An Optimized Model to reduce the operational loss-Supply Chain of Boiler Production

PADIDDAM ANAND REDDY*[1], MAHAK BHATIA[2]
NIRWAN UNIVERSITY, JAIPUR[12]
DEPARTEMENT OF MATHEMATICS[12]

ABSTRACT

Supply chain faces a challenge in terms of sustainability of food supply such as management of waste product and environmental issues. For the production of chicken and its supply there is a need of assimilated supply chain. In India poultry industry is the fastest growing agro-based industry. Supplying of broiler to the shops and marketing is the complicated task. The study conducted focuses to reduce Feed Conversion ratio, weight loss and mortality rate. To increase profits to the retailer's operational research techniques has been employed in the broiler supply chain.

Key words: optimization, broiler, supply chain management, logistics

I. INTRODUCTION

World Chicken Growth Rate World chicken production grew at an unusual rate of 4.5% in 2019 in large part due to surging production in China to make up for lack of pork in the wake of African Swine Flu. Since then, production increases have moderated in China while the problems associated with COVID reduced production increases everywhere. As a result, there was no increase at all in world production this year. Growth is expected to accelerate to 1.8% in 2022, a level that is probably close to the long-term rate of growth that can be expected. With world population increasing at 1% per year, a growth rate of 2% for chicken would mark a continued increase in world per capita consumption.

A. Background of study

India is one of the leading producers of poultry meat in the world. The increase in the average income and the urban population has led to a tremendous increase in the poultry demand and a steady increase in consumption over the years. In 2021, the consumption of poultry meat in India was found to be over four million metric tons.

1) India's poultry stock: To meet the growing demand, the poultry population in the country has grown at a rapid pace. In 2003, the poultry and livestock population in India were almost the same but the poultry sector has grown a lot more comparatively ever since. In 2019, the population of poultry in India was over 800 million. This was a 16 percent increase over the last five years. In 2019, the Indian state of Tamil Nadu had the largest population of poultry in India accounting for more than 100 million.

2) Poultry trade in India: India exported more than 7,000 metric tons of poultry meat to other countries. Even though the volume was high, it was less than the volume exported in 2016. For the same period, import of poultry meat was low but followed an increasing trend shown in below fig.1.

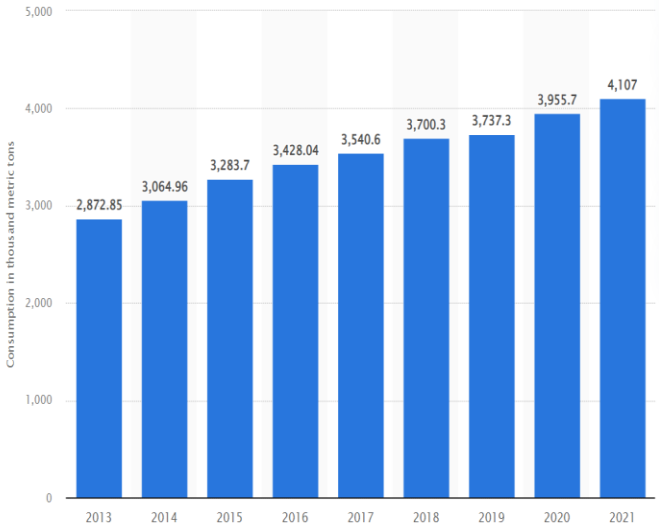


fig.1 poultry meat in India from 2013 to 20121

Source: Retrieved from https://www.statista.com/statistics/826711/india-poultry-meat-consumption/
Although vegetarianism is the commonly accepted typecast for India due to its majority Hindu population, only about 400 million Indians were estimated to be vegetarians. A large portion of the population across all religious groups, including Hindus consumed meat in one form or another. Despite the country having one of the lowest per capita meat consumptions in the world, its southern state of Telangana recorded 98.8 percent of its people as meat-eaters, higher than in countries like the United States or Australia. On the other hand, the volume of meat consumed in the state was far lower than industrial countries. Asia ranked the highest in meat production. However, in India poultry contributed to nearly half of the country's meat production. As an emerging market and estimated from the livestock census, the gross value added from livestock was about seven percent.The Indian poultry market, consisting of broilers and eggs reached a value of INR 1,988 Billion in 2020. Looking forward, the Indian poultry market to grow at a CAGR of 15.2% during 2021-2026.India today is one of the world's largest producer of eggs and broiler meat. The poultry industry in India has undergone a major shift in structure and operation during the last two decades transforming from a mere backyard activity into a major industry with the presence of a large number of integrated players.
Source: Retrieved from (https://researchandmarkets.com/, 2022)

II. SIGNIFICANCE OF STUDY

Broiler meat in the past had been considered to be a delicacy but as a result of increasing levels of urbanization and higher levels of disposable incomes, poultry meat is increasingly seen as less of a luxury product and more as a daily staple. Further with changing food habits and increasing exposure to global cuisines, the Indian population is increasingly converting to a non-vegetarian diet. Poultry meat is preferred over other meat products as it is considered more hygienic and is available throughout the year across the country at relatively lesser prices than fish/mutton. The annual per capita consumption of broiler meat and eggs remains one of the lowest in the world and is significantly lower than many emerging and developed markets. As a result of the low penetration levels and continuously increasing income levels, however, we expect the per capita consumption of both broiler meat and eggs to increase continuously during the next five years. Growth in the food services market such as restaurant and fast food joints are also creating a positive impact on the consumption of broiler meat and eggs. Both broiler meats as well as eggs represent important ingredients in both traditional Indian non-vegetarian recipes as well as fast foods. Eggs represent an important ingredient in bakery foods. The Indian bakery foods market is currently exhibiting strong growth rates. We expect the growth of the bakery foods market to create a positive impact on the consumption of eggs in India.

III. SUPPLY CHAIN MANAGEMENT IN POULTRY

Supply Chain management is the integration of supplier, manufacturer, distributor and the customer. The supplier sends the raw material to the manufacturer who in turns manufactures the products and then sends the delivery to the customers.

IV. OBJECTIVES

1. Decrease feed conversion ratio and increasing body weight.
2. Proper management in minimizing mortality rate and culled rate.

V. LITERATURE REVIEW

1) Forward Supply Chain: The forward Supply chain (FSC) is the process that starts from raw materials collection to the final consumption of the finished product (Cox, Blackstone, and Spencer 1995) It also links together the internal and external partners of suppliers, carriers, investors, policymakers, intermediaries' companies and information systems providers. A key point in supply chain management is that the entire process must be viewed as one system (Lummus and Vokurka, 1999) In summary, the forward supply chain is a step-by-step process of converting raw materials to finished goods (Kocabasoglu, Prahinski, and Klassen 2007) In the same way, the poultry forward chain start with collecting parent stock breed followed by collecting hatched eggs from parent breeder, hatch the eggs in the hatchery, distribute it to farmers through middlemen, rearing them for certain time by the ultimate farmers and selling meat and eggs to the ultimate customers. The smoother the supply flow is, the more benefits start to come to relevant companies to achieve sustainability.
2) Reverse Supply Chain: Recently, supply chain (RSC) was a step towards integrating the issues of disposal, recycling; and remanufacturing of reject wastages or products (Kocabasoglu, Prahinski, and Klassen 2007) It includes the consideration of product re-design, manufacturing by-products, byproducts produced during product use, product life extension, product end-of-life, and recovery processes at end-of-life (Linton, Klassen, and Jayaraman 2007) Experts are calling it a reverse supply chain which has become an area of academics over the last two decades (Tibben-Lembke and Rogers 2002, Stock and Mulki 2009) An inspiring review work in the supply chain was published in the early nineties by the Council of Logistics Management (Stock 1992), while Carter and Elram (1998) have traced indications of scientific interest in the field to the early seventies. Reverse Logistics (RL) is associated with a holistic set of activities like recycling, repair, reuse and reprocessing, as well as collection, disassembly and the processing of used products, components and/or materials (Kokkinaki et al. 2001) It is evident in the literature on the automobile industries, electronic goods (such as cell phone), paper recycling, sand recycling and even carpet recycling industries, all of which display high percentages of product return and hence room for optimal and eco-efficient policies (Aghalaya, Elias, and Pati 2012) Like the above industries, poultry industry generates tonnes of wastes like litter, waste feed, feather, reject eggs, intestines etc. (Shamsuddoha 2011a) There is little literature dealing with poultry wastes reusing or recycling. This research demonstrates the benefits of further usage of poultry wastes which farmers used were dumped into river water and vacant land.

VI. CASE STUDY

Sneha is one of the biggest suppliers of poultry in Telanagana state and the production and processing of the poultry is one of the largest. The market of the poultry is so big that they export the poultry to all cities and towns of Telangana. Poultry productions have gone up in Telanagana as the consumption of mutton has gone down due to its price. The number of small manufacturing enterprises (SME) is still large in number throughout the supply chain. The firm is considered as small manufacturing enterprise if the number of employees is less and therefore the number of SME are more as they have around 200 employees working twenty four hours. The competition in the market is high as there are large enterprises that have almost 90 percent market share in state. The poultry market in Telanagana has more profit as compared to any other meat. Also the raw material in the poultry processing is cheaper. The size of the enterprises is small yet the number is more. Therefore, the competition in the market is tough. (Wijnands, Meulen & Poppe (2007) Also, the company is providing fresh chicken to the market hence the poultry sold is comparatively more as it is fresh. It is very important for the supply chain management to have their own transportation so that they do not rely on the outsourced companies. The supply chain management is based on the demand management. (Buhr, B. L. (2003) As mentioned earlier, the demand of the poultry is high therefore it is vital for the company to cope with the demand and supply management in order to sustain in the market.

Customer plays an important role in the supply management as the end product goes to the customer. They should be happy and satisfied with the end product and also the services. (Chen, IJ & Paulraj, A (2004) The customer satisfaction can be divided into three elements like before transaction satisfaction, satisfaction at the time of transaction and satisfaction after the transaction. The customers who are satisfied will give more business.

1) Integration of material flow and the information: In the company the supply chain management should be able to communicate the information correctly and also the transportation of materials should happen smoothly. (New, S. (2004) The information exchanged should be accurate, adequate and timely.

2) Risk Management should be effective: another way in which the company can evaluate the performance is by the risk factors minimization as there are number of risks involved in the supply chain. If the risks are managed properly, they increase the sustainability of supply chain in the market. (New, S. (2004)

3) Supplier Performance: it is important for the company to have the supplier who is efficient and have good time management. Apart from this the relationship between the supplier and the company is also important. (Sadler & Hines (2002) It is important to have good relationship between the chicken supplier and the chicken processors.

A. Challenges faced in Poultry industry

1) High feed costs: Due to high cost maize and soya feed cost is probably one of the most serious challenges for the industry.

2) Disease outbreaks: Disease outbreaks and implementation of bio-security programs, although the extent and also types of disease outbreaks can vary in different parts of the world. In addition, diseases of metabolic origin including ascites and skeletal disorders are of importance as well.

3) Issues related to water: Sever Issue related to water in terms of both quality and quantity.

4) Limited Access to the Core Markets: It is all because of the limited access to the worldwide markets which is barrier in the way of these farmers. As they get little return on what they sale, so they never try to improve the quality of the poultry products and farms. Various significant improvements can be made in these production systems through the use and implementation of the most advanced and scientific practices.

5) Water, Electricity and Disease Control issues: The sector now faces a number of issues and difficulties including water, food, electricity and other major problems. In addition to the challenges posed by the various pathogenic diseases, the farmers also face the problem for low capital. Help from the side of the government and other investment institutions, is all that is needed by them for ensuring health growth and development conditions for the domesticated animals.

B. Challenges faced by the industry

Only seven per cent of the broilers are further processed into chicken products. This volume is not going up due to lack of cold chain availability and traditional consumption habits. People still like to buy a live bird slaughter and cook in their own way. Note on Poultry Industry in India Strictly Private and Confidential Other key challenges faced by industry include high feed costs, inadequate cold chain and transportation infrastructure, high vulnerability to disease outbreaks and highly volatile realizations affecting cash flows. Poultry is one of the fastest growing segments of the agricultural sector in India currently. As per industry sources, the domestic poultry market in India is valued at between USD 6-7 Billion of which chicken (meat and eggs) account for 90% of the market. Chicken meat is growing at a faster pace than other meats like mutton, beef and pork. During the last ten years chicken meat production grew at a compound annual growth rate (CAGR) of ~ 8% compared with mutton (4.9%) and pork (2.8%) Beef production grew at 8.8%, primarily driven by exports. In India, Chicken is considered a much healthier source of animal protein than mutton, beef and pork, the last two of which are avoided by Hindus (80.5% of India's population) and Muslims (13.4% of India's population) respectively for religious reasons.

C. Key facts on Indian Poultry Industry

India is now the third largest egg (~ 66 Billion eggs, per capita egg consumption at ~55 eggs) and fourth largest poultry meat (~3.4 Million tons, per capita consumption close to 2.8 kg per annum) producer. Total chicken population has registered an annual growth of ~ 8% in the last decade. Organized sector accounts for nearly 70-80% of the total

poultry output in the country and this is growing at a much faster pace. Poultry processing is now close to 20% of total broiler production, the rest being where the live chicken are marketed within a limited radius of the farm. With modern techniques and changing from live bird to fresh chilled and frozen product market the poultry sector in India is changing from a backyard activity to large scale integrated poultry farming. As per ICRA, the India arm of Moody's, the domestic broiler meat demand is expected to grow at around 15-18%, while table egg demand is expected to grow at 5-7% in medium to long term.

D. The key factors responsible for the growth of the sector include

- Increasing urbanization
- Increasing penetration of QSRs (Quick Service Restaurants)
- Continued increase in proportion of working women
- Changing lifestyles with preference towards convenience food
- Higher purchasing power

E. Ways to boost the body weight of broilers

1. Sort the broilers according to their body size and weight
2. Formulate and give them an excellent broiler feed
3. Use broiler growth promoter or enhancer
4. Avoid starving the broiler chickens
5. Procure quality broiler chicks from reputable sources

Source: Retrieved from (https://livestocking.net/)

F. Standard broiler feed chart

All broiler farmers want their broiler chickens to be big while they earn optimal profits from the birds. To achieve this, it is important to know the right or expected quantity of feed to give broiler chickens which usually comes as a broiler feed consumption chart. This is required to avoid wastage or overfeeding as well as allow the farmers to plan how to buy or produce feeds for the chickens.

TABLE.1

BROILER GROWTH CHART

Broiler Weekly Feed Intake Chart and Weight / Growth Chart

Age (Week)	Feed Consumed Per Bird (kg)	Cumulative Feed Consumed (kg)	Average Body Weight Per Bird (kg)	Average Body Weight Gain Per Bird (kg)
Week 1	0.167	0.167	0.185	0.185
Week 2	0.375	0.542	0.465	0.280
Week 3	0.65	1.192	0.943	0.478
Week 4	0.945	2.137	1.524	0.581
Week 5	1.215	3.352	2.191	0.667
Week 6	1.434	4.786	2.857	0.666
Week 7	1.593	6.379	3.506	0.649
Week 8	1.691	8.070	4.111	0.605
Week 9	1.715	9.785	4.649	0.538

Sources: Retrieved from https://livestocking.net/ , (2022)

- A broiler will consume approximately 1.2 kg of feed (broiler starter + grower) from week 1 to week 3
- A broiler will weigh about 1.52 kg at the end of week 4
- A broiler chicken will eat about 8.6 kg of feed (broiler finisher) from week 4 to week 9
- A broiler will have an average body weight of 4.65 kg at the end of week 9

VII. METHODS AND MATERIALS

In this paper to study the growth rate and Feed conversion ratio , I have selected an integrated farm in jagdevpur, siddipet district, Telanagana state.

Total housing capacity of the farm is 6220 chicks. Total age of chick is 51 days.

Feed consumption ratio can be calculated mathematically

$$\text{FCR} = \frac{\boldsymbol{total\ feed\ intake\ (gm)}}{\boldsymbol{total\ body\ weight\ (gm)}}$$

Total body weight = number of chicks + average weight of a bird

Below chart shows age, feed consumption, body weight and mortality given in below chart.

A. First week Broiler record

TABLE.2

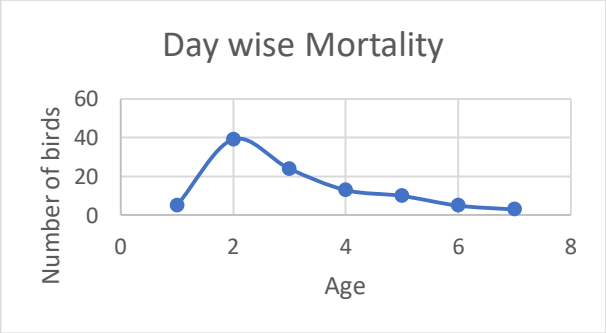
FIRST WEEK BROILER RECORD

First week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
1	6036	5	5	13	17	45	45	0.38
2	6031	39	44	30	34	65	60	0.56
3	5992	24	68	51	51	85	75	0.68
4	5968	13	81	76	76	110	100	0.76
5	5955	10	91	105	105	135	105	1
6	5945	5	96	138	130	160	140	0.93
7	5940	3	99	175	151	190	165	0.92

First seven days are brooding session. Birds need 32^0C temperature during 1 to 3 days. From 4 – 6 days temperature maintenance should be 29^0C to 31^0C. This is a crucial that a greater number of mortalities takes place at this period. Brooding Management in Poultry is done in the first **14 days** period of the broiler poultry life which is the most sensitive period because the bird is changing from an immature system to a mature system. For a better and profitable poultry production we can't ignore Good Brooding Management practice. Pre starter feed had been given to the chicks. Chick housing area from day 1 to day 3 is about 20 x 50 feet. By the day 7 housing area increased to 25 x 50 feet.

First vaccine has to be given on 8^{th} day.

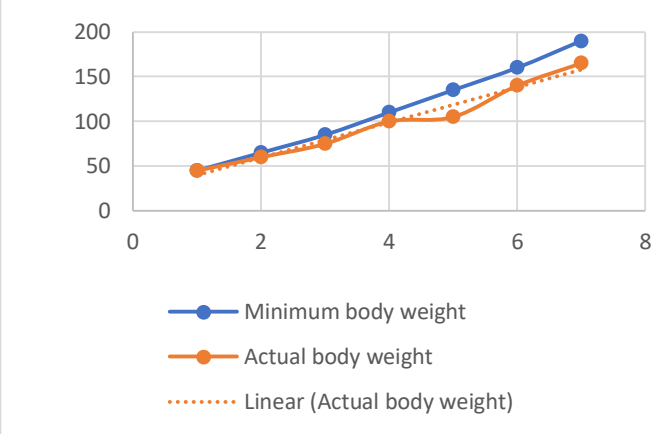
1) Day wise mortality



Graph.1 Day wise mortality

Graph.1 represents day wise mortality rate. From the age of 3 mortality rate gradually decreases. Initially the flock consists of week birds during first three days all the week birds are going to die.

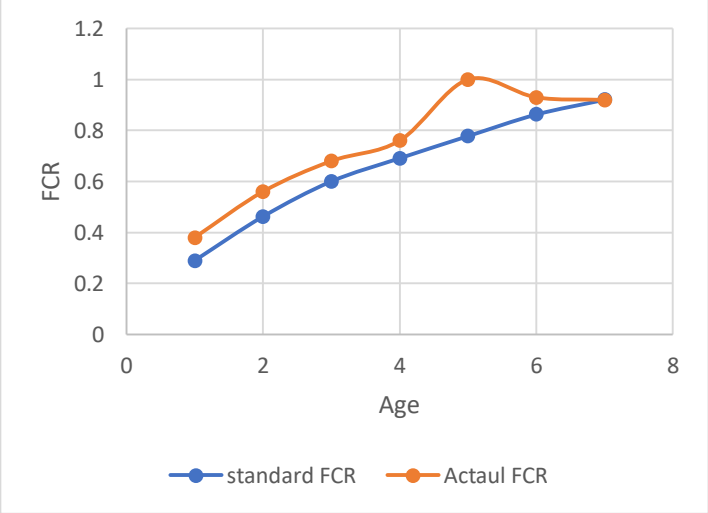
2) Body weight



Graph.2 Body weight

In the above graph.2 blue curve indicates minimum average weight of the chick and orange curve indicates actual body weight of the chick.

3) Feed consumption graph



Graph.3 FCR

In the above graph.3 blue curve indicates standard FCR and orange curve indicates actual FCR.

TABLE.3

FIRST WEEK SUMMARY

Average feed consumption	151 gm
Total feed consumption by all birds	5940 x 151 = 8,96,040 gm
Average body weight	165 gm
Total body weight	5940 x 165 = 9,80,100 gm
FCR	896040 / 980100 = 0.91
Total mortality percentage	1.64 %

Growth rate normal from day 2 to day 5 and growth slightly increased from day 6 to day 7.

B. Second week Broiler record

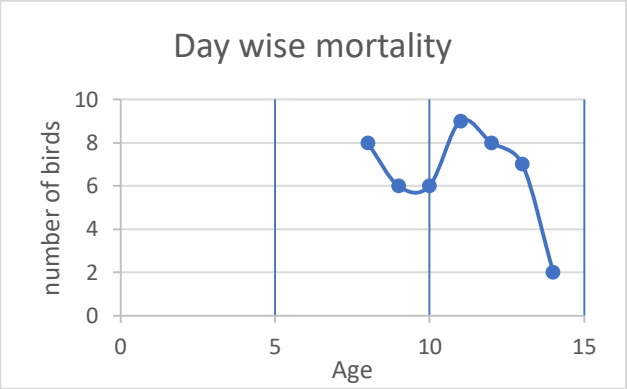
TABLE.4

SECOND WEEK BROILER RECORD

First week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
8	5937	8	107	215	202	225	190	1.06
9	5929	6	113	258	244	265	215	1.13
10	5923	6	119	305	286	300	250	1.14
11	5917	9	128	356	286	340	265	1.08
12	5908	8	136	411	371	375	300	1.24
13	5900	7	143	470	456	415	340	1.34
14	5893	2	145	534	456	450	350	1.3

Brooding session has been completed by the end of 14th day. Temperature has to be maintained during these days is 27^{0}C to 29^{0}C. This is the end of pre stater feed. By the end of 14th day housing area should be 30 x 90 feet. Broiler starter feed has been supplied to chicks after 14th day. Second vaccine has to be given on 14th day. Must and sanitize the poultry from 14th day onwards. Sanitizing reduces the number of germs on a surface to safe levels, according to health officials. This is done by using a commercial sanitizing product, such as chlorine bleach mixed with water.

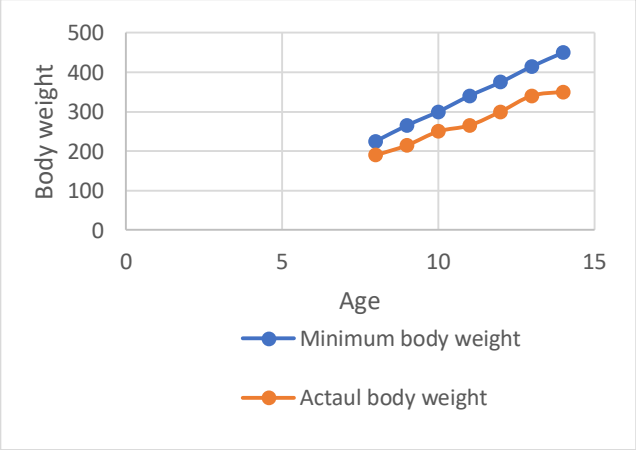
1) Day wise mortality



Graph.4 Day wise mortality

Above graph.4 shows mortality rate from day 8 to day 14. Mortality gradually decreased during the second week.

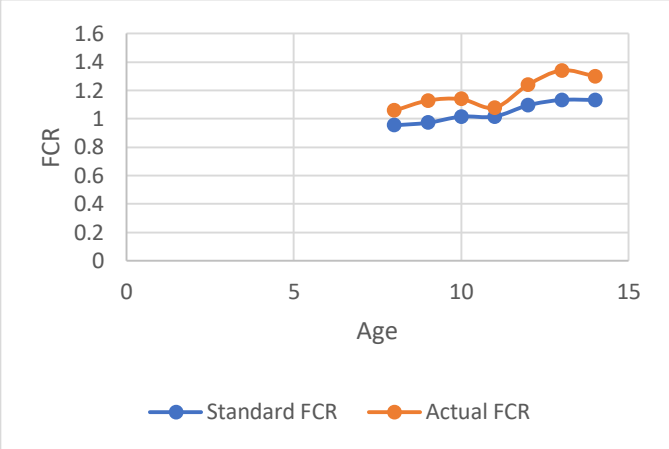
2) Body weight



Graph.5 Body weight

Graph.5 represents body weight of broiler from day 8 to day 14. On the day 10 – 11 and day 13 – 14 body weight got decreased due shortage of feed. It may leads weight loss of the broiler.

3) Feed consumption graph



Graph.6 FCR

Graph.6 represents FCR during second week.

TABLE.5

SECOND WEEK SUMMARY

Average feed consumption	456 gm
Total feed consumption by all birds	5893 x 456 = 26,87,208 gm
Average body weight	350 gm
Total body weight	5893 x 350 = 20,62,550 gm
FCR	2687208/2062550 = 1.3
Total mortality percentage	2.37 %

Growth rate normal from day 8 to day 10 and growth rate gradually decreased from day 10 to day 14.

C. Third week Broiler record

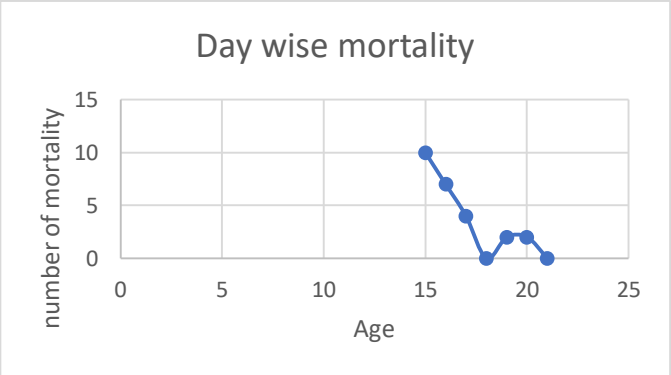
TABLE.6

THIRD WEEK BROILER RECORD

Third week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
15	5891	10	107	603	516	500	380	1.35
16	5881	7	113	677	584	550	420	1.39
17	5874	4	119	756	652	610	470	1.39
18	5870	0	128	840	744	670	530	1.4
19	5870	2	136	929	838	730	600	1.4
20	5868	2	143	1023	940	790	650	1.45
21	5866	0	145	1122	1042	860	700	1.49

By the end of day 21 housing capacity of flock should be 250 x 30 feet. Each and every bird require 1.25 square feet. Slowly chick converting into broiler at this stage. This is the initial stage of broiler.

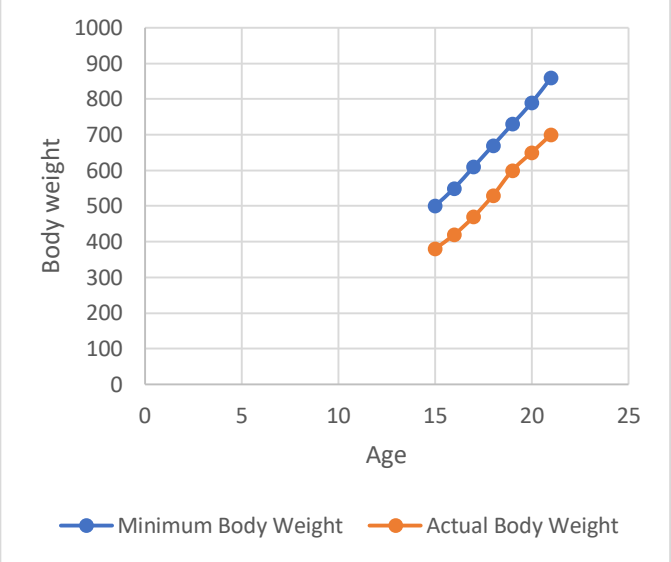
1) Day wise mortality



Graph.7 Day wise mortality

Above graph.7 shows day wise mortality rate during from day 15 to day 21. On day 18 and 21 mortality rate was zero.

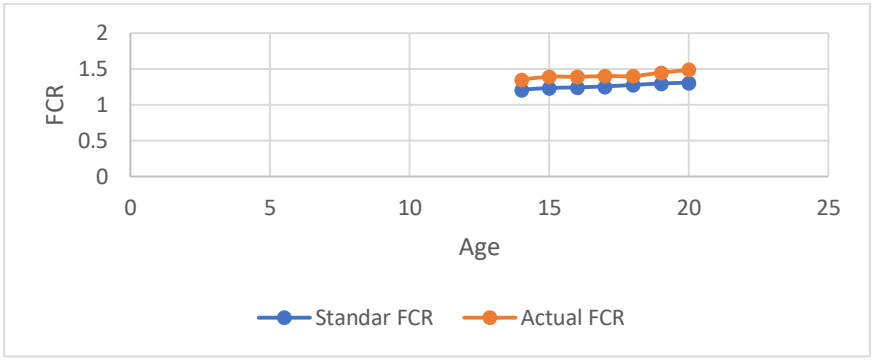
2) Body weight



Graph.8 Body weight

Here body weight changing constantly day to day. The difference between standard body weight and actual body weight was very high. G-Bromin medicine has been given to the birds for body weight. Mix 1 ml for every 1 litre of water with aloe vera juice which is used for body metabolism.

3) Feed consumption ratio



Graph.9 FCR

Above graph.9 comparison between Standard FCR and actual FCR.

TABLE.7

THIRD WEEK SUMMARY

Average feed consumption	1042 gm
Total feed consumption by all birds	5866 x 1042 = 61,12,372 gm
Average body weight	700 gm
Total body weight	5866 x 700 = 41,06,200 gm
FCR	6112372/ 4106200 = 1.49
Total mortality percentage	2.81 %

D. Fourth week Broiler record

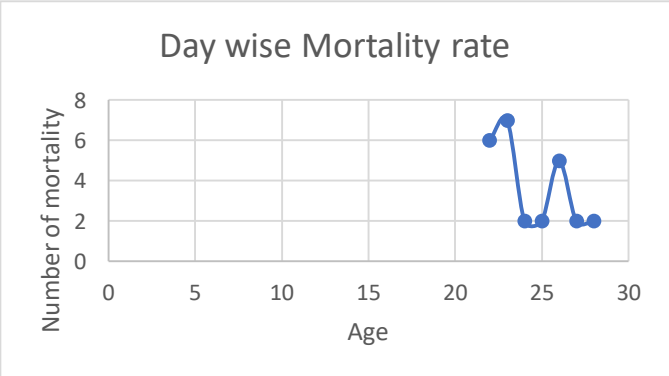
TABLE.8

FOURTH WEEK BROILER RECORD

Fourth week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
22	5866	6	176	1226	1161	930	780	1.49
23	5860	7	183	1335	1238	1000	835	1.48
24	5853	2	185	1447	1357	1070	880	1.54
25	5851	2	187	1564	1476	1150	935	1.57
26	5849	5	192	1686	1587	1230	1000	1.58
27	5844	2	194	1813	1715	1310	1090	1.57
28	5842	2	196	1946	1843	1375	1180	1.56

The above table shows the broiler record from day 22 to day 28.

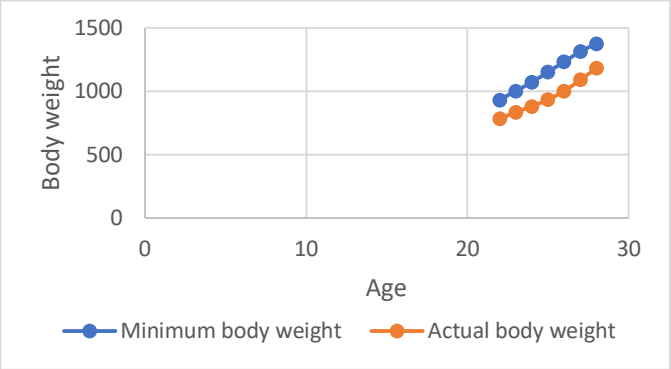
1) Day wise mortality



Graph.10 Day wise mortality

Above graph.10 shows mortality rate gradually decreased in this week. Average mortality in this drop to 3.

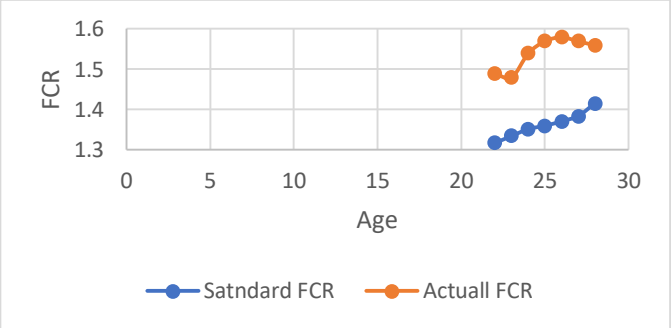
2) Body weight



Graph.11 Body weight

Above graph.11 shows the comparison of standard body weight and actual body weight during day 22 to day 28.

3) Feed consumption ratio



Graph.12 FCR

TABLE.9

FOURTH WEEK SUMMARY

Average feed consumption	1843 gm
Total feed consumption by all birds	5842 x 1843 = 1,07,66,806 gm
Average body weight	1180 gm
Total body weight	5842 x 1180 = 68,93,560 gm
FCR	10766806 / 6893560 = 1.56
Total mortality percentage	3.19 %

E. Fifth week broiler report

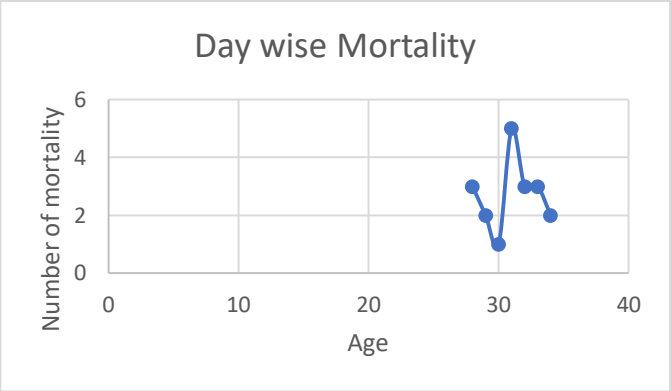
TABLE.10

FIFTH WEEK BROILER RECORD

Fifth week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
29	5840	3	199	2084	1963	1460	1290	1.52
30	5837	2	201	2229	2109	1540	1400	1.50
31	5835	1	202	2380	2255	1640	1490	1.51
32	5834	5	207	2538	2401	1730	1580	1.52
33	5829	3	210	2702	2547	1810	1670	1.52
34	5826	3	213	2872	2710	1890	1760	1.54
35	5823	2	215	3049	2881	1980	1850	1.56

Above table.10 gives fifth week broiler record. In this week feed supplement has to be changed. Broiler finisher has to be given to the flock. Body growth increased according to the feed consumption.

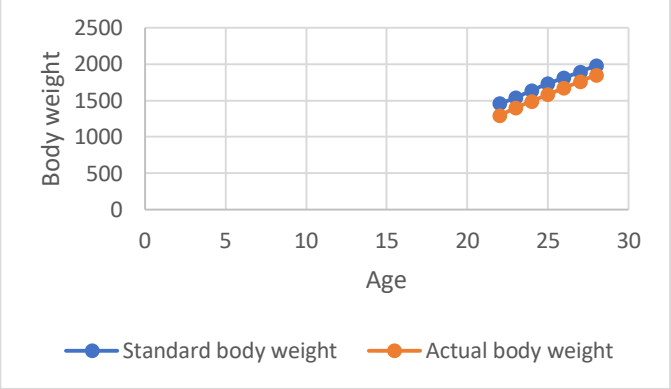
1) Day wise mortality



Graph.13 Day wise mortality

From the graph.13 it concludes that the mortality rate constant during lifting period.

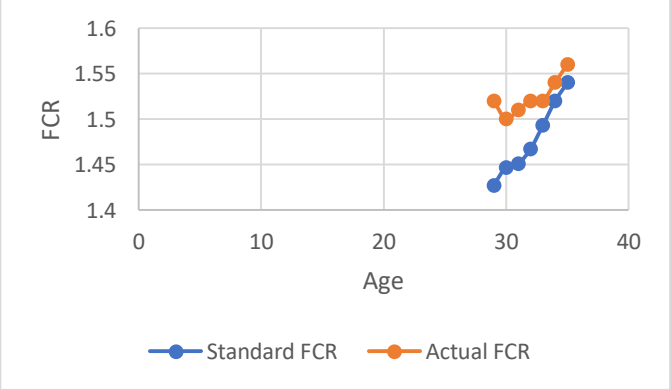
2) Body weight



Graph.14 Body weight

By above graph.14 it concludes that standard body weight and actual body weight nearly same.

3) Feed consumption ratio



Graph.15 FCR

Above graph.15 shows comparison Standard FCR and Actual FCR. Both FCRs are different on day 28 but the FCRs are nearly equal by the end of week.

TABLE.11

FIFTH WEEK SUMMARY

Average feed consumption	2881 gm
Total feed consumption by all birds	5823 x 2881 = 1,67,76,063 gm
Average body weight	1850 gm
Total body weight	5823 x 1850 = 1,07,72,550 gm
FCR	16776063 / 10772550 = 1.56
Total mortality percentage	3.56 %

F. Sixth week Broiler record

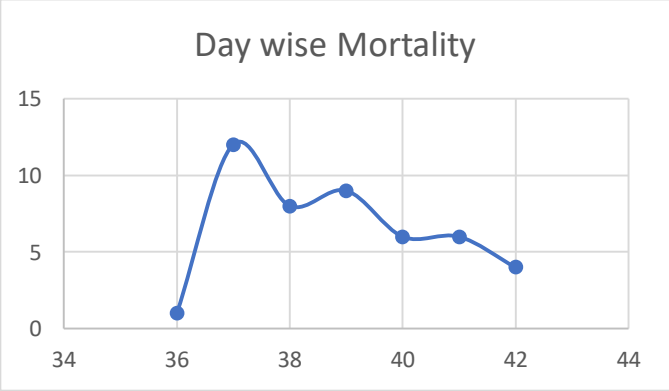
TABLE.12

SIXTH WEEK BROILER RECORD

Sixth week								
Age	No. of chicks	Mortality		Feed intake(gm)		Body weight		FCR
		Day	total	Min	act	min	Act	
36	5821	1	216	3231	3044	2060	1930	1.57
37	5820	12	228	3417	3216	2150	2010	1.6
38	5808	8	236	3607	3397	2240	2100	1.62
39	5800	9	245	3801	3578	2330	2190	1.63
40	5791	6	251	3999	3750	2420	2280	1.64
41	5785	6	257	4201	3931	2510	2370	1.65
42	5779	4	261	4407	4104	2600	2450	1.67

This is the last week of batch. Each bird in the shed has an average weight of 2.450 kgs. This is the time to sell the birds in the markets.

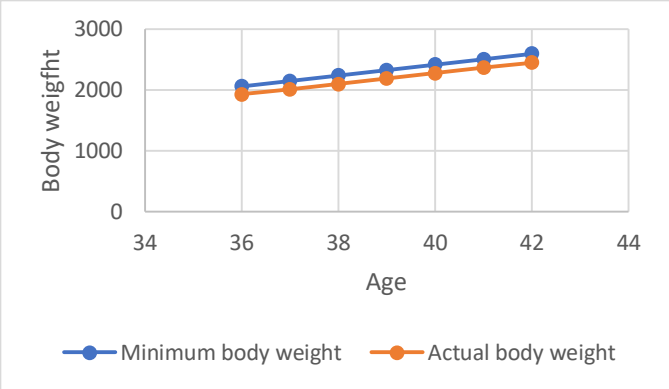
1) Day wise mortality



Graph.16 Day wise mortality

Above graph.16 gives information about day wise mortality. Mortality rate from day 37 to day 42 was slightly increased.

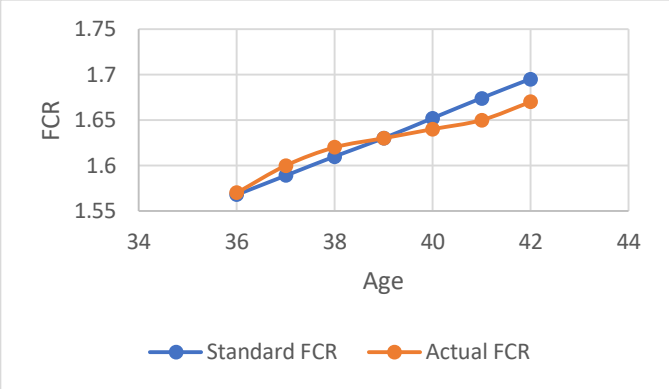
2) Body weight



Graph.17 Body weight

Above graph.17 shows comparison between standard body weight and actual body weight.

3) Feed consumption ratio



Graph.18 FCR

From the above graph.18 it concludes that actual FCR is much less when compare standard FCR which gives good results.

TABLE.13

SIXTH WEEK SUMMARY

Average feed consumption	4104 gm
Total feed consumption by all birds	5779 x 4104 = 2,37,17,016 gm
Average body weight	2450 gm
Total body weight	5779 x 2450 = 1,41,58,550 gm
FCR	23717016 / 14158550 = 1.675
Total mortality percentage	4.32%

TABLE.14

STANDARD VALUES

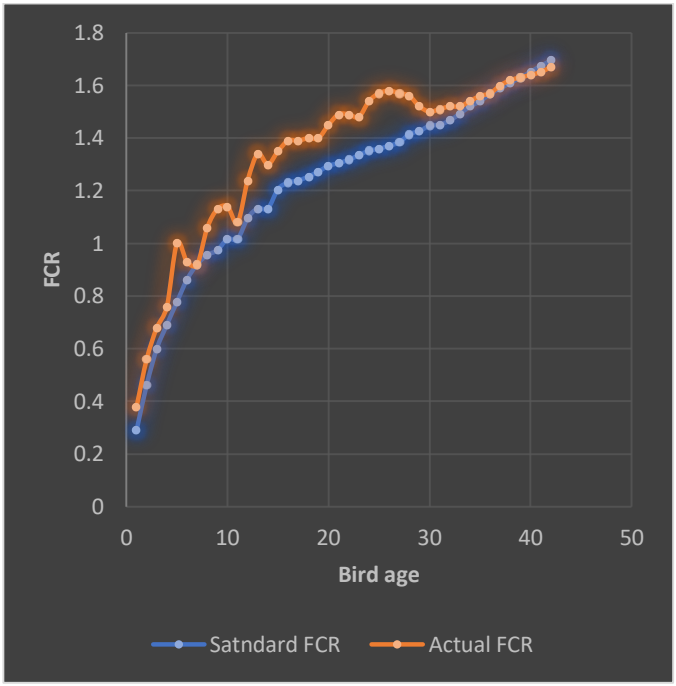
Standard CFCR	1.6
Standard body weight	2 kg
Standard mortality	5 %
Extra incentive per each bird below standard mortality	60 /-
Standard price per kg	95
Amount cutting per bird for above standard mortality	30 /-
Amount per kg at standard price rate and CFCR	5.95 /-

Converted Feed Consumption ratio (CFCR) can be calculated using mathematical formula

$$\text{CFCR} = \frac{\textbf{\textit{Standard flock weight} - \textit{Actual body weight}}}{4} + \boldsymbol{FCR}$$

VIII. RESULT ANALYSIS

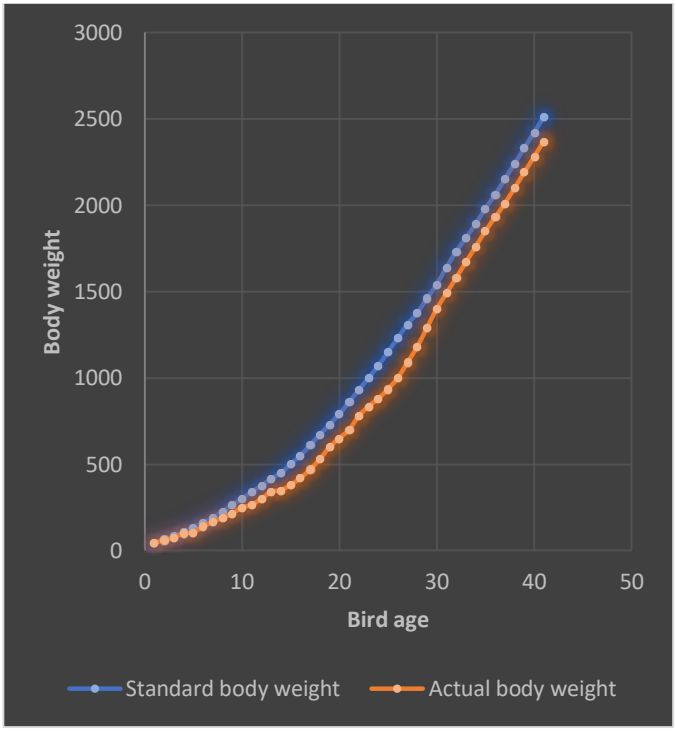
A. Comparison between standard FCR and Actual FCR



Graph.19 FCR comparison from day 1 to day 42.

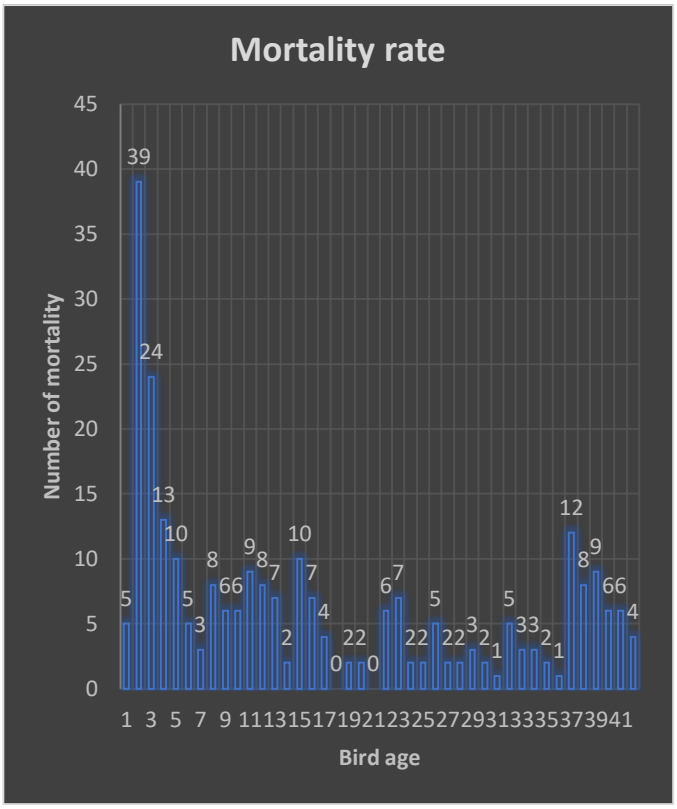
Above graph.19 shows Comparison between standard body weight and actual body weight.

B. Comparison between body weight



Graph.20 Body weight comparison from day 1 to day 42

C. Day to day mortality rate comparison



Graph.21 Mortality rate from day 1 to day 42

D. Standard values

Standard flock weight = 2 kg

Actual flock weight = 2.45 kg

Actual FCR = 1.675

CFCR $= \frac{2-2.45}{4} + 1.675$

$= \mathbf{1.5625}$

Incentive for mortality:

Total mortality percentage : 4.32

Excess mortality %= Standard mortality % – total mortality %

= 5 – 4.32

= 0.68 %

Incentive $= \frac{0.68 * total\ birds}{100} * \mathbf{60}$

$= \frac{0.68 * 6036}{100} * \mathbf{60}$

= 2462.688 /-

Extra incentive per kg = (Standard FCR – Actual FCR) x 5.95

= (1.6 – 1.5625) x 5.95

= 0.223125 /-

Amount per kg = Standard amount + extra incentive

= 5.95 + 0.223125

= 6.17 /-

Total amount for all birds = total weight x amount per kg

= 14158.550 x 6.17

= 87358. 25 /-

Total amount for complete batch

= total amount for all birds + mortality incentive

= 87358.25 + 2462.69

= 89820 /-

IX. CONCLUSION

Most of the poultry industries in Telangana are medium in size having unorganized supply chain network with lack of coordination among stakeholders. Industries are always concerned about the high cost of deployment associated with supply chains. Dynamic process, technology, infrastructures and whole supply chain network management involves huge financial capital which is almost unbearable to achieve in Telanagana. Telanagana poultry can integrate complete supply chain network so that they can compete with the local and global market and also reduce their operation cost. The model in this research shows the way of the integrating supply chains which gives high profits.

X. REFERENCES

[1] T. Pope, L. N. Loupe, P. B. Pillai, and J. L. Emmert. 2004. Growth Performance and Nitrogen Excretion of Broilers Using a Phase-Feeding Approach from Twenty-One to Sixty-Three Days of Age. Poult. Sci. 83:676–682.

[2] Fancher, B. I., and L. S. Jensen. 1989a. Influence on performance of three- to six-week-old broilers of varying dietary protein contents with supplementation of essential amino acid requirements. Poult. Sci. 68:113–123

[3] Warren, W. A., and J. L. Emmert. 2000. Efficacy of phase-feeding in supporting growth performance of broiler chicks during the starter and finisher phases. Poult. Sci. 79:764–770.

[4] L. Niki, Loupe and Jason L. Emmert. 2000. Growth performance of broiler chicks during the starter and grower phases in phase-feeding. vol. 01, article 7, pp. 20-25.

[5] Retrieved from https://chickenpoultry.net/some-folk-methods-of-poultry-farming. 2022.

[6] Retrieved from https://www.agrifarming.in/poultry-diseases-causes-symptoms-and-control (admin@agrifarmin.in) 2022.

[7] Retrieved from https://thepoultrypunch.com/2020/10/indian-poultry-industry-challenges-problems-and-opportunities/ . 2022.

[8] Mohanty, S. & Rajendran, K. 2003. 2010 vision for Indian poultry. International Journal of Poultry Science, 2(2): 139 – 143

[9] Wolstenholme, Eric F. 1990. System Enquiry: A System Dynamics Approach. New York, USA: John Willey & Sons

[10] Hurria Yassin Negash. 2012. Using Management Information in Broiler Supply Chains. pp. 21 – 53.

[11] Lee, H. L., and S. Whang. 2000. 'Information Sharing in a Supply Chain'. Int. J. of Technology Management. 20:373-387.

[12] Vieira, S. L., and E. T. Moran Jr. 1998a. Eggs and chicks from broiler breeders of extremely different age. App. Poultry Res. 7:372-376.

[13] Wilson, H. R. 1991. Interrelationships of egg size, chick size, post hatching growth and hatchability. World's Poultry Science J. 47:5-20.

[14] McCown R. L. 2002. Changing systems for supporting farmers' decisions: problems, paradigms, and prospects. J. of Agric. Syst. 74: 179–220.

[15] R. Srinivasa Rao. 2015. Trends and challenges of poultry industry. vol. 01, No.1: 8-13.