# PRODUCTION OF DRIED CHICKEN MEAT PRODUCTS EXTENDED WITH DIFFERENT LEVELS OF SOYAFLOUR CONCENTRATION

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**Abstract**

This paper analyses the effect of soyflour concentration on costs and profits of the dried meat products.The main objective of present study is the production of low-cost dried meat products utilizing different levels of extenders like soyflour and comparison of production cost and economics of extended products with the control product. Dried meat products were prepared from a standardized formulation without soyflourto use as control and treatments with different levels of soyflour(2%,4%,6%,8% and10%) were used for to determine the most economic preparation. The results of sensory evaluation showed that all the all the treatments were acceptable. Economic analysis showed that extended dried meat were cheaper than control products and among the extended dried meat least cost(Rs.694.1/kg) was observed for soyflour concentration of 10%. The cost of production goes on decreasing with increase in extender concentrationdue to their higher yields and high level of replacement of lean meat. Investment analysis shows that there is scope for increasing profitability and feasibility of processing plant with low cost and economical formulation.

**Keywords: Dried meat; Soyflour; Economics; cost; Extenders, effect of treatments**

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## 1.Introduction

Meat is main source of animal protein. Changing lifestyles, urbanization, changing food habits have increased demand for processed and ready to eat meat products. Innovative processing techniques for meat resulted into the production of variety of meat products which are tasty with superior sensory qualities and convenient to eat. However, high cost of these products makes them unavailable for average consumer for their diet. Therefore development of low cost products assumes importance. Production of low cost, affordable tasty meat products can be achieved by careful selection and reformulation with extender. This has been proved in case of restructured meat products (Malav et al, 2013).

Dried meat technology is a type of products that makes the meat available round the year. But its high cost limits its application. Drying is a method in which meat is dried to remove moisture content to increase its shelf life.Dried meat products are madeby rubbing with salt, spice mixand other ingredients(NRCM 2007). The non-meat ingredients like curry leaf powder ,binder or extenders can also improve the taste, appearance, palatability, texture and functionality of the finished products along with reduction of cost. Besides nutritive value and sensory acceptability of meat product, cost is also very important criteria that determine marketability and also acceptability of any product. Therefore there is need to develop the products that are cost effective. Raw material is the major item of cost for any product. As drying losses account for more than 55% resulting in lower output of only 45% in dried products, raw material has very significant role to play in cost structure and resulting profitability of dried products. Hence reduction of raw material cost assumes significance for the production of low cost dried meat products. This can be achieved by preparing different formulations and comparing them for cost effectiveness.

Therefore in the present study the production cost of dried meat products utilizing different levels of soyflour concentration was compared with control, to determine the least cost combination of ingredients for the production of low cost dried meat products and effect of different levels of soyflour concentration on profitability and feasibility of dried meat products.

## 2.Materials and Methods

This research work is the part research project of first author. The data on inputs, and output yields, sensory scores were taken from experiments of second author conducted at NRCM. For achieving the objectives of the study the required data were collected from the experiments conducted with control and treatments and economics were worked out by various analytical techniques.

### 2.1.Experiment

Experiment was conducted with five treatments and control. Control was prepared by standard method and in treatments soyflour concentration was introduced at 2% level and was increased to 4%,6%,8% and 10% in five treatments.

#### 2.1.1.Formulations

Standard formulation for control: 1kg meat ,3%salt,0.25% turmeric powder, 0.25% curry leaf powder. Treatments were prepared by incorporating soyflour concentration of 2% 4%,6%,8% and 10% for first, second, third, fourth and fifth treatments. The meat content varies with soyflour concentration. Dried meat chunks were selected for the study to avoid interaction effect of value addition with further processing of dried meat products.

#### 2.1.2.Sensory evaluation

After preparing dried meat chunks with control and treatments, they were subjected to sensory evaluation by panelists using 8 point descriptive scale[13]where 8= extremely desirable and 1= extremely undesirable.

### 2.2.Analytical techniques

Data collected from the experiments was analysed with various economic tools. The preparation cost of soyflour treated dried products were calculated considering the ingredients, labour, machinery and other fixed costs utilized in the preparation of product to finally determine the most economical formulation. Data on project cost, cash flows were used to find out the viability of investment on small scale unit. Secondary data was used for outlining baseline assumptions.

Data was analysed using various economic measures. Financial efficiency measures like liquidity ratios, profitability ratios and investment ratios were employed for analysing financial viability of processing plant. Financial feasibility of investment was examined by using the regular project evaluation techniques like Net Present Value (NPV), Internal Rate of Returns(IRR), Benefit –Cost Ratio(B-C ratio), Payback Period etc.

## 3.Results and Discussion

**3.1.Formulation cost**: The comparative cost structure for preparation of 1 Kg control and treated dried products is presented in Table 1. These costs are related to total raw material costs on fresh weight basis. This is cost does not take into consideration output yields. It differs with raw material cost on dry weight basis which take into account yields of the product. Raw material cost on fresh weight basis includes the cost of raw materials required for preparation of dried products which are chicken meat, table salt, spices mixture, curry leaf powder. The formulation cost of 1 Kg product was Rs.242, 239, 237, 234, 232 and 230/kg for control and treatmentswith 2% 4%,6%,8% and 10% soyflourrespectively.

**Table1 :Formulation costs of dried products under different treatments**

| **Ingredient** | **Control** | **Treatments** | | | | |
|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** |
| Chicken meat | 1 | 0.98 | 0.96 | 0.94 | 0.92 | 0.9 |
| Salt(%) | 3 | 3 | 3 | 3 | 3 | 3 |
| Turmeric(%) | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Curry leaf powder(%) | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Soyflour(%) | 0 | 2 | 4 | 6 | 8 | 10 |
| **Total cost of formulaton(Rs)** | **242** | **239** | **237** | **234** | **232** | **230** |

It was found that formulation cost for treated product were less than control product and among the treatments least cost was for treatment with 10% soyflour concentration. Less formulation cost for treatments as compared to control product was due to the fact that all the extender(soyflour) was much cheaper than deboned chicken meat. Among the treatments also lowest formulation cost was observed for treatment with highest percentage of extender i.e 10% soyflour concentration. Further inverse relation is observed between cost and extender concentration. This is due to the fact that replacement of high cost meat with low cost extender.

### 3.2.Investment analysis

Using the comparative raw material costs in presented in table 1, investment analysis was carried out for the production of dried chunks on a small scale unit with different concentrations of soyflour for evaluating effect of soyflour concentration on costs and prices and investment feasibility and profitability of processing units. The results of investment analysis are presented and discussed below

#### 3.2.1.Project cost

Project cost for the production of dried chunks on small scale unit with different raw material costs resulting from different concentrations of soyflour are presented in table 2

**Table 2: project cost for small scale unit for dried meat production under different soyflour concentrations**

| S.No | | Control | | Treatments | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2% | | 4% | | 6% | | 8% | | 10% | |
| | **Description** | Total | % | Total | % | Total | % | Total | % | Total | % | Total | % |
| 1 | Land and Fencing | 1.20 | 10.48 | 1.20 | 10.49 | 1.20 | 10.50 | 1.20 | 10.50 | 1.20 | 10.51 | 1.20 | 10.51 |
| 2 | Building | 4.00 | 34.93 | 4.00 | 34.97 | 4.00 | 35.00 | 4.00 | 35.00 | 4.00 | 35.03 | 4.00 | 35.03 |
| 3 | Machinery and Equipment(M&E) | 3.30 | 28.82 | 3.30 | 28.85 | 3.30 | 28.87 | 3.30 | 28.87 | 3.30 | 28.90 | 3.30 | 28.90 |
| 4 | Miscellaneous Assets | 0.33 | 2.88 | 0.33 | 2.88 | 0.33 | 2.89 | 0.33 | 2.89 | 0.33 | 2.89 | 0.33 | 2.89 |
| 5 | Escalation &Contingencies | 0.88 | 7.69 | 0.88 | 7.69 | 0.88 | 7.70 | 0.88 | 7.70 | 0.88 | 7.71 | 0.88 | 7.71 |
| 6 | Preliminary&Preoperative Expenses | 0.55 | 4.80 | 0.55 | 4.81 | 0.55 | 4.81 | 0.55 | 4.81 | 0.55 | 4.82 | 0.55 | 4.82 |
| 7 | Working Capital Margin | 1.18 | 10.31 | 1.17 | 10.23 | 1.17 | 10.24 | 1.16 | 10.15 | 1.15 | 10.07 | 1.15 | 10.07 |
| | **Total cost(Rs.lakhs)** | **11.45** | **100** | **11.44** | **100** | **11.43** | **100** | **11.43** | **100** | **11.42** | **100** | **11.42** | **100** |
| | **Per kg(Rs)** | **169.6** | | **169.48** | | **169.33** | | **169.33** | | **169.19** | | **169.19** | |

It is evident from table 2 that Minimum of Rs. 11.45 lakhs is required for setting up of dried products unit with standard formulation/ control. This cost decreases with incorporation of extender. It also varies with level of concentration of extender. Project cost for different levels of concentration(2%, 4%, 6%,8% and 10%) were estimated as Rs. 11.44, 11.43, 11.43,11.42, 11.42 lakhs respectively.

It is observed from the table the project cost decreases from Rs. 11.45 lakhs (control/ without extender) to Rs. 11.44 lakhs. Further this cost shows difference among the treatments / extender concentrations. It goes on decreasing with increase in concentration of soyflour/extender. It decreases from 11.45 lakhs to 11.42 lakhs for decrease of extender from 2% to 10%.

Further investment pattern shows that all the except working capital margin all the cost items were kept constant for all the treatments. This working capital shows decreasing trend from Rs. 1.18 lakhs(control ) to 10.07 lakhs (10% concentration). This difference in working capital can be attributed to the differences in raw material costs arising from different levels of extender concentrations. As working capital is the only item of project cost that changes across treatments, differences in project cost can be attributed to raw material costs resulting from different concentrations of extender. Thus level of soyflour concentration affects the project cost through working capital.

Similar to total investment, Per unit investment also shows decreasing trend with level of extender. it decreases from Rs. 169.6 /kg(control) to Rs.169.19/kg(10%)

**3.2.2.Working capital requirement**

Table 3 presents the working capital requirement and contribution by different sources. From table3 it is evident that working capital requirement goes on decreasing with level of extender concentration showing lower raw material costs with increase in concentration.

**Table3 :Working capital requirement and finance**

| S.No | Description | Total | Bank | Margin |
|---|---|---|---|---|
| 1 | Control | 3.15 | 1.97 | 1.18 |
| 2 | 2% | 3.12 | 1.95 | 1.17 |
| 3 | 4% | 3.10 | 1.94 | 1.17 |
| 4 | 6% | 3.08 | 1.92 | 1.16 |
| 5 | 8% | 3.06 | 1.91 | 1.15 |
| 6 | 10% | 3.04 | 1.89 | 1.15 |

### 3.2.3.Cost structure

Overall expenditure incurredincluding raw material for the preparation of dried meat products was presented in table 4. It includes variables costs and fixed costs. All these costs (total and per unit) were same for all treatments except rawmaterial. The raw material cost here refers to cost on dry weight basis. It differs from cost presented in table 1 in such a it is calculated after taking into consideration final weight of the product. Raw material cost for control was estimated as Rs.537.8/kg. it is evident from table 3 that raw material cost decreases from with incorporation of extender to Rs. 531.1/kg . again it shows decreasing trend along with concentration where it decreases from Rs. 531.1/kg to Rs. 511.1/kg if concentration of extender increases from 10%.

Raw material is the major item of cost accounting for 74.59% of cost of production for control. This share of raw material varies with treatment. Its share decreases to 74.35% with incorporation of extender @2% concentration resulting in increased share of other major cost items like labour(8.87% to 8.95%) and depreciation (4.11% to 4.15%).

With in the treatments Its share varies from 74.35% to 73.64% for increases of extender form 2% to 10% . It also forms major cost (84.55% for control) across variable costs. Among the treatments Raw material share in variable costs decreases from 84.4% to 83.9% resulting in increased share of other variable costs like labour, packaging materials etc.

**Table4:Expenditure incurred in preparation of dried meat products under different treatments(Rs. Lakhs &Rs)**

| Description /Year | Control | | 2% | | 4% | | 6% | | 8% | | 10% | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Annl | Per kg | Annl | Per kg | Annl | Per kg | Annl | Per kg | Annl | Per kg | Annl | Per kg |
| Raw Material | 21.78 | 537.8 | 21.51 | 531.1 | 21.33 | 526.7 | 21.06 | 520 | 20.88 | 515.6 | 20.70 | 511.1 |
| Stores& package | 1.08 | 26.7 | 1.08 | 26.7 | 1.08 | 26.7 | 1.08 | 26.7 | 1.08 | 26.7 | 1.08 | 26.7 |
| Power | 0.45 | 11.1 | 0.45 | 11.1 | 0.45 | 11.1 | 0.45 | 11.1 | 0.45 | 11.1 | 0.45 | 11.1 |
| Utilities | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 |
| Wages and Salary | 2.59 | 64.0 | 2.59 | 64.0 | 2.59 | 64.0 | 2.59 | 64.0 | 2.59 | 64.0 | 2.59 | 64.0 |
| Repairs and maintenance | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 |
| Rent, Taxes&Insurance | 0.24 | 5.9 | 0.24 | 5.9 | 0.24 | 5.9 | 0.24 | 5.9 | 0.24 | 5.9 | 0.24 | 5.9 |
| Admin expenses | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Selling expenses | 0.86 | 21.2 | 0.86 | 21.2 | 0.86 | 21.2 | 0.86 | 21.2 | 0.86 | 21.2 | 0.86 | 21.2 |
| Interest on term loan | 0.54 | 13.3 | 0.54 | 13.3 | 0.54 | 13.3 | 0.54 | 13.3 | 0.54 | 13.3 | 0.54 | 13.3 |
| Interest on WC | 0.15 | 3.7 | 0.15 | 3.7 | 0.15 | 3.7 | 0.14 | 3.5 | 0.14 | 3.5 | 0.14 | 3.5 |
| Depreciation | 1.20 | 29.6 | 1.20 | 29.6 | 1.20 | 29.6 | 1.20 | 29.6 | 1.20 | 29.6 | 1.20 | 29.6 |
| P&P Amortization | 0.01 | 0.2 | 0.01 | 0.2 | 0.01 | 0.2 | 0.01 | 0.2 | 0.01 | 0.2 | 0.01 | 0.2 |
| **Total** | 29.2 | 721 | 28.93 | 714.3 | 28.74 | 709.6 | 28.47 | 703 | 28.2 | 698.5 | 28.11 | 694.1 |

**Note: Annl. -in Rs .lakhs and per kg - Rs./kg**

Table 5 presents the cost and price structure of different treatments. It presents cost of production of dried meat product after considering the product yield. As there is no much difference in yields, Product yield of 45% was considered for all the treatments after considering drying loss of 55%.

Total cost of production comes to Rs. 721/kg with variable cost of Rs. 636/kg and fixed cost of Rs. 84.8/kg. variable costs decreases to Rs. 629.4/kg with inclusion of soyflour as extender @2%. Among the treatments variable costs goes on decreasing with increase in extender. it further decreases to Rs. 609.3 /kg if extender concentration is increased to 10% resulting in decreased share of Variable cost. Its share decreases from 88.2% to 87.8%. Fixed costs account for 11.8% of total costs. Decrease in variable costs as a result of decrease in raw material cost results in increase of fixed costs as reflected by increased share of fixed costs from 11.9% to 12.2%.

**Table 5: Cost and price structure**

| **Particulars** | **Control** | | **Treatments** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2% | | 4% | | 6% | | 8% | | 10% | |
| | Rs/kg | % | Rs/kg | % | Rs/kg | % | Rs/kg | % | Rs/kg | % | Rs/kg | % |
| Variable costs | 636.0 | 88.2 | 629.4 | 88.1 | 624.9 | 88.1 | 618.2 | 87.9 | 613.8 | 87.9 | 609.3 | 87.8 |
| Fixed costs | 84.8 | 11.8 | 84.8 | 11.9 | 84.8 | 11.9 | 84.8 | 12.1 | 84.8 | 12.1 | 84.8 | 12.2 |
| Total cost (Rs/kg) | 720.9 | 100 | 714.2 | 100 | 709.7 | 100 | 703.0 | 100.0 | 698.5 | 100 | 694.1 | 100.0 |
| Selling price (Rs/kg) | 793.0 | | 785.6 | | 780.7 | | 773.3 | | 768.4 | | 763.5 | |

Overall cost of production per kg varies from Rs. 721 to 694.1/kg between control and treatments. Selling price at 10% markup comes to Rs. 793 /kg for control and similar to costs it also decreases with level of extender from Rs. 785.6/kg to 763.5/kg if extender concentration increases from 2% to 10%.

**Table 6: Decrease in costs in different treatments over control(Rs/kg)**

| **Particulars** | **Treatments** | | | | |
|---|---|---|---|---|---|
| | **2%** | **4%** | **6%** | **8%** | **10%** |
| Variable costs | 6.6 | 11.08 | 17.78 | 22.25 | 26.72 |
| Fixed costs | 0.0 | 0.01 | 0.02 | 0.02 | 0.03 |
| Total cost (Rs/kg) | 6.7 | 11.18 | 17.89 | 22.36 | 26.83 |
| Markup@10% | 0.7 | 1.12 | 1.79 | 2.24 | 2.68 |
| Selling price (Rs/kg) | 7.4 | 12.29 | 19.67 | 24.60 | 29.52 |

Overall cost structure shows that variable cost decreases by Rs. 6.6 /kg, 11.08, 17.78, 22.25, 26.72/kg for 2%, 4%, 6%,8% and 10% concentration of extender resulting in total cost decrease by Rs. 6.7, 11.18, 17.89, 22.36 and 26.83/kg respectively.

### 3.2.4.Elasticities of costs and prices

Table 7 presents the elasticities of variable costs, fixed costs, total costs and prices to raw material cost decreases. It shows responsiveness of variable costs, fixed costs, and total costs to the changes in raw material cost i.e by how much these variables decreases for 1% decreases in raw material cost.

From the table 7 it is evident that for 1% decrease in raw material cost, variable costs decreases by 5.33% and fixed costs decreases by 0.08% resulting in decrease of total cost by 5.41% for treatment with 2% of soyfour concentration. This responsiveness (% decrease) of variable costs to changes in raw material increases with level of concentration from 5.33 to 5.39% showing that decreases in variable costs increases with extender concentration.

**Table 7: Elasticities of cost and prices for changes in raw material costs**

| Particulars | Treatments | | | | |
|---|---|---|---|---|---|
| | 2% | 4% | 6% | 8% | 10% |
| Variable costs | 5.33 | 5.36 | 5.38 | 5.38 | 5.39 |
| Fixed costs | 0.08 | 0.05 | 0.03 | 0.03 | 0.02 |
| Total cost(Rs/kg) | 5.41 | 5.41 | 5.41 | 5.41 | 5.41 |
| Markup@10% | 0.54 | 0.54 | 0.54 | 0.54 | 0.54 |
| Selling price (Rs/kg) | 5.95 | 5.95 | 5.95 | 5.95 | 5.95 |

As against variable costs, responsiveness of Fixed cost goes on decreasing from 0.08% to 0.02% showing that fixed costs increases along with concentration. Overall increases and decrease responsiveness of variable and fixed costs results in overall responsiveness of total costs by 5.41. similar to costs, selling prices also shows responsiveness extender concentration through raw material costs. For 1% change in raw material cost while total cost decreases by 5.41%, the corresponding Selling price decreases by 5.95%

**Conclusions**

In this paper an attempt has been made to evaluate the effect of different levels of soyflour concentration on profitability of dried meat products. For this purpose five treatments with different levels of soyflour concentration were used and economics were worked out to find out the low cost formulation and its effect on profitability

- In sensory evaluation all the treatments turned out to be acceptable.
- Both total and per unit investment shows negative relation with level of extender.
- Expenditure analysis showed that both annual and per unit costs exhibits negative relation with level of extender
- Raw material is the major item of cost accounting for 74.59%, 84.55% of total costs and variable costs respectively. It shows negative relation with level of extender.
- Variable and fixed costs accounts for 88.2% and 11.2% of cost of production. While Variable costs shows negative relation and fixed costs shows positive relation with extender concentration showing that extender has effect on costs structure through variable costs.
- Economic analysis showed that the treatment with more concentration of soyflour(10%) costs less (694.1/kg) compared to other treatments( Rs.714/kg) and control(Rs.721/kg).
- Cost of production shows inverse relation with extender concentration due to their higher yields and high level of replacement of lean meat
- Elasticity of costs and prices were estimated as 5.41% and 5.45% i.e for every 1% increase in raw material costs, costs of production increases by 5.41% and selling price increases by 5.95%.
- Treatment/formulation withhigh level of soyflour concentration (10%) was most economical among the tested different formulationswith different levels of soyflour concentration.

The study has found that the concentration of extender has an effect on costs, prices and profitability of dried products. Study has established that low cost meat products can be produced with incorporation of high levels of extenders. Low cost dried meat products can be

produced with higher level of concentration which increases profitability and thus feasibility of processing units for dried meat production.

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