



Poultry Farming Research Document

SELCO Foundation



Introduction

The poultry sector in India has undergone a paradigm shift in structure and operation from a mere backyard activity into a major commercial agriculture based industry over a period of four decades from around 1980 to 2017. Development of high yielding layer chickens and broiler chicken varieties together with standardised package of practices on nutrition, housing, management and disease control have contributed to spectacular growth rates in egg (4-6% per annum) and broiler production (8-10% per annum) in India. It is exemplary to see the government put effort into building infrastructure for the industry, especially providing access to various rural regions via entrepreneurial schemes. Despite this, the needs of integrated backyard collectives haven't been properly studied or assessed.

PROBLEM STATEMENT

This research paper will act as an investigation into the livelihood and technological opportunities that we can provide that would help to reduce marginalisation of small scale and backyard poultry farmers.



Context of the Sector

Small scale backyard farmer usually occupy a small amount of land and depend on makeshift solutions. When compared to large scale poultry companies, small scale farmers tend to use decentralised solutions and methods which require more time, manual drudgery and labour costs. Additionally these units are finding themselves at a disadvantage because of high feed and transport costs, expensive vaccines, veterinary care services, the non-availability of credit and lack of supporting marketing outreach and infrastructure. Sub-sectors of poultry farming include breeding, broiler farming, layer farming:

BREEDING

Breeding of poultry is carried out using breeding farms, otherwise known as hatcheries. The purpose of these farms are to raise the poultry to be sold to other farmers who use them for broiler or layer purposes. Usually a smaller farmer will not have the capacity for a hatchery farm and will instead purchase the newborn chicks. Parent pure line flocks produce the eggs to be incubated in the hatchery. The first stage in the process is testing of the eggs, then the eggs are placed inside an incubator for 18 days, and then are placed into a planting chamber. Three days later, the chicks can be expected be born, at which point they will be prepared for sale. Finally the planting and incubation chamber will be cleaned to avoid infection and disease, and the new eggs will replace the old.

BROILER FARMING

Broiler farms are used to rear chicken for their meat. This is the area often occupied by smaller scale poultry farmers, of which there are roughly 1 lakh in India.

Day old chicks are purchased and then usually kept for a period of 6 weeks until they reach of 1.5-2 kilos, after which they are sold to the wider market. Things a farmer must consider when planning a broiler farm are ensuring that the land space is large enough to capacitate the building and the chicken. Furthermore, how the building will be designed so as to ensure sufficient wind flow, ventilation and additionally how it can be best insulated and receive the maximum amount of sunlight. The first step in the process is the cleaning and treating the building in preparation for the new flock. Cleaning could involve disinfectant sprays, waste collection, cleaning of water pipes, feeders and thermal cleaning using kerosene or gas operated flame guns. Next is the brooding process which involves temperature regulation of the building.

Temperatures should start at 95 degrees Fahrenheit and reduce by 5 degrees every week until they reach a final temperature of 70 degrees Fahrenheit. The farmer must also ensure the health of the chickens as they grow by using antibiotics and vaccinations. Feeding management also plays a huge role in the profit margins and output of the farmers, and they must ensure that the process is executed properly according to the age of chicks calorie and nutrient requirement. Following this, once the chicks are of mature age and quality of meat, they are sold to commercial markets.

LAYER FARMING

Layer farms involve the rearing of hens to produce eggs, of which India is the third largest supplier in the world. Comparative to broiler farmers, there are expected to be roughly 1 lakh layer farmers in India. This process happens at the the interchange between broiler and breeding farms, when a set amount of eggs will be kept by the breeder farmer. Superior germ plasm of chickens have been developed by both private and public entities to produce eggs with the right nutrient contents and maximum yield. The procedure begins with a process called rearing which involves raising the female chicks in pullets, an environment which is fairly similar to that of broiler chickens.

Once the chickens are of producing age (18 week mark), the farmers will begin by stimulating the diet of chicks in order to support egg production. The nutrient content is crucial, as it must be ensured that the calcium levels are roughly five to seven times greater than the phosphorus levels.

When a flock first enters egg production (eighteen to twenty weeks old) their rate of production will be around ten to twenty percent. This will continue on to peak production at around ninety percent at the peak age of thirty to thirty two weeks of age, at which point after this productivity will begin to decrease. At around fifty percent productivity, the farmer will often molt the flock to raise the productivity back up to eighty percent.

This molting process can be repeated again, after which the productivity will reduce permanently. Once the eggs have been treated they are sent to distributors. The house is then emptied, stripped of all organic matter and sanitised in preparation for the next flock.



-fig 1. A broiler farm in Puttur, Karnataka (23 Nov). The chicks are kept at one end of the building while they are young for heat retention purposes.



-fig 2. The exterior housing of the broiler farm indicated in fig 1. The building was made by local fabricators. Materials used would have included stone, sand, cement and wood for the structure. Corrugated roofing and asbestos for insulation and rainproofing.

Current Technology Employed in the Sector

1. Ventilation
2. Breeding,
3. Cleaning
4. Artificial insemination
5. Egg handling
6. Grading, hatchery
7. Environmental control (including temperature, humidity, nitrogen content)
8. Feed handling
9. Medication
10. Monitoring,
11. Testing kits
12. Weighing, etc.

Large scale poultry farmers often utilise larger systems which are more efficient when comparing with the number of flocks they must manage. However would still be deemed unprofitable, unsuitable and too expensive if it were used by a large scale farmers. Equipment used includes using ventilation fans, long curtains, heating systems and foggers. Whereas medium and small scale poultry farmers will likely use smaller and decentralised machines and technology collectively for larger purposes.

For hydration purposes, small scale farmers further decentralise the process and increase the number of watering methods. Indirectly, the farmer may use sprinklers to cool the building or roof so as to prevent the chickens from overheating. For direct hydration, manual drinkers, nipple drinkers, bell type automatic water, wood based water basin, and pan/jar types are used, all to accommodate to the different hydration methods that would be functional to the differing size and ages ranges of chicken. In order to maintain stability, control and health within the farm the farmers will have to tackle multiple

parameters including weight, litter management and health of chickens etc.

To measure the weight, farmers will often just use a weighing balance to weigh chickens individually. For heat, the farmers use a number of techniques depending on the heating and electrical requirements which include utilising water heaters, electrical heaters, electrical brooders, infrared/self reflective bulbs, and hovers. To generate heat in areas where there is no electricity access, farmers will use gas brooders, charcoal/kerosene stoves or bukhari which is a traditional wood burning stove often found in Kashmir. For litter management, generally a basic rake, although time consuming and inefficient, it is suitable for the job as the scale of the farm does not demand anything larger.

One of the most important factors for the chicken's health is the administration of vaccinations, and in order to accomplish this, farmers will use automatic vaccinators to inject different doses of vaccines into a large number of birds. Additionally to ensure a healthy environment, farmers may use hand held, kerosene operated flame guns and back mounted, DC operated disinfectant sprays which serve the purpose of ridding the building and surrounding farm of parasites.

Lastly the most crucial and profitable factor is how the chickens are fed. Feed occupies up to 70% of the total budget of a farmer, of which 95% is used to meet the protein and energy requirements, while the remaining percentiles are for minerals and vitamins.

A more lucrative farm will likely use electrically operated automatic feeders which will line the entire length of the poultry house using specially designed feed troughs, and will be height adjustable to tend to the different sizes of chicken. Other farmers will likely use linear feeders which operate as non electric automatic feeders. There are also shell grit boxes which is used to supply shell grit to the birds as a source of calcium and circular feeders which use gravity to deliver the food at a slower rate.

Contextual examples of infrastructure and tech gathered from Primary research on field

CONTRACT BROILER FARMER IN BENGALURU

- **Flock size:** 8000
- **Heating element:** Heating coal in tin cans to provide warmth to chicks. Coal is bought for 15,000 RS every 36 days.
- **Electrical supply and tech:** This farm was connected to the grid and was able to power the majority of its equipment ie water pumps, electric sprayers, and LED bulbs (recently transitioned from CFL bulbs). For cooling purposes water was pumped to the roof through drip pipes in summer to provide an evaporative cooling effect.

BACKYARD BROILER FARMER IN ODISHA

- **Flock size:** 300
- **Heating element:** One brooding tin can with coal as the heat source is utilised. Additionally the farm has one gas brooder, estimated to be between 4000-5000 RS (cost was subsidised in this case). This runs on a 14.2 KG Indane LPG cylinder.

- **Electrical supply and tech:** Developing infrastructural electrical access in surrounding area. Supply is unreliable and farm often experiences outages. There is 1 bulb per shed. Higher quality LED bulbs are planned to be distributed by Bissamcuttack-an FPO.

MEDIUM SCALE LAYER FARM IN VET COLLEGE

- **Flock size:** 15,000
- **Heating element:** The farm uses a Murphy's IR heating element, with an output of 250 watts.
- **Electrical supply and tech:** The farm was a vertically integrated unit connected to grid electricity and located near to a Bangalore main city and was using CFL bulbs for lighting.

BISSAMCUTUCK HATCHERY, HARSHA TRUST

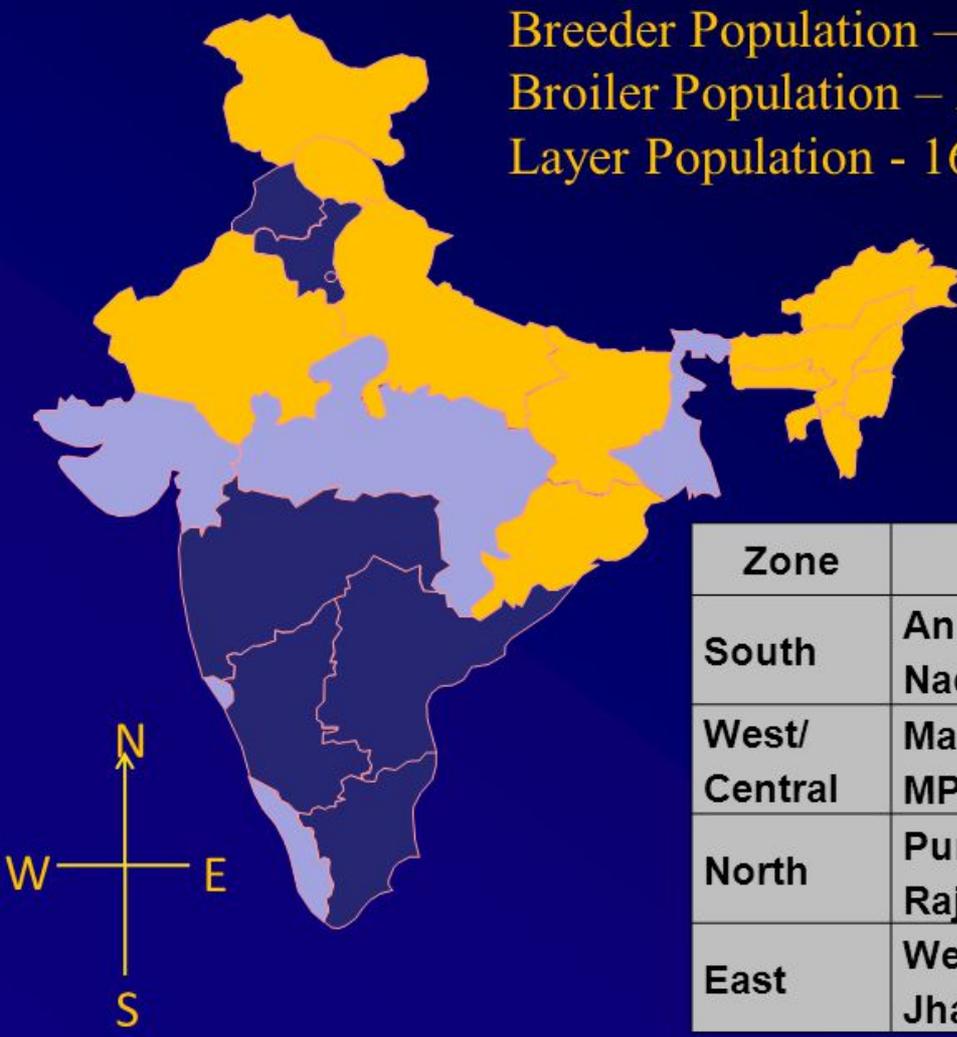
Egg stock: 15,000 eggs.

Electricity supply and tech: The farm uses generators and on grid electricity to operate the hatchery. Additionally the egg incubation machinery is not used to its full capacity due to improper usage and electrical inefficiencies

Transportation issues: The eggs are often transported as far as 100KM away to areas such as Mysore and Bhubaneswar. The Hatchery report up to 15% worth of losses due to infertility and manhandling.

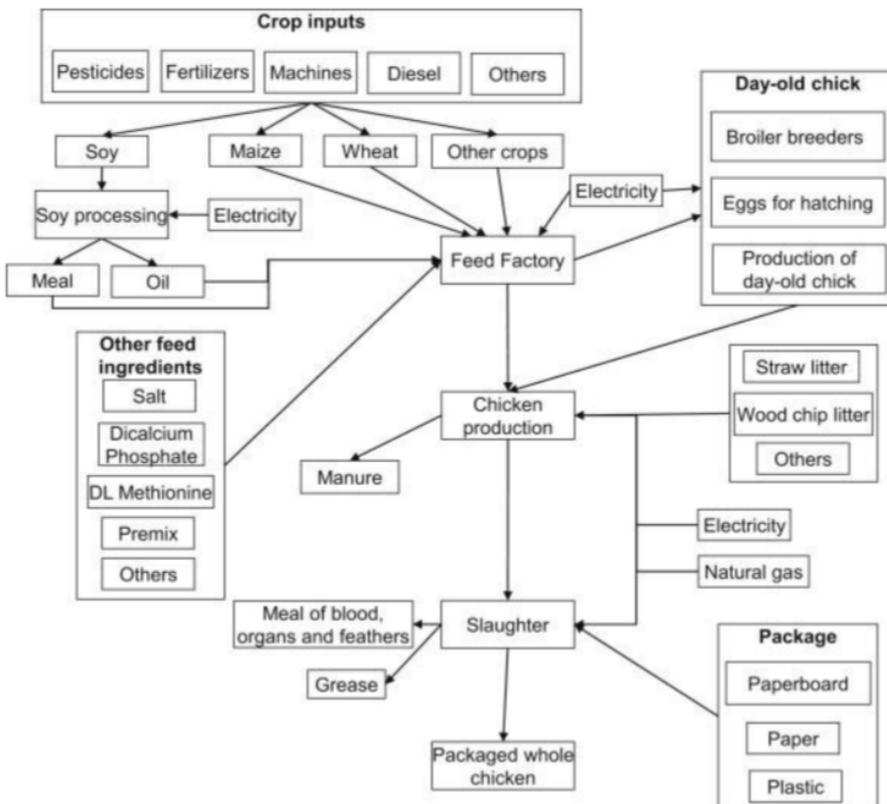
Breeder Population – 15.6 m
 Broiler Population – 2000 m
 Layer Population - 165 m

■ High population
 ■ Moderate population
 ■ Low population



Zone	State	Share
South	Andhra Pradesh, Tamil Nadu, Karnataka, Kerala	40%
West/Central	Maharashtra, Gujarat, MP, Chattishgarh	25%
North	Punjab, Haryana, Rajasthan, HP, UP, J&K	20%
East	West Bengal, Orissa, Jharkhant, North East	15%

-fig 3. This map indicates the distribution of poultry farmers around India. It illustrates the concentration variation between the north and south of India, as well as the population amounts of breeder, broiler and layer chickens.



-fig 4. This process map demonstrates the stakeholders that are involved along the process chain right from the feed supplies for the flock through to the packaging of the chicken.

User Type

Small scale poultry farmers: Small scale backyard farmers usually don't have much land and depend on local crafts and makeshift solutions to aid their process. Additionally output is usually dependant on demand from the market and to resolve food security issues.

State:

Backyard poultry is mostly active in Andhra Pradesh where there is stated to be more than 20,000 farmers. This is followed by Maharashtra at 15,000-20,000 and then by Tamil Nadu at 10,000-15,000.

Geography and weather:

In Andhra Pradesh, Maharashtra and Tamil Nadu the areas of largest activity. A drinking water for the flock is the largest concern. Often farms will be located in rural areas also, large distances away from its nearest town or city meaning that there is no local infrastructure to provide water, instead it is usually supplied from water tankers or accessed using boreholes. The scarcity of water is also linked to the weather conditions. In specified areas temperatures can reach between 40-43 degrees Celsius in the summer months which can lead to a number of effects such as feed failure through death of crops, labour issues, and low productivity of the flock as chicken struggle to thrive in this temperature.

Organisation and ownership models:

Backyard poultry farmers often own their own farms or are partnering up with integration schemes, whereby the integrator will take a large majority of ownership for the farm's output and capital due to the larger investment.

Farm and flock size: Backyard and small scale poultry holders will often have between 300-3000 birds.

Types of processes and equipment used:

Often the size and scale of equipment and infrastructure will depend of the figure indicated above. Generally most backyard farms will have basic makeshift sheds, that they or a local fabricator had made. Tech and capital used will often involve some form of manual involvement from the farmer. Examples could be flame guns, manual sprayers for sanitation and moisture, rakes for cleaning and maintenance or automatic vaccinators for vaccination purposes. Equipment will usually be locally sourced and decentralised. Processes will not be too comprehensive also and will often just occupy the first few stages in the supply chain, ie processes involved in producing broiler chickens (chicken for meat) or layer chickens (egg producing). Small farms are unlikely to follow processes following this such as processing, sales and distribution of the output.

Type of produce and flock: Small scale farmers will all operate in the field of producing broiler or layer chickens. Produce amount often varies on the type of flock used as well as the size of the farm. Bird types most commonly used are indigenous birds which could include Aseel, Ankaleshwar, Buser, Brown Desi. Additionally improved desi birds which could include Vanaraja and Giriraja. Lastly the least used are commercial strains which include Cobb, Ross and Lohmann.

Training and education:

Will often be fairly unstructured and informal, and will most likely be presented in the form of passed down information. Schemes and training are available by entities such as the Central Poultry Development Organisation, but only if approached or through marketing as there is no mandatory training process that has to be undertaken when starting a farm.

Demography of workers:

Poultry farming is a male dominated market with the majority of work being done by males within families. However there a growing number of initiatives to get women into the poultry trade, such as TATA trusts funding for tribal womens poultry companies. The average age range of the poultry farmer will also be 41-50 years old. The farmers will generally be educated to basic primary and secondary standards, so are easier to train. The majority of backyard farmers, 43.34% have 1-5 years of

experience while 20% of the respondents had 6-10 years of total experience. The majority live in town areas and will have their poultry sites near to their homes while the minority will live further away from the municipality but will host their farms within a close vicinity to their farms.

Energy access:

The Indian agricultural sector receives subsidies for commodities such as fertilisers, pesticides and electricity. Despite receiving a subsidy, poultry farmers still must pay a higher tariff and sales tax than other entities within agriculture. Energy requirements will depend largely on the equipment in use. Some of the equipment in use would be a heating infrared bulbs that usually available in 150 to 250 watt bulbs. Electrical brooders are also used which consume between 200 to 750 watts.



Barriers

MARKET RELATED

- Smaller rural farmers are unable to compete with larger commercial poultry producers due to the advantages they have. Larger providers will tend to rear strains that produce more eggs, more meat and resistant to certain illnesses. Additionally they often have more capital investments to manage and increase production for their large flock, which contrasts the minimal investment into backyard farming for smaller flocks. This makes the larger providers more productive and through economies of scale, more cost efficient and cheaper. Rural farmers often raise desi poultry (country chicken) which are smaller and less productive but which will still be sold for higher prices than commercial producers. This creates a large output and price gap between the commercial and smaller farmers where the smaller farmers are not able to compete.
- Another issue that exists is the lack of marketing channels and opportunity for commercial activity among backyard farmers. Over seventy percent of the poultry products and eggs are consumed in urban and semi urban areas, of which the majority of sales come from commercial players due to competitive prices and increased market linkages. While rural markets should be the ideal consumer for backyard poultry producers, they often are not. The higher prices of the poultry in combination with the lower incomes of the rural community mean that there is a market gap.

- For newcomers to the poultry business, there is insufficient training resources and programmes to teach poultry farmers how to exercise efficiency and get the maximum output from the trade. As a result Poultry farmers are not gaining their expected return and often abandon the trade before its fruition.

TECHNOLOGY RELATED

- Electrically efficient solutions are few in number and also hard to access, when considering the context of backyard farmers. For example, temperature control and lighting are often a large issue for backyard poultry farmers and essential for illuminating feed and maintaining homeostasis. Each chicken requires an optimum temperature range which is dependant on their size and age. Varying these temperature accordingly can be costly, when using electrical appliances as it requires a new purchase for every temperature range.
- An increasing demand for quality poultry product, has meant the adoption of better machinery and thorough processing has become the new standard. Often backyard farmers are unable to gather the funds to be able to finance for these new machines. Additionally another factor driving the increase in production of these machines is the increase in the size of the poultry farm. These machines are generally catered towards larger suppliers and therefore would not be suitable for backyard farmers.

- Despite vaccination efforts, there is still a higher instance of deaths among flocks belonging to backyard farmers. This is due to the unavailability of the vaccines, lack of health checks and regulations involved with backyard farming in comparison to large scale poultry farmers. The lack of regulations in turn poses another issue whereby the chicks could become antibiotic resistant due to over administration. Additionally the high frequency that the drugs must be administered, especially when the chick is young can be time consuming. A normal course for a chick for the first 8 weeks requires 5 different vaccinations and periodic deworming at 3-4 month intervals. Among this farmers have to ensure they are informed of and are able to prevent the chicks contracting Newcastle disease, Marek's disease, infectious coryza, fowl pox among others.

USER ISSUES

Those who occupy backyard farming report that the task of maintaining and managing a poultry farm is far too time consuming and not worth the investment. Often labourers are involved in other work i.e. agricultural, managing other livestock and would rather spend their time focusing on low investment, easily accessible jobs opportunities.



Possible Areas of Intervention

CONCERNING SUSTAINABLE ENERGY USE

- Lighting systems that can run for 10+ hours off grid
 - Alternative heating and temperature control solutions and within this hot feeding to induce homeostasis. Additionally non electric heating methods such as increased insulation, non electric brooder investment and easy practical chick warming (surrounding thermals and blankets etc)
 - Increased innovation and access to decentralised but suitable and efficient poultry related accessories that matches the quality of large scale supplier.
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CONCERNING LABOUR QUALITY IMPROVEMENT

- Improved design of raking solution, to reduce manual drudgery involved in process
 - Overall reduction in time spent on activities involved in poultry farming, in order to increase the appeal of the livelihood, and reduce the time and drudgery spent doing the manual labour.
 - Increased access to training resources and training centres.
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CONCERNING MANAGING REUSE

- Re-utilisation and processing of litter mixed with chicken secretion for feeding processes to reduce cost of purchasing new feed.
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IMPROVING FLOCK PRODUCTIVITY

- Egg and chick transportation method without damage, in order to maximise output sales.
 - Re-investment and further innovation into non electric brooding systems, to reduce electrical consumption and maximise heating capacity.
 - Improvements in ventilation, moisture control, aeration, and temperature.
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MODELS OF ADOPTION AND REPLICATION

- Singular custom feed production kit, so as to prevent wastage and cater feed requirements to chickens without having to use various equipment.
 - Increasing the market linkages for backyard farmers, so they are able to appeal to a wider local market.
 - Hike up employment and entrepreneurship by introducing shared output and promotions of vertical integration schemes. This could lead to a reduction in cost through reduced capital investment as well as increased economies of scale
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CONCERNING BIO-SECURITY, SANITATION AND HYGIENE

- Bird diagnosis kit for first aid/epidemic prevention, so as to prevent deaths within the flock.
- Brooder emission disinfection/utilisation, to reduce the chance of ill health to chicks.
- More energy efficient and easier methods of sanitation of farm, and chicken house space.
- Increased access to vaccinations and more efficient method of administration.

Market Linkages and Existing Schemes

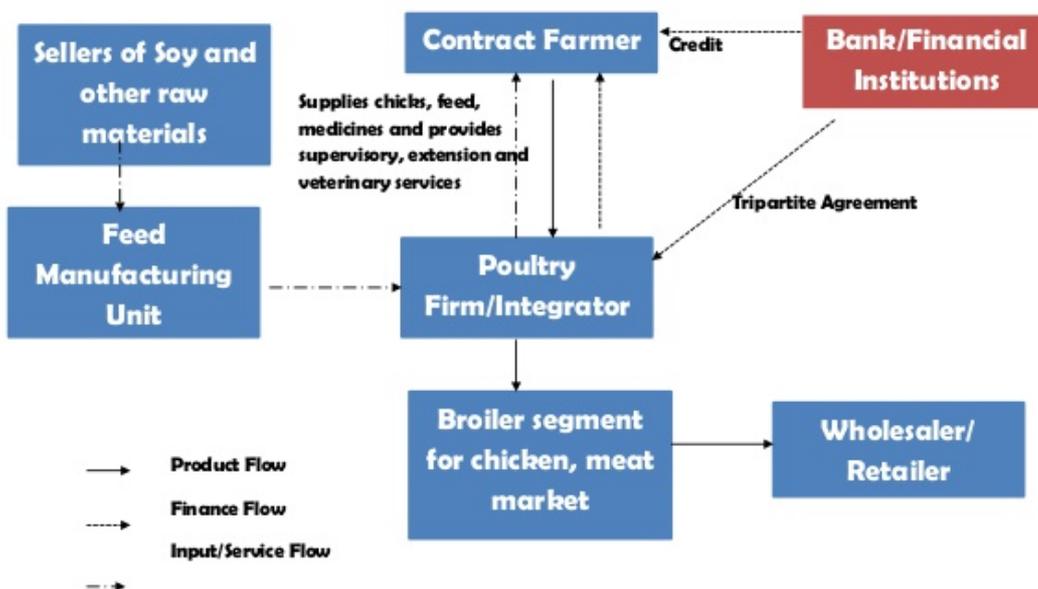
There have been several programmes and poultry schemes with the aims of improving the business and livelihoods of backyard poultry farmers, of which are supported by local NGO's or current governments (state and central)

Vertical integration/contract farming

Contract farming involves the integrator investing in the entire supply chain on a smaller scale. While the poultry farmers will then invest in the infrastructure and equipment needed to set up, the integrator will provide day old chicks, feed, medicines/vaccines, training/cost management and technical supervision. The farmers are paid an agreed price for growing the chickens to a suitable size, usually 42 days old, at which point the integrator will take the broiler chickens to be sold to the wholesaler market. Many new farmers have begun to emerge and take the scheme forward as it bares many advantages.

In this model there are no intermediaries as it goes directly from farmer to integrator to wholesaler, with no extra costs being added to the farmer's profits. Additionally the farmer gets paid a fixed rate from the integrator and is therefore not prone to price fluctuations that may occur in the market. At current, the south of India has undertaken 80% of integration, west 70%, north 10% and east 50%. The largest facilitators of these schemes are Venkateshwara Hatcheries, Godrej, Suguna, Shanti, Taffa, Arumbagh, and skylark.

Contract farming: broilers



-fig 5. The diagram illustrates the integrating process undertaken by broiler farmers and private integrators.

NECC

An association that many initiatives have been deployed through is the The National Egg Coordination Committee (NECC). There are over 25,000 poultry farmer members associated. It functions in a similar fashion and ideology to a trade union, bringing farmers from all over India together to, solve poultry and market related issues. As of current, the NECC operates in market intervention, price support operations, egg promotion campaigns, and consumer education.

National livestock mission

The purpose of this programme is to improve by quantitative and qualitative measure, an improvement in the livestock and poultry production systems and capacity building of all stakeholders. The mission will support any initiative that aims to increase the productivity of livestock and improve the support the overall development of the poultry industry.

NABARD poultry venture scheme:

The scheme aims to strengthen the poultry industry by increasing employment in low employment areas by funding and promotion of new poultry farms. Additionally the scheme aims to upgrade the equipment used to a more technologically advanced standard in order to boost productivity and income generated. They also promote the rearing of other avian livestock such as quail, turkey, and ducks in order to boost output and incomes.

The scheme is open to be applied to by farmers, individual entrepreneurs, NGO's, private limited companies, cooperatives, groups of organised and unorganised sectors. The scheme is made affordable and fundable in a number of ways:

- Entrepreneurs contribution (margin) for loans upto Rs.1 lakh, banks may not insist on margin as per RBI guidelines. For loans above Rs.1 lakh: 10% (minimum).
 - Back ended capital subsidy 25% of outlay
 - Effective bank loan (excluding eligible subsidy as above) balance portion, minimum 40% of outlay
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Bank Loans:

Both SBI bank and the Bank Of India offer loans for farmers wishing to start a poultry farm. The aim of the funding is to improve access to poultry training, establish and expand, layer, broiler, hatchery farms and processing units.

- For The Bank Of India loan- those eligible are individual farmers, agricultural labourers (trained or experienced in poultry), and individual partnerships and limited companies.
- For SBI, the focus of provision is slightly different-instead the loan focuses on providing for the purpose of constructing poultry sheds, feed room and other equipment. The repayment period is paid over 5 years and eligibility only requires that you have adequate experience in poultry farming or shed construction.

Ecosystem Mapping

Ecosystem Aspect	Nature of Stakeholder*	Justification for nature of stakeholder selected	Name of Partner
Finance	End User (Cooperatives/ Crowd Sourcing/ MFIs/ CSR/ Bank/debt/ other)	The stakeholder offers low interest loans and grants for poultry farmers. They are also very accessible for both NGO's and farmers alike.	SBI bank, Bank Of India, NABARD,
Implementation partners (Service provider - depending on project - market linkage/channels of implementation)	NGO (Not-For-Profit)	SELCO Foundation is capable of implementing poultry solutions. TATA trust, is now involved in poultry solutions (financing tribal womens poultry company)	SELCO foundation, TATA trust,
	Enterprise (For Profit)	SELCO India is capable of implementing solar powered poultry solutions. If solution is orientated towards poultry integration, then the indicated companies offer financing and setup for this.	SELCO India Integration partners include: Venkateshwara Hatcheries, Godrej, Suguna, Shanti, Taffa, Arumbagh, and skylark
Capacity Building	End-user	NABARD, are invested in improving output through tech and also in employment through capacity building	NABARD
Policy	(ThinkTanks/ Civil Society/ Institutes/ Govt.)	This committee acts as a large trade union for poultry workers and would likely be the best candidate to take solutions to a policy level through.	The National Egg Coordination Committee.

Conclusion

It can be assumed that to improve the overall prospects of the backyard poultry farming industry requires multiple interventions deployed and supported by different entities, therefore the need for a developed ecosystem surrounding the backyard poultry industry is imperative. The document outlines both the issues and potential opportunities that exist for backyard poultry farmers. From this we can understand that both technology and biosecurity issues are largely due to the capital gaps and inefficiencies that exist when comparing small and large scale poultry farmers. This could be solved by innovating and investing in energy efficient decentralised equipment that is able to match the standards and quality of commercial equipment.

Additionally it was identified that the farmers lack the proper training that would result in a fruitful poultry business, which often made them leave the trade. To resolve this, training schemes were identified which would help to raise the skill level of the farmer so that they could maximise output and reduce inefficiency. Another large difference between larger poultry farms and smaller farms is that the latter had a much larger market reach than the smaller farms to sell their output, as well the investment capacity and funds to start a farm. Promotion of vertical integration initiatives in combination with joining forces with organisations such as the NECC and NABARD, would help to give a farmer the capacity to start farm in the first place and then maintain it with a supporting foundation following this.



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