocean or Pakistan. These ducks are small than domesticated and usually hunted for meat. The hunter use a wooden model ducks for attracting the wild ducks for hunting. Duck eggs are larger than chicken and is consumed by the owners families or sold in the market. The feather color pattern is different, from white to brown, black spotted and etc.

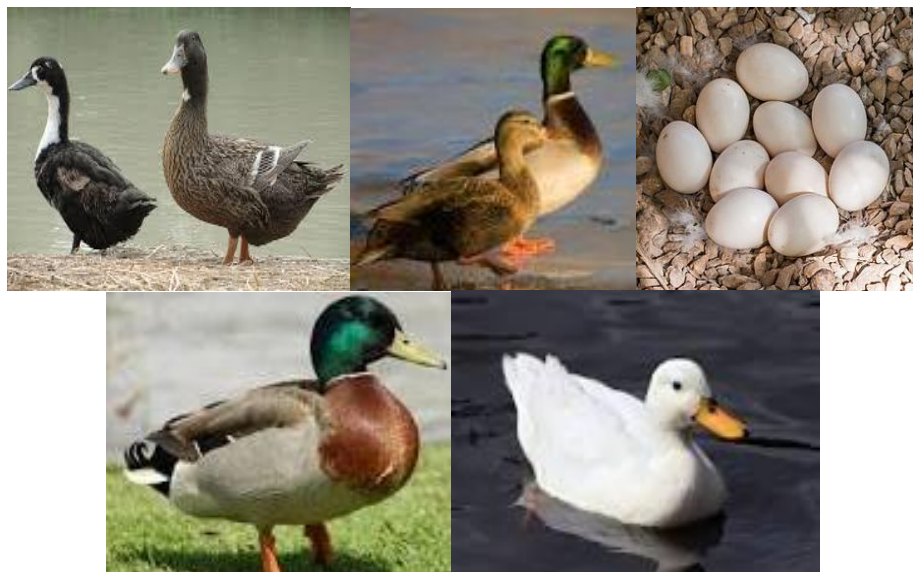


Figure 9. Indigenous different types of ducks

3.5 Pigeons

Pigeons are stout-bodied birds with short necks and short slender bills with a fleshy waxy appearance. The domestic pigeon, is common in many shrines throughout Afghanistan as the feral pigeon. Pigeons are likely the most common birds in the country. Unlike most birds, both sexes of pigeons produce "crop milk" to feed to their young, secreted by a sloughing of fluid-filled cells from the lining of the crop. Young doves and pigeons are called "squabs". The rock pigeon has been domesticated for hundreds of years. It has been bred into several varieties kept by hobbyists, of which the best known is the homing pigeon or racing homer. Other popular breeds are tumbling pigeons such as the roller pigeon and fancy varieties that are bred for certain physical characteristics, such as large feathers on the feet or fan-shaped tails. Domesticated rock pigeons are also bred as decorative pigeons, used for thousands of years used in ceremonies flight games. In Afghanistan as per the Islamic philosophy, the pigeon family in general are respected and favored because they are believed to have assisted the final prophet of Islam, Muhammad, in distracting his enemies outside the cave. The pigeon keeper make special wooden boxes on the top of roof for keeping and rearing the home pigeons. Day time they are moving free for scavenging and the night returning back to their relevant homes. Furthermore, there are 1000s pigeons living in the shrines, getting feed by the visitors (the visitors buy the wheat and put in front of the pigeons). The local names used for pigeons are Kafter, Kabooter, Bughdadi Kafter, Mallaqi (rolling flights in the air) and etc.

Generally, all types of these pigeons can be dangerous for spreading the poultry disease, because of their free movements up to far distances for scavenging.



Figure 10. Pigeons are rearing in Afghanistan



Figure 11. Pigeons at the mosque and shrine of Ali, Mazar-e Sharif, Afghanistan

3.6 Guinea fowl

The traditionally raised guinea fowl were introduced into the Indian sub-continent during the slavery era of mediaeval centuries and from there to Afghanistan. The guinea fowl shows its distinct popularity with marginal farmers and other vulnerable groups in Afghanistan. The indigenous germplasm seems well adapted to the diversified agro-climatic conditions prevailing. There is no any statistics to show guinea fowl population in the country, it is raised as decoration or luxury birds. Guinea fowl are raised in different part of the country. Present production status in this country is widely spread and highly fragmented.

The descriptions of guinea fowl breeds/ varieties are essentially based on the plumage color variations. Pearl, Lavender and White are the three main varieties recognized world over. In Afghanistan, 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, color is also regarded as the 'wild' mutant. Lavender birds are identified by

their light gray distinctly spotted feathers. White variety is very rarely found which possesses completely white plumage.

The live mature birds are sold to the market in good prices (Afs. 500-800). Eggs are mostly used for natural hatching. The meat is not so much favored. In most houses it is used for guarding the house especially during night. The bird is loudly crying if some unknown person or thief appears in the house. This character of guinea fowl is given great important than its production in Afghanistan. During day time the bird is scavenging, spent the night on the trees in the yard.



Figure 12. Different types of guinea fowl

3.7 Quail production

The quail production in Afghanistan is not much common. The wild quails are being hunted in summer and autumn seasons from wheat fields using special nets. The quail is kept as a hobby and as well as game birds. Some people keep it in a cage covered with cloth. Recently commercial quail farming is started in Kabul and other cities of Afghanistan. There is good market for quail meat and eggs. Meanwhile, the Ministry of Agriculture, Irrigation and Livestock (MAIL) of Afghanistan and some donor agencies are planning to initiate the small scale quail production on village as backyard poultry development programs.

Quail is a distinct diversification offer birds, females are slightly heavier than males. The females begin to lay eggs at average of six weeks of age, and continue to produce eggs economically for at least a year. At this age body weights range from roughly 100 to 150 grams. The males can be slaughtered

for meat at the age of 6 weeks. Even older animals are easy to butcher and can be prepared for food in a variety of ways. These birds need only a small amount of space. Quail are efficient converters of feed. With each egg female deposits an edible package of 8 percent of her own body weight (compared to 3 percent in the case of chickens). Quail eggs are characterized by a variety of patterns. They range from snow white to completely brown. More commonly they are tan and dark brown speckled or mottled brown with a chalky blue covering. The average egg from mature female weighs about 10 gram. Japanese quail are prolific layers. The average egg weight is about 10 percent of the hen's body weight (more than twice the egg weight ratio that is typical for most birds).



Figure 13. Diversification of quail genetic resources

4. Characteristics of Backyard Poultry Framing

4.1 At subsistence level

In Afghanistan village poultry production is a culturally acceptable practice that addresses both food insecurity and income needs for the households. Poultry provide scarce animal protein and can be sold or bartered to generate income. Poultry also provide manure for fertilizer use on household's garden plots. Most poultry in Afghanistan, like many developing countries of the world are maintained as backyard flocks and can be characterized as scavenging or semi- scavenging system of production. Under the scavenging system the indigenous breeds with the four birds average flock size is the most common practice, while the semi-scavenging system is mostly practiced under the improved backyard system with 15 average flock size.

During the past several years various donor supported interventions for female poultry producers have taken place with varying results. Apart from introducing new skills, women were encouraged to organize themselves in village poultry producer groups (VPPGs) and very many were established but due to limited follow-up as a result of short project durations and/or ambitions to cover many beneficiaries in shortest time possible, most of these VPPGs are no longer active. It is however learn when a business approach is followed from the on-set and sufficient guidance and hand-holding is provided that these VPPGs manage to provide services to its members as well as reaching out to neighboring women and villages.

In order to bring the necessary positive changes in the traditional system of family poultry husbandry, the local knowledge of producer communities in backyard poultry was well developed through ample training and provision of quality inputs with integration of practical and participatory approach of FFFS in family poultry management (RMLSP-BYP model). Most of the technologies introduced by the model, effectively contributed to development of local resources, knowledge, capacity and skills needed for successful and sustained backyard poultry farming,, which initiated good practices that are accepted and well adopted by the targeted rural communities.

In the past, with the local chicken breed, the family only managed to produce around 50 eggs per year. Production was low, the eggs were small and chicken mortality was high. Today, using high yielding breeds, each family produces more than 200 eggs per hen in a year. This has enabled the rural women to generate income by selling eggs in the market and egg production contributes about 40 percent of the income of poor families.

Under the backyard development programs, more than one hundred thousand women received improved poultry packages along with ample technical trainings.

4.2 At commercial level

The government is committed to private sector-led development, considered a key to the country's longer-term economic development and poverty reduction. Developing, implementing and administering the privatization process in Afghanistan are crucial for clarifying the roles of the state and private sector, freeing productive resources and improving the usage of resources. FAO has a major contribution to make in ensuring this process within the poultry sector. In line with government policies, steps were made to develop the private sector by establishing associative structures at village level (VPPGs/VPPAs) and at central level. Continual training for both government and non-governmental staff extended the development concepts

of the program to a wide group of technical people. The growing interest and plans of other organizations (national and international) to initiate development activities for poultry production and their request to learn from the experiences of the FAO program are a clear signal that the program had a significant impact beyond its immediate target groups.

The FAO program for Afghanistan also developed support of small to medium-scale commercial poultry farmers who have been organized in regional poultry associations. These associations are at present a major supplier of services and poultry appliances in the country.

Moreover, several poultry associations and poultry farms throughout the country are established with technical support of FAO and these are coming for supply of poultry products and services. The main associations and poultry farms are as follows:

- 1) Kabul poultry association (220 poultry farms)
- 2) North region poultry association (150 poultry farms)
- 3) Eastern region poultry association (3000 poultry farms)
- 4) Kandahar poultry association (420 poultry farms)
- 5) Farah poultry association (1500 poultry farms)
- 6) Balkh (north-west) poultry association (520 poultry farms)
- 7) Heart poultry association (3500 poultry farms)
- 8) Helmond poultry association (220 poultry farms)
- 9) Kunduz (north-east) poultry association (130 poultry farms)
- 10) Other associations (120 poultry farms)

As shown in above list there are 9780 poultry farms are operating under the 9 registered poultry associations throughout the country, out of which 7928 are broiler farms and 982 are layer farms. Moreover, there are 6 poultry feed mills producing 1374280 MT poultry feed/year; 5 poultry slaughter houses processing above 509 MT poultry meat/year and 3 large size hatcheries producing above 82 million day old chicks per year. These private agencies play important role in facilitating the supply of required poultry inputs for the backyard poultry development programs throughout the country.

5. Management Practices at Backyard Poultry Framing

5.1 Housing

Village poultry are often free-ranging, which makes them susceptible to predators, theft, and diseases. Accessibility, safety, exterior appearance, and appropriateness of design are important aspects of housing for family poultry flock. The design should allow for easy access to nests, perches, feeders, and

drinkers. Suitable access will make it easier to clean all areas of the coop. Provision of proper housing facility for chicken include:

- Protection from predators.
- Protection from rain, snow and other inclement weather.
- Protection from excessive heat and cold.
- Provision of enough space for layers (30 cm²/adult layer), feeder, drinker and nesting.
- Provide enough ventilation and light.
- Proper location in the yard, away from living rooms.

Two types of poultry housing are common in rural poultry farming in Afghanistan namely; traditional and improved one. The traditional housing is generally very small, located in a corner of the yard, with no ventilation and lighting systems, mostly used for few birds under the full scavenging system.

5.2 Feeds and feeding

Two feeding systems of backyard poultry are common in rural Afghanistan namely; scavenging feeding and semi-scavenging feeding systems. The first one is mostly practiced under traditional type for the small flocks (average 4 birds), while the second is under improved semi-scavenging system, where 50% feeding is provided by the commercial or homemade mixed grains or other alternative methods as introduced and applied by the Rural Microfinance and Livestock Support Program (RMLSP). In Afghanistan, irregular availability of poultry feed with seasonal variations, especially during prolonged and harsh winter season, is resulting in lower productive capacity and even high mortality. Under such conditions, the village poultry have to be fed depending on the region for 3-6 months. In order to overcome these limitations, new, economic and easily applicable winter feeding technique has been introduced such as “barley and wheat hydroponic forage and pulses sprouting” which increased productivity and improved health and general body condition of laying hens. Sourcing good-quality poultry feed in Afghanistan is difficult. Encouraging the private sector to produce the required raw materials within the country and to produce good-quality feed is essential for further development of the poultry industry.

Feed analysis services are also needed to assist with formulation of region specific balanced rations for various poultry farming systems based on the quality and content of essential nutrients of locally available poultry feeds. Alternative feeding sources should be identified, introduced and extended for sustained and economic backyard poultry development.

5.3 Breeding and reproduction

Poultry breeding and reproduction is an important aspect for continuation of family poultry farming. For most of the rural families it is difficult to get pullets or day old chicks for restocking and sale. This limitation can be addressed through natural hatching, poultry suppliers or small capacity incubators:

5.3.1 Access to young stock through natural hatching

The improved method of natural hatching could be introduced as is being practiced by the RMLSP-BYP-model, in which simple brooding nest model, made from mud was also designed and introduced by the RMLSP BYP project through with increased the hatching percentage to 95 percent, compared with the traditional practices of 40-60 percent.

5.3.2 Access to young stock through poultry services suppliers

The young stock on village level can be supplied through linking the producers with the poultry suppliers by the village group leaders (VGLs) as is being practiced by the RMLSP-BYP-Project.

5.3.3 Access to young stock through small capacity incubators

Due to lack of electricity and need of precise technical expertise for operating the incubators by rural women, a lot of efforts were made by the various NGOs to extend the artificial hatching technology on the village level, but the results were not satisfactory. Thus the RMLSP-BYP project experiences showed that natural hatching with broody hens or turkeys and procurement from chick suppliers are the best options of reproduction and restocking of backyard poultry flocks. Operation of small incubators in the villages are not recommended because of the lack of electricity, fuel shortages and higher cost for operation of incubators. The RMLSP project provided a package with a cockerel and 14 hens which allowed for breeding and collection of fertile eggs for natural hatching.

In consideration with the above mentioned findings, the improved natural hatching should be further encouraged and strengthened through launching proper training and extension work by the interested parties involved in backyard poultry development.

6. Diseases Management

Diseases are the number one problem limiting small-scale poultry production in Afghanistan. The most common poultry diseases in the country are Newcastle disease (ND), Infectious Bronchitis (IB), Chronic Respiratory

Disease (CRD), Fowl Pox (FP) and Pullorum. Ecto-parasites and Endo-parasites are also problems to be considered in a proper poultry health care systems. Two very important factors that should be addressed to ensure having a healthy flock of chickens are management and environment. When chickens are healthy they eat less food and produce more meat and eggs. They are less trouble to look after and less money is spent on medical costs.

The preventive and curative measures of the poultry health care that are being practiced through backyard poultry development programs for the control of main poultry diseases are very effective and some contagious poultry diseases are almost eradicated in all areas where the improved backyard poultry programs are being implemented. The poultry producers groups are linked through their VGLs with VFUs and poultry services suppliers for supplying quality vaccines and medicines which control contagious diseases in most rural areas. In order to ensure a proper and institutionalized health care system of wider scale, the following steps are recommended:

- Regular vaccination campaigns against ND and IB by the VGLs, VFUs and provincials veterinary departments. The vaccines required to control poultry diseases should be made available by the VFUs and suppliers through a proper cold chain system under the control of provincials veterinary departments and the general directorate of animal health and production of MAIL;

Most of the backyard poultry programs are following the effective and sustained poultry health care system and general awareness of producers groups on the poultry health care; as is being practiced through the RMLSP-BYP-model.

7. Bio-security and Disease Control

Preventive measures taken to minimize the introduction and spread of diseases and other hazards are referred to as "bio-security." The following simple and inexpensive bio-security measures are being considered under the improved backyard poultry development programs:

- Restrict visitors and observe proper hygiene.
- Prevent contact with wild birds.
- Practice proper rodent control.
- Mixing birds of different species and from different sources increases the risk of introducing disease to your flock. It is preferable to keep only birds of similar age and species together.
- Recognize and report any illness: Early detection is critical to successfully dealing with a disease outbreak.
- Clean housing and proper ventilation.

- General hygiene and manure management.

Dealing with live birds could be both way hazardous, either for their own health and rarely for farmers/public as well. In order to avoid this risk and ensure the health of birds and public, all hygienic measures, such as clean coop, farm, environment/atmosphere and regular preventive and curative measures should be taken into consideration. Control of contacts with wild birds, lack of clean drinking water in many parts of the country and a water treatment program (chlorination) with 70 percent bleaching powder is being introduced at village level to control colibacillosis (Ecoli infection).

8. Marketing of Backyard Poultry and Poultry Products

Poultry products are good source of protein to every individual and a viable avenue of income for both the nation and citizens of Afghanistan. Although the majority of smallholder households keep village poultry, this is considered as a part-time activity with only a few, if any, that are keeping indigenous poultry on commercial basis. Furthermore, productivity and production is low leading to low and unplanned sales at the farm gate level. However, looking at the differences between the minimum and the maximum production, and considering that it is a low input activity, potential for growth exists. The backyard poultry value chain mainly consists of producers, assemblers/wholesalers and retailers. However, the absence of processors along the chain means that chickens are sold live and consequently cannot be retailed through formal channels like supermarkets leading to exclusion of potential customers in the middle and high income categories who normally shop from supermarkets. Furthermore, as population and incomes grow, demand for backyard chicken is likely to continue growing, especially among the high income groups who not only prefer it for its taste, but also for health reasons due to its low fat content. Finally, although the value chain for backyard chicken shows positive gross margins for all the players along the chain, there is need to address the various constraints affecting the value chain for backyard chickens in order to improve the operation of the chain and hence lead to increased incomes for the value chain actors and at the same time ensuring cheap delivery of backyard chicken in a more convenient form and in formal outlets.

Capacity development on improved production methods (i.e. proper housing, provision of medications, breeding and supplementary feeding) of backyard chicken through extension programs to targeting producers can profoundly improve the growth, profitability and income opportunities for a large number of small farm households (over 90 percent) who are engaged in backyard chicken production, and provide employment to those involved in the marketing process.

Efforts have been made by different agencies to improve the village poultry production, but with little success. Based on these experiences the FAO program developed a new concept of intensive training and organizing village women in poultry producer groups to arrange supply of inputs and services and the marketing of products. It also includes the support of small to medium-scale commercial poultry farmers who have been organized in regional poultry associations. These associations are at present a major supplier of services and poultry appliances in the country. The well trained village group leaders play an important role as facilitator for input supply and marketing of outputs through these identified sources. The VGLs are linked with the suppliers on district/city levels and the supply through them is regularly done against a reasonable commission, which in turn support and encourage them for creation of working capital and sustained delivery of services to their relevant members of the producer groups. The RMLSP BYP project is a good example of establishment of a sustained input-output delivery system on village level also provided through well trained and in-kind supported VGLs (feed, vaccines and medicine) as initial working capital. The VPPGs facilitate marketing of poultry products through their VGLs. They are collecting the eggs from their group members and sell them through different channels, like the poultry services suppliers, to district bazaar, to the major cities, vendors, institutions and food shops. The government should encourage private suppliers and up-scale the VGLs/VPPGs in order to further develop rural poultry farming. Private-sector participation can be further promoted if the government provides the following support:

- Easy payment loans for local entrepreneurs in the poultry business (feed milling, poultry equipment manufacturing, large scale hatcheries, poultry feed processing mills and poultry equipment manufacturing factories);
- Efficient control of low quality and banned importation of poultry inputs and poultry products.

The marketing of poultry products mainly eggs and culled layers are mostly sold through linking the producer groups through their VGLs with different marketing channels. While the independent producers who follow the traditional system by keeping few birds mostly sell the products to the neighbors and street shops. As presented in the RMLSP-BYP-model, very effective input-output delivery system is established for marketing the products and supply of poultry inputs through the well trained and equipped VGLs.

9. Economics of Backyard Poultry Farming

The comparative advantage of backyard poultry must be sufficient to reduce the cost per egg produced to be less than that in commercial egg production. Meanwhile, the scavenging and semi-scavenging feeding system in backyard poultry ensures the comparative advantage of village's poultry compared to commercial egg production. Beside the scavenging facility and supplementary feeds, some alternative feeding techniques such as mung bean sprouting and hydroponic barely as winter feeding are being introduced which reduce the cost of feeding up to 50 percent and increased the egg yield by 30 percent in winter season.

Efforts are being made to further encourage the producers to take the next step to build into an enabling environment by creating of other income sources from family poultry income, linking the producers with MFIs (Microfinance Institutions) and micro-credit sources for expanding their poultry farming and other created family size businesses.

To further strengthen the social empowerment and economic transformation, the participatory approach of female farmer field school in backyard poultry farming is being introduced and have been initiated during 2013 and is being practiced in all IFAD funded poultry projects of MAIL, which have positive impacts on motivation and mobilization of producer communities for their active participation in identifying and solving the actual problems and collective decision making with the project approach and for conflict management, with increased poultry production and ensured economic sustainability. As workout through the RMLSP-BYP- project, the average annual income from backyard poultry was US\$ 306 and above US\$ 25 per month with the range of US\$ 250 to US\$ 500.

10. Existing Models and Key Players in Backyard Poultry

The Key players in backyard poultry development in Afghanistan are Food and Agriculture Organization (FAO), International Fund for Agriculture Development (IFAD), National Horticulture and Livestock Project (NHLP), Comprehensive Agriculture and Rural Development Facility (CARD-F), USAID, German Trust Fund and other aid agencies through the Ministry of Agriculture, Irrigation and Livestock (MAIL) of Afghanistan. Private poultry suppliers/veterinary clinics and VGLs are also the key players for the supply of required inputs and services. Considering the situation of rural Afghanistan, promoting poultry production is probably more suitable for many poor people than other livestock production systems. Since 1999, FAO has successfully developed a sustainable approach for improving the backyard production system over a wide range of locations in Afghanistan through a village poultry program. Activities began in the Faizabad district of

Badakshan and were then extended to 10 other provinces covering the total number of 47000 rural women beneficiaries under the World Bank/HLP/MAIL, USA/MAIL and German Trust fund as stated in table 1.

The IFAD funded projects of MAIL, Rural Microfinance and Livestock Support Program (RMLSP) covered 6000 rural women in Balkh and Jauzjan provinces. The Community Livestock and Agriculture Program (CLAP) is being targeting 20000 rural women in Kabul, Parwan and Logar provinces, and as well the Support to National Priority Program 2 (SNPP2) is approved and in the process of targeting 6000 rural women beneficiaries Herat, Nangarhar and Balkh provinces. All the IFAD funded backyard poultry development projects of MAIL is using 15 layers modified model of RMLSP with good and satisfactory achievements.

In addition other aid agencies through the MAIL also played key role in the development of backyard poultry farming in Afghanistan, using different models (15, 20, 25, 30 and 100 layers models). The key player agencies implementing the 15-100 layers models are presented in table 1 below:

Table 1. The agencies playing key role in backyard poultry in Afghanistan

Sl. No	BYP-Model (birds No.)	No. of Layers + Cockerels	Donors	Implementing Partner/ Service Provider	No. women Beneficiary Covered	No. Province	Dates/ years
1	Backyard	14+1	IFAD/RMLSP/ MAIL	FAO and BLDU	6000	2	2010-2016
2	Backyard	14+1	IFAD/CLAP/ MAIL	Local NGOs	20000	3	2015 - 2020 ongoing
3	Backyard	14+1	IFAD/SNaPP2/ MAIL	Local NGOs	6000	3	2017 - 2019 Up-coming
4	Backyard	15+0	WB/HLP/ MAIL	FAO-AF	24800	5	2009-2012
5	Backyard	15+0	USAID/MAIL	FAO-AF	4000	3	2010
6	Backyard	15+0	German Trust FUND	FAO-AF	16000	3	1999 - 2003
7	Backyard	15+0	MAIL	GDLAH/ MAIL	1500	1	2017 ongoing
8	Semi-commercial	30	World Bank/NHLP/ MAIL	Local NGOs	30000	-	2013-2016 ongoing
9	Semi-commercial	100	World Bank/NHLP/ MAIL	Local NGOs	5000	-	2013-2016 ongoing
10	Semi-commercial	Small-scale	British Gov./CARD-F/MAIL	Local NGOs	4113	11	2010-2017
	Total	-	-	-	117413	-	-

The backyard poultry model developed by FAO and being implemented by a range of NGOs and donor agencies throughout Afghanistan was very effective in rehabilitation of the seriously damaged poultry sub-sector in the whole country. However, there are some concerns on the long-term sustainability of these models, which may need some modifications in present situation to ensure the long-term sustainability of the approach on village level. The change in training methodology to FFFS approach, change in poultry coop design to simple and inexpensive poultry shelter, poultry breeding by natural hatching, in-kind support to VGLs, and the formation of VPPAs/VPDCs as legal rural registered institutions are good examples for modification and can be recommended for future programs.

However, assessment of various poultry production models is supposed to be done by the National Horticulture and Livestock Program of MAIL to identify the most effective and sustained model of backyard poultry production in Afghanistan.

11. Livelihood Improvement through Backyard Poultry

In order to address the most important role of backyard poultry raising and production on livelihood through providing a source of income and a tool for poverty alleviation for most poor rural families in Afghanistan, special attention was paid in selection of the most vulnerable women beneficiaries in line with the program goal. Rural women in Afghanistan traditionally play an important role in this sector and are often in control of the whole process from feeding to marketing, which is not the case in production systems for other livestock species. For women who stay at home, poultry enable them to (i) help the family in time of need, and have cash for emergencies; (ii) obtain an income to provide for the needs of their children and the households and (iii) supplement the family's protein intake. However, there are some constraints for rural women such as limited access to knowledge, technologies, training and extension services. To overcome these limitations and constraints, the BYP development program in Afghanistan identified the key aspects in promoting the women economic and social empowerment and supported women's role as poultry owners, producers and user of poultry products through providing them with the ample training and quality inputs to strengthen their decision making power and enabled them to break the cycle of poverty in targeted areas of Afghanistan.

The backyard poultry is initially designed (i) to provide support, training and guidance in an effort to promote rural poultry and help those who strive to work with poultry in rural setting (ii) to break the cycle of poverty by strengthening poor and vulnerable rural households through improved livelihood, incomes, food security and nutritional status (iii) to foster

community prosperity by enhancing the knowledge and skills needed for improved economic decision-making.

Family poultry is rarely the sole means of livelihood for the family but is one of a number of integrated and complementary farming activities contributing to the overall well-being of the household. The right to food as a human was identified in the initial design of the project as per the FAO Guidelines, which protects the right of all human beings to feed themselves in dignity, either by producing their food or by purchasing it. To produce his or her own food, a person needs land, seeds, water and other resources, and to buy it, one needs money and access to the market. The right to food therefore requires states to provide an enabling environment in which people can use their full potential to produce or procure adequate food for themselves and their families. To purchase food, a person needs adequate incomes: the right to food consequently requires States to ensure that wage policies or social safety nets enable citizens to realize their right to adequate food. The backyard poultry follows most of these principles and Guidelines, by producing quality food for themselves (eggs and meat) and also generating income from the sale of products for other domestic need (sugar, tea, vegetables, cooking oil and etc.) the family poultry also provide quality protein by supplying organic eggs to the market.

Moreover, the backyard poultry is a major income-generating activity due to the sale of birds and eggs. Family poultry was additionally clarified as “small flocks managed by individual farm families in order to obtain food security, income and gainful employment for women and children. Poultry also play an important socio-cultural role in rural communities in Afghanistan. Poultry keeping uses family labour, and women are major beneficiaries. Women have an important role in the development of family poultry production as extension workers and in vaccination programs. Occasional consumption provides a valuable source of protein in the diet thus improving occupational safety and health.

12. Women Empowerment through Backyard Poultry

Poultry production in Afghanistan makes significant contribution to the rural and national economy. Moreover, backyard poultry rearing is popular throughout the country but farmers who are dealing in poultry rearing are mostly following the traditional systems and are not aware of improved poultry management skills and knowledge to achieve a significant development in this field.

The Ministry of Agriculture, Irrigation and Livestock (MAIL), designed and managed several development programs to address the current need of rural communities to enable them to have control on their own wealth conditions;

aiming at reducing the gender disparities by increasing the social and economic status of women engaged in the proposed activities under such programs. Backyard poultry is one of rural development initiatives plays a crucial role in improving food and nutritional security and as a result; enhancing the socio-economic status of poor communities particularly for women and women led-families.

Over 90 percent of poultry production is managed by women and small-scale poultry development as a significant asset to the rural women of Afghanistan, contributing to poverty alleviation, food security and enhanced nutritional standards. This is especially important for rural women and less-favoured areas affected by several decades' war and civil unrest. The specific impacts of backyard poultry on women empowerment in Afghanistan is mainly attributed to the following facts:

- Backyard poultry development is specifically designed for rural women because they can manage the small family size poultry farm effectively.
- Rural women are socially and economically empowered and enabled them to make group wise decision through organizing them in village poultry producers groups.
- Increased access to regular and dependable egg marketing.
- Increased women participation in development of livestock sector.
- Improved food security and increased household income from poultry production.

13. Government Policies and Action

Backyard poultry development responds to specific constraints in the country context in term of major issues of poverty and food Insecurity, especially in rural Afghanistan. This is because that the government of Afghanistan through the Ministry of Agriculture, Irrigation and Livestock (MAIL) in line with national policies, strategies (Afghanistan National Development Strategy, 2008, National Priority Program-2 and National Comprehensive Agriculture Production and Market Development, 2012) is promoting small holder poultry production to address poverty alleviation in the country. The backyard poultry development programs helps farmers enhance their food security, and control over the available resources and encouraged women participation in agricultural development.

In order to know the general situation of poultry sub-sector in the country, an international consultant was hired by the horticulture and livestock project to assess the situation, development opportunities and constraints with regard to the poultry sub-sector in Afghanistan as a whole. The assessment was made through consultations with a wide range of stakeholders in the poultry sector

and through separate workshops with representatives of both intensive and village-based poultry production systems. Through group assignments, representatives of the intensive production systems were requested to draft actionable plans to address a set of identified problems and issues, such as unfair competition and lack of basic infrastructure, while representatives of the village system worked on strengthening backyard poultry systems, keeping backyard poultry systems feminine, and organizing female human resources with regard to poultry production.

With the experience gained from the current project and considering various economic and other major constraints of the poultry industry in the country, it can be concluded that effective poultry production development policies are needed to safeguard the current poultry farmers and attract newcomers into poultry farming. Currently, these are not available. Another constraint is a lack of protection from unfair competition caused by the uncontrolled dumping of imported poultry products. These imports also create a high risk of introducing serious poultry diseases into the country. The policies to be developed can be divided into two major groups:

- policies related to the internal environment of the country, e.g. tax exemptions, subsidies and allocation of lands; and
- policies related to the environment outside the country, e.g. control of imports, taxation of imported products and quarantine policies.

Based on the ground reality, experiences and lessons learnt from previous poultry projects, the poultry section of the General Directorate of Livestock and Animal Health (GDLAH) of MAIL prepared a draft policy to address the sustainability of backyard poultry sector in the country.

14. Recommendations for Future Research and Extension Services

- Further attention for the promotion of small scale backyard poultry is strongly recommended recognizing the fact that the extensive poultry production system is a good entry point for strengthening rural development in Afghanistan
- Based on RMSP BYP project experiences, the incorporation of the Female Family Poultry School (FFPS) approach to the capacity building and training/extension programs is strongly recommended for social empowerment and economic transformation through participatory approach
- The RMLSP BYP project experiences show, that natural hatching with broody hens or turkeys and procurement of chick/pullets from suppliers through Village Group Leaders (VGLs) are the best options for restocking of backyard poultry flocks. Operation of small

incubators in the villages are not recommended because of the lack of electricity, fuel shortages and higher cost for operation of incubators.

- Improved natural hatching should be further encouraged and strengthened through launching proper training and extension work by the interested parties involved in backyard poultry development.
- For economic approach to poultry feeding, alternative feeding sources should be identified, introduced and extended for sustained and economic backyard poultry development approaches like those that were introduced by the RMLSP poultry project.
- Yet, the RMLSP-BYP-model can be accepted the appropriate one for family poultry development in rural Afghanistan. However, the impacts of other models in terms of methodology, geographical coverage, findings and conclusions are still to be identified, knowledge gaps and needs for further research to support poultry as a tool for poverty alleviation are suggested.
- Support to upgrade the local poultry production systems such as parent stock, hatcheries, feed mills and etc in order to establish small scale and medium scale commercial layer farms in the country as a national program to achieve self sufficiency in eggs and required inputs.
- The backyard poultry development policies should be worked-out which can be divided into two major groups: (i) Policies related to the internal environment of the country, e.g. tax exemptions, subsidies and allocation of lands; and (ii) Policies related to the environment outside the country, e.g. control of imports, taxation of imported products and quarantine policies.

15. Conclusions

- Small-scale poultry production is a significant asset to the rural population of Afghanistan, contributing to poverty alleviation, food security and enhanced nutritional status. This is especially important for rural women in less-favorable areas of the country.
- Deteriorating security situation of the country, escalation of the prices of inputs, difficulty in obtaining quality inputs, fluctuation of end product prices (eggs and meat) in the market etc are the main constraints in backyard poultry development in Afghanistan.
- There are various aid agencies working and practicing different models on backyard poultry development in the country with some concerns of long-term sustainability. This needs an Impact assessment to identify the proper and sustained model for the country.

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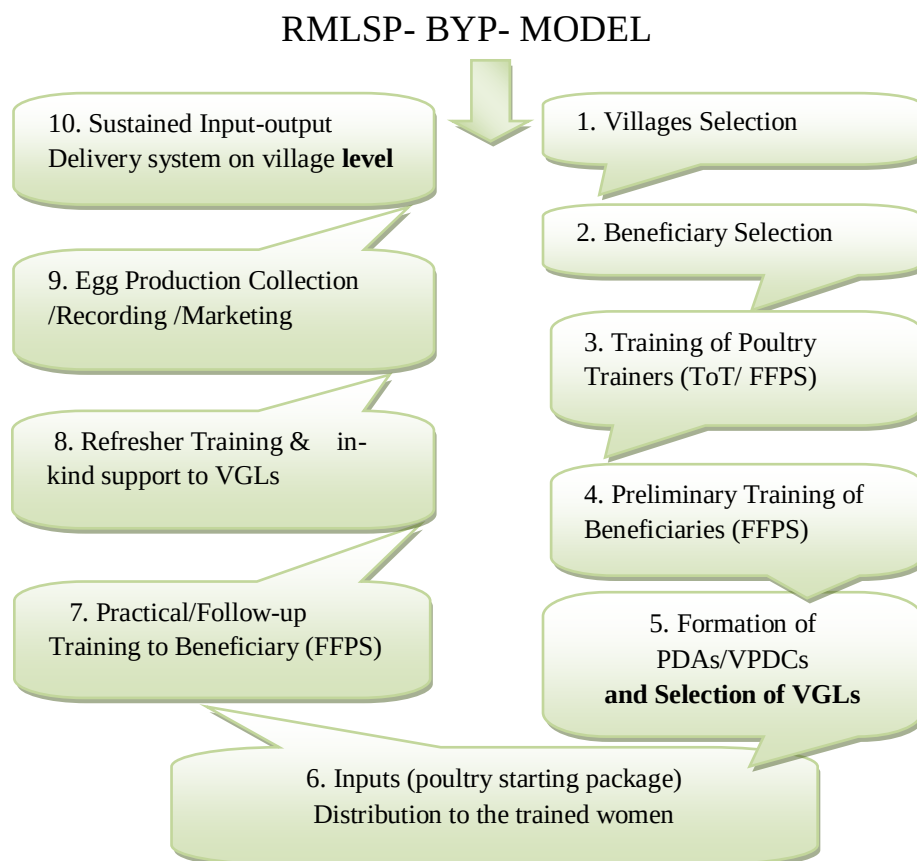
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SUCCESS STORY-1

RMLSP- BACKYAD- POULTRY MODEL (RMLSP-BYP-Model)

The RMLSP poultry project of MAIL funded by IFAD and implemented by FAO (2010-2014 and BLDU (2014-2016), developed an innovative BYP-Model by introducing some necessary innovations/change in training methodology to FFPS approach, change in poultry coop design to simple and inexpensive poultry shelter, poultry breeding by natural hatching, in-kind support to VGLs, and the formation of VPPAs and VPDCs as legal rural registered institutions as presented below:

The various steps of implementation of RMLSP- BYP-model are summarized in the following diagram:



The major components/activities of RMLSP-BYP-model are summarized as follows:

1. **Beneficiary selection:** Selection of vulnerable women beneficiaries within the targeted districts and provinces is done as per the design of proposed project. The beneficiaries, the target group, are the poorest segment of the village population and in particular women.
2. **Capacity building in poultry husbandry and management:** Through FFPS (Female-Family Poultry School approach).
3. **Poultry starter package:** Each trained women beneficiary receives the poultry starter package of 15 pullets (Golden crossbred, three months), 14 layers and one cockerel, 75 kg feed, a drinker and feeder, necessary medicines and vaccines).
4. **Institutional arrangements:** Trained women beneficiaries in Poultry Development Associations (PDAs) on district level and the Village Poultry Development Centers (VPDCs) as members of PDAs on village level.
5. **Identifying, selection and support of Village Group Leaders(VGLs):** Provision of extra capacity building to the selected VGLs for enabling them to perform better as day-to-day advisor/facilitator to her relevant group and in kind support to the VGLs for creation of working capital/revolving funds.
6. **Input-output delivery System:** Establishment and strengthening of proper and sustained Input-output delivery network on village level by linking the VPDAs/VPDCs with the suppliers and VFUs.
7. **Poultry health care system:** All the trained VGLs/beneficiaries were made aware about the importance of preventive and curative measures of poultry health care and linking them with ensured sources of poultry vaccines and medicines.
8. **Creation of an enabling environment:** Through linking successful producer groups with the micro-credit sources and creation of self-saving scheme for up-scaling the poultry production business on village level.
9. **Ensuring alternative feed sources:** Introduction and development of alternative feed sources (homemade mixed grain, green/ hydroponic forages, pulses sprouting, scavenging and commercial feed).
10. **Poultry breeding:** Introduction of well adopted and high producer crossbred layers (Golden Crossbred) and encouraging the breeding of this layer breed through natural hatching.

- 11. Social empowerment and economic transformation:** Selected women beneficiaries are empowered socially and economically through participatory approach of FFFS with increased income and technical skills and knowledge.
- 12. Project coordination:** The project established and strengthened the coordination mechanism on local and central levels which ensured the follow-up of producers by the involved parties (MAIL/DAIL/UFUs /Suppliers) through capacity building in Backyard Poultry production and related activities (forward- and backward linkages) of relevant DAIL, VFUs, SPs and others,
- 13. Systematic documentation:** Good Practices and Lessons Learnt through field studies and data collected on poultry production.

The innovative measures introduced and adopted in the RMLSP-BYP-model are listed as below:

- Introduction of Female Family Poultry School (FFPS).
- Access to young stock for restocking.
- Institutionalized poultry health care system.
- New design of poultry coop.
- Economic approach to poultry feeding.
- New institutional arrangements.
- Technical and In-kind support to the VGLs/PDAs/VPDCs.
- Creation of enabling environment.
- Encouraging other income sources from poultry products.

Each of the above mentioned innovations and good practices are explained and discussed as follows:

1. Introduction of Female Family Poultry School (FFPS)

In order to improve the quality of work and strengthen the sustainability of backyard poultry development efforts, the RMLSP/FAO poultry project initiated the attempt to integrate and explore the FFS approach on women's capacity building into the FAO Backyard Poultry Development Model for the first time during 2013 under the name of Female Family Poultry School (FFPS). The FFPS approach proved that the women have gained both technical and business skills which enhanced their abilities to manage and make decisions relating to poultry farming activities at the household level. It opened up a space for women to develop their self-confidence and it served as a place for building strong friendship among the rural women folk. In general, the approach was very effective in overcoming the main constraints affecting the women in rural areas of Afghanistan.

1.1 Specific Feature of FFPS

The FFPS is unlike traditional approaches to agricultural extension, which rely on extension workers providing advice to farmers, it mostly rely on Female Village Group Leaders (VGLs) as day-to-day advisors/instructors/facilitators to their relevant Village Poultry Producer Groups (VPPG) and also to the interested adaptors. The approach enabled groups of women farmers to find out the answers for themselves. They learn how to farm better by observing, analyzing and trying out new ideas on their own poultry farms. During the learning activities, women producer groups are trained and are encouraged to be active in the discussions about the topics, hands-on field practice, the whole processes are followed-up by poultry project trainers/monitors and DAILs extension workers in beneficiary's houses on seasonal basis.

1.2 FFPS Curriculum

Special Curriculum was development on the bases of specific field identified problems as presented below:

1.2.1 Main topics

- (1) **Poultry housing:** Designs, location, size (capacity), maintenance, nesting,
- (2) **Poultry breeding/ hatching:** Natural hatching under broody hens/turkey, procurement of day old chicks/pullets from suppliers
- (3) **Poultry feeding:** Homemade (mixed grain, bone ash, hydroponic forage, kitchen wastes), feed from suppliers (poultry companies), scavenging,
- (4) **Poultry health care:** Preventive (vaccination, hygiene), curative (introduction to common poultry diseases and small treatments),
- (5) **Inputs-output delivery network:** Responsibilities of VGLs, Input suppliers (private companies), VFUs, veterinary medicines stores/shops, marketing poultry products (Eggs , day old chicks/ pullets/ old stock),
- (6) **Documentaries:** Simple records keeping, small scale business development,
- (7) **Practical /group work:** Demonstrations, experimentation and new models, group work, exposure visits.

1.3 Training Materials

The following training materials were designed developed, prepared:

- (1) Printed training materials in local language (Dari): manuals, leaflets, brochures and charts.
- (2) Models: models of poultry nests and poultry coop, homemade drinkers and feeders, models of trays for hydroponic forages.

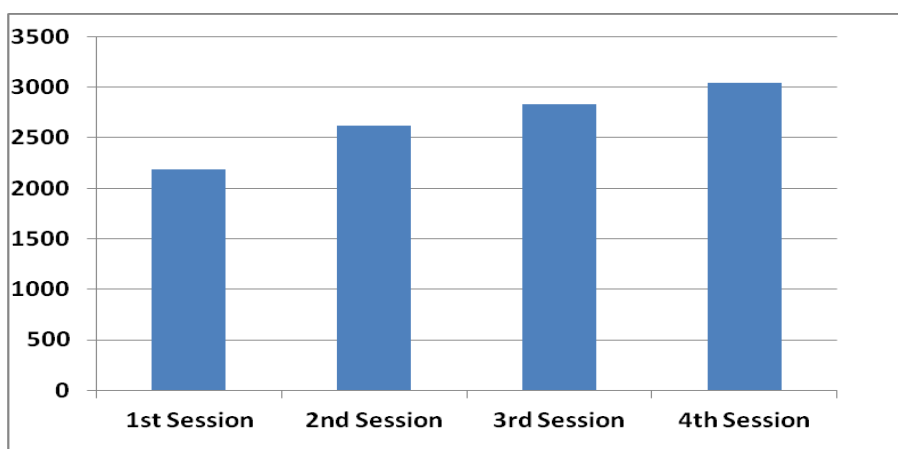
1.4 Training methodology

The training program was conducted with classroom teaching followed by practical training in poultry vaccination, medication and exposure visits to poultry inputs suppliers.

1.5 Participation of rural women in FFPS

The FFPS approach was introduced and incorporated in backyard poultry development training program for the first time in 2013. The total number of 2233 women beneficiaries and 812 rural women (non-beneficiary/adopters) was trained in 4 different sessions on specific topics of backyard poultry husbandry through FFPS program. All 4 sessions of FFPS were successfully conducted during 7 months.

The total number of rural women (beneficiary, non-beneficiary) attended the FFPS program was 2190, 2617, 2828 and 3045 in first, second, third and fourth session respectively, which shows an increasing trend from the first to 4th sessions and can be attributed to the positive impacts of FFPS program on motivation, mobilization of producers communities as shown in the bellow graph.



SUCCESS STORY-2

My name is Mahira, belong to Nahrishahi district of Balkh province, I have 6 children, I benefited very well from the training in improved poultry husbandry. I learnt how to feed the chickens, vaccination, minor treatments, hatching, poultry coop and collection and marketing the eggs. I have 15 layers provided by the BYP of RMLSP/MAIL, funded by IFAD, I can easily manage this small family size poultry farm in proper way and now I am getting good income from these layers. The living condition of my family is improved and most of the family needs are solved by the income from selling the eggs.

My husband is a Gardner, he has to sell the flowers his income is not enough for family and couldn't pay for all domestic expenses. The eggs collected and sold is good and easy source of income, now I can purchase school cloths, pen, notebook and foot wears for my children. I can say that chicken keeping brought very positive changes in our life and now I am getting on average Afs2000/month from selling the eggs. Before this poultry Project, I had to request my husband to give me some money for buying cloths or other domestic needs, but now my husband is asking me for money. I could purchase 6 m Iranian carpet for my house. I also produced 12 small chicks by natural hatching by the hen and I will keep and raise these chicks for replacing the old mother stock. I am very grateful from the Government of Afghanistan for this Support.

SUCCESS STORY-3

My name is Bobani, I am from Yaka Bagh village of Nahri Shahi district of Balkh province. I am an Afghan women, member of Village Poultry Producers Group. I received 20 pullets from poultry project funded by IFAD through Ministry of Agriculture of Government of Afghanistan. The poultry starting kit and 6 months training in backyard poultry management helped me a lot to continue and expand my small family size poultry farm. I benefited very well from this poultry development program. Beside the chicken given by the project, I could buy 80 chicks and reared them for selling to other women of this VPPG. Training in improved poultry husbandry was very effective. I learnt how to feed, vaccinate, hatching eggs under the hen, poultry housing and collection and marketing the eggs. I can easily manage this small family size poultry farm in proper way and now I am getting good income from the layers and pullets. The living condition of my family is improved and most of the family domestic needs are solved by the income from selling the eggs and pullets.

I can say that poultry keeping brought very positive changes in our life and now I am getting on average Afs. 2100/month from selling the eggs, about 60 eggs are the home consumption. Before this poultry raising and keeping, I had difficult economic condition and I was not able to find proper source of income to pay for carpet, children cloths, foot wear, food items, fan, gas balloon, dishes and most of the house domestic needs from poultry income.

I also bought a sheep from poultry income and I will sell it back after three months which will bring me more than Afs.3000 net income, which will help me to pay for domestic needs in the winter season such as fuel and food. The net income I am getting from the selling of pullets to neighbors and other Group member is about Afs.3500/batch of 100 chicks reared for 1-2 months. I have plan to rear three batches, which will bring Afs.10500 as net income. I am very grateful to the Ministry of Agriculture for this support.

Chapter 2

Backyard Poultry Production System in Bangladesh

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1. Introduction

Poultry keeping is an integral part of multi-species subsistence livestock farming in Bangladesh. The method of keeping poultry under the subsistence farming has been characterized as the backyard poultry farming (FAO, 2006). This is the oldest and traditional system of keeping poultry in almost 95% of the rural households of Bangladesh (BBS, 2017). Backyard system in Bangladesh is a low-input and low-output system which mainly comprises of indigenous genetic resources and crossbred birds housed with minimum facilities (Alam et al., 2014). This system allows the bird free-movement for scavenging food sources and in most of the cases, the birds are supplemented with kitchen waste, family food leftovers and self-produced food grains by the farmers (Sonaiya, 2007). Chicken, ducks and pigeon are the most common backyard poultry species of Bangladesh. However, quail, goose, guinea fowl and turkey are also kept by the farmers mainly as the hobby (Alam et al., 2014 and Dolberg, 2008). The eggs and meat of the backyard poultry farming is mainly used for home consumption and the surplus are for income generation, particularly by the women who spend this money to support children's education and to mitigate family's financial gap in severe needs what help them to be empowered in the male-dominated rural families of Bangladesh (Islam et al., 2017).

The dates back to 1990s, backyard poultry were the sources of 98% supply of poultry meat and eggs in the country and the rest 2% would come from industrial poultry (UNDP/FAO, 1983). In those days, per capita egg and meat consumptions were approximately 12 nos and 4.8 kg per year with the country's total production approximately 1000-1200 million eggs and 40,000-53,000 metric tons of meat (BBS of different years). In 2016, the yearly consumption of eggs and meat in the country were 75 no./head and 36 kg/head, respectively with the country's total production of 11912 million eggs and 6.2 million metric tons of meat (all types) respectively (DLS, 2016). The current increment in supply and consumption is not solely by the

influence of a single factor, rather this change has been taken place either by the direct or indirect influences of the socio-economic and technological changes in the country and in the world. The factors those have played major role for the increment of country's total egg and meat production are: i) availability of high yielding poultry breeds, varieties and strains locally; ii) technological development in the housing, nutrition and feeding, and disease control approaches and management protocols; iii) availability of cost-effective and skilled manpower locally; and iv) supports and incentives from government for the local and international entrepreneurs. Country's total consumptions of poultry products has been increased as a result of the cumulative effect of i) increased population; ii) higher purchasing power of the people; iii) health consciousness and higher education level; vi) competitive market prices of eggs and broiler meats, and v) changes in food habits and life styles of the people, particularly in urban areas. Surprisingly, majority of the influences were almost towards the flourishing of industrial poultry, as a result, currently the farm-produced poultry meat and egg in Bangladesh have occupied 60% and 50% market share, respectively in supply and consumption of the country (Bhuiyan, 2011). No doubt that this time-being shuffled in poultry productivity is in lined with the global trend, but in the face of 64% low income rural and agricultural population, more than 20% poverty in the country and severe inequality in wealth possession in the society, the need of backyard poultry farming cannot be ignored towards achieving the food and nutrition security in the country towards achieving SDG by 2030.

According to Das et al. (2008) and some other researchers, it is clear that backyard poultry meat and eggs are still highly demanded by the consumers even at premium prices. Scientifically, it has also been proved that free-range poultry meat and eggs are enriched with some valuable nutrients. For example, free-range egg contains 2-times higher omega-3 fatty acids, 3-times vitamin E and 7-times beta carotene than that of the similar size caged egg. Free-range eggs also been reported to supply 33% less cholesterol, 25% less saturated fat and 66% more vitamin A compared to equal size caged eggs (Axe, 2016). Other than eggs, the meat of free-range scavenging chicken has also been proved to be rich in taste and flavor (Islam et al., 2002).

After the endemic avian flu attack in the country in 2007 onward, the poultry sector is facing almost stagnant demand for the farm poultry eggs and meats, whereas the demand for free-range (Desi) chicken and slow growing crossbreed chicken is increasing (Personal observation). Safety questions of the growing number of health conscious consumers of Bangladesh about farm produced poultry eggs and meat; like higher level of *salmonella* and *E.coli* contamination, antibiotic, hormone and heavy metal residues in farm eggs and meat what have been widely broadcasted in the print and electronic

Medias, might prolong the stagnancy of this wet market demand for farm poultry products. Although the expansion of safe production model and further process markets can help the industrial poultry sector to overcome the stagnancy but it can be speculated that the backyard poultry will occupy a significant market share in the meantime, at least for a period of until the nation reach to a developed country status, through ensuring the availability with year-round competitive prices. However, flourishing of backyard poultry sector in Bangladesh in any dimension like breeding, feeding, management, health care, marketing channel etc, stakeholders must know the current status of this sector along with its scopes and limitations for further expansion.

2. Poultry Population and Demography

Although chicken, duck, quail, goose, pigeon and guinea fowl are the commonly kept backyard poultry species in Bangladesh, only three species, namely; chicken, duck and pigeon population data are available in the reliable sources. The chicken and duck population in Bangladesh during 2015-2016 were 268 million and 52 million heads, respectively whereas the total meat (from all sources) and egg yield of the country in the same time were 6.2 million metric ton (MMT) and 11,912 million numbers, respectively (DLS, 2016). However, the DLS (2016) statistics did not provide specific figures on farm and backyard poultry population separately. Therefore, a time series data on backyard poultry and poultry products from the widely accepted sources are given below:

Parameters	Year			
	1980	1990	2000	2010
Total poultry (Million)	67.7	114.1	165.7	270.7
Chicken (Million)	52.1	91.1	132.7	228.0
Duck (Million)	15.6	23.0	33.0	42.7
Indigenous chicken meat ('000 Tons)	53	89	126	202
Indigenous duck meat ('000 Tons)	15	23	33	42

Source: FAOSTAT (Online data retrieved on 20 October 2017)

In-depth analysis of the available data revealed that the country's poultry population has been increased by 4.7 times over 1980 to 2015 (FAOSTAT and DLS, 2016), whereas the indigenous or backyard poultry meat production is increased by 3.58 times during 1980 to 2010 (own calculation from FAOSTAT data). Therefore, it is clear that this additional poultry meat

has come from the contribution of industrial sector, which was supported by a sudden increase in the number of commercial farms, that is 147 in 2007 from 60 in 1995 (Rahman et al., 2017). However, the change in duck population over the same time indicates a relatively less industrialization in the duck sector.

The FAOSTAT publishes figures on chicken and duck population only, although the pigeon, quail and guinea fowl rearing in both the rural and semi-urban families are getting popularity day by day (own observation). The figures of different poultry species population seem to be varied in some extents, which can be explained by the difference in season of data collection. Several reports confirmed that the seasonal variation has effect on backyard chicken and duck population in Bangladesh (Dolberg, 2008). According to him, backyard duck population become lowest in dry season and highest in rainy season. The distribution of poultry population over the 64 administrative districts of Bangladesh indicates a clear geographical influence on backyard poultry population (BBS, 2017). The district-wise poultry population indicates that low lying areas are dominated with duck species, whereas the big city surrounding districts are rich in commercial chicken production. However, the distribution of backyard poultry species varies with the categories of farmers; such as landless, medium and large scale farmers possess <11, 12 to 22 and >22 heads of poultry per family, respectively (Alam et al., 2014). Whatever might be the sources of information and distribution pattern of the poultry birds in Bangladesh, it is reported that the country is deficient in 13% meat (all type) and 29% egg productions (DLS, 2016).

3. Backyard Poultry Breeds

3.1 Chicken

The indigenous chicken population is comprised of a number of breeds/types such as non-descript Desi, Aseel (Sarail and Chittagong type), Naked Neck, Hilly, Yasine, Native Dwarf, and Frizzled Plumage (Bhuiyan et al., 2005; Das et al. 2008). Currently, the F₁ crossbred (named Sonali) produced through a planned breeding between RIR male and Fayoumi female are widely available in the country both at backyard and small-scale semi-intensive rural farms (Dolberg, 2008). The Sonali population of Bangladesh has been increasing since 2010 and that time it was about 150.9 million Sonali DOCs were produced throughout the country, representing about 35 percent of the country's total commercial broiler and layer production (Huque, 2011). The Sonali crossbred has been claimed to lay 156 eggs per hen per year with a yearly average weight 55 g/egg. The birds can attain 1.18 kg body weight at around 20 weeks of age with FCR values ranges from 2.7-

3.0 (Rahman et al., 1997). The performance of some purely indigenous backyard chicken is shown in the table below:

Table 1. Performance of some purely indigenous backyard poultry

Trait	Type of indigenous chicken		
	Desi	Naked Neck	Aseel
Hatch weight (g)	29		
Body weight (g) at 4 weeks	77		
at 8 weeks	175*		
at 12 weeks	315*		
Weekly weight gain (0 - 12 wks), (g)	24*		
Age at first egg (d)	175	234	240-300*
Mature body weight (kg)	1 - 1.3	1.171	1.7-4.50*
Egg production/hen/year (no.)	45-50	50-55	33*
No. of eggs/clutch	10 - 16		
No. of clutch/year	3-4		
Egg weight (g)	35-39	42	
Fertility (%)	83		
Hatchability of all eggs set (%)	75 - 87		
Feed efficiency (kg per kg body wt.)	4-5		
Feed efficiency (kg per kg egg mass)	8.6 8.8		
Mortality (%) (up to 500 days)	9.0	8.33*	

Source: Adapted from Bhuiyan et al. (2005)*Performance under intensive management system.

The photographs of some important indigenous and crossbred chickens are given below:



Non-descript Desi chicken



Naked Neck chicken



Aseel chicken



Hilly chicken



Sonali Crossbred (♂ RIR X ♀ Fayoumi)

(Photo Courtesy: Bhuiyan et al., 2005)

3.2 Duck

The common duck breeds reared under the backyard system in Bangladesh are Desi Black (Nageswari), Desi White and Sylhet Mete which constitutes 97-98% of total population (Sing and Moore, 1978). Among the exotic breeds, Jinding, Khaki Campbell, Indian Runner and Muscovy are dominant. Other than the indigenous and exotic breeds, the crosses between indigenous and exotic breeds are also common in the backyard system along with the Muscovy duck in some areas (Bhuiyan, 2011 and Pervin et al., 2013). The

average age at maturity of the backyard duck breeds are close to 26 weeks with an average body weight 1.7 kg/bird, annual egg production 77 per bird, egg weight 59 g per egg and hatchability of the fertile egg 79% (Rahman et al., 2009; and Hamid et al., 1988). Both of the Desi White and Desi Black duck attain 1.5-2.0 kg body weight at maturity and lay 150-175 eggs per year. In a study by Huque, (1999), it was found that the total number of ducks, including the ducklings, were 56% higher in the season comprised of April-June, compared to the season made by October to December, implying that there is, indeed, a seasonal influence to duck production in Bangladesh. The photographs of Desi Black and Desi White ducks are shown below:



Desi white male



Desi white female



Desi black male



Desi black female

3.3 Other backyard poultry species

After the chicken and duck, other backyard poultry species in Bangladesh are pigeon, goose, guinea fowl and quail. In 2005, Bangladesh had a population of 10.8 million pigeons of which 11% were kept on a system what is termed as commercial farms (Agricultural Sample Survey, 2005). Such farms are however not defined. In no division do pigeons kept under commercial farm conditions exceed 1% of total poultry population. The common indigenous pigeon breeds are Gola, Sirajee, Jallaji, Gribaz and Mookee, those have been reported to produce 8-10 pairs of squab per year (Islam, 2010). Among goose breeds, the Chinese goose and non-descript type goose are dominant. Their average mature body weight is about 4-5 kg/head and lay 30-40 eggs per year. The common colour variety of Guinea fowl in Bangladesh is Pearl that attain approximately 1.5 kg body weight at maturity and lay 50-60 eggs per year (unpublished data). For quail, wild type Japanese one is the widely available, whose mature weight is 120-150g at maturity and lay 220-250 eggs/year (unpublished data). In recent years, five more colour mutations of Japanese have been isolated at Bangladesh Agricultural University (Rahman et al., 2016). Turkey farming is getting popularity in Bangladesh among the young and innovative farmers as a source of lean meat for financially solvent consumers, although the exact population size and number of turkey farms in the country are not known. The turkey breeds reared by Bangla Desi farmers are mostly traded from India. These breeds are not of standard type and mostly of non-descript type. These breeds reached maturity at 6-7 months of age attaining 6-7 kg body weight by male and 3-4 kg by female with FCR values ranges from 3.5-4.0. They have been reported to lay approximately 60-70 eggs per year under the standard semi-intensive system in Bangladesh (Personal communication).

4. Housing

For backyard chicken, no standard housing is provided. The common features of backyard poultry houses are; i) provide less living spaces than the requirement, ii) lack of fresh air and sufficient light, iii) attached to living houses and iv) commonly used for multi-species sheltering. These backyard houses are made up of mud, bamboo, jute stick, and zinc and wooden sheet involving minimum cost and locally prevalent designs. The common places of keeping the backyard poultry species are bedroom (approximately 50%), verandah and small pens placed at backyards (Islam et al., 2014). However, irrespective of type and location of the backyard houses, the birds normally take shelters in the houses at night and farmers never take care to protect them from wetting and chilling. However, the housing practices vary from farmers to farmers throughout the country and the common practices by the representative backyard poultry farmers are shown below (Table 4):

Table 2. Housing patterns, bedding materials and cleaning frequency of the backyard poultry houses in Bangladesh

Parameters	Frequencies (average %)
Living house	55
House made up of tin and wood	27.5
House made up of tin and soil	10
House made up of soil, bamboo and wood	7.5
Ash as the bedding material	67.5
Sand as the bedding material	20
Paper and ash as the bedding materials	12.5
Practice cleaning of the poultry house daily	55
Practice cleaning of the poultry house twice in a week	7.5
Practice cleaning of the poultry house once in a week	27.5
Cleaning of poultry house once in a two weeks	10

(Source: Islam et al., 2014)

Below are the photographs of some common backyard poultry houses in Bangladesh:



Brick and Tin made house



Tin made two-tier house



Brick made house with feed supplying bowl

5. Feeding and Water Supply

Backyard poultry species normally live on scavenging feed sources. Scavenging sources are of two types; i) outside the owner houses from where the birds scavenged for seeds, grass, earth worm, insects etc; ii) within the territory of owners house where they eat kitchen and household wastes, and spilled food grains during harvesting season (Rahman and Howlider, 2006).

It has been reported that the availability of scavenging feed vary in seasons, normally highest in Rainy season and lowest in Winter season (Rahman et al., 2004). Rahman and Howlider (2004) stated that the backyard feed sources are nutritionally imbalanced and deficient of proteins and phosphorus. However, a study in some selected areas of Bangladesh reported that other than harvesting season, farmers (62%) provide supplemental feed at the rate of 50-108 g/d/head to the backyard birds at morning and evening (Islam et al., 2014). The grain supplement is given to the bird through spreading over the ground and only few farmers use standard feeder (25%) and drinker (12%) for the backyard poultry, and no hygienic care is taken by the farmers during feeding them (Islam et al., 2014). Most of the time, the backyard poultry birds drink water from household waste water streams around the kitchen.

6. Genetics, Breeding and Reproduction

The backyard chicken population of Bangladesh is dominated by non-descript indigenous chicken which is approximately 90% of the total population (Bhuiyan et al., 2005). Until 1935, there was no exotic breeds in the backyard population, but after 1960s, a range of crossbreeds have been incorporated in the backyard flock through the so called cockerel exchange program adopted by the government (Ambar et al., 1999). This cockerel exchange programs introduced high yielding breeds of chicken and facilitates the cross breeding between indigenous population and exotic stocks resulting serious dilution in the local germ plasm. Now, in competition with the higher producer crossbreeds the low producer indigenous Naked Neck, Frizzled, and Dwarf genotypes are facing extinction.

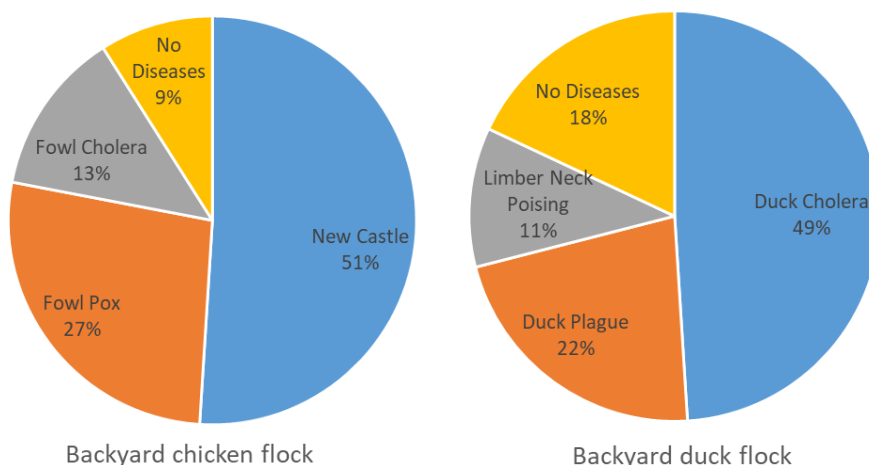
In backyard production system, no planned breeding is practiced and natural mating is the only means of reproduction. Fertility is generally lower (less than 70%) due to inappropriate male to female ratio (Dolberg, 2008). Indigenous chicken and ducks become broody after a clutch of 10-12 eggs and the hatching is done by broody mothers or by using Rice Husk Incubator (mainly for duck) in some areas.

7. Disease Management

Backyard poultry flocks of Bangladesh suffers from some common species-specific diseases. Backyard chickens are mostly attacked by Newcastle Disease (ND) which accounts 51% of total death. Its prevalence is higher in Winter than any other season. However, the prevalence of Fowl Pox and Fowl Cholera in the backyard chicken flock is not uncommon, which account approximately 30% of total death. Among the duck diseases, duck plague and duck cholera are widely prevalent those cause 30% and 49% death in the

flock, respectively (Alam et al., 2014). There are little reports on the death (13% only) of backyard flock by avian influenza (birds' flu), even after a big massacre, during 2006- 2011, in the commercial flock, which might be the consequences of poor monitoring and weak surveillances (Biswas et al., 2009). The vaccines for ND, Fowl Cholera, Duck Plague, Duck Cholera, and Pigeon Pox are produced locally and available at every government livestock offices (Sarker et al., 2012). However, small flock size and lack of farmers' knowledges about disease prevalence are the major problems in successful vaccination program and disease control in the backyard flock and the bio-security concept is poorly realized in the backyard system of Bangladesh.

The results of a sample survey on the prevalence of diseases in the backyard chicken and duck flocks of Bangladesh (Alam et al., 2014) are shown below:



8. Farming Practices

According to FAO (2000), backyard farming is the 4th category of poultry farm after the integrated and commercial farms. The modern concept of backyard poultry is popularly termed as the Family Poultry (FP), which is distinctly characterized by indigenous birds live on natural feed sources with or without feed supplementation, found in small flock having single or multispecies of birds kept together, usually taken care by the female family members, and a low input-low output system (Rath et al., 2015; Saleque, 2001; Rahman, 2003). In present scenario, the backyard system of poultry production in Bangladesh does not mean the rearing of poultry birds under free-range only, but in semi-scavenging and fully intensive system also with the flock size up to 100 birds per farm (Chowdhury, 2013). Therefore, all the backyard farms in Bangladesh can be categorized into two main types depending on their special features:

8.1 Small holding free-range farm

This is the most common and traditional type of backyard farming in Bangladesh and the integral part of subsistence agricultural farming. These farms consist of 5-25 birds of single or mixed species. The products are mainly used for family consumption. This is the most profitable (benefit-Cost ratio 1.9) family farming system with low-input and low-output. Indigenous breeds of poultry species are used in this system and normally the replacement stocks are produced from own flock ((Alam et al., 2014). Average cost per farm is 4126 Bangladesh Taka (BDT; 1 US\$= 80 BDT) and net profit per family per year is 3706 BDT (Islam et al., 2015).

8.2 Small holding commercial farm

This kind of backyard farming has been evolved in Bangladesh when the traditionally poultry birds were recognized for their commercial value other than the just a source of family consumption. Under this kind of farming, birds are kept in semi-intensive or fully intensive system. Commercial or own formulated feed is supplied to this bird. In true sense, this kind of backyard farming is a gateway to transform the family poultry into mini-industry and it is getting popularity day by day in the peri-urban and urban area as a source of safe food and extra cash income through self-employment. Of course, very few farms, approximately 5-10%, of the total family farming are of this kind (unpublished data). Flock size under this farming system ranges from 25-100 birds, although Chowdhury (2013) reported that the flock size of 72 birds is most profitable under this system. The high yielding strain, crossbreeds like Sonali chicken and cockerels of layer strains and pure breeds of duck are reared under this system. Very recent, the trend of rearing guinea fowl, turkey and pigeon under this system is increasing. In this system, farmers provide relatively better housing to the bird than that of the free-range system and the replacement stock is sourced from nearby small-scale hatchery.

9. Marketing

In Bangladesh, live bird transaction is a very common mainly due to religious beliefs and specific preferences of the consumers of different categories. This live bird markets (LBMs) in Bangladesh are of two types, i.e. retail shops and traditional LBMs, where minimal food safety standards or veterinary inspection are implemented. However, a survey on live market of poultry near Dhaka city showed that the % of consumer for Sonali and native chicken are 19% and 14%, respectively (Islam et al., 2017). The main players in the backyard poultry and egg marketing are farmers, faria (broker bought live poultry from farmers), bepari (year round broker

bought poultry from faria and farmers), wholesaler, market developer, super shop, retailer and consumer (Islam et al., 2017). The marketing channels of backyard eggs, indigenous chicken and Sonali chicken are shown below:

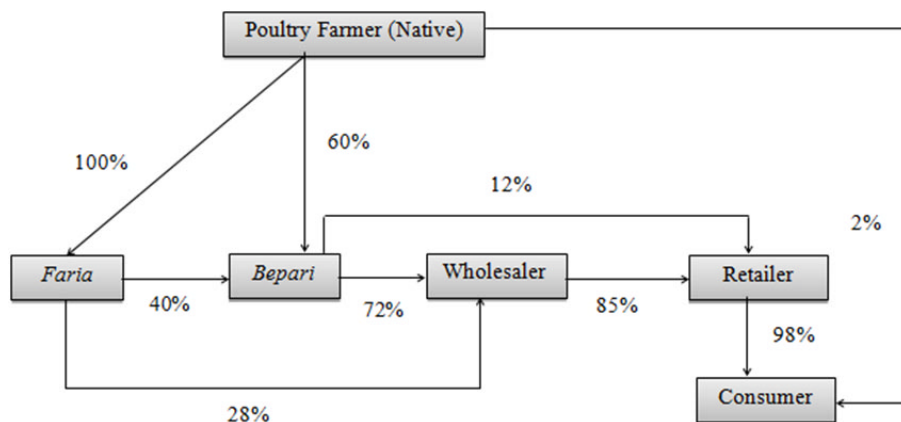


Figure 1. Marketing flow chart of live native chicken movement (Islam et al., 2017)

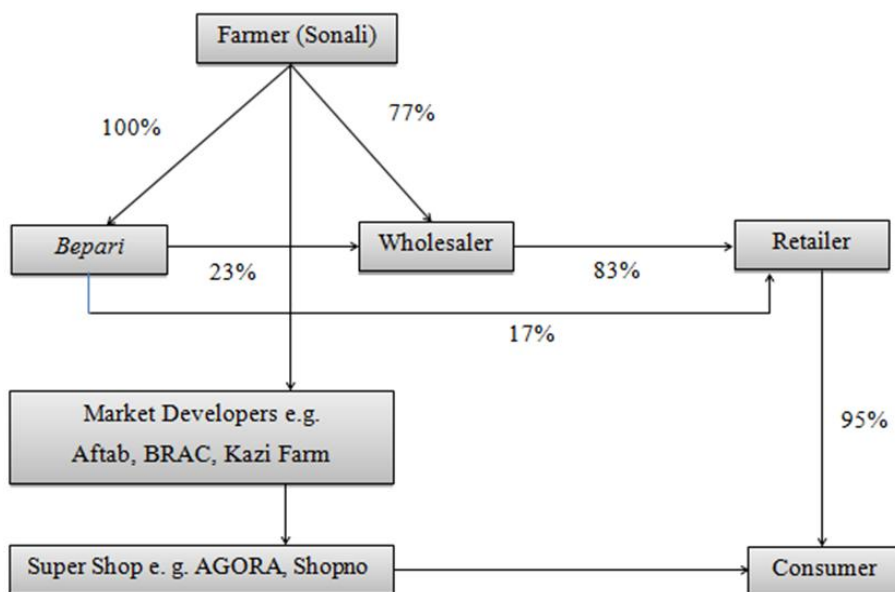


Figure 2. Marketing flow chart of live sonali bird movement (Islam et al., 2017)

The demand and market price of backyard poultry and their eggs are not constant throughout the year and these are normally vary in seasons. Whatever might be the season, all the middlemen together in whole

marketing channel enjoy 13% and 7% shares on the values paid by consumer of the indigenous and Sonali chicken, respectively (Islam et al., 2017). The figure shown below is a representative of countrywide and year-round price index of indigenous chicken in Bangladesh:

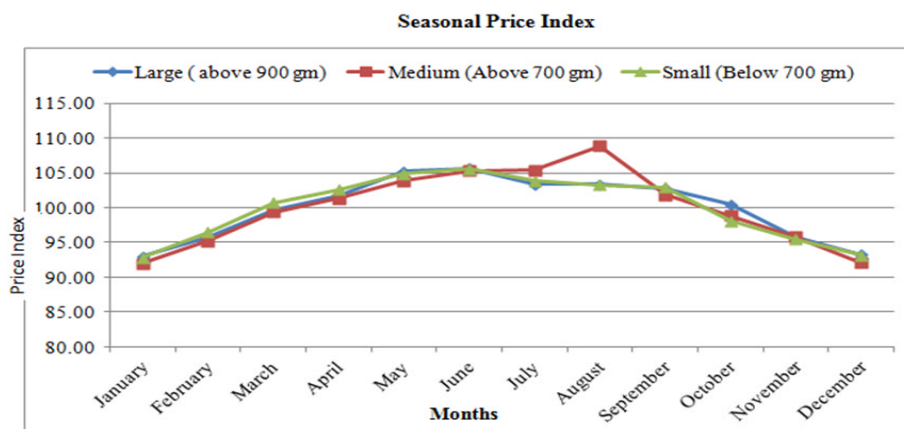


Figure 3. Seasonal Price Index of Native Chicken in National Level (Islam et al., 2017)

10. Economics of Backyard Poultry Farming

In backyard system, day old chick (DOC), housing, feeder and drinker are the major input items, whose type, standard, price and sources vary from farmer to farmer. Farmers who rear indigenous breeds normally get the replacement DOC from their own flock, whereas the Sonali or Cockerel keepers spent 370 BDT per year for the DOC (Islam et al., 2015). The houses, feeder and drinkers are usually made by farmers themselves using own materials available around them. Therefore, it is difficult to generalize the input cost of backyard farming throughout the country. To get comparable data, results of few pilot studies conducted on the representative backyard farmers can be considered. Sarkar et al. (2008) conducted a study on the productivity and profitability of family poultry farming who reported that the Sonali birds are most profitable (net profit BDT 8.43/kg) when compared to broiler and Native chicken. Islam et al. (2017) reported that one kg Sonali chicken production incurred highest amount of cost that is BDT 171 followed by broiler BDT 95 and native chicken BDT 73. They reported highest net return from the native chicken (BDT 176) followed by Sonali BDT 37 and broiler BDT 11, respectively. The profitability in per kg live cockerel has been reported to be BDT 13.40 in 2006 (Roy et al., 2006) and sometimes it was found to increase up to BDT 21.78 in 2008 (Sarkar et al., 2008). The economic aspects of small-scale family farming is shown below (Table 10):

Table 3. Economic aspects of back poultry farming

Parameters	Values
Variable Cost/family farm	89% of total cost
Fixed cost/ family farm	11% of total cost
Net profit/family farm	3705 BDT/year
Benefit Cost Ratio (CBR)	1.90
Contribution of the backyard farming to total household income	6.9%
Return from family consumption egg and bird	40% of total value
Return from egg and bird sold	40% of total value

(Source: Islam et al., 2015)

11. Livelihood Improvement through Backyard Farming

Other than the monetary benefit, backyard poultry farming has been reported to impact total livelihood improvement of the farmers, particularly through improving food habit, knowledge and skill, savings, social status, recreational facility and family health, nutrition and sanitation (Islam et al., 2015). A large number of micro-finance institutions and NGOs like TMSS, ASA, BRAC, Grameen Bank etc are using family poultry as tool for livelihood improvement in Bangladesh (Islam et al., 2015; Dolberg, 2008). The results of a recent pilot study on the impact of family poultry farming on livelihood development is noted below:

Table 4. Impact of family poultry farming on livelihood changes

Indicators of livelihood	Extent of change (%)		
	High	Medium	Low
Increased knowledge and skill	50	33	17
Improved food nutritional condition	50	40	10
Change in food habit	53	44	3
Improved family health and sanitation	40	44	16
Increased savings	23	50	27
Increased social status	27	53	20
Increased recreational facility	33	47	20
Women empowerment	48	34	18
All	41	43	16

(Source: Islam et al., 2015)

12. Women Empowerment in Backyard Farming

Backyard poultry farming is a very familiar activity to rural women in many countries of the world including Bangladesh. Women have been considered to be the predominant owners of the family poultry (Dolberg, 2008) and this kind of poultry production serve as a small scale business avenue for them. It creates an average 53 man-days employment opportunity to the rural farm family during both the on and off season of crop farming especially for women (Islam et al., 2015). In backyard farming, women look after the birds and sale eggs and birds which is often a significant source of their cash income (Sonaiya et al., 1999). Using this cash, they meet up their family heads financial gap particularly in serious needs and can fulfill the daily necessities such as paying school fee for their children, buying food and medicine, purchase household equipment, joins in social activities etc. Thus, through backyard farming women can take part in family decision making using the power of their own money from backyard poultry sales.

13. Recommendations

13.1 For future research

- Identification and conservation of the promising indigenous poultry genetic resources.
- Upgradation of the local poultry species and development of new types or varieties using local genes through structured breeding strategies.
- Introduction of low-input and high-output backyard poultry farming model to be fitted with local needs, resources and environment.
- Development of cost effective disease control strategies for backyard poultry species through surveillance, research and bio-security measures.
- Establishment of innovative and farmers' friendly marketing channel for backyard poultry species in Bangladesh context.

13.2 For extension services

- Upgradation of backyard poultry farmers' skills, particularly women's skill on better husbandry practices, feeding, nutrition and disease control on priority basis.
- Massive publicity and motivation of the local community towards comparative advantages of backyard poultry and its products.
- Attracting school children and semi-urban and urban dwellers to backyard farming for its sustainability.

13.3 For policy makers

- Performing a comprehensive census on current backyard poultry farming status.
- Establishment of regional gene bank for the conservation of promising backyard poultry genetic resources.
- Promoting organic backyard poultry production providing incentives to farmers and consumers.

14. Conclusion

Backyard poultry farming is a traditional practice in Bangla Desi agricultural sector and still it might be an important tool to improve rural socio-economy. This can contribute to ensure family's animal protein consumption, generate employment on unproductive time, facilitate extra income of the female family members using which they can help children education and minimize family's financial burden and thus they can empower themselves in the family. The contribution of backyard poultry to total poultry production is decreasing over the time and it is due to higher growth rate of the industrial poultry. The demand of backyard poultry products to the increasing number of financially solve and health conscious consumers of the low middle income status Bangladesh is increasing day by day. The challenge is to ensure the farmers 'profit consistently and reasonably. Local climate adaptive high yielding poultry breeds, low-cost production technology and management protocols, and robust government and non-government livestock extension services along with farmers friendly marketing channel might work properly in this regard to boost up the backyard poultry sector in Bangladesh. However, the whole approach needs integrated involvement of the local and regional partners, researchers, extension workers and policy makers to speed up the goal.

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Chapter 3

Backyard Poultry Production System in India

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1. Introduction

Rearing of chicken in small number has been an essential integral component of human evolution for food and recreation purpose since ages. However, for the past five decades, the poultry farming has taken a shape of commercial venture with large number of high yielding chicken (broilers and layers) and with huge financial inputs in terms of sophisticated housing, highly balanced feeding and required health care measures. Though the commercial poultry farming is gaining wider popularity among the progressive farming community, it has certain inheriting limitations like price fluctuations for egg and chicken meat, feed ingredient scarcity / high cost, disease challenges and non availability of skilled manpower. Concentration of commercial poultry farming is mainly near to urban and peri-urban areas and therefore, the availability and consumption of the poultry products are considerably higher in urban population compared to the rural / tribal areas.

In our country about 2/3rd of population live in rural / tribal areas, who are primarily involved in agriculture and animal husbandry or fisheries. The staple food of majority people living in rural areas is largely cereal (rice or wheat) based food. Therefore, protein deficiency is quite common in rural areas among the vulnerable population, who frequently suffer from several diseases. It is essential to provide proteins (animal) to rural people to protect them from protein malnutrition to ensure proper growth and sound health.

Chicken meat and egg are highly nutritious protein sources readily available in rural areas at an affordable price by adopting the concept of backyard / rural / free range poultry farming. Backyard poultry farming is one of the proven potential tools to alleviate protein hunger and provide subsidiary income among the rural and tribal people across the country. Backyard poultry farming is a family enterprise generally practiced by rural / tribal people and the contributions of women clearly highlight their articulation of activities in poultry farming. The backyard poultry farming can be converted into a profitable activity by imparting rural people with skills for scientific rearing and utilizing the natural food base available in backyards.

2. Current Profile of Industrial and Backyard Poultry

In general, two poultry production systems exist in India, a commercial production system covering about 79% of chickens and a traditional village or backyard system. These two systems use different breeds/strains/varieties of poultry based on their productivity and consumer acceptance. Commercial hybrids are used by the commercial system, while the village system makes use of indigenous or local breeds or improved chicken varieties developed for specific purpose either dual or meat purpose. The modern high yielding chickens are derived from the White Leghorn, Rhode Island Red, Plymouth Rock, New Hampshire and White Cornish breeds. Commercial poultry accounts for 50% of the chicken population in India. Most of the layer strains are derived from White leghorn and Hyline and broiler strains from Plymouth Rock and Cornish breeds.

India ranks 3rd in egg production and 5th in poultry meat production in the world with annual growth of 5-6 % and 6-8 % in chicken egg and broiler meat production, respectively. India produces about 82.9 billions of eggs per year and 3.26 million tons of poultry meat. Majority of these poultry produces (egg and meat) are from the intensive poultry farming, which is mostly concentrated in few pockets of our country like Andhra Pradesh, Telangana, Tamil Nadu, Maharashtra, Chattisgarh, West Bengal and Haryana. Close outlook of the industrial poultry growth indicate that it is concentrated mostly around urban pockets, where the demand for egg and meat is more. Currently the produces are being transported to farthest places like North Eastern States, Bihar, UP, J&K, which involve cost and storage issues. One of the major concerns is wide fluctuations in cost of egg and meat. Many a times, the sale price is less than the cost of production of egg / chicken meat. Therefore, the small and marginal farmers could not sustain the losses and became part of contract farming where resourceful entrepreneurs supply chicks, feed, other inputs and technical knowledge. The produces are taken away by the integrator by paying incentives to the farmers based on their performance. Very soon the industrial poultry farming will be in hands of few successful integrators and all farmers will work within their umbrellas. Another limitation for the growth of the industrial poultry is food habits and marketing network. Cold chain / frozen meat are not the choice of traditional meat consumers in India. Therefore, broiler market is based on sale of live birds, whenever there is an increase in production, fall in consumption during summer season the price falls significantly and farmer loose heavily.

On the other hand, the availability of chicken products is far below the recommended levels in rural areas. The per capita consumption of eggs and meat is about 66 eggs and 2.5 kg, respectively per annum in India. In rural areas, these poultry products are expensive (10-40% higher) due to their non-

availability and cost of transportation. Backyard poultry populations are chicken-104.7 millions, ducks-13.48 millions, turkeys-0.25 million, quails – 0.26 millions, other poultry (Guinea fowl etc.) 1.83 millions etc.

3. Backyard Poultry Genetic Resources

According to *The State of the World's Animal Genetic Resources for Food and Agriculture* there are 1644 local, 85 regional trans-boundary and 157 international trans-boundary avian breeds reported in the Domestic Animal Diversity Information System (FAO, 2007). The local or indigenous breeds make up most of the world's poultry genetic diversity. Chicken breeds make up the vast majority (63 %) of the total number of avian breeds, followed by ducks (11%), geese (9 %) and turkeys (5%). Red Jungle fowl (*Gallus gallus*), the progenitor of modern day domestic chicken (*Gallus domesticus*) and Grey jungle fowl (*Gallus sonneratii*) is originated from India. Besides these jungle fowls, India is blessed with a total of seventeen recognized and registered breeds of native chickens i.e. Ankaleshwar, Aseel (Rajkumar et al., 2017), Busra, Chittagong, Danki, Daothigir, Ghagus, Harringhatta Black, Kadaknath, Kalasthi, Kashmir Favorolla, Mewari, Miri, Nicobari, Punjab Brown, Tellicherry and more recently Kaunayen from Manipur (<http://www.nbagr.res.in/regchi.html>). Some of the lesser known native chicken ecotypes reported in the literature are Kumaon hill fowl, Tripura black, Titri, Teni, Brown Desi, etc. Further, native chickens with major genes of tropical adaptability features like naked neck, dwarf and frizzle genes were also available. These important native germplasm needs to be characterized for various traits of growth, production, disease resistance, heat tolerance, etc. The gene pool of these important native chickens in the form of pedigreed breeding population need to be conserved at farm level. This paper presents the status of poultry genetic resources and their conservation strategies for sustainable use and maintenance of the poultry genetic resources. The native poultry genetic resources with their genotypic and phenotypic characteristics are given in table 1.

Table 1. Registered native chicken breed

Sl. No	Breeds	Home Tract	Accession number
1	Ankaleshwar	Gujarat	INDIA_CHICKEN_0400_ANKALESHWAR_12001
2	Aseel	Chhattisgarh, Orissa, A. P.	INDIA_CHICKEN_2615_ASEEL_12002
3	Busra	Gujarat and Maharashtra	INDIA_CHICKEN_0411_BUSRA_12003

Sl. No	Breeds	Home Tract	Accession number
4	Chittagong	Meghalaya and Tripura	INDIA_CHICKEN_1319_CHITTAGONG_12004
5	Danki	Andhra Pradesh	INDIA_CHICKEN_0100_DANKI_12005
6	Daothigir	Assam	INDIA_CHICKEN_0200_DAOTHIGIR_12006
7	Ghagus	A.P. and Karnataka	INDIA_CHICKEN_0108_GHAGUS_12007
8	Harringhata Black	West Bengal	INDIA_CHICKEN_2100_HARRINGATBLACK_12008
9	Kadakhnath	Madhya Pradesh	INDIA_CHICKEN_1000_KADAKNATH_12009
10	Kalasthi	Andhra Pradesh	INDIA_CHICKEN_0100_KALASTHI_12010
11	K. Favorolla	Jammu and Kashmir	INDIA_CHICKEN_0700_KASHMIRFAVOROLLA_12011
12	Miri	Assam	INDIA_CHICKEN_0200_MIRI_12012
13	Nicobari	Andaman & Nicobar	INDIA_CHICKEN_3300_NICOBARI_12013
14	Punjab Brown	Punjab and Haryana	INDIA_CHICKEN_1605_PUNJABBROWN_12014
15	Tellichery	Kerala	INDIA_CHICKEN_0900_TELlichERY_12015
16	Mewari	Rajasthan	INDIA_CHICKEN_1700_MEWARI_12016
17	Kaunayen	Manipur	INDIA_CHICKEN_1200_KAUNAYEN_12017

Source: (<http://www.nbagr.res.in/regchi.html>; (<http://www.nbagr.res.in/regchi.html>)

Table 2. Phenotypic traits and production potentials of some native chicken breeds

Sl. No.	Breed	Body weight (24 weeks/matured)		Egg weight (g)	Egg number (40 wks)	References
		Males	Females			
1	Aseel	1872	1303	48.0	36.2	Haunshi et al., 2011
2	Kadakhnath	1440	1231	41.4	49.2	Haunshi et al., 2011
3	Nicobari	-	1162	44.7	142	Chatterjee et al., 2007
4	Ghagus	2019	1471	47.2	29.6	Haunshi et al., 2013
5	Tellicherry	1620	1240	40.0	60-80	Vijh et al., 2008
6	Miri	1507	1214	38.7	33.6	Haunshi et al., 2009
7	Denki	3115	2223	46.2	-	Vij et al., 2006
8	Kalasthi	2482	1850	42.9	-	Vij et al., 2006



Figure 1. Photographs of native chicken breeds also available in NBAGR website (www.nbagr.res.in)

Phenotypically, the improved backyard chicken has multi colored feather pattern, survive and perform under diversified climatic stress and grow faster and lay higher number of eggs compared to the native chicken. Some of the ideal features of the improved chicken germplasm are as follows.

- Multi-colored feather pattern
- Longer shanks
- Morphologically resemble the native chicken
- Higher growth and egg production potential than the native chicken

- Adaptability under diversified climatic conditions
- Disease tolerance
- Should thrive and perform on low plane of nutrition
- Self propagation

3.1 Improved rural chicken varieties

During the past one and half decade many new varieties have been developed at both Indian Council of Agricultural Research (Ministry of Agriculture & Farmer's Welfare) and state Agricultural/ Veterinary Universities. The pioneer in this concept was Karnataka Agricultural University, who developed *Giriraja*, a multicoloured dual purpose chicken which got wider popularity in Karnataka and some other southern states of India during early 1990. Subsequently, ICAR-Directorate of Poultry Research (ICAR-DPR), Hyderabad (formerly Project Directorate on Poultry, Hyderabad) has developed *Vanaraja* (dual purpose) and *Gramapriya* (egg layer) chicken varieties. Considering the success of the initial two chicken varieties several government organizations intensified research in developing the rural chicken varieties specific to the geographic location. Due to the consolidated efforts made by the scientific and technical team of the Institute, these varieties got popularized all through the country including NEH, J & K, A & N Islands, etc. Some of the varieties developed and propagated are as follows (Table 1). AICRP on poultry breeding centres developed location specific rural chicken varieties to cater to the needs of the farmers in their respective region.

Table 3. Improved chicken varieties available for rural poultry farming

Variety	Type/purpose	Institution
Giriraja	Dual	KVAFSU, Bangalore
Vanaraja	Dual	DPR, Hyderabad
Gramapriya	Egg	DPR, Hyderabad
Srinidhi	Dual	DPR, Hyderabad
CARI Devendra	Dual	CARI, Izatanagar
CARI Gold	Dual	CARI, Izatanagar
Nicorock	Dual	CARI, Portblair
Kuroiler	Dual	Kegg farms, Delhi
Krishna Priya	Dual	KAU, Manuthy
CARI Nirbhik	Egg	CARI, Izatanagar
CARI Shyama	Egg	CARI, Izatanagar
Nishibari	Egg	CARI, Portblair

Variety	Type/purpose	Institution
UPCARI	Egg	CARI, Izatanagar
Rajasree	Egg	SVVU, Hyderabad
Krishna J	Egg	JNKV, Jabalpur
Nandanam Chicken	Egg	TANUVASU, Chennai
Gramalaxmi	Egg	KAU, Manuthy
Gramasree	Egg	KAU, Manuthy
Kalinga Brown	Egg	CPDO, Bhubaneswar
Pratapdhan	Dual	MPUAT, Udaipur (AICRP)
Kamarupa	Dual	AAU, Guwahati (AICRP)
Narmadanidhi	Dual	MPPCVV, Jabalpur (AICRP)
Jharsim	Dual	BAU, Ranchi (AICRP)

4. Backyard Poultry Genetic Resources (Other than Chicken)

4.1 Ducks

No native breed of duck is registered so far. However, there are distinct population of ducks are found all over the country such as Chara, Chambelli, Pati, Indian Runner, Nageswari, and Muscovy Duck etc. The egg production of native ducks are varies from 60-120.

4.2 Guinea fowl

Guinea fowl were 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. 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 best summed up as widely spread and highly fragmented.

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. Levender 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 (Singh and Sharma, 2005).

The ecogenetic characterization is identification of species specific potentials to survive under non-conductive harsh environments. Evolved in tropics, guinea fowl is considered to possess relatively higher level of tolerance for rigorous tropical climatic conditions. Although no detailed studies are reported but preliminary observations indicate existence of better potentials.

Body conformation and plumage cover are the two important factors in determination of heat tolerance potentials. Light in body weight, long-legged guinea fowl present greater surface area for heat dissipation per unit body weight. Low feather weight estimates (7.8%) at 12-week to 16-week age are comparatively lower than the average values reported for different domestic fowl classes. Long neck devoid of feathers, poorly feathered thighs, exposed and highly vascular nares, wattles and helmet play important role in thermoregulation. Its more fluffy monotype plumage covering and potential to elevate feathers permit better circulation of air through plumage, more efficient dissipation of internal heat. Normal respiratory actions and stress panting with outstretched wing help dissipation of internal heat through vaporization movement. The normal respiratory frequency for guinea fowl is not different from that of chicken (18-30 breaths/min). Experiments revealed comparatively little polypnea during moderately high ambient temperature (85°C-110°F) among guinea fowl vis-à-vis chicken. Mycotoxin contamination of feed grains is more common in tropical and sub-tropical countries, particularly when coupled with poor handling operations. The higher aflatoxin tolerance of guinea fowl indicates its potential to utilize lower quality feed ingredients.

4.3 Turkey

Although, turkeys were introduced in this subcontinent several decades back by the Christian missionaries, but till date turkey farming has achieved very little progress as well popularity.

In India, Beltsville small white type turkeys are being maintained at most of the government/university experimental farms. At few centers, broad breasted bonze and broad breasted large white units are also being kept.

Organized turkey farms under private sector are practically non-existent, limited to few small units at government/public sector farms. Domestic turkey maintained at private small-scale units scattered throughout the country are mainly the decedents of semi-improved broad breasted bronze turkey imported from Europe and North America during the early years and it is referred to as local breed. The hardy 'local' turkey stocks are able to thrive under hot climate to the arid conditions, from sea level to mountains with near temperate climates and from rain forests to deserts. Turkeys walk rather than fly and find almost all their food on ground when kept on range. They possess excellent foraging and scavenging abilities. The turkey may be reared under intensive as well as extensive system of rearing. 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. One sq. ft of floor space per poult is required during the first 3-4 weeks and thereafter the floor space requirement per bird is 1.5 sq. ft up to 8th week, 2 sq. ft up to 12th weeks of age, 2.5 sq. ft up to 16th weeks of age and 305 sq. ft after 16th weeks of age. 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.

5. Characteristics of Backyard Poultry Farming

The word backyard poultry farming is widely used and interchanges with other terminology like rural poultry farming, free range poultry farming or family poultry farming. All these terminology is aiming to increase the availability of poultry produces (egg and chicken meat) besides providing supplementary income to rural/ tribal population by rearing improved chicken varieties (10-20 birds per household) with minimum cost of input. As the productivity of native chickens is very low and has greater acceptability among the rural, tribal and even urban people across the country. The backyard poultry though existed since ages in villages, the scientific modern backyard poultry started from nineties with initiation from ICAR and state agricultural/ veterinary universities. The Directorate of Poultry Research (formerly Project Directorate of Poultry), Hyderabad was involved both in research and popularization of backyard poultry farming in various diversified agro-climatic conditions across the country. As per the concept conceived by the directorate team based on their 20 years of experience in this core area, the concept can be implemented broadly in small scale farming and also rearing the improved backyard chicken varieties in

large number by providing all the required inputs for commercial exploitation.

5.1 At Subsistence level

Rural poultry farming is being followed by majority of rural/ tribal population by rearing the chicken varieties in small number (15-25 per family) preferably under backyard/ free range and also under semi intensive system. In this system, the birds get feed from scavenging on the natural feed base in the backyards. The chicks are reared intensively up to 4/6 weeks by providing balanced feed, health care and brooding. From 5/7 weeks onwards, the birds are reared under free range system during day time and shelter with proper ventilation and protection is provided to rest in the night. Calcium source and adequate lighting (16 hrs/day) are provided from the onset of egg production. Periodic deworming and vaccination against common viral diseases are followed to protect the birds from Newcastle Disease (ND), Infectious Bursal Disease (IBD) and fowl pox. The eggs and meat produced from such free range conditions fetch high premium prices particularly in urban markets.

5.2 At Commercial level

The rural poultry farming can also be practiced by rearing the improved rural chicken varieties under intensive system by providing all the inputs similar to that of commercial broiler / layer chicken varieties. Traditionally the rural chicken varieties yield is less compared to the commercial crosses, the cost of production is higher if reared under intensive farming. As these birds resemble the native chicken and lay tinted eggs, the producers fetch higher price compared to that available from the industrial market. Under this system large number of birds (few hundreds to thousands) can be reared in relatively small area from day one to till marketing age. It is ideal to start this approach considering the potential season and or connecting and linking with retail out let chain. In some parts of the country including the North Eastern states, the commercial poultry farming with improved backyard poultry varieties is practiced.

6. Management Practices in Backyard Farming

Practically the backyard poultry farming is being operated in three modes i.e. free range farming (Egg type varieties), semi scavenging farming (dual purpose or egg type) and small scale intensive farming for meat purpose (dual type or meat type birds). Success and economic viability of rural poultry farming largely depends on the availability of quantum and quality of the natural food base under free range conditions. The second most important

factor is the local demand and premium in price for poultry produce (tinted eggs and multi colored feathered birds) of backyard poultry farming. Farmers can adopt one of the above three practices depending on the local demand for egg or meat or both.

The package of practices including management, feeding and healthcare measures required for the above are narrated hereunder based on the research experience and feedback received across the country by the directorate for the past two decades in this front line area. Egg or dual type chicken varieties need to be reared under controlled conditions up to 4-6 weeks of age followed by free range scavenging in backyards where birds get feed in the form of natural food base. Egg type birds (females) will be reared till the end of the production cycle up to 70-100 weeks of age. Males of both egg and dual purpose varieties are reared with additional feed or grains to obtain the higher body weight at the time of disposal at 3-4 months of age. The meat type rural chicken varieties are reared under intensive system with balanced feed from day one to the marketing age with all inputs similar to the commercial broilers.

The management practices of rural/ backyard poultry is highly diversified. However, it is essential to rear the day old chicks under confinement by providing all the required inputs like feed, light, warmth and health care (nursery rearing) before the bird are left for free range rearing.

6.1 Nursery rearing

Basically, day old chicks are produced with artificial incubation and they need initial mother care in the form of nursery rearing, where they will be provided with balanced feed, artificial warmth (heat), protection from predators and health care up to 4/6 weeks of age. After attaining the required body weight (550-750 g), these birds can be introduced in backyards for free range farming, where the management and care is just similar to the native birds. Nursery rearing of chicks up to 6 weeks of age plays a major role in success of backyard poultry farming. Required warmth, balanced nutrition, good quality drinking water and vaccination are important steps in nursery rearing (Figure 1).

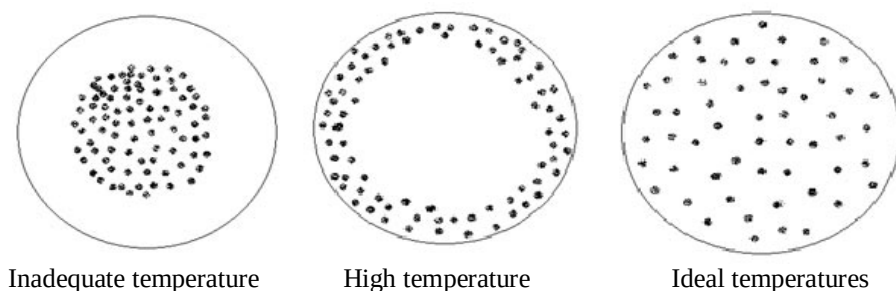
6.2 Brooding

Brooding is essential to provide the warmth to juvenile chicks during the initial age. Before housing the chicks prepare the pen (where chicks are placed) by uniformly spreading the clean litter material (rice husk/ground nut husk/saw dust/sand) of 2-3 inches thickness. Spread the news paper on the litter to prevent access of litter material to chicks and arrange the feeders and drinkers alternatively around the heat source.



Figure 2. Nursery rearing like brooding, feeding and drinking water

Hang the brooder hovers with electrical bulbs of different capacity (60/100 watt) based on the season of the year and temperature. The movement of the chicks can be restricted with the help of the chick guards which are arranged in circular manner near the heat source. The temperature may be adjusted based on the behavior of the birds as shown in the figure 2. If the temperature is higher the birds move away from the heat source and start showing the typical system of panting. When temperature is inadequate, the chicks huddle under the brooder near to the heat source. At ideal temperature, chicks are uniformly distributed across the brooding area.



Inadequate temperature

High temperature

Ideal temperatures

Figure 3. Distribution pattern of chicks at different temperatures

6.3 Free range rearing

The chicks are introduced into the farmer's backyards from 5-7 weeks of age depending on the body weight. The number of chicks per household depends

on the area and availability of natural food base. However, 15-25 birds per household are ideal for successful and effective management of birds. The birds are let out for foraging during the day time and are kept in night shelter during the night. The birds under free range can easily pick up its food from the backyard, once it learns to scavenge in the fields. Based on the quantity and quality of the natural food availability, the birds have to be provided with supplementary feed (cereal grains and oil seed cakes) to meet the growth and production requirements. Generally, birds meet their protein requirements through scavenging under backyards. Therefore, feeding the birds with available cereals is always beneficial to sustain the production. Care should be taken to maintain the optimum weight of pullet (female) at maturity to sustain the egg production during laying period. During the laying phase calcium supplementation (shell grit, stone grit and lime powder) is essential to avoid the shell less eggs and broken eggs. The laying hen needs about 4 g of dietary calcium per day to produce an egg. Under natural scavenging conditions, it is hard to get required calcium. Usually, the deficit quantity of calcium is drawn physiologically from medullary bones for optimum shell quality. When birds consume adequate required calcium, little or nil quantity of calcium is drained from bones. To maintain leg health of the bird and also shell quality, it is recommended to offer 5-6 g calcium source/day/bird along with grain feeding.

6.4 Housing

Night shelters are required to house the birds during night / bright sunny days and rainy days which are made up of with locally available low cost materials i.e., mud, stone, wire mash, bamboo, wood etc. The night shelter also protects the birds from rain and sun during day time. Birds should be provided 1.5 to 2.0 square feet floor space for each in the night shelter. The shelter should have artificial lighting and windows for adequate ventilation.

Utmost care is needed to keep dry inside the night shelter. Dampness in the house increases the growth of ecto-parasites like lice, mite, fleas, flies etc. Parasitic infested house should be thoroughly cleaned and sprayed with lime powder. Spraying of the house and premises with proper disinfectants, ensuring good ventilation will help in controlling the parasitic infestations. Egg laying or dual purpose hens are let in households/ farm backyards/ orchards for roaming, scavenging, playing and for fetching feed in the surroundings during the day time. The birds need to be protected in well ventilated night shelter from the predators and extreme environment variables.



Figure 4. Traditional housing of backyard poultry of India

6.5 Feeds and feeding

Complete balanced feed containing all nutrients, minerals, vitamins, amino acids and other essential feed additives should be provided to the chicks during the nursery phase up to 6 weeks of age. In general, backyard chicken varieties require about 2400-2500 kcal ME/kg, 16% protein, 0.77 % lysine, 0.36% methionin, 0.35 % available phosphorus and 0.7% calcium up to 6 weeks of age. Farmers can use commercially available feed (layer chick feed) or can prepare their own with the locally available ingredients as shown in the table 2. Birds intend to be reared for meat production can be fed with commercial broiler diet available in the market.

Table 4. Typical composition of feed for backyard chicken varieties during nursery phase

Ingredients	kg/100 kg
Maize/bajra/ragi/broken rice/sorghum/ korra	50 .0
Rice bran/Wheat bran/ de oiled rice bran	17.4
Soybean meal/ground nut meal/sun flower meal/till cake/ linseed cake/ cotton seed cake/rapeseed meal/guar meal (combination of protein source is ideal)	28.0
Calcium source (shell grit/ stone grit/ marble chips)	1.0
Phosphorus (Dicalcium Phosphate/ Mono calcium phosphate)	1.2
Common salt	0.4
Vitamin and mineral mixture (Commercial)	2 .0

6.6 Breeding and reproduction

The uniqueness of the birds developed for the rural poultry farming is coloured plumage, higher performers than native, sustain and perform under diversified backyard/free range conditions. Accordingly, the ICAR-Directorate of Poultry Research, Hyderabad has developed few promising

chicken crosses meeting the majority of the above desired characteristics. While developing the rural chicken varieties, emphasis was given for longer shanks for male parents, which help the terminal cross to run faster and escape from the predators. Similarly, for development and improvement of female line/ parent non-specific immune response against sheep red blood cells (SRBC) were considered along with egg production for layer type chicken and body weight for dual type rural chicken varieties. The basic requirement for all varieties is the colored plumage. Recently, the breeding program involve crossing of different native chicken variety with improved and proven parent line for development of location specific rural chicken variety under the All India Coordinated Research Program (AICRP) for Poultry Breeding. Utilization of the native chicken gene pool help to develop bird which resembles the native bird and better adaptation in the specific agro-climatic zone.

Table 5. Growth and production performance of native chicken breeds

Sl. No.	Breed	Body weight (24 weeks/matured)		Egg weight at 40 weeks (g)	Egg number (40 weeks)	Reference
		Males	Females			
1	Aseel	1872	1303	48.0	36.2	Haunshi et al. (2011)
2	Kadaknath	1440	1231	41.4	49.2	Haunshi et al. (2011)
3	Nicobari	1536	1162	44.7	142 (Annual)	Chatterjee et al. (2007)
4	Ghagus	2019	1471	47.2	29.6	Haunshi et al. (2013)
5	Tellicherry	1620	1240	40.0	60-80 (Annual)	Vij et al. (2008)
6	Miri	1507	1214.	38.7	33.6	Haunshi et al. (2009)
7	Denki	3115	2223	46.2	-	Vij et al. (2006)
8	Kalasthi	2482	1850	42.9	-	Vij et al. (2006)
9	Harringhata Black	1088	989	36.53	-	Vij et al. (2015)
10	Ankaleshwar	1759	1487	35.09	61.15	Anonymous (2011)
11	Bursa	1110	980	31.56	40-55 (Annual)	Anonymous (2011)

Sl. No.	Breed	Body weight (24 weeks/matured)		Egg weight at 40 weeks (g)	Egg number (40 weeks)	Reference
		Males	Females			
12	Daothigir	1792	1625	44.42	60-70 (Annual)	Anonymous (2011)
13	Kashmir Favorella	1875	1415	45.76	60-85 (Annual)	Anonymous (2011)
14	Punjab Brown	2149	1567	46.0	74 (Annual)	Anonymous (2011)

6.7 Disease management

Prevention and control of the diseases is quite challenging in rural poultry farming. Proper biosecurity measures and good management practices minimize the incidence of diseases in poultry farms. Specific vaccination schedule during chick and adult stage is very important to control the diseases. The important diseases prevalent in rural areas causing considerable losses to farmers are ND, fowl pox and fowl cholera under free range conditions. Endo and ecto-parasite infestation is common under free range conditions. Infestation of internal parasite can largely be minimized by providing fresh drinking water with proper protection during early hours before the birds left for scavenging. Periodic deworming (preferably a week days before vaccination) will also help to reduce the incidence of internal parasites. The vaccination schedule (Table 3) followed for rural poultry is as follows.

Table 6. Vaccination program for rural poultry

Age	Vaccine	Strain	Dose	Route
Hatchery				
1 st day	Marek's disease	HYT	0.20 ml	SC injection
Nursery				
7 th day	Newcastle disease	Lasota	One drop	Eye
14 th day	Infectious bursal disease	Georgia	One drop	Oral
21 st day	Fowl pox	Fowl pox	0.20 ml	IM/SC njection
28 th day	Newcastle disease	Lasota	One drop	Eye
Field (free range conditions)				
9 th week	Newcastle disease *	R2B	0.50 ml	SC injection
12 th week	Fowl pox*	Fowl pox	0.20 ml	SC injection

*Repeat these two vaccines at every six months interval

Apart from the vaccination, it is essential to provide probiotics in water immediately on arrival of the chicks in nursery unit. Supplementation of B-complex vitamins in drinking water is recommended during, before and after the inevitable managerial stresses (bird shipment, transportation, shifting the birds, debeaking etc.) All the rural chicken varieties has tendency to pick feathers of other birds (cannibalism), it is essential to trim the upper and lower beak of the birds at 2-10 weeks of age to prevent fighting injuries to the birds at lower social order of flock hierarchy.

6.8 Biosecurity

Bio-security is really a big challenge and limitation in the rural poultry farming, where multiage chicken, other poultry species and livestock is being reared together. Keeping the premises clean, providing fresh drinking water early in the morning, reducing dampness in night shelter, periodic deworming and vaccination, immediate treatment of infected birds are some of the measures which will reduce disease incidence and improve the productivity in rural chicken farming.

7. Marketing of Backyard Poultry and Poultry Products

There are no organized marketing channels for sale of birds after attaining the desired market weight. Marketing component is vital for success of the rural poultry. Creation of marketing channels through self help groups or co operative model of marketing will help the farmers to market their produce. Many consumers/ farmers prefer local country chickens which have got good market in both rural and urban areas. The new development in rural poultry is rearing of native breed of chicken for meat purpose. Chicken breeds like Aseel, Kadaknath, Gaghush, etc. are known for their meat qualities. These local chicken breeds are reared under intensive conditions till they reach market age 4-6 months depending on the breed. All these local chicken breeds have lot of demand and are sold for meat purpose at premium price.

8. Economics of Backyard Farming

An economic analysis was carried out our (ICAR-DPR) varieties based on the quantity of natural food base available, body weight and health of the birds for input and on the basis of productivity and body weight of birds for output. The analysis is for 12 and 15 weeks for male birds of *Vanaraja* (Table 4) and *Gramapriya* (Table 5), respectively. The layers are kept for complete laying cycle of 72 weeks of age.

The input cost includes price of the chick, feed, and health etc. up to 4-6 weeks of age, there after the recommended mode of rearing in backyard/free

range without any feed supplementation. Additional feed supplementation is optional which may increase the performance of the birds. The input cost growers and layers include medication and additional feed supplementation (optional) under the free range conditions.

Table 7. Economics of *Vanaraja* bird under free range conditions per bird

Input			Out-put		
Sex	Age of the bird	Cost (Rs.)*	Particulars/details of the bird	Receipt (Rs.)	Profit (Rs.)
Male	12 weeks	100	Bird at 12 weeks (1.5-1.8 kg) @ Rs. 120/kg	180-240	80-140
Female	72 weeks	225	Eggs: 100-110 @ Rs. 3/egg Birds: 3.0 kg @ Rs. 80 kg	300-330 240 540-570	315-355
Total profit from a pair of birds		325		720-810	395-485

*Includes cost of day old chick, feed, medicines and healthcare etc.

Table 8. Economics of *Gramapriya* under farmers backyards per bird

Input			Out-put		
Sex	Age of the bird	Cost (Rs.)*	Particulars/details of the bird	Receipt (Rs.)	Profit (Rs.)
Male	15 wk	90	Bird at 15wk (1.5-1.8kg) @ Rs. 120/kg	180-240	90-150
Female	72 wk	220	Eggs: 160-180 @ Rs. 3/egg Birds: 2.5kg @ Rs. 80 kg	480-540 200 680-740	460-520
Total profit from a pair of birds		310		860-980	550-670

*Includes cost of day old chick, feed, medicines and healthcare etc.

These economics were estimated under the assumption that the natural food base under free range system is fairly reasonable to meet the bird's nutritional requirements. The estimates were calculated hypothetically taking into consideration the present market price and demand for eggs and meat, however the profit varies based on many factors:

- Availability of natural food base in the backyards.
- Fluctuations in the price of the poultry produce (eggs and meat).
- Demand for the products.
- Supplementation of feed ingredients in free range system.
- Livability of birds.
- Cost of the brooding and nursery rearing.
- Cost of the chick feed during the nursery rearing.
- Cost of medication.

The farmer can earn a net profit of about Rs. 100 /bird on males and 500/bird on female birds by rearing improved chicken varieties. A unit of 20 birds with 15 females and 5 males is ideal and viable for providing additional income for the family and also ensure nutritional status of the family.

9. Existing Models and Key Players in Backyard Farming

9.1 Establishment of mother units

Mother unit is placed where chicks are grown during nursery period for a period of 4-6 weeks before distributing to the farmers. This activity offers a small scale enterprise development in rural poultry where in progressive farmer/unemployed youth can establish a rearing facility for 1000 chicks with all necessary equipments by availing loan or self financing. After rearing for 4-6 weeks, chicks can be made available to the farmers in and around the village with a reasonable price adding his inputs and profit. Since lot of demand is there for improved chicken varieties, mother units play an important role in providing the chicks at farmers door steps reducing add on cost of transportation and possible mortality.

9.2 Establishment of small hatcheries

Small hatchery is another activity which offers an enterprise development in rural poultry farming. An unemployed youth or progressive farmer can establish a small facility with an incubator of 500-1000 eggs capacity in a village. Fertile eggs from government organizations or local sources will be collected and incubated. The chicks will be distributed to the farmers on cost basis. With little technical guidance and training, a farmer can establish a sustainable small scale poultry enterprise with reasonable profits.

9.3 Propagation of backyard poultry and ICAR-DPR supply chain model

Directorate of Poultry Research is acting as the nodal agency for maintenance and supply of parents of *Vanaraja*, *Grampriya* and *Srinidhi*

varieties of chicken apart from supplying commercial day old chicks and fertile eggs. Parents are supplied to several government agencies (AH depts., SAUs, CPDOs, ICAR institutions, DRDO, etc.), wherein they produce chicks and supply to the farmers in their respective regions. The commercial chicks are supplied to farmers through government and non government organizations (NGO) which rear the birds up to 5-6 weeks of age under standard brooding and management practices (nursery rearing) before distributing chicks to the farmers. Fertile eggs are also supplied to the governmental and private agencies which have an established hatchery for incubation and hatching. The fertile eggs are supplied to some individual farmers in limited numbers who intend to brood with the help of Desi (native) hen. The supply chain model for propagation of germplasm is illustrated in figure 3.

Apart from providing the germplasm, the institute undertakes the consumer education programs to popularize the technologies among the farmers. The institute participates in all poultry/ livestock/ agricultural developmental activities across the country to popularize the rural poultry farming concept with improved chicken varieties among the farmers. The transfer of technology section of the directorate took up the extension activities through training programs, exhibitions, brochures, information booklets, apart from utilizing mass media (television, radio programs and press) to popularize the technology. The directorate has established linkage with all state and central developmental departmental institutions across the country. With untiring efforts of the scientists, the germplasm developed at the Directorate has been well accepted and adapted to different agro-climatic conditions prevailing in the country starting from Kashmir to Kannyakumari and Gujarat to all north eastern states of the country. These birds have proven performance record in hot-dry, hot-humid, hilly and extreme cold climates in different agro climatic conditions of the country. The institute is receiving the feedback from the farmers and other stake holders and refining the selection /breeding programs constantly for further improvement in the productivity and adaptability of the birds and to increase the consumer acceptability. Field demonstrations with success stories of farmers rearing rural chicken varieties to build the confidence in farmers.

Utilization of new technological advancements like face book, mobile apps, twitter etc. can be utilized for effective dissemination of information from lab to land.

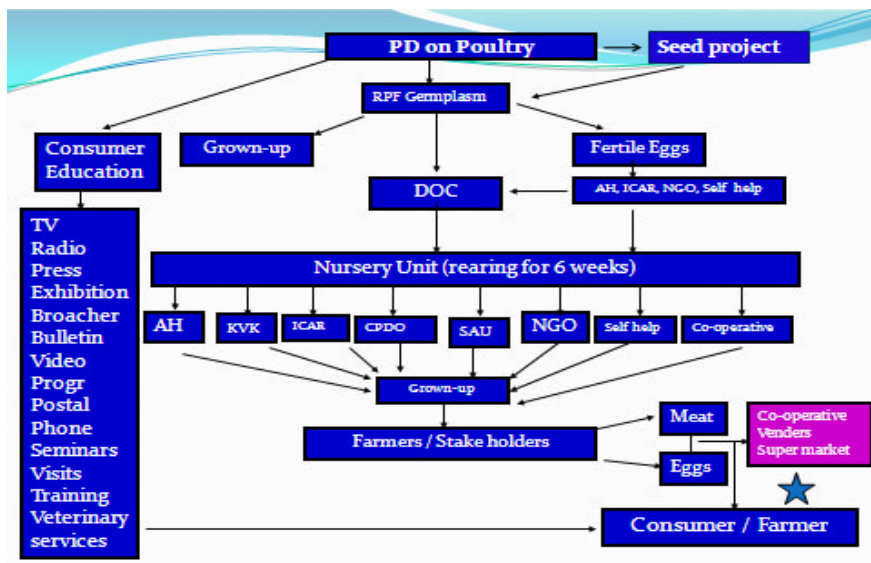


Figure 5. ICAR-DPR supply chain model for propagation of rural poultry

9.3.1 Role of ICAR-DPR

Directorate of Poultry Research, Hyderabad has developed few improved chicken varieties for backyard poultry farming i.e., *Vanaraja*, *Gramapriya* and *Srinidhi*, which are well accepted by the rural and tribal people across the country. These chicken varieties with multi-colored plumage resemble the native chicken in their feather pattern; produce more meat and eggs than the natives. Due to these advantages the improved varieties of birds gained wider acceptability across the country. These are being maintained by the women with house hold waste, green fodder, insects, supplementary feed, etc. allowing the women to live respectful life with additional earning to the family. Keeping in view the importance of rural poultry in alleviating protein hunger and improving the livelihood security, the Council has reoriented its entire AICRP on poultry breeding towards rural poultry with an aim to develop location specific chicken varieties utilizing the native chicken germplasm of the respective regions. In this endeavor four location specific improved chicken varieties for backyard farming have been released and some are in pipe line. Some of the popular varieties developed by the DPR are as follows.

9.3.1.1 Vanaraja

This is the first backyard chicken variety that was developed and successfully propagated by this Institute (ICAR-DPR). This bird is a dual-purpose variety for free range farming in rural and tribal areas. *Vanaraja* males grow up to

1.5 to 1.8 kg at 12 weeks and females lay up to 160 eggs under farm conditions and up to 120 eggs in free range condition in a laying year of up to 72 weeks of age. The bird is hardy with longer shanks and having better immune competence. Because of its multi colored plumage and produce brown eggs, it is well accepted by the rural people. The birds have good majestic appearance and attractive with well built body shape. The male birds are sold at 12 weeks of age with premium price on par with the native birds. Hens produce eggs from 24 weeks onwards which resemble the native eggs in size and colour.



Figure 6. A pair of *Vanaraja* and female birds

9.3.1.2 Gramapriya

A layer type colored chicken variety was developed for free range farming in rural and tribal areas. It can lay up to 180 eggs per year in backyard / free-range conditions with required supplementary feed and produce up to 220 eggs under farm conditions. It has colored plumage and lays bigger size eggs (52-58g) with brown shell color (Rajkumar and Rama Rao., 2015). These tinted eggs are preferred by rural and tribal people. It is hardy and livability is high. The male weighs around 1.2 to 1.5 kg at 15 weeks of age and suitable for *tandoori* preparations. The rural and tribal farmers of many states are gaining advantage through its eggs and meat.



Figure 7. Male and female birds of *Gramapriya*

9.3.1.3 Srinidhi

A promising dual purpose variety for free range farming was developed by this Institute which has fast growth and higher egg production potential under farm and as well as backyard conditions. Unique feature of this bird is feather pattern, which is highly diversified and much resemble to the native chicken breeds. The birds can weigh about 1.8-2.0 kg at 15 weeks of age and can lay about 150 eggs under field conditions. The variety has been evaluated under field conditions at different locations and the performance was satisfactory.

9.3.2 Availability of improved germplasm

To meet the ever growing demand for the improved chicken varieties all over the country, ICAR has established twelve poultry seed project centres (states) to cater to the needs of the farmers in their local regions. Easy access of improved chicken germplasm to the farming community is the main objective of this seed project. It also reduces the transportation cost and mortality of chicks. The seed project centres are in operation in different states i.e. Bihar (Bihar Agricultural University, Patna, Bihar); West Bengal (West Bengal University of Animal and Fishery Sciences, Kolkata, West Bengal); Chattisgarh (Chattisgarh Kamadhenu Viswa Vidyalay, Durg, Chattisgarh); Tamil Nadu (Tamil Nadu Veterinary and Animal Sciences University, Hosur, Tamil Nadu); Goa (Central Coastal Agricultural Research Institute, Panaji, Goa); Andaman & Nicobar (Central Island Agricultural Research Institute, Portblair, Andaman & Nicobar Islands); Jammu & Khasmir (Sher-e Khasmir University Agricultural Sciences and Technology, Srinagar, Jammu & Khasmir); Sikkim (ICAR Research Complex for NEH Region, Sikkim Centre, Gangtok), Jharnapani (ICAR Research Complex for NEH Region, Nagaland Centre), Imphal (ICAR Research Complex for NEH Region, Manipur Centre); Barapani (ICAR Research Complex for NEH Region). The project came in to operation during 2009-10 and further strengthened during 12th plan. The main mandate of these centres is to rear and maintain the parents of improved rural chicken germplasm (*Vanaraja*, *Gramapriya*, *Srinidhi*, etc.) at the centres and produce the commercial chicks and supply the chicks to the farmers of the region. In addition, the location specific chicken varieties are also available at different AICRP centres (12) across the country. However, the improved chicken varieties are also developed at different state veterinary universities which are being propagated in their respective regions.

9.3.3 Other key players from private organizations

Though initial main impetus on backyard farming was given by public R & D organizations, due to inherent limitations in commercialization of these

birds, the government institutions could not meet the huge demand for the improved backyard chicken varieties all through the country. The efforts of government organizations resulted in huge demand for the improved germplasm, which could not be met by the infrastructure existing and that is being developed over period of time. Considering the huge demand for improved chicken, few private organizations initiated work and developed improved chicken varieties (Kroiler and Kegg Farm Pvt. Ltd., New Delhi; Rainbow Rooster of Indian Broilers Pvt. Ltd., Hyderabad), which are similar to the crosses developed by the government agencies. Based on the demand these companies have increased the parent capacity to over 100000 birds. Their varieties are identified in several government sponsored schemes involved in food security and poverty alleviation.

10. Livelihood Improvement through Backyard Farming

Adaptation of rural poultry farming help in generation of subsidiary income to the farmers with little input cost depending on the availability of natural food base, health condition of the bird and market conditions. Typically, under rural farming conditions, males are sold for table purpose (meat consumption) on attaining about 1.5 kg and females are allowed lay eggs up to the end of productive period (72 weeks of age). Cost involved in rearing, feeding and health care is less for birds reared under rural farming conditions. There is a demand for egg and meat produced by rural chicken varieties and hence fetches premium price compared to the eggs and meat produced by industrial birds. Considering the body weight realized, number of eggs produced and cost of inputs for feed and health care, a pair of dual purpose rural bird fetch about 400-500/ and egg type rural variety can provide Rs. 550-650 which was calculated considering the present market scenario. Therefore, rearing of 7-10 pairs of rural chicken varieties by a household has the potential to provide additional income of Rs. 3000-6500 to the rural/ tribal family in addition to providing nutritious egg and chicken meat for family consumption.

11. Woman Empowerment through Backyard Farming

Traditionally, women is involved in rearing of chicken since ages in our country, who take care and offer house hold grains and kitchen offal to the birds and also protect them from predators. The birds get mother care from women and perform better when the rural poultry farming is managed by women. Many success stories were observed and recorded by this institute, when women was involved in rural poultry farming, who purchased jewelries, school books, bags, bicycles, repaid load, etc. with the revenue generated by rural poultry farming activity. More such incidents were

observed in areas like NEH region, Andaman & Nicobar Islands, Jammu region and many other remote areas of the country. Beside women empowerment, the rural poultry farming also provide nutritious egg and meat to women, therefore the family nutritional status and health is well taken care by women.

12. Government Policies and Actions

Realizing the importance of rural poultry farming both central and few state governments started promoting backyard/ rural poultry farming with improved chicken varieties developed by both public sector (ICAR, SAU, etc.) and private sectors (Kegg Farms, Indbro, etc.). Under government system the Indian Council of Agricultural Research developed few promising chicken varieties (as listed above) and popularized them initially from its research institutes (DPR, Hyderabad). Through AICRP mode “location specific chicken varieties” are being developed in collaboration with state veterinary/ agricultural universities. To meet the demand of people located in remote areas, the ICAR started supplying the improved rural chicken germplasm through flagship program of poultry seed project, whose centers are located in more than 11 states of the country. Central Poultry Development Organizations (CPDO) located in 4 quarters of the country are also involved in popularization and supply of few elite chicken varieties for rural poultry farming. Animal husbandry department of various states with the assistance from DADF (Ministry of Agriculture & Family Welfare) are also promoting the concept of rural poultry farming for the benefit of the respective states.

National Bank for Agriculture and Rural Development and other government financial institutions are supporting for establishment of mother units and hatcheries required for rural poultry arming.

13. Recommendation for Future Research and Extension Services

13.1 Policy

- Utilization of region specific indigenous breeds for the development of varieties for the backyard poultry farming.
- Promising populations need to be conserved in a structured breeding program. Conservation and maintenance of the indigenous breeds is the urgent necessity as they are available in few numbers with farmers. The responsibility should be given to the Government farms in the respective states or regions for taking up the conservation program.

- Development of germplasm and its improvement should be delinked from the task of multiplication and propagation. Regional poultry farms, state animal husbandry departments should concentrate on propagation whereas Indian Council of Agricultural Research institutions and State Agricultural University should work on development of new varieties.
- Some native chicken varieties with self propagating capacity (brooding) should be developed compromising the production ability for self propagation of the rural germplasm.
- Controlling the common disease like ND and fowl pox is very important in backyards. Regular vaccination and medication should be practiced for better production and returns from the birds. Vaccination doses in small quantities should be made available to the farmers enabling them to go for vaccination instead of larger doses. Community based vaccination program gives better results to contain the disease incidence in rural chicken germplasm.
- Public Private Partnership (PPP) mode for large scale propagation of rural poultry germplasm.

13.2 Research

- Selection for longer shanks which enables the birds to escape from the predators. However, shanks have negative correlation with egg production and therefore, optimum levels of each of the trait should be kept in mind while planning the breeding program.
- Healthcare practices particularly viral disease control, vaccination program should be standardized so that minimum medical interventions are required after the birds are introduced under free range/scavenging condition in the farmers field.
- Trace mineral/micro nutrient supplementation program needs to be established for birds under free range conditions.

13.3 Extension

- Skill up gradation of rural farmers and women has to be taken up on priority basis for effective implementation.
- Efforts should be oriented towards the effective extension mechanisms in transferring the technologies developed to the farmers.
- Co-operative mode of marketing of the poultry producers to encourage the farmers. Effective and accessibility of the marketing options to the farmers is very important in popularizing the rural poultry.

14. Conclusions

Backyard poultry has proven to be one of the viable technologies for alleviating poverty among the rural/ tribal people and source of women empowerment across the country. The rural and tribal women are earning a subsidiary income to their family. The backyard poultry rearing with improved chicken varieties is playing a vital role in the livelihoods and nutritional status of the rural and tribal people in our country. Considering the merit of native chicken varieties and increasing demand for the native chicken breeds, emphasis should be laid in conservation, improvement and propagation of native chicken like Aseel, Kadaknath, Kalahasti, Danki, etc.

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SUCCESS STORIES

1. Self employment through poultry farming in Nagaland: A success story (ICAR Research Complex for NEH Region, Nagaland Centre, Jharnapani, Published: ICAR website@icar.org.in)

Low input backyard farming with desi birds is the mainstream of poultry production prevailing in north eastern states in India in general and Nagaland in particular. The status of organized poultry sector in Nagaland is too little, consists of only 1.64% broiler and 0.80% layer to meet the demand of egg and meat required for almost 100 percent non vegetarian people inhabited in the state. Further, the preference of eggs and meat from coloured birds resembling to desi is always very high and fetches almost double price than the commercial eggs and broiler meat.

With the aim of improving the rural poultry production in Nagaland, ICAR Research Complex for NEH Region, Nagaland Centre, Jharnapani initiated the production of quality germplasm of dual purpose Vanaraja and layer type Gramapriya varieties under Poultry Seed Project in collaboration with Directorate of Poultry Research, Hyderabad since 2009-10. In last five years, the centre has produced 5.93 lakhs fertile eggs and 2.63 lakh chicks at the hatchery unit. More than 2.03 lakh chicks were supplied to the farmers' directly or through KVKs, NGOs, and central sponsored programs throughout the states of Nagaland, in Assam, Meghalaya, Manipur and Arunachal Pradesh. Besides providing the germplasm at farmers' doorsteps, more than twenty capacity building programs for farmers, unemployed rural youth, women SHGs, covering about 1000 beneficiaries and 744 on-farm demonstrations with 25632 birds were conducted to popularize the Vanaraja and Gramapriya varieties in the state.

Impact: small scale backyard poultry farming with improved variety is now reality in each corners of the state. Several entrepreneurs have come up with medium to large scale intensive poultry farming with Vanaraja and Gramapriya varieties for egg and meat production and thus, generated self employment and livelihood security.



Success story on egg production:

Considering the enormous demand of dark brown eggs in Dimapur district of Nagaland, Mr. LibemoLotha, an educated unemployed youth got interested in poultry farming.



On his own curiosity he attended training at ICAR Research Complex, Nagaland centreduring March 2013 and initiated small scale intensive poultry unit with 400 Vanaraja and Gramapriya chicken. He had maintained the male birds for four months before selling for meat purpose at average live weight 2.50 kg. The female birds were exclusively maintained for eggs production on homemade feed with locally available ingredients.

From first batch he could able to earn a net profit of Rs. 9400 per month. Experiencing from his own farm and realizing the profit, he has extended the layer birds' strength up to 700 birds in another unit of 2000 sq. ft area with the financial assistance of North Eastern Development Finance Corporation Ltd (NEDFi), Dimapur. Mr. Libemo is now producing on average 580-600 eggs daily and selling at Rs. 7 per eggs in wholesale market. His net profit is now reached up to Rs. 57800 per month from his layer unit. His achievement has motivated the fellow villagers and unemployed youths to initiate poultry farming as business venture.

Success story on meat production:

Mrs. Thezanoan educated, unemployed woman from Sethikema-A village, Dimapur was traditionally engaged in animal husbandry activities, but could not get success due to lack of scientific knowledge and expertise. She underwent three days training on scientific poultry rearing at ICAR Research Complex,



Nagaland Centre, and started a semi-intensive poultry unit comprises of 400 *Vanaraja* birds. The performance of *Vanaraja* birds was satisfactory. About 98% percent birds survived during the period of four months of rearing and attained an average body weight of 2.5 kg at 16 weeks of age. She sold 1057 kg live weight at Rs. 150 per kg in local market and neighbouring villages.



From each batch, she could be able to earn net profit Rs. 35000 to 40000. She is now maintaining four batches in a year and earning an additional income of Rs. 1.4 to 1.6 lakh annually. Learning by doing at her own farm and realizing the profit, she has planned to extend the poultry unit for maintaining a stock of 1000 birds all the time. Her success

has motivated the women SHGs in neighbouring villages for initiating backyard poultry farming with improved *Vanaraja* birds and made them self sustainable.

ICAR Research Complex, Nagaland Centre is playing as driving force in the region by extending technical guidance for establishment of poultry unit, supplying improved germplasm and assisting in financial and market linkage besides constant supervision and health care consultancy. Thus, Poultry Seed Project has brought new hope in the life of tribal people of Nagaland and acted as pivotal force in transformation of traditional zero input backyard poultry farming into profit oriented, year round employment opportunities and livelihood option for hundreds of rural youths and women folk of the state.



(Source: ICAR Research Complex for NEH Region, Nagaland Centre, Jharnapani, Medziphema, Nagaland – 797 106)

2. Empowerment of tribal farmers through *Vanaraja* backyard farming in Sikkim (ICAR, Sikkim, Published in: Rural marketing, April 2015)

Backyard poultry in Sikkim is very popular and mostly under taken by the farm women as an avenue for income generation and livelihood security. ICAR Research Complex for NEH region, Sikkim centre, Tadong intervened with the '*Vanaraja*' dual purpose improved backyard poultry birds through Poultry Seed Project of Directorate of Poultry Research, Hyderabad under Tribal Sub Plan (TSP). '*Vanaraja*' thrives well under restricted feeding and limited management practices followed by the farmers of Sikkim. The faster growth habit and higher egg laying capacity than indigenous birds have made marked improvement in livelihood of the farming community. Thus, the *Vanaraja* birds have been identified for intervention due to multiple color plumage which resembles to the indigenous birds and fetches better price in terms of meat as well as egg in the market.



The best poultry producers within SHGs of the adopted villages of the state were identified as the first line beneficiaries. Lepcha, Bhutia, Tamang and Limboo tribals of the state have been covered under the scheme. The institute organized several off and on campus training and demonstration programmes on “backyard poultry rearing” for farmers especially farm women. During 2014-15, more than 27000 *Vanaraja* birds have been distributed to around 1300 beneficiaries of all the four districts of Sikkim along with timely vaccination and treatment etc. under the programme. The parameter wise observations showed significantly better performance of the improved poultry bird over the local ones; in respect of average body weight of male at three months (2.4 kg), average body weight of female at three months (1.7 kg), average age at first laying (150-155 days), average egg production (150-170 per annum) and the benefit: cost ratio (1.93).



The institute has also developed a model village on backyard poultry at Timpyem, east Sikkim District. Around 1600 birds have been distributed among the 35 individual farmers and Timpyem Kisan Samridhi Group (SHG). Now, Timpyem has become a hub for backyard poultry production with improved birds and village has become a role model for the rural youths and farm women of neighboring villages and state as a whole for adoption of improved backyard poultry as a potential practice for agro-preneurship development leading to sustainable livelihood security. ICAR Research Complex for NEH Region, Sikkim centre, Tadong has made an excellent impact for improving the livelihood status of farming community of the state through relevant intervention through backyard *Vanaraja* rearing.

Chapter 4

Backyard Poultry Production System in Nepal

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1. Introduction

Nepal is an agricultural country and thus agriculture shares a major part i.e. 29% in national GDP. About one third of the total contribution of agriculture comes from the livestock sector. Poultry farming is one of the fastest growing sectors among agriculture in Nepal which alone contributes about 4% in national GDP. Poultry sector includes both backyard poultry and commercial poultry of which the backyard poultry contributes about 45% in total poultry production and the remaining 55% from the commercial scale.

1.1 History of poultry sector of Nepal

- 1957 AD: Black Minorca, Rhode Island Red and White Leghorn were imported by Nepal Government.
- 1960 AD: Central Hatchery was established at Parwanipur of Bara and 1700 New Hampshire chicks were introduced.
- 1962 AD: Ratna Feed Industries was established at private sector. Imported improved chicks from India.
- 1967 AD: Central Biological Production Laboratory was established at Tripureshwor to produce vaccines against Newcastle disease and Fowl Pox.
- 1970 AD-1980 AD: Government hatcheries were established at Tarahara, Pokhara and Nepalgunj.
- 1991 AD: Giriraj breed was introduced from India.
- 1998 AD: Enactment of Animal Health and Livestock Services Act.
- 2005 AD: Standard for poultry breeding farm and hatchery approved.
- 2007 AD: Bird flu control order approved.
- 2009 AD: 1st bird flu outbreak in Nepal (in Jhapa district of eastern Nepal).
- 2012 AD: Enactment of Poultry Policy.
- 2015 AD: Establishment of Ministry of Livestock Development.

- 2016 AD: Rural poultry promotion program in 40 districts for self sufficiency and improving family nutrition security.

1.2 Poultry population trend of Nepal

The poultry population has been growing yearly and the recent trend shows a highest growth of 36.65% from last year.

Table 1. Yearly population of poultry in Nepal

Year	Poultry Population (in Millions)
2005/06	23.2
2006/07	23.9
2007/08	24.6
2008/09	24.4
2009/10	25.7
2010/11	39.5
2011/12	45.2
2012/13	47.9
2013/14	48.1
2014/15	50.2
2015/16	68.6
Growth %	36.65%

1.3 Proportion of backyard and commercial poultry

Total population of poultry in Nepal, including commercial and backyard, stands at 50,195,285 as of 2014/15. Out of this around 55% is the commercial birds and the remaining 45% is from the backyard birds.

1.4 Status of poultry products

The annual production of poultry meat is 55041 metric tons as of 2015/16 which is around 15% of total meat production of the country. Similarly, the egg production for the year 2015/16 was 1308072000.

1.5 Ranking of Nepalese poultry sector in the world

Nepal stands at 112th position for chicken meat production in the world while stands at 92nd position for egg production in the world (FAO, 2014).

1.6 Status of poultry industry

There is a good number of commercial poultry farm has been established in the country. The summery of poultry industry is given below:

Table 2. Number of poultry industry

Sl. No.	Name	Number
1	GP Farm	1
2	Hatchery	194
3	Commercial poultry farm large scale	450
4	Feed industry	98
5	Fresh meat house	4500
6	Processing industry	9
7	Dealer and sub dealer	2800

2. Backyard Poultry

Poultry rearing is an imperative factor for improving the nutritional security of rural people in the country. Backyard poultry, also known as scavenging poultry, are mostly reared in rural areas in 8-10 numbers or more and are the good income source for rural people which are like ATMs for poor farmers. Backyard poultry farming involves rearing of local or improved chicken and duck varieties under free range or semi intensive conditions. Rural farmers rear local type chicken and ducks with low egg and meat production in backyard system. They are kept for meat and egg production for human consumption and mainly due to religious and cultural significance i.e., sacrifice in temples. They are valuable for the food security at rural places as they are good source of nutrients. They are rich source of protein and other nutrients and thus help to reduce malnutrition, child mortality and maternal mortality rate. Also they are contributing a lot in women empowerment.

2.1 Chicken

There are the 3 indigenous breeds of poultry in Nepal:

2.1.1 Sakini

These are the principal chicken breed, most abundant indigenous breed in our country. They are found throughout the country as they have a wide range of adaptability from tropical to temperate region. They are kept for dual purpose i.e., for meat and eggs and are hardy and suitable for scavenging conditions. Characterization of this breed has been done at phenotypic level and molecular level. They are not at risk from conservation point of view. Their age for sexual maturity is 6 months and produces 60-80 (average 68) eggs per year. The adult body weight for female is 1.5-2.4 kg and for male is 1.8-3.0 kg. They have excellent maternal instinct and brooding nature. Egg hatching capacity is over 80%.

2.1.2 Ghanti khuile

Also known as Naked-Neck chicken in local terms. These breed are located throughout the country in a limited number. They are hardy and well suited to local environments and are found in different color. They are characterized at phenotypic level only. Their population is very low and need conservation attention. These breed are also kept for dual purpose. They are heat tolerant breed. They attain sexual maturity at 5-6 months and produce 60-80 (average 75) eggs per year. The adult body weight for female is 1.5-2.2 kg and for male is 1.8-2.8 kg. They have good brooding nature and over 85% egg hatching.

2.1.3 Pwankh ulte

These breed have peculiar ruffled feathers in the body. They are located throughout the country but in limited pockets with few numbers. These are also kept for dual purpose. They are good scavenger birds that are hardy in nature well suited to local environments. These breed are characterized at phenotypic level only. These are at risk from conservation point of view and need immediate conservation attention. They attain sexual maturity at 6 months and produce 60-80 (average 65) eggs per year. The adult body weight for female is 1.4-2.2 kg and for male is 1.7-2.5 kg. They have good mothering ability.



Figure 1. Indigenous chicken in Nepal

Table 3. Morphological body parts measurements of indigenous chickens

Traits	Sakini	Ghanti Khuile	Puwankh Ulte
Body length	18.7±0.51	18.8± 0.19	16.2± 0.70
Wither height	27.6± 0.82	30.6 ±1.56	27.2± 1.13
Colour of skin	Yellow	Yellow	Yellow
Colour of shank	Yellow	Yellow	Yellow
Type of comb	Single and rose	Single and rose	Single and rose
Colour of egg	Brown	Brown	Brown

Table 4. Production performances of indigenous breeds of chickens

Traits	Sakini	Ghanti Khuile	Puwankh Ulte
Body weight at 8 wks (gm)	400-600	400-600	400-600
Age at 1 st lay (days)	170± 4.5	162± 5.1	176± 3.9
Body weight at 1 st lay (kg)	1.04± 0.02	1.14± 0.06	1.0± 0.04
Egg production/hen/year (number)	68± 4.0	75± 2.8	52± 2.9
Egg weight (gm)	40-45	40-45	40-45
Adult weight (kg)	Male: 2.4± 0.05 Female: 1.8±0.05	Male: 2.2± 0.04 Female: 1.6± 0.04	Male: 1.9± 0.03 Female: 1.6± 0.03
Hatchability	85± 3.5	86± 4.0	80± 4.1

Other major breeds of poultry reared in backyard system in Nepal are New Hampshire, Australorp, Giriraja

2.2 Ducks

Different breeds of ducks are also reared under backyard system in Nepal. These are wild or exotic breeds but have been domesticated at local level. Generally, ducks are reared by certain ethnic groups in our country for their cultural and religious importance. But now they are slowly being upgraded to commercial scale. The duck breeds found in our country are:

2.2.1 Mallard

This duck breed is mainly reared by Newar community in Nepal. The female is stripped brown in color and male has bright grey or black plumage and green colored head. They are reared for both eggs and meat. The breed is smaller in size, active and goes along with other birds. Egg production is around 150 eggs per year. The clutch size is around 10-12 eggs and egg hatch in 27-28 days. Female is around 1.5 kg while male is around 2-2.5 kg.

2.2.2 Peking duck

This breed is mainly reared for meat as it is considered very tasty. It lays around 180 eggs per year. It shows lesser brooding instinct than other duck breeds. The female is around 3.5 kg while male is around 5.0 kg.

2.2.3 Indian runner

The breed is unique in appearance with erect posture. It is well known for egg production and produces an average of 200 eggs per year. The female duck is around 2.0 kg and male 2.5-3 kg. This breed prefers water bodies, cannot fly but run in land for searching food.

2.2.4 Khaki campbell

The breed is mostly khaki (light brown) colored with a darker head. The breed is noted for egg production and produces about 300 eggs per year. The breed begins laying egg at 18 to 19 weeks and lays eggs for 2-3 years. The male is around 2.5-3.0 kg and female is around 2.0 kg.

2.2.5 Muscovy

They are larger duck, with the males weighing up to 7.0 kg. Females are considerably smaller, and only grow to 3.5-4 kg. The color is black and white with glossy back feather in males. Both male and female birds have pink or red wattles around the head and bill, those of the male being larger and more brightly colored. The breed is considered popular for meat. Egg production is around 120 eggs per year.



Figure 2. Duck farming in Nepal

2.3 Others

Japanese quail, Turkeys are some other types of poultry reared in our country. They are kept by sporadic farmers both at backyard (free range) and few at commercial (intensive) scale.

2.3.1 Quail

Two breeds Pharaoh (Rusty brown presented underbelly and an original brown color on the head and upper body) and British Range (Red-brown chocolate all over) are reared in Nepal. Its meat is considered tasty and also medicinal. The meat contains less cholesterol and is good for respiratory and arthritis patients. Quail starts production at 42-45 days of age. The female lays 280 eggs per year. The mature body weight of male is 100-140gm and female is 120-150 gm. Male has red patch while female has black or grey spot below neck.

2.3.2 Turkey

In Nepal, Turkey is reared mainly for meat purpose. Turkey meat is preferred for its less fat content, low cholesterol, high percent fleshy parts and good taste. Female starts laying at about 46 weeks of age. Female produces around 80-120 eggs per year. Adult weight of male is around 12 kg and female is around 7-8 kg.



Figure 3. Quail and turkey farming in Nepal

3. Housing, Feeding and Disease Management of Backyard Poultry

3.1 Housing

Backyard poultry are reared mainly in free range or in semi-intensive system in Nepal.

3.1.1 Free range system

This system has been practiced over centuries in our rural community where few numbers of birds are kept. Generally, the birds are let free to graze at day time and are housed in small sheds at night. They are fed with kitchen wastes and other by-products. The initial cost for rearing the birds by this system is very economic.

3.1.2 Semi-intensive system

Many farmers have now upgraded to semi-intensive system for backyard poultry rearing. In this system, they are confined within the locality of the shed by fencing and provided with feeder and drinker. They have modified system of feeding where farmers let them graze and also provide supplement feeds.



Figure 4. Some photographs of backyard chicken rearing in Nepal

3.2 Breeding and reproduction

Male and female birds are reared together and breeding is practiced between them. Occasionally the farmers exchange male birds between villages and community such that inbreeding is prevented. Many hatcheries have been established for the chick production. They maintain different lines of parent birds which are crosses of indigenous and exotic birds. Mainly the backyard poultry focuses on meat or egg production and so breeding management is not practiced for production. Breeding is only done for stock maintenance.

3.3 Brooding

Brooding is practiced for 4-6 weeks and the chicks are kept in a confined area providing appropriate environment to survive. The temperature, feeding and drinking are taken care during the brooding period. Temperature is maintained by using oil, gas or electric lamps. The farmers use traditional methods for brooding and so relatively higher losses of chicks occur in comparison to intensive system.

3.4 Bio-security and disease management

The backyard poultry are reared in closed vicinity of the community in many areas. Multi flocks or breeds of poultry are kept alongside. Some confinements are created where the birds are kept in semi intensive system. The bio-security measures are not enough applied against the disease transmission in case of backyard poultry production.

Table 5. The major poultry diseases of Nepal (during Jan-June 2016)

Disease	No. of outbreaks	No. of affected*	No. of dead*
Respiratory disease-unclassified	469	210428	8207
Infectious Bursal Disease	234	185797	8373
Coccidiosis	667	94399	3915
Diarrhoea	0	89628	3113
Collibacillosis	155	77202	3183
Intestinal Helminthiasis	0	60661	756
External Parasites	0	60327	646
Newcastle disease	157	54695	5182
Mycotoxycosis	55	37451	1533
Fowl Typhoid (<i>S. gallinarum</i>)	23	13615	1039

*Includes both backyard and commercial poultry

Of these listed diseases, infectious bursal disease, Newcastle disease, avian influenza, fowl pox, coccidiosis, parasites are commonly diagnosed while other diseases remain undiagnosed in case of backyard poultry. Apart from these, marek's disease also causes a major loss. Such diseases are controlled to some extent where people rear backyard poultry in semi confined area using bamboo fencing and wire nets. Vaccination mainly against Newcastle disease and to some extent infectious bursal disease, fowl pox and marek's is carried out. Antibiotics are used as the first measures for controlling the diseases which is one of the major issues in poultry sector.

4. Financial Model for Backyard Poultry (Chicken) in Nepal

4.1 Cost-benefit analysis (for 4 months)

For 10 birds

Cost (Shed+chick+feed+medicines): NRs. 4050

Income: NRs. 7500

Net benefit: NRs. 3450

For 20 birds

Cost (Shed+chick+feed+medicines): NRs. 7600

Income: NRs. 15000

Net benefit: NRs. 7400

For 30 birds

Cost (Shed+chick+feed+medicines): NRs. 10650

Income: NRs. 22500

Net benefit: NRs. 11850

5. Success Story: Initiation and Promotion of Backyard Poultry

Nepal is one of the undernourished countries in the world with over 40% of children under the age of five suffer from stunting, 11% of children suffer from wasting and 29% are underweight. There is the problem of protein energy malnutrition among women during pregnancy and in children.

For addressing this problem, a project named Suaahara under the aid of USAID is working closely with the Nepal government to strengthen policies and programs that improve the health and nutritional status of women and children. Suaahara integrates health, nutrition, agriculture and food security activities. The project is contributing for the promotion of community based backyard chicken farming as one of its major sub sectors. The project is

promoting the Black Australorp, New Hampshire and Giriraja breeds of poultry along with the indigenous breeds rearing under backyard system for the family nutrition. It focuses on improved backyard management and feeding system. The project is targeting disadvantaged groups that have significantly lower levels of income with latest evidence based intervention in backyard poultry, food production.

- One example in the remote Kaluketi village of the far-west corner of Bajhang district in Nepal, the Joshi family who were traditionally forbidden to eat eggs or meat has started rearing backyard chickens. They own seven chickens and feed their 17-month-old son eggs and meat frequently. The mother also regularly eats eggs and meat. According to them their second baby looks bigger and healthier than their first one and is also smarter and has never suffered from a serious illness.
- With the scenario of rapid increase in commercial poultry farmers, one exception is Mrs. Nirmala Katuwal of Saniarjun Municipality, Jhapa, Nepal who is motivated to rear local chickens. Though in rural community local birds are reared traditionally, it is very less often reared as an income source. With basic training on backyard poultry provided by District Livestock Service Office about three years ago, she became acquainted with improved husbandry practices and began rearing local chickens. She began with one female hen and crossing the progeny with pure breed local cocks and in span of 2 years, has extended her flock to 50-70 birds throughout the year. She has made an income up to NRs. 2,50,000 to 3,00,000 in one year. Ms. Katuwal has now become a face of progressive farmer in her district.

These are some representative stories of the beneficiaries of backyard poultry farming in our country. This way, backyard poultry is contributing to improved nutrition, increased family income and rural women empowerment.

6. Importance of Backyard Poultry

- a) Help to alleviate hunger and malnutrition in vulnerable groups including expectant women, lactating mothers and children.
- b) Provides egg and meat with almost no or meager investment through backyard poultry farming as compared to higher investment required for commercial farming.
- c) Encourages women participation and provides additional income to the rural households thus aiding in women empowerment.

- d) Products of rural poultry farming fetches high price compared to those produce from intensive poultry farming. Consumers seem to prefer the local products and these help attract tourists to such areas.
- e) Generate employment opportunity in rural areas and help in checking migration of people to urban areas.
- f) Eggs and meat from birds reared under free range conditions have higher health benefits for example low cholesterol concentration, compared to those produce under intensive poultry farming.
- g) The birds reared at the backyard poultry are generally hardy in nature and resistant to diseases in comparison to commercial poultry.
- h) Waste material (fallen grains, green grass, kitchen waste, vegetable waste etc) can be efficiently converted into egg and chicken meat for human consumption.
- i) Integrates well with other agricultural operations as well as aid in enhancing the soil fertility in backyards (15 chicken produce 1-1.2 kg of manure/ day).
- j) Minimizes environmental pollution per unit poultry produce, which is otherwise a major problem with the intensive poultry farming.

7. Major Policy and Plan Related to Poultry Sector

Following government policies and plans are related to the development of poultry sector in Nepal:

- Three year interim plan
- Agriculture development strategy
- National agricultural policy
- Agri-business promotion policy
- Poultry policy

8. Major Program for Conservation and Promotion of Backyard Poultry Sector

Following programs are in effects for the promotion and development of backyard poultry in Nepal:

8.1 Backyard poultry promotion program

For achieving the aim of self-sufficiency in egg production, government had launched the backyard poultry promotion program in 26 districts. Based on this program, farmer groups are formed; they are trained and are provided with subsidy for shed construction, free 25 dual breed chicks per farmer and disease management.

8.2 Single women targeted livestock program

Under this, farmers are aided for buying 25 chicks, shed construction, vaccination and disease management.

8.3 Backyard poultry development program for agro-tourism promotion:

This program focuses on development of backyard poultry via integration with tourism by supporting farmers and tourism entrepreneurs according to their demand for indigenous poultry.

- Mini hatchery establishment program: Nepal government also has provision of subsidy for mini hatchery establishment to promote backyard poultry production.
- Poultry animal genetic resources promotion Program: Incentives for the farmers are provided in the pocket areas by Nepal government for conservation of the breed.
- Technology dissemination program: Community based approach for pure bred flock management and exchange program for cock is being supported.
- Bio-security promotion program: This program focuses on implementing bio-security via improved shed management.

8.4 Vaccine production of poultry

- Development of vaccines for different poultry diseases and dissemination of vaccines to farmers.
- Field trials for the thermo-stable New Castle (ND) disease is being carried out.

8.5 Cooperative poultry farming program

9. Acts, Regulations and Orders Related to Poultry Sector

Following acts, regulations and orders are functional for the poultry sector in Nepal:

- Animal health and livestock services act, 1998 and regulation, 1998.
- Animal slaughterhouse and meat inspection act 1998 and regulation, 2001.
- Nepal veterinary council act 1998 and regulation, 1999.
- Consumer protection act, 1998.
- Nepal agriculture research council act, 1991.
- Animal feed Act, 1976.

- Bird flu disease control order, 2008.
- Standard operating procedure for bird flu control, 2010.

10. Challenges

Backyard poultry is like a lifeline for the rural community of Nepal for their economic, nutritional and socio-cultural/religious importance. But the prospering of this sector has been in shades mainly due to following reasons:

- There is lack of proper data related to the number and status of backyard poultry in Nepal.
- Remoteness due to the geography of country creates difficulties to transport vaccine and other facilities in such areas.
- Lack of strict bio-security at the backyard poultry farmers' level has been creating high chance of disease outbreaks and threat of emerging and reemerging diseases. Since 2009, 216 outbreak of bird flu has occurred in Nepal mostly at these sites.
- Porous border and illegal trade from India is a great huddle causing both economic and public health losses.
- Natural disaster regularly causes losses to the farmers along with the climate change adversities.

11. Future Strategy for Promotion of Backyard Poultry

The development and promotion of this sector is possible if we are able to address the challenges:

- Proper data collection relating and reflecting the status of backyard poultry in Nepal is a must for its advancement.
- Formulation and strict implementation of policies related to backyard poultry for health, vaccination, feeding and bio-security will help this sector.
- Conservation and utilization of indigenous poultry breeds should be supplemented by the knowledge of its true genetic potential. Programs for the conservation at farmers' level should be supported technically and financially.
- Organic poultry production should be encouraged by providing incentives to the farmers and value addition of these products.

12. Recommendations

- The backyard poultry is the genetic resource of indigenous bird, having high potentiality and economic importance. Hence, it should be conserved, properly utilized.

- In Nepal, backyard poultry is also a good source of protein and nutrition for women and children. Hence promotion of such bird will aid in poverty alleviation.
- The taste and popularity of backyard poultry is much acceptable by both internal and external tourists. It has importance of agro-tourism.
- The tradition of rearing of backyard poultry is not much organized and usually not commercialized. The healthcare management, feeding, breeding, housing and marketing should be improved in all regions of Nepal by implementing the designed policies.

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Chapter 5

Backyard Poultry Production System in Pakistan

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1. Introduction

Poultry sector is one of the most organized segments of the agriculture industry of Pakistan. It has shown a robust annual growth, which reflects its inherent potential. During the last three decades, poultry farming in Pakistan has developed as an important sub-sector of livestock. This expansion continues to fill the gaps of the animal protein and should be fully encouraged in order to promote the welfare and prosperity of the people by providing them with a nutritious balanced diet.

In livestock sector the poultry production has its own impact and value on the overall livestock market and in the GDP contribution. By enhancing poultry production in the form of eggs and meat production ultimately the per capita requirement of the protein in the country has been bridged markedly. Poultry production is considered to be one of the most efficient and economical system of production of animal protein. In Pakistan, poultry has been playing a vital role in bridging the gap between supply and requirement of animal protein food of high biological value. Poultry production is mostly dependent on exotic commercial lines but still indigenous poultry at small scale level contribute about 25% share to our national requirement of eggs and 10% share to meat production. The indigenous poultry possesses bright prospects for future development in view of easy and abundant availability of all the requisite inputs such as land, labor and feed resources in rural areas and lower cost of production as compared to commercial poultry. However there is need to improve indigenous poultry breeds because the indigenous chickens have the advantage of being well adapted to the local environmental conditions (hot, cold, humid, dry and rainy weather) and can live as a scavenger bird and can be reared at a low cost.

Backyard poultry production is of great importance as a primary supplier of eggs and meat and a source of income, especially for women in a community where cost of keeping is low. The scavenging chicken has a cultural, social, nutritional and economic value and as a backyard poultry venture it is simple to operate and provides supplementary income for millions of the people in the rural and urban areas. In spite of tremendous progress in commercial/

industrial poultry production for last 40 years in Pakistan, backyard poultry continues to play an important role in the country's economy.

There are more than 85 million backyard rural poultry birds which contribute 24.5% of the egg production and 9.25% of the meat production in the country (Economic Survey of Pakistan, 2016-17). The rural backyard poultry birds are practically raised under organic farming conditions and their meat and eggs fetch much higher prices than the ones from industrial poultry. Backyard poultry is therefore not only helping to improve family nutrition but it also helps in increasing family income. Backyard poultry offers the best prospects such as less requirements for land, capital and labor and rural chickens possess the ability to convert inedible agricultural and kitchen wastes into high animal protein diet. It can be easily managed and taken care by village women and school going children and can be further developed by introducing better productive breed, which can produce maximum at comparative less feed cost.

2. Current Profile of Industrial and Backyard Poultry

Poultry production in Pakistan is divided into two quite different sectors i.e., backyard production and large-scale intensive production. The commercial industrial sector is based on continuous imports of grandparent breeding stocks (GGP) from large poultry enterprises in Europe or North America.

Poultry sector is second largest industry after textile in Pakistan. This sector provides employment (direct /indirect) to over 1.5 million people. The current investment in poultry industry is more than Rs. 700 billion. Poultry has not only been a balancing force to keep check on the prices of mutton and beef, but also serving as backbone of agriculture sector, as it consumes over 7 million metric tons of agro residues. Poultry meat contributes 31 percent of the total meat production in the country. The commercial layer, breeders and broiler stocks showed estimated growth of 7.0 percent, 5.0 percent and 10 percent respectively while backyard rural poultry developed @ 1.5 percent when compared to 2015-16 (Pakistan Poultry Association, 2017). The poultry has contributed 1.4 percent in GDP during 2016-17 while its contribution in agriculture and livestock value added stood at 7.1 percent and 12.2 percent respectively. Poultry slaughterhouses, processing/value addition in organized industrial sector is 5-6%. The poultry value added at current factor cost has increased from Rs. 151.1 billion (2015-16) to Rs.162.8 billion (2016-17) showing an increase of 7.7 percent compared to the same period last year. The estimated production of commercial and backyard rural poultry and poultry products for the last three years is given in table 1.

Table 1. Backyard / rural and commercial poultry production in Pakistan

Type	Units	2014-15	2015-16	2016-17
Backyard poultry	Million Nos.	83.32	84.58	85.86
Cocks	Million Nos.	10.95	11.24	11.55
Hens	Million Nos.	40.18	40.90	41.64
Chicken	Million Nos.	32.19	32.43	32.67
Eggs	Million Nos.	4,018	4,090	4,164
Meat	000 Tons	112.99	115.24	117.54
Duck, Drake & Ducking	Million Nos.	0.48	0.46	0.44
Eggs	Million Nos.	21.25	20.36	19.52
Meat	Million Nos.	0.65	0.62	0.59
Commercial poultry	Million Nos.	53.4	56.9	60.6
Layers	Million Nos.	42.65	45.64	48.83
Broilers	Million Nos.	794.63	874.09	961.50
Breeding stock	Million Nos.	10.70	11.24	11.80
Day old chicks	Million Nos.	829.99	912.99	1004.29
Eggs	Million Nos.	11,307	12,077	12,900
Meat	000 Tons	960.65	1054.46	1157.51
Total poultry				
Day old chicks	Million Nos.	862	945	1037
Poultry birds	Million Nos.	932	1,016	1108
Eggs	Million Nos.	15,346	16,188	17,083
Poultry meat	000 Tons	1,074	1,170	1,276

Economic Survey of Pakistan 2016-17

2.1 An overview of poultry sector in Pakistan

Contribution in GDP =1.4% Employment generation =1.5 Million Contribution in agriculture=7.1 % Contribution in livestock=12.2 % Poultry meat share=31 % of total meat Annual growth rate=7.1 % Poultry meat (000 tones)=1276 Eggs (Million Nos.) =17,083 Per capita meat consumption=6.41 kgs Per capita egg consumption =85.80 No.	Hatcheries =120 (0.95 billion. DOC) Feed mills=160 (6.5-7 mill ton feed) Broiler grand parent=0.25million Broiler parent stock=13 million Commercial broilers=961.50 million Layer grand parent=4000 Layer parent stock=0.925 million Commercial layers=48.83 million Backyard poultry=85.86 million
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There are more than 85 million rural poultry birds which contribute 24.5% of the egg production and 9.25% of the meat production in the country.

3. Backyard Poultry Genetic Resources

The backyard rural poultry, which is scavenger by nature, always remained a major source for provision of protein in the form of eggs and meat to the rural people, especially the women and children. Various rural poultry breeds like Fayoumi, Rhode Island Red, Black Australorp, Desi, Naked neck, Aseel and Crosses of different breeds were developed and propagated in the field. The characteristics of improved rural birds are given as under:

3.1 Fayoumi

Fayoumi is an exotic breed and it has been introduced in Pakistan in 1978 and is well adapted to local environmental conditions. They are a light-weight fowl, with roosters weighing in around 2 kg and hens 1.6 kg. They appear only in a single variety. In roosters, the plumage is silver-white on the head, neck, back and saddle, with the rest in a black and white barring. Hens have heads and necks in the silver-white hue, with the rest barred. Fayoumi has a single comb, earlobes, and wattles are red and moderately large, with a white spot in the earlobes. They have dark horn colored beaks, and slate blue skin.

This breed has a tremendous scavenging ability, good livability, adaptability to adverse hot humid climatic conditions, good egg production and exceptional high hatchability. Fayoumi is a hardy breed, and particularly well suited to hot climates. The breed is thought to be especially resistant to viral and bacterial infections. Fayoumi hens are good layers of small, off-white eggs. They are not given to broodiness as pullets, but can be when they reach two or three years of age. The breed is fast to mature, with hens laying by four and half months. Small body size and egg size are the only apparently weak points of this breed. In order to improve the existing Fayoumi, fresh flock has also been imported from Egypt in 2016 to improve the native Fayoumi. The breed is being multiplied in large numbers and distributed in the Punjab by Poultry Research Institute (PRI), Rawalpindi, Punjab.

3.2 Rhode Island Red

This is also an exotic breed and imported in the country. This single combed breed was developed in Rhode Island Red (USA). The bird's feathers are rust-colored often with white streaks; however darker shades are known, including maroon bordering on black. Their eyes are red-orange and they have yellow feet, with reddish-brown beaks. Chicks are a light red to tan

color with two dark brown bars running down their backs. There are good strains of both broilers and layers in the breed and is considered to be the best dual purpose breed. This breed has been introduced in Pakistan in 80's and is known as "Golden breed". Weight of mature male is 3.0 to 3.8 kg and of female is 2.5-3.0 kg. This breed is a very good egg producer (180-250 eggs/year), has a large body size and has excellent carcass quality, when sold as a spent hen especially, under the farming conditions of Pakistan. A fresh flock of RIR has also been imported in 2016 to improve the performance of existing germplasm. The breed is also being disseminated in the field through Poultry Research Institute, Rawalpindi, Punjab. The breed is also being used for cross breeding to improve existing potential of Fayoumi, Desi and other non descript backyard poultry.

3.3 Black Australorp

This is breed of Australian origin. It is a dual purpose breed. The feather color is black, comb type is single, beak is black, skin is white, shank color is black or dark slate colored with underside of feet as white. Weight of mature male is 3.0 to 3.5 kg and of female is 2.5-3.0 kg. Female birds lay light brown eggs. It is a good egg producer with egg production varying between 200-250 eggs/year.

The comparative performance of Fayoumi, RIR and Black Australorp breeds studied at PRI, Rawalpindi, Punjab during last five years is given below:-

Table 2. Comparative performance of Fayoumi, RIR and Black Australorp breeds

Parameter	RIR	Fayoumi	Black Australorp
Age at Maturity	19 wks+3days =136 days	18 wks+3day =129 days	19wks+1day =134 days
Weight at maturity (Male)	1780 gm	1225 gm	1660 gm
Weight at maturity(Female)	1280 gm	950 gm	1247 gm
First egg weight	37.2 gm	25.4 gm	35.9 gm
Average egg weight	50.8 gm	45.9 gm	49.9 gm
DOC weight	32.79 gm	27.09 gm	31.1 gm
Hatchability	75.1 %	78.0 %	79.9%
Egg production (No./hen)	208	178	206

3.4 Desi breed

In Punjab, Desi breed is known to be well adapted to the harsh environment, which is characterized by extreme climatic conditions and poor management,

housing and feeding. is a non-descript chicken possessing slow growth rate, poor egg production low feed conversion efficiency, smaller egg size and broodiness. Efforts are needed to increase productive potential of Desi rural chickens, which are known to possess century old adaptation to local rigorous environmental conditions and also better resistance to infections.

These Desi birds in three plumage colour i.e. light brown, silky and black are being maintained and propagated at the PRI, Punjab with the objectives to develop and maintain a population of pure germplasm of indigenous poultry breed and to improve genetic potential of indigenous poultry breed in respect of growth, meat and egg production by selective breeding. The results on comparative productive performance of Desi parents and their subsequent four generations obtained after selective breeding have been presented as under:

Table 3. Comparative productive performance of Desi parents and their subsequent generations

Parameters	Desi Parent	Desi G-4	Desi-G5	Desi-G6
Av. egg production (dozen/hen)	2.50	8.90	9.83	9.98
Av. feed intake (kg/hen)	36.60	46.63	45.29	44.93
Av. egg weight (g)	44.03	44.51	44.62	45.44
Av. egg mass (kg)	1.32	4.82	5.26	5.36
Av. Feed conversion (feed/dozen eggs)	14.73	6.35	4.6	4.5
Av. Mortality %	3.33	3.6	3.87	3.36

3.5 Aseel breed

This breed is a handsome, sprightly and shapely bird with an upright and majestic gait, long, strong and straight legs, short and broad breast, straight back and a strong tail root, little or no under-fluff on plumage, thick and long Neck, long and slender face without feathers, short beak, short and small comb, and absence of wattles, bred for its highly valued meat superior in taste and texture. Presently, this breed is limited only to hobbyists and cock-fighters.

In Pakistan, Aseel is a recognized indigenous ecotype and used either as a backyard poultry in the rural areas or as a game bird. Aseel has five varieties depending upon its place of origin and phenotypic characteristics. Lakha, Mushki, Mianwali, Sindhi and Peshawari Aseel.

Aseel chickens are well known for their excellent meat producing qualities and are among the ancestors of the white cornish and plymouth rock, the

parents of the modern day broiler. Keeping in view the meat potential of Aseel, PRI conducted a research trial on crossing of Aseel with other rural and commercial breeds. Weekly body weights on different types of feeds are given as under:

Table 4. Weekly weights on different types of feeds

Age	Aseel X Plymouth Rock		Aseel X RIR		Aseel X Australorp	
	Layer Feed	Broiler feed	Layer Feed	Broiler feed	Layer Feed	Broiler feed
Day-old	42.5	43.4	28.4	30.2	26.1	31.2
1st week	63.5	65.3	36.6	39.0	36.9	44.0
2nd week	119.0	120.0	60.9	66.0	61.1	68.0
3rd week	203.0	214.0	78.6	116.0	106.5	119.0
4th week	332.0	375.0	125.0	211.0	152.0	250.0
5th week	400.0	486.7	255.0	299.9	265.2	300.0
6th week	496.0	528.6	280.0	340.0	325.0	460.0
7th week	745.0	788.0	440.0	485.0	472.0	512.5
8th week	875.7	920.6	495.0	580.0	580.0	700.0
9th week	1045.7	1217.5	611.1	620.0	750.1	798.3
10th week	1335.2	1413.3	788.0	806.6	860.0	891.5
11th week	1582.3	1637.8	836.4	950.0	990.0	1033.0
12th week	1617.0	1725.5	985.0	1006.7	1026.0	1158.3

The FCR of different crosses on different type of feeds was observed as under:

Table 5. FCR of different crosses on different type of feeds

Age	Aseel X Broiler breeder		Aseel X RIR		Aseel X Australorp	
	Layer Feed	Broiler Feed	Layer Feed	Broiler Feed	Layer Feed	Broiler Feed
1 st week	1.3	1.3	2.3	2.2	2.3	1.9
2 nd week	1.6	1.6	3.1	2.9	3.1	2.8
3 rd week	1.7	1.6	4.4	3.0	3.2	2.9
4 th week	1.6	1.4	4.3	2.6	3.5	2.2
5 th week	1.9	1.6	3.0	2.6	2.9	2.6
6 th week	2.1	2.0	3.8	3.1	3.3	2.3
7 th week	1.8	1.7	3.1	2.8	2.9	2.7

Age	Aseel X Broiler breeder		Aseel X RIR		Aseel X Australorp	
	Layer Feed	Broiler Feed	Layer Feed	Broiler Feed	Layer Feed	Broiler Feed
8 th week	1.9	1.8	3.4	2.9	2.9	2.4
9 th week	2.0	1.7	3.4	3.3	2.8	2.6
10 th week	1.8	1.7	3.1	3.0	2.8	2.7
11 th week	1.8	1.7	3.4	3.0	2.9	2.7
12 th week	2.0	1.9	3.3	3.2	3.1	2.8
Average FCR	1.8	1.7	3.4	2.9	3.0	2.5

The slaughtering data of different crosses at the age of 12 weeks was observed as given below.

Table 6. Slaughtering data of different crosses at the age of 12 weeks

Age	Breed & Sex	Live weight	Carcass	Dressing %
12 th week	Aseel breeder male	1680.0	1013.0	60.2
	Aseel breeder female	1449.0	803.5	55.5
	Aseel RIR male	1217.7	606.0	49.8
	Aseel RIR female	1037.7	532.0	51.2
	Aseel Australorp male	1218.7	608.7	50.0
	Aseel Australorp female	1032.7	508.0	48.6

3.6 Naked-Neck breed

This breed is naturally devoid of feathers on its Neck and vent. Among the indigenous chickens this breed is found superior in egg production (50-60 eggs per hen), egg size and body weight. It is generally agreed that population of naked-Neck breed in Pakistan has decreased over the years mainly because eggs produced by commercial layers are more easily available and broiler meat is available in all major towns.

The naked Neck trait which this breed is controlled by an incompletely dominant allele (Na) located near the middle of chromosome 3. Since this allele is dominant individuals which are either homozygous dominant (na/na) or heterozygous (na/na) will exhibit the naked Neck characteristic though the

heterozygous individual will exhibit less reduction in feathering-true breeding members of the breed must then be homozygous dominant, and all individuals in the recognized breed must be also. Individuals which are homozygous recessive (or wild type feathered) (na/na) would not exhibit any feather reduction characteristics of the Naked Necks and, barring mutation, would be unable to pass that trait down. The 'naked-Neck' (Na) gene reduces feather coverage by about 15-20% in heterozygous (na/na) and 30-40% in homozygous (na/na).

Limited research work at NARC, Islamabad, University of Veterinary and Animal Sciences, Lahore has already been reported. Poultry Research Institute, Rawalpindi observed the following performance of Naked Neck (NN). Now a crossing programme is being carried out at PRI in which NN males are being utilized for production and distribution of poultry units in rural areas of Punjab.

Parameter	Naked Neck breed
Age at lay (days)	20wk+6days=146
Egg production (No./hen)	128.5
Egg production (%)	35.7
Avg. Egg weight (gm)	42

3.7 Cross-bred chickens

Crossbreeding has been a major tool for the development of present day commercial breeds of chickens and could likewise be used to improve the backyard rural chicken. Cross breeding can be carried out as two-way, three-way or four-way crosses, back crosses or rotational crosses. 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 later adaptability to harsh environment. This system also maximizes the expression of heterosis, or hybrid vigour, in the cross, normally reflected in improved fitness characteristics. In poultry, reciprocal effects in crosses have been detected for sexual maturity, egg production, egg quality and viability traits.

Poultry Research Institute has imperative role in efforts to produce better productive birds through succinct and effective cross breeding programmes during different eras of past and present. During 1980-1990, local poultry breeds i.e. Aseel, Desi and Fayoumi were crossed with exotic poultry breeds such as Rhode Island Red (RIR), Barred Plymouth Rock (BPR), Australorp (AL) and White Wyandotte (WW). The findings of that breeding plan

revealed that F1 cross between RIR and Fayoumi had better productive performance than other crossbreds studied. The salient findings and details of cross breeding work are presented here below.

Table 7. Salient findings and details of cross breeding

Crosses		Body Wt. (kg)	Age of Maturity (Days)	Avg. Egg Wt. (gm)	Avg. 1 st week (HH%)	Egg Prod. 16 Weeks (HD%)
Sire line	Dam line					
BPR	Fayoumi	1.32	173	45.60	35.00	43.75
WW	Desi	1.22	187	48.20	34.25	38.39
AL	Fayoumi	1.33	196	46.80	41.35	49.00
BPR	Desi	1.24	181	47.90	38.84	51.70
AL	Desi	1.22	202	47.30	37.04	39.28
RIR	Desi	1.20	178	46.70	35.00	38.40

These cross breeding trials were carried out at different government poultry farms. Resultantly, better productive birds were distributed throughout the villages of Punjab & other provinces. During 2008-2013, a project “developing a hybridized chicken for rural poultry” was conducted to evolve a high trait hybridized poultry breed that can produce more eggs and meat than the Desi / Fayoumi chicken and yet can subsist under rugged rural environment as a scavenger bird funded by Higher Education Commission.

The plan of reciprocal crosses was as under:

Cross A (RIFI): RIR male	X	Fayoumi female
Cross B (FIRI): Fayoumi male	X	RIR female

The better performing crossbred females were selected on the basis of sexual maturity, egg number, egg weight; egg mass, bodyweight and viability. These females (Line 1) were mated naturally with White Leghorn (WL) selected males in cross C.

Cross C:	WL males	X	Line 1 female
(Designated as Rural Leghorn (RLH) crossbred)			

The resultant crossbred chicken named as Rural Leghorn (RLH) showed better performance in all egg traits than parents and other crossbred chickens.



Figure 1. Backyard poultry genetic resources in Pakistan

3.8 New initiatives under annual development programs

A project entitled “rural poultry breeds through augmenting R&D” under annual development programme was initiated in 2014-16 with the following objectives:-

- To supply better productive rural poultry on subsidized rates in Punjab.
- To increase the availability of rural poultry meat and eggs for rural human population.
- To economical empowerment and self reliance of rural women through small scale poultry keeping.
- To reduce the mortality losses in rural/domestic poultry rearing through vaccination and medication of the supplied birds.

For the production of better productive birds the rural breeds that have superior potential of eggs and meat were utilized for cross breeding and production of poultry units to be supplied in 36 districts of Punjab province. These breeds included RIR, Fayoumi, Black Australorp and Naked Neck. The breeding programme of crossbred bird production included pure breeds of RIR, Fayoumi, Australorp and Naked Neck as GGP lines. In GP flocks reciprocal crosses of these breeds are being produced and resultant chicks are Designated as Parent flocks. In Parent flock females are crossed with Fayoumi or Naked Neck males again to produce poultry units. These poultry units are being reared at different GPF's and at the age of 80-100 days supplied to rural areas in a ratio of five female and one male so the target beneficiaries. The detailed breeding programme of this project is as under:

GGP (Pure Lines)		Grand Parent flocks (Cross-1)		Parent Flocks (Cross-2)		Poultry Units
RIR male X RIR Female		Fayoumi Male X RIR Female		Fayoumi Male X Female of F1 cross		DOCs of Cross -2 (F2)
Fayoumi Male X Fayoumi Female		RIR Male X Fayoumi Female		Fayoumi Male X Female of F1 cross		DOCs of Cross -2 (F2)
Naked Neck Male X Naked Neck Female		Fayoumi Male X Naked Neck Female		Fayoumi Male X Female of F1 cross		DOCs of Cross -2 (F2)
Black Aust Male X Black Aust. Female		Naked Neck Male X Black Aust. Female		Naked Neck Male X Female of F1 cross		DOCs of Cross -2 (F2)

Figure 2. Detailed breeding programme at PRI, Rawalpindi, Punjab

The comparative performance of different crossbred birds is depicted in the table below.

Table 8. Comparative performance of different crossbred birds

Parameters	Breeds		
	RIR x Fay	Fay x RIR	Fay x Aus
Age at first egg (day)	146	149	144
Egg weight (g)	46.1	47.5	47.3
Dayold chick weight (g)	27.6	30.0	28.50
Av. number of eggs/hen	178	198	189
Feed intake (g/hen/day)	112	115	113
Mortality	5.0	4.1	4.0

Along with improvement in egg and meat production, some good phenotypic characteristics were also observed in these crosses. The chest width in these birds was reduced as compared to their parents which leads to less exposure to extreme environment i.e. wind, temperature etc. Their size was smaller than pure RIR and Australorp which help them in protecting themselves from predators. Same was the case with comb size as smaller comb size is better than bigger one leading to less injuries and protection from being preyed. The crosses of Naked Neck with other breeds have been recently introduced in the breeding plan and their performance is being recorded.

3.9 Ducks rearing

White pekin, Aylesbury and Muscovy are excellent meat producers, while Khaki Campbel and Indian Runner are egg laying breeds reared in Pakistan. Very limited population of 0.48 million duck exists in Pakistan. The ducks are important biological control agents and have natural tendency of foraging on aquatic weeds, algae, green legumes, fungi, earthworms, maggots, snails and endoparasites and ectoparasites that cause diseases to humans, animals and crops. Local ducks are best screeners and can get their food from human and livestock wastes and provide many ecosystem services. They are good exterminators of beetles and slugs. Ducks when reared with livestock help in controlling ticks and tick borne diseases. They play a major role to free water from mosquito larvae and pupae. Local breeds of the ducks can easily withstand local environmental conditions and are resistant to many common avian diseases. Only a restricted rearing of ducks is present in Pakistan.



Figure 3. Propagation of ducks rearing

3.10 Pigeon rearing

Pigeon farming is a very popular in Pakistan, entertaining and profitable business that requires less labour and low investment. Pigeons are raised easily in yards and on roofs. Pigeon meat is very tasty having silky texture thus its demand is continuously increasing. Its meat also has high medical value and is considered excellent for patients of facial palsy (laqwa). Pigeons mainly kept on seeds and grains. They also eat fruit, and vegetation, and

scavenge food people provide for them. Pigeons raise four to five broods annually. In captivity, pigeons commonly live up to 15 years, sometimes longer. In the wild (including urban areas) pigeons seldom live more than three years. Pigeon farming is coming up as an excellent cottage industry. ND and pox are common diseases, which are being controlled through vaccination



Figure 4: Propagation of pigeon rearing

3.11 Quail farming

Japanese quails (*Coturnix Coturnix Japonica*) are the type of popular commercial line commonly known as “betair” in Pakistan and have certain specific advantages including, can be used for meat production at a short period of time (4 weeks) and matures at an early age (6 weeks) with comparatively shorter (17 days) incubation period. With the introduction of breeding stocks of Japanese quail in early 1970s, its farming flourished in Pakistan. A number of quail hatcheries were set in Karachi and Lahore, producing substantial number of day-old quail chicks for supply to the farmers. Quail farming, despite having enormous potential remained one of the neglected components of the poultry sector in the country, reason being, very little research work is done on its breeding, incubation, housing, nutritional requirements, feeding, management and disease control aspects. Continuous inbreeding, uncontrolled mating and poor knowledge of selective breeding were the main factors behind the deterioration in the production performance of quails in Pakistan. Keeping in view the above mentioned scenario, a comprehensive study unit was established at Avian Research and Training (ART) center, University of Veterinary and Animal Sciences, Lahore, Pakistan with the main objective to improve four week body weight in Japanese quails through selective breeding. After six generations of selection, significant ($P < 0.05$) improvement in body weight was observed. Day old chick weight improved significantly (8.08 to 9.65) and the same was the trend for four week body weight (149.40 to 243.50). The results of study

on quails are very promising, suggesting selective breeding to be an important tool to improve growth performance in quails without any major decline in reproductive performance and immune profile. ART centre is also propagating quail farming in the country.



Figure 5. Quail farming

4. Characteristics of Backyard Faming

4.1 At Subsistence level

Backyard rural poultry farming is basically a venture of poor and moderate farmers. These chickens are mostly kept for their own household use. Rural women keep 5-10 birds per house for their livelihood. Any surplus production of eggs and birds are being sold to get some extra income to be utilized to fulfill family needs. Some pet lovers keep Aseel and other fancy birds as a prestige or hobby. Mainly women are poultry keepers in rural areas due to following reasons.

- Less initial investment and quicker returns
- Easy management
- Less economical loss in case of theft, predation and disease.

Mostly female birds are kept for egg production along with few males and surplus male birds are either slaughtered by themselves or sold on demand.

4.2 At Commercial level

Commercial rural farming is common in different areas of Pakistan. The farming is carried out in open house farms. Flock size varies from hundreds to thousands. Proper housing, feeding, breeding, disease control and bio-security practices are carried to rear birds in these farms. Local markets are also available for the sale of produce of these farms.

5. Management Practices in Backyard Farming

5.1 Housing

In rural areas birds are usually kept open during day time and are confined at night. For confinement different housing amenities are used including wooden baskets, hand build brick & mud houses, cages made of wood and net. These are basically used to protect birds from extreme weather, stealing and predation. These low cost bird houses are very common and made by farmers themselves. Some sort of bedding material is also used including sand, wheat straw. Earthen water pots are used for drinking water. At commercial rural poultry farming proper sheds are being constructed for rearing chicken. These are usually open houses supported on pillars with large net windows for ventilation. Roof of the shed may be of bamboos, straw or concrete. Birds are kept in these sheds at day and night although some farmers working on organic poultry production who let the birds scavenge for some time but scavenging area is also confines by netting. Rice husk is used in these sheds along with proper feeding and watering utensils made of silver or plastic.



Figure 6. Backyard poultry keeping at subsistence and commercial level

5.2 Feeds and feeding

Rural birds kept at household level are not fed balanced diet. These are usually fed whole grains including wheat or corn along with kitchen waste. These birds also scavenge in the field from where birds obtain some sort of vitamins and minerals. Birds are fed early in the morning and sometimes at night. But these birds lack many nutrients. Due to this deficiency production of these birds remains very low, grow slowly, mature very late sexually, show broodiness frequently and get moult. In this feeding system not only indigenous birds but high producing also remains unable to depict their full potential. So it is imperative to focus on feeding of rural poultry in order to get maximum eggs and meat. Although non conventional poultry feeds recipes are also recommended for preparation at domestic level from locally available feeding resources as under:

5.2.1 Concentrate to prepare feed

Table 9. Ingredients of concentrate and their uses

Sl. No.	Ingredients for concentrate	Percent	Use
1	Rapeseed, canola, linseed, sesame, groundnut, cottonseed, sunflower cakes or meals etc.	60	i. The concentrate is mixed in cereals (maize, rice tips, sorghum, millet, crushed dried wheat bread etc.) in a ratio of 50:50 to prepare feed. ii. Additional 01 kg marble powder, 01 kg DCP/ bone ash, 03 kg green fodder, 50-100gm common salt is also used per 100 kg feed.
2	Barseem, lucern, jantar, groundnut hay etc.	40	

5.2.2 Complete feed at domestic level

At domestic level some farmers prepare feed from their locally available feed ingredients with the following composition for their poultry.

Table 10. Composition of domestic feed

Sl. No.	Ingredients	Quantity per 10 kg feed
1	Cereals (maize, rice tips, sorghum, millet, crushed dried wheat bread etc.)	6
2	Cotton seed cake	1
3	Rapeseed cake	1
4	Pulses waste	0.5
5	Wheat bran	0.5
6	Marble powder	0.25
7	Bone ash/ DCP	0.25
8	Green fodder	0.5
9	Common salt	One table spoon

The above mixture of ingredients is soaked with clean water and kept for about one hour, and then offered to the laying flocks at the rate of 100 gm per bird per day. In addition to this complete balanced feed is also used for the birds kept at commercial level. Normally chick starter with Metabolizable Energy (ME) content of 2750 kcal/kg and crude protein 16-18 percent is used during non laying period. During laying phase layer feed having ME 2750 kcal/kg and crude protein from 15-17 percent is used for flocks kept at commercial level.



Figure 7. Feeding of rural birds at subsistence and commercial level

5.3 Breeding and reproduction

In rural areas of Pakistan poultry breeding is mostly uncontrolled as the birds scavenge together outside the houses and due to rearing of mix breeds any male chicken can breed a hen. A small number of pure breed farmers try to keep their flocks pure through controlled breeding. Males are also exchanged within neighbors and friends for getting fertile eggs from a particular favorite male having certain characteristics. Getting eggs from a hen and then

hatching those eggs upon her broodiness is not common in these days due to non availability of broody hens. Only Aseel and Desi (non-descript) females show broodiness and all other breeds like Fayoumi, RIR, Australorp and crossbred are lacking in this character. So replacement flocks are mostly purchased from market or neighbors although hatching and rearing of chicks at village level is naturally done with hens but proportion of this practice is very low. 16-18 eggs are placed under a broody hen that hatch after 21 days. Chicks are taken care by the hen.



Figure 8. Natural and artificial incubation of eggs

5.4 Disease management

A major trouble in poultry rearing is the incidence of contagious diseases. Scavenging chickens within mixed flocks do obtain certain immunity because viruses and/or antibodies are transferred from the elders to the young chicks. However, Newcastle disease is the major threat for backyard poultry. It can considerably minimize a flock if the chickens are not vaccinated. mortality rates are higher in chicks as compared to adult chickens. Predators such as birds, snakes and rats can also cause much damage. Government has taken corrective measures to control such losses. Mass vaccination through campaigns is launched in rural areas to reduce the incidence of frequent outbreaks. Government also supports free of cost vaccination against all viral diseases at commercial level farmers. These farmers already follow proper vaccinations of their flocks so face less damage due to mortality and low production. Farmers are recommended the following vaccination schedule, which most of the farmers strictly observe at their farms:

Table 11. Recommended vaccination schedule for backyard poultry

Age	Vaccine	Route of Administration
1 st day	IB	Spray/ED
5 th day	ND+H9 & ND lasota	SC+ED
9 th day	IBD intermediate	DW
12 th day	IB	ED or DW

Age	Vaccine	Route of Administration
16 th day	IBD intermediate Plus	DW
20 th day	ND Live	ED or DW
23 rd day	Hydro	SC
30 th day	Fowl pox	Wing web
55 th day	ND+H9 & ND live	SC or IM & DW
95 th day	ND+IB+EDS	SC or IM
96 th day	ND+IB live	DW

5.5 Bio-Security

There is no concept of bio-security at village level. Healthy and diseased birds scavenge at the same place and carry infection easily from one another. Multiage birds are also reared in same premises so risk of disease transfer from older to younger birds remains positive. The dead birds are usually thrown outside that become source of disease for whole surrounding area which leads to significant mortality and economical losses of poor farmers. However the commercial farmers do have the concept of bio-security. They have constructed proper fencing or boundary wall at their farms. Solid waste or mortality is properly disposed off according the given guidelines under Punjab poultry production rules, 2017 as follows:

1. The bio-security measures in view of risk of highly pathogenic diseases shall be adopted at poultry premises according to the nature and scale of poultry farming.
2. The poultry premises shall:
 - be enclosed with a fence of the height of at least 1.50 meter above the ground with a gate and lock for prevention of the entry of humans and animals;
 - not be located in close proximity to the water bodies;
 - be built so as to prevent the incursion of animals, wild, feral birds;
 - be surrounded by compacted border;
 - be kept free of weeds, scrap and any other object;
3. The entry of a personnel, visitor, pharmaceutical and vaccine representative inside the farm shall be subject to the use of coveralls, cap, dress and shoes, in a specific changing room at the gate.
4. The personnel of one poultry farm shall not visit other poultry farms, except on necessity and after taking appropriate precautionary measures.
5. The vehicles shall be parked at Designated place and disinfected before and after leaving the premises.

6. As far as possible, the equipment, supplies and personnel shall not be borrowed from other farms.
7. The disposable egg trays and eggs boxes shall be sent from farms to hatcheries but in case of use of reusable- boxes, the same shall be disinfected on exist or entry points.
8. The log book shall be maintained and uniform age-group policy shall be adopted.
9. On entry of new flock it shall be ensured that all birds are from disease –free stock.
10. The feed and water shall be checked for each batch.
11. An area of six feet around the building shall be kept free from any vegetation organic matter-litter, feather and debris.
12. For the collection of sample and gathering of necessary data an officer duly authorized, shall be allowed to enter the premises.
13. The following methods shall be adopted for surveillance:
 - Inspection of transport vehicles carrying poultry, dead or sick poultry (If dead birds are detected, collect cloacal swab whole bird for diagnosis);
 - Surveillance of live bird from markets;
 - Surveillance of slaughter houses or poultry sale points and their environment;
 - Proper measures or strategies for effective and early detection of disease.
 - Any doubtful cases (infected material for early diagnosis) shall immediately be sent to poultry disease diagnostic laboratory;
 - Exchange of latest scientific information at the appropriate level may be practiced for better control and safety of the region and for effective disease management;
 - Harmonization of communications between risk assessment and risk management; and
 - Proper coordination among veterinary, public health. Industry professionals, NGOs and administrators should be established.

6. Marketing of Backyard Poultry & Poultry Products

Commercial poultry farming is supported by a well organized marketing system while marketing of backyard poultry is not an organized activity. In rural poultry keeping, the main consumers are keepers themselves. The neighbors and other village households buy eggs and birds from the producers unofficially. In certain areas where number of poultry birds per household are more and trend of marketing exist, the producers either sell eggs from door to door or to a shopkeeper in the village. The cycle man

known as “*Pheri wala*” plays important role in sale of live poultry from commercial poultry farms to the villages and other poultry keepers. In big cities mostly at divisional and district level, exclusive backyard poultry markets have been established. The middle man procures live poultry and eggs from weekly *mandies* in different areas and commercial farms. The birds are shifted to backyard poultry markets during night. The middle man takes his own margin of Rs. 10-15 per bird and sells it with *Arhati/ Phattay wala*. The *Arhati/ Phattay wala* then also sells at a profit margin of Rs.10-15 per bird to the individual purchasers. Similarly the eggs are sold through the middle man and *Arhati/ Phattay wala* with a profit margin of Rs.10-20 per dozen.



Figure 9. Marketing of backyard poultry and poultry products

7. Economics of Backyard Farming

Backyard poultry has always been a source of income for the rural peoples. Women and Children in particular keep chicken in the villages as an income generating activity at small level. At subsistence level poultry is kept at kitchen wastes and no additional expenses are involved for feeding. So such type of poultry keeping in 5-10 numbers is highly economical. Moreover these birds don't require much investment and are easy to manage by the family members. Backyard poultry farming at commercial level is also economical. Farmers who keep birds ranging from 50-500 earn more profit due to homemade poultry feed with the use of their locally available feed ingredients. Sometimes scavenging is also added to minimize expense on feeding. Brief economics of such type of backyard poultry farming in Pakistani rupee is given as under:

Table 12. Economics of backyard poultry keeping

Particulars	50 birds	100 birds	250 birds	500 birds
Capital investment	13000	24370	59130	117660
Cost of chicks, feed, etc.	64350	148200	409500	819000
Depreciation	1100	2062	4795	9470
Return	107612	215365	538742	1078345
Profit	42162	65103	124447	249875
Monthly profit	3510	5425	10371	20823

8. Existing Models and Key Players in Backyard Farming

After 18th constitutional amendment in 2010, livestock and poultry has become a devolved subject under the provinces. Therefore all the provincial governments are focusing to facilitate and support private sector led backyard poultry development activities in their respective provinces. Academia including University of Veterinary and Animal Sciences, Lahore and University of Agriculture, Faisalabad are playing key role through research on all disciplines of poultry production including housing management, nutrition, diseases, breeding and genetics etc. In Government sector Poultry Research Institute, Rawalpindi, Punjab, Poultry Research Institute Sind and Jaba (Mansehra, KPK) are playing vital role to support commercial and rural poultry sector with the following core functions:

- Problem oriented research in different disciplines to improve productive performance & marketing of poultry.
- Disease surveillance and diagnostic facilities to control poultry diseases.

- Improved Extension Services in poultry husbandry.
- Human resource development for need based capacity building in alignment with the requirement of poultry sector.
- Productivity enhancement of backyard Poultry.
- Regulatory control in poultry sector for the benefit of all stakeholders.

Commercial poultry sector in Pakistan has altogether transformed from open housing to environmentally controlled farming in nineties. Therefore small poultry farmers, who could not compete technology induction due to less investment, have shifted their farming from commercial to backyard poultry farming. The main key players in backyard poultry sector are enlisted as under:-

Table 13. Main key players in backyard poultry sector

Sl. No.	Name of owner & contact
1	Haji Afzal , High-Bird Rawat, Thanda pani Rawalpindi
2	Javed Sb , J.S Chicks Tarlai Islamabad
3	Ch. Javed Mehmood , Chohan Chicks Rawat Islamabad
4	M.Younis Sb, H.H.Chicks Mera Bhagwal, Barah Islamabad
5	Faiz Mohammad, Galliat Chicks Sihala, Islamabad
6	M. Shakeel, Faisal Chicks Tarlai Islamabad
7	Abdul Rasheed, Pak Chicks Tarlai, Islamabad
8	M.Anwar, Margalla Chicks Sihala Islamabad
9	Rana Shehzad, Multan
10	Ameen, Ladday Wala, Gujranwala
11	Shaja-ur-Rehman, Ghakkar Gujranwala
12	Saeed Warraich, Noora Kot ,Gujranwala
13	Attiq-ur-Rehman, Ghakkar Gujranwala
14	Mian Iftikhar, Ghakkar Gujranwala
15	Kaly Khan, Samundri, Faisalabad
16	Zeshan Khan, Samundri, Faisalabad
17	Ali Akbar, Samundri, Faisalabad
18	Zain Baber, Samundri, Faisalabad
19	Pervaiz Iqbal, Samundri, Faisalabad
20	Muhammad Adeel, Samundri, Faisalabad
21	Sharafat Ali, Samundri, Faisalabad
22	Rana Arshad, Samundri, Faisalabad
23	Ali Asghar, Samundri, Faisalabad

9. Livelihood Improvement through Backyard Farming

Backyard Poultry has been a source of quality animal protein and income generating for the people living in rural areas. It considerably contributes to the cash income of the rural families for their daily expenses. Poultry products in the shape of live birds and their eggs have been used as barter for purchasing essential food and other items in particular. Previously poultry keeping had been considered a difficult task due to low productivity and heavy mortality during disease outbreaks. Government interventions through breed improvement, distribution of better productive poultry, mass vaccination against viral diseases and treating bacterial diseases for health management have increased livability and productivity in backyard poultry thus making it a sustainable business.

10. Women Empowerment through Backyard Farming

As the women and children are mainly involved in taking care of birds kept in houses so income obtained from the sale of eggs and live birds is in the hands of females. They can take decisions regarding utilization this money. They can spend this it on food, health and education of their children. Different development programmes are running at national and local levels to support women economically so that they can start their own business. Loaning facilities are provided by banks and different NGO's for small scale farming on easy terms under microfinance schemes.

11. Government Policies and Actions

Revival and propagation of backyard Poultry is one of the initiatives of Livestock & Dairy Development Departments (L&DD) in the provinces for eco-balancing and availability of cheap source of animal protein in rural and urban areas. In addition poultry keepers are making some earning as well. The departments intend immediate propagation of backyard poultry with the objective that in addition to the domestic consumption, export of these birds to other provinces and Afghanistan is attracting more demand for which support of public sector for the involvement of private sector is must. This exigency is backed by the activity of China Pak Economic Corridor (CPEC), where the demand of organic eggs is likely to escalate. Besides Provincial Government resolve to provide more protein to the infants and women in rural areas.

National policies regarding livestock and poultry are very clear at this moment. The Punjab Livestock Policy has visible framework to promote backyard poultry and the same is being followed in other provinces. The Policy envisages sustainable supply of wholesome poultry meat; eggs and

value added products to the local and international markets at competitive prices and aimed at facilitating and support private sector-led development for sustainable poultry production. The strategy revolves around improving regulatory framework; disease control and genetic improvement in rural poultry; hi-tech poultry production under environmentally controlled housing; processing and value addition; improving bio-security; need based research and development and farmers training & education. Poultry sectors growth of 15-20% per annum can be achieved if bold measures are taken to support the poultry industry in line with competing countries of the region.

The commercial poultry sector is highly organized and vibrant in the private sector in Pakistan. The entire organization of poultry research and production facilities of L&DD is thus being focused for the development of backyard poultry. The backyard rural poultry, which is a scavenger by nature, always remained a major source for provision of protein in the form of egg and meat to the rural poor, especially the women and children. With the promotion of the organize products, for which the meat and eggs of backyard poultry have gained popularity, there remains a high scope of its propagation and economic viability by keeping small units. The floods and the killing disease of ND have played havoc to this sector. It requires urgent replenishment with healthy fully vaccinated stocks, to reoccupy its due place in the backyard of rural home. The commercial production of backyard poultry has potential demand in the Northern KPK and Afghanistan with possibility of fetching handsome price. Facilitation to such poultry producing farms will be encouraged by the Departments.

The initiatives of the departments are therefore shedding positive impact and interest of backyard poultry farmers to propagate backyard poultry production in all the provinces. The Departments are also committed to facilitate backyard poultry farmers to provide the disease free and healthy rural poultry to the public and quality bird for export to other provinces and other countries. The trust building on backyard poultry of the provinces is of prime focus. Mortality losses due to the emerging disease challenges are one of the major impediments in backyard poultry propagation. L&DD Departments are of the considered opinion to support backyard poultry farmers through supply of prophylactic vaccination for their breeding and rearing flocks.

12. Recommendation for Future Research and Extension Services

1. We have low producing genetic productive potential of Desi native chickens in terms of egg production and growth rate, which could further be improved through selective breeding. So efforts must be

done to work on improvement of existing breeds along with evolving new breeds with better egg and meat production. The improved Desi stock with fixed characters obtained after selection breeding up to 8th to 9th generations should be maintained in different ecological zones to record performance of birds under different environmental conditions.

2. Maintenance of pure germplasm of Fayoumi, Rhode Island Red (RIR), Black Australorp and Naked Neck must be continued at Govt. poultry farms through selection of productive birds and culling of non productive birds along with those that are not true to breed and should be distributed in the field .
3. Similarly, Rural Leghorn (RLH) crossbred chickens needs continued selection process up to 8th to 9th generations in different genetic groups of RLH chickens.
4. The crossbred birds of Fayoumi, RIR, Black Australorp, Naked Neck and Desi breeds are generally found in the rural areas of Pakistan. Cross breeding if needed, must be restricted to non-descript indigenous birds at village level. Exotic breeds if ever needed should be kept under strict confinement and never disseminated in villages as live birds, in order to avoid cross breeding with pure indigenous chicken breeds.
5. Developing community level organizations of rural farmers of a locality and helping them market their products at profitable prices.
6. Improved management practices of housing, feeding, disease control & bio-security through improved extension services will improve backyard poultry.
7. Reduction in mortality especially due to disease outbreaks can be effectively controlled through mass vaccination campaign throughout the country and monitoring of the results.
8. Improved extension services in far flung areas and need based training of rural poultry farmers. The village women should be provided training on better husbandry practices, disease control and nutrition to obtain better egg and meat yield from improved rural chickens under field conditions.
9. Improved investment and loaning facilities through banks and other loaning agencies under microfinance will support backyard poultry development.
10. Attracting school children to backyard poultry farming through school focus program.
11. Development of organized marketing system for rural poultry and poultry products.

13. Conclusion

It has been observed during the last thirty five years that poultry farming in Pakistan has developed as an important sub-sector of livestock. This growth continues to plug the indisputable gaps of the animal protein and should be fully supported to endorse the wellbeing and prosperity of the deficient rural people by providing them with a cheaper and healthy balanced diet. It can help in empowering rural women by generating income from subsistence level farming so steps must be taken at national level to fetch attention of loaning agencies to provide easy term short loans to rural women to start farming of rural birds.

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Chapter 6

Backyard Poultry Production System in Sri Lanka

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1. Introduction

1.1 History of poultry industry in Sri Lanka

As an agricultural country Sri Lankan rear chicken for food such as meat and eggs especially for home consumption since ancient time. From 1815 onwards there was an increasing demand for chicken meat and eggs from the foreigners who lived in Sri Lanka. Those days chicken was imported to meet the demand. Rearing system was extensive and semi intensive of a capacity of batch of poultry 10-20. Production capacity of these birds was for meat 1kg after rearing for nearly for a year and 40-50 eggs per year. Increasing population and demand had a need of rearing improved breeds. Therefore to fulfill this aim government had imported several improved poultry breeds in 1955. In the year 1960 the small scale poultry farms had developed with the government intervention by distributing 10-50 birds /farm to promote the poultry industry in Sri Lanka. In 1960 the poultry industry has developed in two main directions respectively broiler and layer industry. Involvement of private sector has started to cater for the increasing demand and popularizing industry in 1960 by producing day old chicks from small scale hatcheries and formulating a commercial poultry feed by getting the ownership of the Oils and Fat Cooperation by Ceylon Grain Elevators Pvt Ltd. In 1964 1st batch of broiler parent stock was imported to country. To facilitate the rising poultry industry government decided to ban the importation of eggs in 1968. But the ban was lifted in 1992 to cater for high demand which generated due to high price of eggs and was ban again in 1995. Then onwards the government continues the ban of importation o chicken meat and eggs though it is cheaper in the world market. In 1980's the privet sector gradually entered into the poultry industry. Thereafter the poultry industry is sub divided into breeding sector, rearing sector, poultry feed sector, poultry processing sector, marketing sector, health care extension sector, accessory industries etc (Kurugala, 2002).

1.2 Backyard poultry in Sri Lanka

Several terms are being used to describe backyard poultry such as family poultry, village chicken, indigenous chicken, native chicken, scavenging chicken, local chicken, traditional chicken, free range chicken, pasture chicken, organic chicken etc. There is no uniformity in the terminology but all the terms refer the similar production system (Kithsiri, 2014).

Backyard poultry rearing requires hardly any infrastructure setup. Besides targeted egg production, it is a potent tool for the livelihood improvement of the poor. It has a very positive impact to improve the socio-economic status of the rural poor. Backyard poultry production can cater to the nutritional requirements of the family as well as cater a niche market, thus providing a source of subsistence income.

Backyard poultry can be taken up by every household as a subsidiary occupation, as a source of additional income or to cater the egg and meat requirements of the family by taking up colored bird units ranging from 10-20 birds per family in their backyards. Such units require very little hand feeding and can give a fairly handsome return with bare minimum night shelter.

In several decades before the backyard poultry was reared in Sri Lanka had around 40 birds for a flock consists of adult males, adult females, growers and chicks. Reduction of the land area with increase of the human population together with migration of rural women to urban areas and as foreign labour has resulted in decline of the backyard poultry farming or deduction of the flock size. Currently the flock size is around 12-15 birds including all age groups. These flocks are not profitable but may provide nutrients for the family only. Poultry which is reared in backyard is simply called as backyard poultry. This type of poultry rearing is mainly characterized by low cost inputs, low production capacity, with the involvement of disease resistant, indigenous or improved breeds. Extensive and semi intensive rearing systems are practiced. Daily the birds are left to be loose on ground (field) called as “range” sometimes in limited area (fenced). Overcrowding is avoided by ensuring desired stocking density and facilities like shelter, green feed, water, room for exercise and safety should be provided. Birds should provide with facilities to conduct their natural behaviors such as fighting, pecking, dust bath, perching, hiding, nesting & laying, spreading of wings etc which ensure the bird welfare.

Being an agricultural country people in Sri Lanka were closely associated with poultry which reared as backyard poultry. There were several types of backyard poultry. Main types of backyard poultry reared in Sri Lanka were chicken, ducks and turkey etc. Improved backyard poultry production has

started in Sri Lanka with the introduction of Central Poultry Research Station (CPRS) brown breed among rural poor.

2. Current Profile of the Poultry Industry and Backyard Poultry

The contribution of the livestock sector to the national GDP is 1.2% whereas that of total agriculture sector is 5.6%. The indigenous livestock possesses many valuable characteristics such as high adaptability, high resistance to common diseases, high fecundity, early maturity, good mothering ability, longevity etc. ability to produce at low input levels is the most unique feature. Preference of farmers towards indigenous livestock depends on two reasons as availability of resources and market facilities. Furthermore, there are lots of risk factors affecting the sustainability of indigenous livestock farming. High productivity and lack of resource are two major risk factors.

2.1 Poultry industry in Sri Lanka

Poultry industry has shown a significant difference after 1977 with economic reforms in Sri Lanka. Since 1980, poultry population has grown from 6.3 to 37.2 million in 2015. The per capita consumption of chicken meat and eggs had changed from 100 g and 38 eggs in 1980 to 7.82 kg and 109.1 eggs in 2015. When compared with other livestock products, per capita availability of poultry products, especially chicken meat and eggs, is very much higher in position and with a significant growth.

Table 1. Per capita availability of livestock products

Item	2011	2012	2013	2014	2015
Milk & milk products LME (Liters)	43.83	46.18	46.96	45.16	48.56
Chicken (kg)	5.57	6.8	7.09	7.19	7.82
Beef (kg)	1.71	1.72	1.8	1.55	1.53
Mutton (kg)	0.09	0.1	0.107	0.08	0.09
Pork (kg)	0.32	0.32	0.32	0.34	0.34
Eggs (numbers)	81.78	112.1	102.56	107.91	109.05

(Source: Department of Animal Production & Health, Livestock Statistical Bulletin-2015)

The poultry production is in private hands with forward contract for input supplying and marketing mainly in small scale broiler production. The national consumption poultry products are totally supplied by domestic enterprises. There is a programme by Department of Animal Production & Health to register all livestock farms at the regional veterinary surgeon's office.

Total poultry population in 2015 is 37.2 million which has 18.81 million majorities is layer bird population and 12.10 million is broiler bird population. Backyard poultry population consists of 1.7 million birds in the year of 2015 (Department of Animal Production & Health, Livestock Statistical Bulletin-2015).

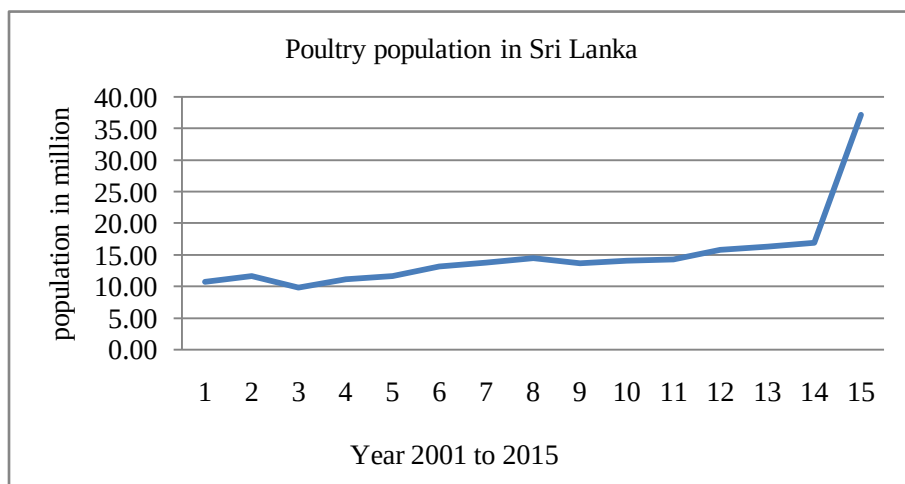
Table 2. Poultry population-2015

Category	Type	Number of birds (Mn)
Grandparents & parents		
	Broiler Grandparents	0.09
	Broiler parents	2.82
	Layer parents	1.68
Commercial		
	Broiler	12.10
	Layers	18.81
Backyard		
	Backyard	1.7
Total		37.2

(Source: Department of Animal Production & Health, Livestock Statistical Bulletin-2015)

2.2 Importance of poultry farming

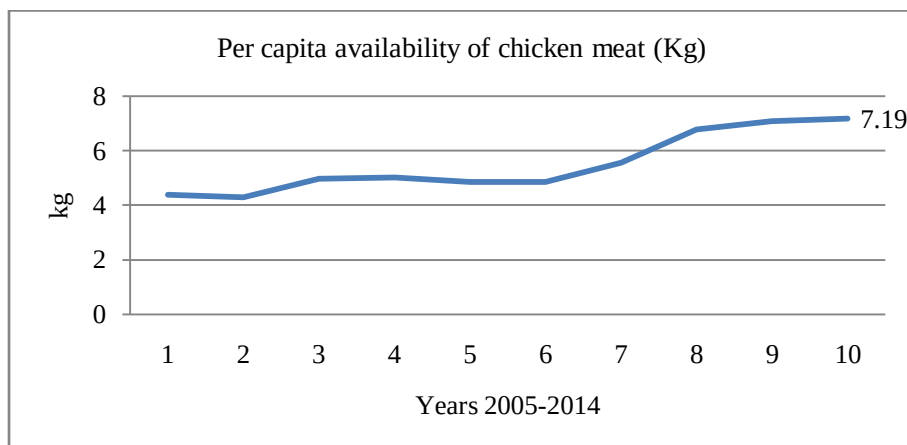
The poultry industry in Sri Lanka was growing since 2001 by 29% for a period of 15 years. The annual growth in average is 1.9%.



(Source: Department of Animal Production & Health, 2015)

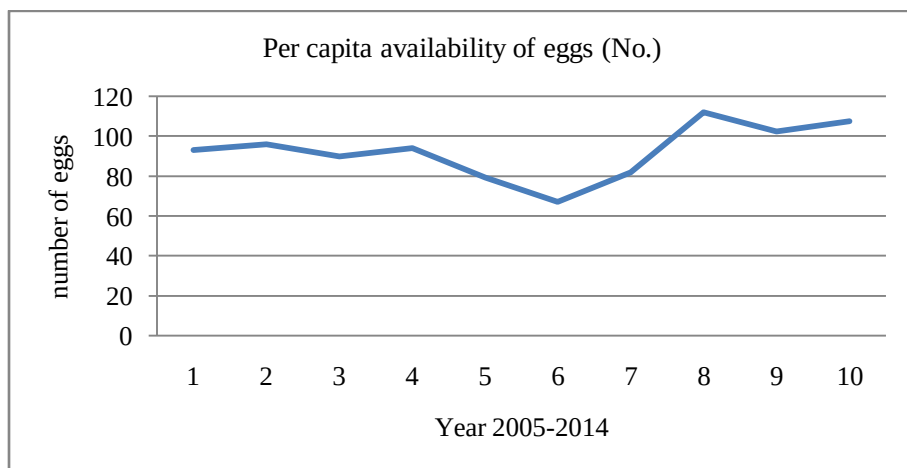
Figure 1. Poultry population dynamics in Sri Lanka 2001-2015

The poultry meat demand in the country has a growth of 61% where as demand for eggs has 86 % since 2005 over a period of 10 years. Poultry products such as chicken meat and eggs constitute a primary source of protein.



(Source: Department of Animal Production & Health, 2015)

Figure 2. Per capita availability of chicken meat 2005-2014



(Source: Department of Animal Production & Health, 2015)

Figure 3. Per capita availability of eggs 2005-2014

Poultry farming is one of the well organized animal industries in Sri Lanka. As a result of that the poultry sector has been developing in rapid rate during the past few decades (Wijewantha, 2003). Thus poultry farming can be divided into four major rearing systems on the basis of scale of operation.

- Intensive commercial scale; improved breeds are reared in medium & large scale operations.
- Buy back/ contract rearing/ out grower; improved breed are reared in medium to large scale operation especially with the contract agreement with the mother company.
- Semi intensive small scale; a small scale operation with improved breeds.
- Small scale scavenging type backyard poultry; high genetic variability, small scale, low/ no cost inputs, mainly for the family nutrition.

2.3 Backyard poultry industry

The family poultry is an integral component in the rural economy in Sri Lanka. Production system has become self sustained since the input did not reach the calculations. Present contribution of backyard poultry to national egg production of Sri Lanka is 15%. Their performances are poor due to traditional husbandry, questionable ethno veterinary practices and stressful environment. Motility is more than 50% during chick stage under extensive rearing system mainly due to predators and competition with other scavenging animals. Newcastle disease is a common killer disease tends to wipe out the flocks. These birds have created diversity in plumage colour, productivity, body size and disease resistance in different eco systems (Kithsiri, 2013).

Table 3. Backyard poultry population

YEAR	WP	EP	SP	NP	NWP	NCP	CP	UP	SABARA	TOTAL
2014	586205	662191	25607	608918	43948	66064	89082	147212	76465	2305692
2015	611613	694076	23434	698703	33505	75535	97767	151130	78349	2464112
2016	665396	743184	28393	529486	42733	123080	666992	158687	81961	3039912

Source: Data collected to write the country report from District Veterinary Surgeons – Unpublished data DAPH

3. Backyard Poultry Genetic Recourses

Locally evolved and non-descript type birds predominate in the backyard poultry system with small flocks kept under free range or semi free range system. Sri Lankan backyard poultry have never been subjected to selective breeding for any particular trait. Instead, they have been subjected to natural selection imposed by endemic diseases, climate, nutrition, predators and other stresses. Therefore there is a huge diversity in their population in the traits such as plumage colour, productivity, body size and disease resistance

etc. this immense bio diversity have been acquired for their survival against diseases in diverse ecological zones by naturally being selected for survival fitness (Wickramaratne, 1999).

3.1 Poultry breeding in Sri Lanka

There are two main types of poultry breeding programmes in Sri Lanka. They are commercial poultry breeding and backyard poultry breeding.

3.1.1 Backyard poultry breeding

There are several backyard poultry breeding hatcheries in Sri Lanka. The government own breeding stations are CPRS and regional hatcheries located in regional training centers of the country representing each province. Other than these hatcheries there are small scale backyard poultry breeding hatcheries operate in different places of the country. As they function in very small scale they do not register under the DAPH. These hatcheries produce day old chicks or one month old growers according to the demand and request of the customers.

3.1.2 CPRS breeding programme

CPRS located at Karandagolla, Kundasale, Sri Lanka attached to the Veterinary Research Institute (VRI). The main functions of CPRS are to conserve the local poultry gene pool and development of up graded backyard chicken which is suitable for the Sri Lankan climatic condition and farming system. Imported improved chicken breed is cross bred with local village chicken selected from different parts of the country under this breeding programme. Output was the CPRS brown and CPRS white backyard chicken breeds.

3.1.3 Backyard poultry breeds

Backyard poultry shows wide variation in appearance as well as the status of production. Thus they are different in size, colours and shapes. There are several village chicken types already identified but not phenotypically characterized. They are naked Neck, giant, deep brown, orange tan, black, black with yellow silver, white, light brown, white brown, black and white barred etc. Sri Lankan backyard poultry industry divers but unique group of birds where they have close genetic relationship to red jungle fowl (*Gallus gallus*) and gray jungle fowl (*gallu sonneratii*) (Silva et al., 2016a). Game birds are also very popular type in the country but cock fighting is prohibited. There is a wide a variety of chicken breeds, developed for egg production, meat production, and/or good looks. While many breeds are adaptable to a

backyard setting, certain breeds are better than others for backyard conditions. Medium to large breeds are good for cold seasons. A mellow temperament and good egg laying are also pluses. Indigenous poultry in Sri Lanka has wide variation by their body size, colour, shape and other phenotypic characters. According to local nomination there are five distinct types of backyard poultry types in Sri Lanka. They are;

3.1.3.1 Gam Kukula (village chicken)

Backyard chicken having black, brown, orange, white, barred and mixed feather colours are belongs to this category.



Figure 4. Picture of backyard chicken (Gam Kukula and Mas Kukula)

3.1.3.2 Mas Kukula (Naked Neck chicken)

Backyard chicken that do not have feathers in the Neck area (naked Neck) are belongs to this group.

3.1.3.3 Pora Kukula (fighting chicken)

These are long legged backyard chicken especially reared for fighting purpose.



Figure 5. Picture of backyard chicken (Pora Kukula and Konda Kukula)

3.1.3.4 Konda Kukula (crested chicken)

This group of chicken does have feathered combs as polish or as a crown.

3.1.3.5 Kaperi Kukula (frizzled feathered chicken)

The term “Kaperi” means “curled hair like black African”. As these birds have genetically changed feathers which are frizzled they are called as curled haired.



Figure 6. Picture of backyard chicken (Kaperi Kukula and Rumples chicken)

3.1.3.6 Rumples

There is a rare breed called as rumples chicken in Sri Lankan which lacks its tail feathers. Limited attention has been paid to characterization and classification of backyard chicken types in Sri Lanka. It has a genetic relationship to red jungle fowl (Silva et al., 2016). There are quantitative and qualitative traits described for characterizing chicken types which is given in the table 4.

Table 4. Quantitative and qualitative traits described for characterizing chicken types

Trait	Parameters	Description
Qualitative	Directly link to breeds type characters & indirectly link to production	Comb type, colour of plumage, shank, foot, skin, eye, comb, ear lobe, distribution of feathers, body condition score
Quantitative	Directly link to production such as dimensions of different body parts & live weight	Chest circumference, wing length, back length, shank length, shank circumference, breast width, pelvis width, body weight

(Source: Monograph on Indigenous chicken in Sri Lanka)

In 2015 by the sponsorship of the GEF-UNEP-ILRI-FAnGR Asia project with the help of the University of Peradeniya a study was carried out to identify the substantial diversity of existing backyard poultry population. Under this study there are descriptive variations observed in the backyard population is given in the table 5.

Table 5. Descriptive variations observed in the backyard population

Character	Variation
Plumage colour	Black, brown, brown+black, brown+white, gray/ash, yellow. Golden mix, white, black+white, multi colour
Colour pattern of the feathers	Solid, barred, mottled, laced, naked
Comb type	Single, pea, rose, cushion, strawberry, buttercup
Comb colour	Red, white+red, pink
Earlobe colour	Red, white+red, white, red+yellow
Shank & foot colour	Yellow, black, gray/ash, pink, greenish mix
Eye colour	Orange+black, yellow+black, brown+black
Skin colour	Pink, yellow, white

(Source: Monograph on Indigenous chicken in Sri Lanka)

Detailed description about each type of backyard poultry present in Sri Lanka are given in the table 6.

Table 6. Detailed description about each type of backyard poultry present in Sri Lanka

Name	Village chicken	Naked Neck chicken	Long legged chicken	Crested chicken	Frizzled feathered chicken
Local name	Gam kukula	Mas kukula	Pora kukula	Konda kukula	Kaperi kukula
General	Normal	Lack of feathers in Neck	Long legs	Head with crown like feathers	Frizzled feathers
Body shape	Small & lean	Massive round	Tall, slim & strong	Small & lean	Small & lean
Behavior	Not aggressive	Aggressive	Aggressive	Not aggressive	Not aggressive

Name	Village chicken	Naked Neck chicken	Long legged chicken	Crested chicken	Frizzled feathered chicken
Egg production /month	13.3	12.4	9.1	12.6	10.4
Plumage colour	Multi colour (bron++white, brown, gray/ash, white, white+black)	Black, rarely brown+black, muti colour	Golden, brown+black, multi colour rarely brown+white, brown, gray/ash, white, white+black	Multi colour, gloden, brown+white, brown, white, brown+black	Black, brown+black, golden mix
Feather colour patter	Solid, barred, mottled	Solid, barred, mottled, laced	Solid, barred, mottled	Solid, barred, mottled, laced	Solid, barred, laced
Comb type	Single, rarely rose	Single, pea, cushion rarely rose, strawberry	Single, pea, rarely rose, strawberry, cushion	Single, rarely pea, cushion	Single rarely strawberry
Comb colour	Red, rarely white+red, pink	Red, white+red, pink	Red, white+red, pink	Red	Red, pink
Earlobe colour	Red rarely white+red, red+yellow	Red rarely white+red, red+yellow	Red rarely white+red, pink	Red	Red, pink
Shank & foot colour	Yellow, rarely black, gray/ash, pink, greenish	Yellow, rarely black, gray/ash, pink, greenish	Yellow, rarely black, pink, greenish	Yellow, black, gray/ash	Yellow, black, greenish
Eye colour	Orange+black, yellow+black	Orange+black, yellow+black	Orange+black, yellow+black	Orange+black, yellow+black	Male brown+black, female orange+black, yellow+black, brown+black
Skin colour	Pink, rarely yellow	Pink, rarely yellow	Pink, rarely yellow	Pink, rarely yellow	Pink, yellow, white

Name	Village chicken		Naked Neck chicken		Long legged chicken		Crested chicken		Frizzled feathered chicken	
Sex	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mature body weight (g)	1759.3	1298.5	1672.1	1271.9	1851.4	1430.3	1720	1321.1	1575	1101.5
Body circumference (mm)	348.4	39.4	345.2	299.9	350.3	307.7	350	315	307.5	392.3
Back length (mm)	302.4	265.6	282.8	252.6	293.8	271.7	277.5	268	300	267.3
Breast width (mm)	85.3	76.3	81.1	75.8	83.1	76.1	77.5	79.4	76	69
Keel length (mm)	115.8	100.2	112.1	99	117.8	104.2	102.5	98.1	103.5	98
Pelvis width (mm)	9.8	20.6	11.6	20.4	7.7	14.4	10	19.4	9	16.8
Shank length (mm)	149.9	127.2	153.3	128.6	155.3	139.7	142.5	133.4	142.5	127.3
Wing length (mm)	166.1	147.5	282.8	252.6	168.2	156.4	177.5	145.6	182.5	130.5

(Source: Monograph on Indigenous chicken in Sri Lanka)

Table 7. Rare backyard poultry breeds in Sri Lanka

Name	Local name	Description
Black chicken	Kalu kukula/ kalukuma	Body is black with, black comb, shank, eyes, earlobe, skin & meat
Rumples chicken	Penda nethi kukula	No tail feathers
Boot chicken	Sapaththu kukula	Bantam type, feathered shanks

(Source: Monograph on Indigenous chicken in Sri Lanka)

4. Characteristics of Backyard Poultry Farming

Backyard poultry are reared in Sri Lanka according to extensive and semi intensive farming system.

4.1 Extensive system

Birds are allowed to scavenge in the farmers land as well as within neighborhood. Day time is used for scavenging. Birds' numbers of 1-10 groups are reared under this system and all age and sex groups are allowed to scavenge at the same time. All the birds are belongs to indigenous or cross

breeds. They mainly depend on low or no inputs of feed and management. Birds are sent free for scavenging at about 6.00-8.00am in the morning and are housed again at 5.00-6.00 pm. Birds are free but use the house when required especially in bad weather (rain, hot sun), laying time, brooding, when predator attack. Sometimes brooding places are provided separately.

This brooding facility is calm, quite, dark, without any disturbance, with certain amount of protection as it is located near or in the farmer's house. The bird is provided with a place to brood with bedding material; often she is covered with a basket which is made out of cane; sometimes with a gunny bag. Replacement stock is originated from incubation within the farm itself. Access to veterinary services is very rare so that mortality is up to >70% can be seen. Eggs and live birds are marketed within the neighborhood and regional markets if there is excess after home consumption.

4.2 Semi intensive system

Birds are kept in the poultry house for a longer time where they are provided with food and water. Nest is provided in the poultry house with comfortable bedding so that they lay eggs in the poultry house. Bird let free 1-3 hours a day 1-2 times for scavenging around the farmer's house. In this farming system 60% of the food is provided in the poultry shed and 40% is gained by the range. Therefore the farmer should provide commercial feed, kitchen waste, agricultural by products, grains as food ingredients. Birds production is higher than extensive system which can be increased up to 100 to 120 eggs/year as they get more food, certain amount of protection from external factors such as bad weather, stress factors etc. One of the main aims in this farming system is income generation. There are 5-30 number of birds irrespective of breed, age and sex are reared under this system and sent out for scavenging together as one group as in extensive system. Replacement stock is originated from incubation within the farm itself or by purchasing from local market or by neighbors. Access to veterinary services is very rare so that mortality is up to >50% can be seen. Eggs and live birds are marketed within the neighborhood and regional markets if there is excess after home consumption.

4.3 At subsistence level

Most of the development activities conducted by the Department of Animal Production and Health, other government and private organizations have distributed backyard poultry in different ranges and areas of the country. Different levels of subsidies are provided by government and non-governmental organizations with a considerable amount of participation or percentage of financial support by the involvement of the farmers. Main

items that give as subsidy are materials for the poultry house, chicks, adult birds, veterinary services, market facilities etc.

4.4 Commercial level

There are very few commercial level backyard poultry farms in Sri Lanka. They produce chicks as they manage a breeder flock which may be local village chicken or cross breed. Other than producing chicks there are farmers that produce growers. Such farms have small to medium level incubators for artificial incubation of eggs. Chicks are reared for 1-2 months at commercial level farms, vaccinated for all relevant diseases and sell for organizations or individual farmers as growers.

5. Management Practice of Backyard Poultry

5.1 Housing

A quality house is essential to backyard chicken production. Layers are provided with one nest box per 5-10 birds as they produce less number of eggs. Chickens are descended from jungle birds, which mean they like to be up high, so a place for them to roost is important. House must provide protection from the weather and predators. There should be a well-insulated area with a light bulb as well as ventilation for fresh air. Their main predators are eagles, mongoose, rats, owls, hawks, dogs and cats. Housing is also important for poultry management. In Sri Lanka poultry house are constructed with low cost materials like bamboo, wooden planks, polythene sheets etc which will be easily available and need minimum expenditure.

Housing should provide protection from all kinds of weather, predators, injury, and theft. Locate the building in a well drained area, with access to water and electricity. It is necessary to keep the birds comfortable at all times. The house should be tight, well ventilated and insulated. It is important to provide adjustable ventilation for adequate air movement in cold and hot weather.

5.1.1 Types of houses

There are several types of houses. They can be categorized as permanent and temporary. However in some occasion birds are kept in night shelter.

5.1.1.1 Permanent

Some people had build a permanent house for backyard poultry within the farm premises but the main character is the materials used are purchased with low or no cost. Though they have permanent houses the birds do not keep in

door in day time. Bricks or mud clay walls with wire mesh, mud clay or cement floor with roofing sheets or cadjan roof are the common materials used for houses. The next boxes, feeders, water troughs are provided inside the house. Floor of the house is covered with litter. Though the space requirement for an adult bird is 2 sq. ft but the space available in the houses are lesser than that. The houses are built by good quality materials and they are easily cleanable. Therefore a substantial amount of cleanliness is maintained under permanent houses.



Figure 7. Pictures of backyard poultry permanent houses

5.1.1.2 Temporary

Temporary houses for backyard poultry are very common in Sri Lanka. These houses are mainly built by non durable materials such are wood, sheets and other used materials. The protection and shelter is ensured but the durability is very less. As the backyard poultry farming also not very much sustainable among rural poor the farmers are satisfied with temporary houses. In these houses there are facilities to provide food, water and laying. Materials which are used for temporary houses are in very low quality. Therefore cleaning is difficult. So the hygienic quality of the house is comparatively low to the permanent type house.

Temporary or portable housing is typically used when birds are raised on pasture. Pastured poultry includes raising chickens or other poultry on pasture rather than raising them indoors. Typically, the birds are raised in bottomless pens directly on pasture and provided feed and water daily. Depending on the breed of poultry, you may want to consider outside run areas. Outside run areas can be fenced with temporary or permanent fencing and overhead netting to protect the birds from predators.



Figure 8. Pictures of backyard poultry temporary houses

5.2 Feeds and feeding

There is a growing concern over utilization of commercial concentrated feeds incorporated with additives. Most of the feed types are household waste, raw pulses, grain seeds, crop residues etc (Kithsiri, 2014; Gunarathne et al., 1993). With minimum or no additional feeding and animal health inputs, the productivity of local chicken is low. Improved feeding may results only marginal increase in productivity probably due to genetic limitations (Wickramarathe, 1999). The family poultry production in the free range system mainly depend quantity and quality of Scavengable Feed Recourse Base (SFRB). The SFRB varies with the season, altitude, climatic conditions, farming activities as well as social, management and village flock biomass (Gunarathne et al., 1999). Birds are familiar with the routine pattern of the farmer's family. They are free early in the morning for foraging and are called “ba....ba” for food when the refusal feed is collected at the kitchen for two three times daily where they gather to the farmer's doorstep with the calling sound.

5.2.1 Types of backyard poultry feeding

As there are different feeding types which are categorize according to the way of feeding, consistency of feed etc. In Sri Lanka backyard poultry are fed with very little amount of commercial feed especially at the young age. When they are adults they mainly fed with kitchen waste agricultural by products. If the birds are laying more eggs farmers tend to feed them with supplementary feed and shell grids very rarely. Kitchen waste and agricultural by products are fed to bird when they are available in the house. There is no special time of feeding. Chicken are fed only in day time in both extensive and semi intensive farming system. Wet feeding is not practiced. As the kitchen waste is not available all the time adlib feeding also not practiced in backyard poultry farming.

5.3 Disease management

Sri Lankan backyard poultry are resistant to many endemic diseases and stressful environment and survival is better than commercial chicken. There is no scientific evidence to prove but backyard poultry is commonly blamed for serving as the disease carrier to the commercial poultry. Among backyard poultry the flock depletion due to predation and theft is very high (Wickramarathne, 1999)

5.3.1 Diseases

Diseases like Gumboro (Infectious Bursal Diseases-IBD), Raniket (New Castle Disease -ND), Fowl Pox (FP) etc are common diseases among backyard birds in Sri Lanka. There are rarely vaccinated for these diseases not like routine vaccination of commercial chicken. As these diseases spread annually among the backyard poultry flocks the population is maintained high mortality. Government veterinary surgeon is responsible to treat and report livestock diseases. Farmers consult the veterinary surgeon when their animals are sick. As backyard poultry farming systems limited observation most of the disease cases are not reported to veterinary surgeon's office. Staff of government veterinary surgeon office vaccinates poultry to control spreading of diseases.

5.4 Biosecurity

Health risks to backyard poultry are posed by a number of factors, including poor biosecurity and the sourcing and mixing of birds of unknown health and/or vaccines status. It is important for all poultry keepers to maintain good levels of knowledge about flock management, husbandry, health problems and disease prevention. Due to poor biosecurity backyard poultry are some vulnerable to spread many zoonotic diseases like avian influenza and other emerging and re-emerging diseases.

Veterinary advice should be sought in a timely manner on both the prevention of disease, and if bird or flock health problems are experienced. When investigating poultry health problems, first principles of clinical veterinary investigation are applicable, starting with a full clinical history. It is also recommended to make a veterinary flock health plan, and all poultry keepers should keep good records, including a medicines book.

It is important to ensure that high standards of flock biosecurity and hygiene are kept at all times, coupled with high quality management and husbandry, to maintain good standards of poultry health and welfare

6. Marketing of Backyard Poultry and Poultry Products

Before the introduction of hybrid chicken to Sri Lanka there was a reasonable market for backyard poultry especially for eggs and meat. Market for commercial poultry has been well established as the production output became high which dwindle the backyard poultry market to a small scale market. Therefore usage of backyard poultry in poultry production systems has been declining over the years. Backyard poultry keeping is carried out by small holders as a part time activity today in Sri Lanka. Most of the products reach the consumer with no or less value addition and processing. But it fetches a high price compared to processed, value added commercial products in the market. Hence, it shows there is a growing demands among special kind of consumers those who have a capacity purchase at high price which is a best opportunity for backyard poultry.

Market channel/ net work regarding the backyard poultry in Sri Lanka is relatively short having smaller marketing margins compare to commercial poultry marketing. The marketing is mainly consists of retail shop marketing close to the backyard poultry farmers so that it is not widely distributed all over the country.

7. Backyard poultry products

Backyard poultry meat is mainly sold as live birds. Live birds are processed according to customer preference. Tamils and Muslims prefer to process the bird at home by themselves. However there are some farmers process meat and sell in packets as the commercial broiler meat. But the market is mainly supermarkets and door to door delivery for special customers. Eggs also are sold without packet at farm gate or small boutiques in the village. There are few farmers sell eggs in containers but especially in targeted supermarkets.

It is generally accepted that backyard family poultry products are also close to organic products in terms of product quality and thus backyard owners earn premium price for their products. Income by selling backyard poultry products are mainly used for household requirement and to buy school equipments by the Sri Lankan rural society (Gunaratne et al., 1993).

8. Existing Models and Key Players in Backyard Poultry Farming

There are different models in backyard poultry farming in Sri Lanka in which several key players perform their distinctive role. They are;

- For eggs: There are farms that rear chicks up to adult stage. The main production in these farms are eggs. They sell eggs as whole sale or retail.

- For meat: There are farms that rear chicks up to adults aiming production of meat. So they kill the birds at 6-7 months old or lesser than that according to the demand.
- For sell breeders: There are some farms rear chicks up to adults. These adult birds are rear for breeding purpose. Example CPRS, Kundasale.
- For fight: Some farms rear fighting birds (Pora Kukula). They sell the males and females birds for fighting purpose. Male bird cost is SLR 3000-4000 and female cost is SLR 2000-3000.
- For hobby: Some people rear birds ornamental purpose as the plumage colour of birds are different
- Egg incubators: There are place that do not have a farm but they collect eggs from nearby farms and artificially incubate. They sell chicks as day old chicks (price SLR 75-350) or as one month old growers (Price SLR 400-1400)
- Meat processors: There are live bird markets. Farmers can sell their birds to these markets or processors collect birds to kill. Customers can select the birds to their preference and are sold live or slaughter and processed for the customer.
- Sell growers or sell adults: These farmers do not have a flock of birds with a broody hen or do not have incubators. But they buy day old chicks and rear at their farm up to one months old or older than that according to the demand of the customer. This is a kind of contract farming. Birds are sold at the age according to the contract. The farmer has to include cost of mortality, feed, medicine, vaccine for the price of the bird.
- Egg collectors: There are people collect eggs from farm to farm and sell to urban market. This gives opportunity for urban customers to taste backyard eggs. But the farmer get less profit as there is middle man involvement. The middle man collects eggs once or twice a week.
- Rear breeders: There are few farms rear breeders as commercial poultry breeder farm and sell day old chicks after artificial incubation.

9. Livelihood Improvement through Backyard Poultry Farming

Under backyard poultry farming farmers are able to get income from eggs, meat, chicks and live adult birds. Eggs are not collected for a long duration and sell as and when required. In general the average flock size of backyard poultry farming in Sri Lanka is 20-30 birds including 5-7 male birds. The

flock produces 10-20 eggs daily out of which 5-10 eggs will be sold at SLR 15-20. The farmers' income by selling eggs in average is SLR 150-200 per day. This can be varying with the season.

They can earn by selling adult males and layers also. Males and old layers are sold as live birds for meat. Rarely the birds are processed before sell on the request of the customer. The price for live birds varies with the sex. Price of the male bird is higher than female birds as it bears more meat. At present one live male bird priced as SLR 1500 where as female bird is SLR 900 irrespectively the weight of the bird. Meat market is mainly depending on the local festival seasons and family functions. Therefore the daily and continuous income generate from eggs which is around SLR 4500-6000 per month. This income is not at all enough for an average family in Sri Lanka. But the money can be utilized for daily petty cash for house women and children. Live adult birds are sold for replacement flock. Breed characters are considered for sale. Naked Neck, birds with brown, black and mixed colour plumage have the highest demand. Birds of 6 months to 1 year old are sold for rearing purpose as they are in production stage. The price for one bird is SLR 200-1200 in different districts. Market of live birds for replacement stock also has a relationship with local festival season. Due to slaughtering of birds for festivals there is a high demand for replacement just after festival. Chicks are sold for replacement stock. Principally farmers hatch their own chicks within the flock using a broody hen. Selling chicks after natural incubation is seldom take place. But chicks are sold after artificial incubation as day old chicks at a price of SLR 60-350. The price for day old chick at CPRS is as follows;

- | | |
|--------------------------|--------|
| • Day old male | SLR 5 |
| • Day old female | SLR 60 |
| • Day old chicks unsexed | SLR 45 |

10. Women Empowerment through Backyard Poultry Farming

Ownership of backyard poultry is largely women and therefore poultry is a unique tool to reach the rural poor women with minimum disturbance of the patriarchal family pattern. Therefore rural chicken holds a big potential as a tool for poverty alleviation among the poor in the rural society (Wickramarathne, 1999).

Family poultry flock is a good asset for destitute women who constrain to manage the entire household with extremely limited resources. Access for such financial resources help them to develop as better managers than their male counterpart in Sri Lanka (Wickramarathne, 1999).

10.1 Characters of the women engaged in backyard poultry farming

Poultry keeping is a very familiar activity among rural women in many countries. Women have been considered to be the predominant owners of rural poultry. Most women in the rural areas rear the indigenous types of domestic fowl in extensive system of poultry production. Backyard poultry production serves as a small scale business for generating income controlled by women. The enterprise provides regular income using little inputs and the production can be solely managed by women in the household. Although rural poultry production cannot contribute any large income, it represents a very familiar skill to most of the poor women and it can help them in moving into a positive spiral of events that may lead them for elevation of their socio-economic status.

11. Government Policies and Actions

11.1 Backyard poultry policy

The backyard poultry is identified as an important farming system for the national and rural economy. Strategic alteration of the system of farming should be practiced in order to minimize the risk of Highly Pathogenic Avian Influenza (HPAI) in Sri Lanka. Migratory birds visits Sri Lanka from August to March annually by eastern fly way and western fly way. Though Sri Lanka is free of HPAI there is a huge tendency of getting HPAI through these migratory birds due to high populations of migratory water birds (ducks, shore birds) who act as carriers.

11.1.1 DAPH backyard poultry projects

Ministry of rural economic affairs and DAPH are mainly responsible for the livestock development programmes for poverty alleviation to cater for millennium economic goals of the country. The attention is paid for rural poultry development, by issuing backyard poultry for rural poor. Following development programmes were done by the regional veterinary surgeon's office. Under such projects they also provide backyard poultry chicks to rural poor farmers for poverty alleviation. These projects are;

11.1.2 Backyard poultry projects in Non Governmental Organizations (NGO)

There is several NGOs work in Sri Lanka. Some are branches of world organizations. Regional cooperative societies and charity organizations in Sri Lanka also work in hand with NGOs. Funds are provided by these organizations to do development projects. Backyard poultry farming is one of

the most popular projects for rural economic development. The table 11 shows the number of birds supplied under several projects in different districts in Sri Lanka.

Table 8. Supply of backyard poultry birds projects under NGOs

YEAR	WP	EP	SP	NP	NWP	NCP	CP	UVA	SABARA	TOTAL
2014	0	8475	0	100	0	0	0	0	0	8575
2015	0	9050	0	520	1120	0	0	0	0	10690
2016	0	11375	0	1770	880	0	0	0	0	14025

11.1.3 International Committee of the Red Cross (ICRC)

The ICRC is responding to the needs of some of the most vulnerable households, to provide them with the means to acquire basic necessities to restore a decent life. The support is to vulnerable households in the north and east of the country to start a small business of their choice through our micro economic initiatives programme, which is carried out in line with the Sri Lankan government's community empowerment programme. A member of the household receives a cash grant and basic training to develop this business into a sustainable source of income. Vulnerable communities receive the support required to start income generating activities through community based livelihood support programme, which is designed to meet sector-specific needs in the fisheries, agriculture, livestock, and small-business sectors. The programme is carried out through local community-based organisations, which ensures ownership of the project and guarantees its sustainability in the long term. By the rural development projects under above organization backyard poultry farms were developed and birds were issued.

11.1.4 United Nation Development Programme (UNDP)

The country has achieved middle-income status and is on track to achieving the Millennium Development Goal (MDG) of halving poverty by 2015. However, variations exist at the regional level and between different socio-economic groups still suffer from high levels of poverty, hunger and malnutrition. In line with the national MDG priorities, UNDP support in the area of poverty reduction is aimed at promoting equitable and sustainable pro-poor growth and addressing regional disparities, through awareness creation, improved data collection and strengthening of planning capabilities. By the rural development projects under above organization backyard poultry farms were developed and birds were issued.

12. Recommendation for Future Research and Extension Services

12.1 Promotion of backyard poultry

Backyard poultry is promoted by various government & non-governmental organizations all over the country. Especially the DAPH and the NLDB are responsible for poverty elevation and rural economic development programmes by which they issue chicks of backyard poultry through national and regional development programmes. Under various programmes commercial layer birds are issued to rear as backyard poultry. Though most of the programmes conducted by the Ministry of Rural Economic Affairs by the said institutions; there are several other government organizations issue backyard poultry to rural poor in a range of development programmes.

12.2 Organic poultry

Nowadays many people are concerned about where their food comes from, how it's been raised and what it's been fed. In order to be certified organic, chicken farms must follow a strict set of guidelines and be inspected annually by a third-party certification body to ensure those standards are met. Organic foods are grown and processed differently than conventional agricultural products. Meats like chicken are fed organic feed and provided with access to the outdoors. Organic chickens receive a balanced diet and clean housing, which helps decrease the propensity of disease. Some people believe that organic chicken is superior because farmers are not allowed to use growth hormones on the animals. These standards of organic farming are-

- The birds must be raised organically not later than two days after they hatch;
- They must be fed certified organic feed for their entire lives. Organic feed cannot contain animal by-products, antibiotics or genetically engineered grains and cannot be grown using persistent pesticides or chemical fertilizers.
- It is prohibited to give drugs, antibiotics and hormones to organic birds
- All birds must have outdoor access.
- If they are sick they have to be treated separately and after the withdrawal period of the drug they can be mixed with the flock.

In Sri Lanka there is a growing trend for organic eggs and chicken meat which especially comes from backyard chicken. The price for one organic egg is SLR 30-35 which is SLR 15-20 higher than a commercial chicken egg. The price for chicken meat is 800-900 SLR/kg which also carry a higher price of 450-550 SLR/kg than broiler chicken meat. Therefore the farmers can get high price for their products if they rear in organic way. Training,

methods of farming practices, regulations, breeds, feeds and market facilities are several deficient areas in Sri Lanka which authorities should address for the promotion of the organic poultry industry.

12.3 Pasture poultry

Pasture poultry is a sustainable agriculture technique that calls for the raising of laying chickens, meat chickens (broilers), and/or turkeys on pasture, as opposed to indoor confinement. Humane treatment and the perceived health benefits of pastured poultry are causing an increase in demand for such products. Though pasture feeding improves the nutritive quality of poultry meat composition is not well established. Pasture poultry is also gaining popularity because it helps the farmer, through reducing capital costs, and increasing pasture fertility. It is very well suited for incorporation within a system of managed intensive grazing. Pasture poultry is not limited to chickens and turkeys. It includes a variety of other birds, including ducks, geese, and exotics in the poultry family. In Sri Lanka pasture poultry and organic poultry are not differentiated while managing. Most of the practices of free range chicken are similar to pasture chicken management. Training, methods of farming practices, regulations, breeds, feeds and market facilities are several deficient areas in Sri Lanka as organic poultry. Responsible authorities should provide facilities and develop rules and regulations to popularize the pasture chicken industry in Sri Lanka as there is a high demand.

12.4 Future trends

The poultry industry in general is a developing industry in Sri Lanka. There are no ethnic, cultural and religious issues regarding chicken eggs or meat within the Sri Lankan society.

13. Details of other Poultry Species like Pigeon, Guinea Fowl, Quail, Turkey & Ducks

13.1 Pigeon and guinea fowl

Pigeon, guinea fowl are very uncommon farming system in Sri Lanka. People believe that pigeon is an innocent animal and do not rear for meat purpose. But they are reared as game birds and pet birds. No data was available to get an idea about population of pigeons in the country. Pigeons are release in different religious and other occasions and festivals for the desire of peace.

13.2 Quail, turkey and ducks

Quail, turkey and ducks are reared in Sri Lankan farms for egg and meat purpose. There are very few number of farms compare to commercial chicken industry. These farms are not commercial rather small scale backyard types of farms are more common. Commercial rearing of quails farms present in few places in the country such as regional animal husbandry training centers for teaching and demonstration purpose. Nearly 50,000 ducks in the country and according to the unpublished data there are nearly 60,000 of turkey population and 55,000 of quail population in the country in the year 2015. The farms are rear Japanese quail in their farms. This is the main popular breed of most of the farms. There are white, black, bronze types of turkeys rear in Sri Lanka. People mainly like white type as they bear pink skin. Main duck types reared in Sri Lanka are Muscovy, Petrose, Veluvi and Khaki Campbell.

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REPORT OF THE REGIONAL EXPERT CONSULTATION MEETING ON “BACKYARD POULTRY PRODUCTION SYSTEMS IN SAARC MEMBER STATES”

(11 July 2017 through Video Conference)

SAARC Agriculture Centre (SAC), Dhaka, Bangladesh organized an expert consultation meeting through video conferencing on “Backyard Poultry Production Systems in SAARC Member States” which was held on 11 July 2017. It was a virtual meeting and the focal persons were connected through Skype. The meeting was attended by the eight focal point experts from the all SAARC Member States. There are seven technical papers has been presented by the seven focal point experts along with other experts. The meeting was productive and fruitful in terms of participation, knowledge sharing and interaction and it was really interactive and outcome based. The meeting was inaugurated by Dr. S. M. Bokhtiar, Director, SAARC Agriculture Centre while the meeting was facilitated by Dr. Md. Nure Alam Siddiky, Senior Program Officer of the centre. Following elaborate and extensive discussion, the meeting proposed a good set of recommendations on different thematic areas for further intervention. The proposed recommendations are as follows:

A. Thematic Area 1 (Researchable Issues):

- Identification and characterization of local promising and potential indigenous backyard poultry genetic resources
- Structured and planned breeding programs to be initiated considering the consumers need using native and other suitable germplasm
- Sharing of promising backyard poultry genetic resources under the initiative of SAC
- Development of effective disease control strategies through surveillance, research, bio-security measures and introducing thermo-stable new castle disease vaccines
- Development of cost effective feed ingredients and feeding strategy using local resources (household wastes, processing wastes, plants, and probiotics)
- Development of suitable backyard poultry farming model to be fitted with local needs, resources and environment
- Development of comprehensive marketing channel for supplying safe poultry meat and eggs with premium price
- Generation of small scale poultry processing technologies for value addition in poultry meat and eggs

- Utilization of region specific indigenous breeds for the development of varieties for the backyard poultry farming
- Improvement of native poultry species (chicken, duck, geese, quail) for enhancing growth and egg production performance through selective breeding
- Conservation and improvement of specialized poultry species (Guinea fowl, Pigeon, Turkey, Ostrich) for the consumers
- Trace mineral/micro nutrient supplementation program needs to be established for birds under free range conditions
- Non-descript indigenous chicken can be upgraded using improved indigenous or exotic germplasm
- Maintenance of pure germplasm of Fayoumi, Rhode Island Red (RIR), Black Australorp and Naked Neck, Aseel at Govt. poultry farms through selection of productive birds and culling of non productive birds along with those that are not true to breed and should be distributed in the field

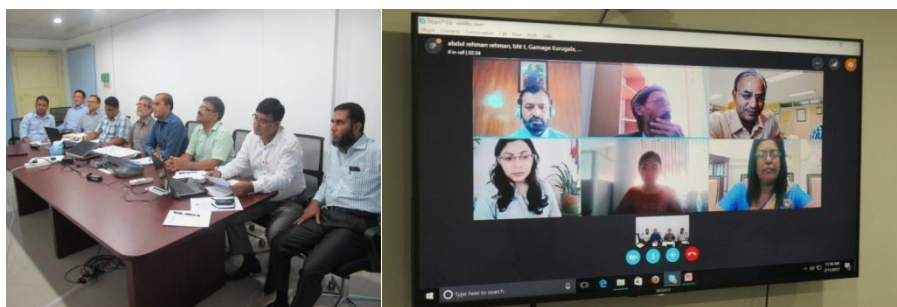
B. Thematic Area 2 (Extension Issues):

- Controlling the common diseases like New Castle Disease, Marek's Disease and Fowl Pox is very important in backyard poultry. Regular vaccination and medication should be practiced for better production and returns from the birds
- Regular monitoring and surveillance of disease outbreak to be strengthened
- Community based vaccination program to be initiated to control the disease incidence in rural poultry
- Improved management practices of housing, feeding, disease control & bio-security through improved extension services to be ensured
- Skill up-gradation of rural farmers and women on better husbandry practices, disease control and nutrition on priority basis for effective backyard farming
- Developing community level organizations of rural farmers of a locality to access them in formal marketing channel to sell their products at profitable prices. Effective and accessibility of the marketing options to the farmers is very important in popularizing the rural poultry
- Reduction in mortality especially due to disease outbreaks can be effectively controlled through mass vaccination campaign throughout the country

- Massive publicity and motivation on the comparative advantages of backyard poultry and its products to be communicated to the community
- Attracting the school children to backyard farming for its sustainability
- Use of non-electric chick brooder in remote area for proper brooding management of chicks
- Popularization of rice husk incubation system for supplying ducklings / chicks to different agro ecological zones

C. Thematic Area 3 (Policy Issues):

- Establishment of Regional Gene bank for the conservation of promising backyard poultry genetic resources
- Promising populations need to be conserved in a structured breeding program. Conservation and maintenance of the indigenous breeds is the urgent necessity as they are available in few numbers only with farmers
- Public Private Partnership (PPP) mode for large scale propagation of rural poultry farming to be initiated
- To promote organic backyard poultry production by providing incentives to the farmers and value addition of these products
- A comprehensive census relating and reflecting the status of backyard poultry has to be done at country level
- Development of organized marketing system for rural poultry and poultry products
- Emphasis has to be given to promote backyard poultry production in national poultry development policy
- Ensure sufficient support/ input services to farmers and stakeholders through Govt. Departments
- Mutual sharing and replication of successful backyard poultry models in the region



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