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Economics of the production of protein rich extruded chicken meat puffs

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Abstract
The cost of production of calcium enriched extruded chicken meat puffs was calculated taking the assumption that per day production of the product was 100 kg. To estimate accurate cost of production of extruded chicken meat puffs under commercial conditions, the cost of expenditure in terms of recurring and non-recurring cost including raw material cost, labour charges, water and electricity charges, depreciation on machineries, rent of the premises and packaging cost was taken under consideration. the cost of formulation of 100 kg control product incorporated with 10% chicken meat powder was Rs 13,178/- and the cost of production of 100 kg puffs incorporated with 10% chicken meat powder and 1% egg shell powder was Rs 13,328/-. Therefore, total expenditure including the formulation cost, cost of machineries (depreciation cost), cost of water and electricity, packaging cost, labour cost, premises rent and miscellaneous cost for preparation of 100 kg extruded chicken meat puffs incorporated with 10% chicken meat powder (control) was Rs 16,498/- and for 100 kg extruded chicken meat puffs incorporated with 10% chicken meat powder and 1% egg shell powder (T-1) was Rs 16,648/- The final cost of production for 1 Kg chicken meat puffs was app. Rs 168/Kg and the cost of production of calcium enriched product was app. Rs 175/Kg. Break-even point for this complete project was Rs. 49,022.26/- and cost benefit ratio was calculated as 0.52. Return on investment was calculated as 11% for the first year of the project after paying all the expenditure and interest on the capital invested.

Keywords: Healthy, recuring, snacks, packaging, sale, cost benefit ratio

Introduction
Extruded chicken meat puffs were developed in the present study. This product was developed by the ingredients and method as described by Kamal *et al*., (2025) [3]. Chicken meat puffs are protein rich snack-based products and may serve as alternative to the carbohydrate and fat rich snacks prevalent in market. Sensory qualities of the snack products are very important to be popular among the consumer. Cost of the food product is also equally important for the broader consumer base (Goswami *et al*., 2025) [2]. Protein rich cheaper food products are needed in the developing countries like India where the purchasing power of most of the people is lower and the population has the problem of protein malnutrition (Vellakkal *et al*., 2015) [7].
Development of technology of food products depends not only on its general sensory qualities but also on its nutritive value and cost of production. Taking these points in considerations, the cost of production of calcium enriched extruded chicken meat puffs was calculated taking the assumption that per day production of the product was 100 kg. To estimate accurate cost of production of extruded chicken meat puffs under commercial conditions, the method described by Poodari *et al*. (2019) [4] was applied. The cost of expenditure in terms of recurring and non-recurring cost including raw material cost, labour charges, water and electricity charges, depreciation on machineries, rent of the premises and packaging cost was taken under consideration.

Materials and Methods
Source of Materials
The recurring and non recuring cost involved in the process of preparation of calcium enriched chicken meat puffs was calculated. Non recuring cost include rent of the processing plant and cost of processing equipments, under this head depreciation in the cost of machinery @ 10% per year was considered (Singh *et al*., 2016) [6]. Recuring cost included the cost of raw materials, labour charges, electricity charges, water charges, packaging material used for the preparation of chicken meat puffs (Verma *et al*., 2015; Singh *et al*., 2016) [6, 8]. The raw materials required for the preparation of chicken meat puffs included - corn flour, chicken meat powder, table salt, ginger and garlic powder, egg shell powder, vegetable oil and food grade colour.
These raw materials were procured from the local market at prevalent market rate. The chicken meat powder and hen egg shell powder were prepared in the laboratory. The chicken meat powder was prepared by the method as described by the Kamal *et al*., (2025) [3], whereas the hen egg shell powder was prepared by the using the following procedure.

Preparation of Hen Egg Shell Powder
Egg shells were procured and cleaned to remove any dirt and then stored in a refrigerator. These egg shells were then boiled for about 10 -15 minutes to make them safe for consumption and remove any source of infection. The white

foam that formed during boiling was removed from the water which left the egg shells clear of any layering. The egg shells were then kept for drying for a few hours to drain any water present in the egg shells. These egg shells were then heated in an oven at 155 degrees Celsius for 30 minutes. This completely dry the egg shells and removes moisture from the egg shells along with the sterilization (Rahmawati and Nisa, 2015) [5]. After drying, the egg shells were crushed using a mortar and pestle to obtain crushed egg shells. These crushed egg shells were then put in a grinder to obtain a fine egg shell powder. Then the egg shell powder was filtered through a fine sieve to obtain a fine powder to remove grittiness. This powder This was stored in the air tight jars and was later incorporated into the extruded chicken meat puffs as per the formulation.

Results and discussion

Calculation of Raw Material Cost

Raw materials are the basic ingredients in the manufacture of any food product. The raw materials required for preparation of calcium enriched extruded chicken meat puffs are corn flour, chicken meat powder, table salt, ginger and garlic powder, egg shell powder, vegetable oil and food grade colour. The retail prices for these ingredients are variable and at higher side in our marketing system. However, the cost of these ingredients can be lowered if purchased in bulk quantities from distributors/whole sale agents (Al-Hattami *et al*., 2020) [1]. The cost of raw materials is presented in Tables 1.

Table 1: Cost of formulation for 100 Kg calcium enriched extruded chicken meat puffs

Ingredients	Price (Rs/kg)	Control (10% CMP)		T-1 (10% CMP, 1% ESP)	
		Qt.(kg)	Rs.	Qt.(kg)	Rs.
Corn flour	50	67.5	3375	66.5	3325
Chicken meat powder	800	10	8000	10	8000
Table salt	20	1.5	30	1.5	30
Ginger and garlic powder (1:1)	1100	1.0	1100	1.0	1100
Egg shell powder	200	____	____	1.0	200
Vegetable oil	95	5.0	475	5.0	475
Food grade colour	990	0.2	198	0.2	198
Total			13,178		13,328

Therefore, the cost of formulation of 100 kg control product with 10% chicken meat powder was calculated as Rs 13,178/- and the cost of formulation of 100 kg treatment product that is meat puffs with 10% chicken meat powder and 1% hen egg shell powder was calculated as Rs 13,328/-

Cost of processing equipments

The essential machinery for the preparation of extruded chicken meat puffs includes twin screw extruder, deep freezer, meat mincer, tray drier etc. The approximate cost of these equipments are presented in Table 2.

Table 2: Cost of processing equipments

Sr No.	Equipment	Cost (Rs.)
1	Twin Screw Extruder	15,00,000
2	Deep freezer	60,000
3	Meat mincer	5,000
4	Sealing machine	3,000
5	Tray drier	1,00,000
6	Knives, utensils, furniture etc.	50,000
7	Weighing balance	2500
	Total	17,20,500/-

Thus, the total cost of all the equipment that are used for the manufacture of the product is Rs 17,20,500/-. A 10% depreciation is considered on the cost of processing equipments every year. Depreciation in a year in terms of money is Rs. 1,72,050/- per year. The per day depreciation cost is calculated as Rs. 470/-.

The processing plant/ premises rent was considered as Rs. 10,000 per month. Therefore, per day rent cost will be Rs. 330/-.

Cost of electricity

The electricity is required for the operation of various processing equipments and adequate illumination of the working space. The electricity charges presently are approximately Rs 8/KWH under industry category use. The cost of electricity incurred for production of 100 Kg of extruded chicken meat puffs can be calculated as shown in Table 3.

Table 3: Cost of electricity

Equipments	Watt x Hours	KWH/ unit
Deep freezer (2)	1000 x 24x2	4.8
Extruder	15000 x 1	15
Mixer	7000 x 1	7
Meat mincer	1000 x 1	1
Tray drier	1000 x 48	48
Light, fans etc.	400 x 10	4
Sealing machine	100 x 2.0	0.2
Total		80

Therefore, the total electricity charges were calculated as (Rs. 8/unit): 80 x 8= 640.00/- per day

Other recuring expenses
The approximate cost for the utilization of water was Rs. 50.00 per day. 04 labourer were employed for the preparation of chicken meat puffs and cleaning of utensils and processing plant. The daily wages Rs. 320/person therefore the total labour charges were 1280/- per day. The LDPE pouches were used for the packing of the finished product; therefore, the cost of packaging material was Rs. 300/ day. A miscellaneous cost of Rs. 250/day was also included in the recuring expenditure.

Total expenditure for the preparation of 100 Kg product
The sum of all the above expenditures incurred in the preparation of 100 kg of control and treatment chicken meat puffs as calculated above are shown in the Table 4.

Table 4: Total expenditure for the preparation of 100 Kg product

Parameter	Control (10% CMP)	T-1 (10% CMP, 1% HESP)
Raw materials cost	13178	13328
Cost of machineries (Depreciation cost)	470	470
Cost of electricity	640	640
Packaging cost	300	300
Labour cost	1280	1280
Cost of water	50	50
Premises rent	330	330
Miscellaneous cost	250	250
Total expenditure	16, 498/-	16,648/-

Therefore, total expenditure for preparation of 100 kg extruded chicken meat puffs incorporated with 10 % chicken meat powder (control) is: Rs 16, 498/- and the total expenditure for preparation of 100 kg extruded chicken meat puffs incorporated with 10 % chicken meat powder and 1% egg shell powder (T-1) is: Rs 16,648/-

Calculation of the final cost of the product
During the preparation of products there are loses in the form of evaporation of moisture, spillage, shape deformation etc. these losses are considered at 5% weight of the total formulation giving the product yield of around 95% i.e. 95 Kg product was prepared from the per 100 kg of the total raw material used.

$$\text{Cost of 1 kg product} = \frac{\text{Total expenditure}}{\text{Product yield}}$$

- Cost of 1kg Control product (10% CMP) = 16, 498/ 95 = Rs. 168.34
- Cost of 1kg T1 product (10% CMP, 1% ESP) = 16,648/95 = Rs. 175.24

Let us assume the selling price of the developed extruded meat puffs to be Rs. 270/kg.

Total income from 100 kg extruded meat puffs = Total sale price of 100 kg product – Total cost of production of 100 kg product
= (270 x 100) – (175.24 x 100) **= Rs. 9,476/-**

Total profit on the sale of 100 Kg chicken meat puffs
= Total income – retailer's commission @ Rs.2 per packet (i.e. 100 x 2 = Rs. 200)
= 9476 – 200 = Rs. 9276/- (for 100 packets of 1kg each)
For calculating the total profit in month, 25 working days for the production of extruded chicken meat puffs are considered, therefore total profit per month will be equal to (9276 x 25) that is Rs 2,31,900/-

Calculation of net profit
For the calculation of total project cost, the fixed cost and variable cost of the project was taken into account that were Rs. 17,20,500/- and Rs. 4,38,100/- (17,524 x 25). Therefore, the total project cost was Rs. 21,58,600/-. Keeping the loan amount of 20,00,000.00 @ 8% interest per annum = Rs.20,00,000+Rs.1,60,000=Rs.21,60,000/-. Amount of loan repayment per month is Rs.21,60,000/12 =Rs.1,80,000 /- (for 12 months only). Therefore the Net Profit/month was Rs 2,31,900 (total profit in month) - Rs.1,80,000 (loan repayment per month)= Rs.51,900/-

Calculation of break-even point
For the net profit in an enterprise the level of sale of goods should be more than the break even point. Under this study the break-even point is calculated as Rs 49,022/- that is lower than the net profit (Rs.51, 900/-) of the business.

$$\text{Break Even Point (sales in Rs.)} = \frac{\text{Fixed Cost x selling price}}{\text{Total sales price – Variable cost}}$$

= 17,20,500 x 270 / 27,000 – 17,524
Break even point = Rs. 49,022.26/-

Cost benefit ratio
Cost benefit ration calculated under the present study is 0.52. Normally it should be more than one more the profitable venture but due to the inclusion of cost of loan repayment it has lower values

Cost benefit ratio = Total profit / Total cost of production
= **9276 / 17,524 = 0.52**

Return on investment (ROI)
The rate of return on the investment under the current study is 11%.
ROI = Net profit per year / working capital + fixed cost
= 51,900 x 12 / (17,524 x 25 x 12) + 1,72,050
= 0.11 i.e. 11% for the first year.

Conclusions
Manufacturing of nutritious and healthy snacks improves the overall wellbeing of the population specially the growing children. Preparation and sale of the extruded chicken meat puffs is also a profitable venture. The cost of production for 1 Kg chicken meat puffs was app. Rs 168/Kg and the cost of production of calcium enriched product was app. Rs 175/Kg.

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