
UNIT 3 ECONOMICS OF PRODUCTION

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3.0 OBJECTIVES

After reading this unit, you will be able to :

- enumerate the factors which influence the economics of producing meat products;
- evaluate the relative advantages of value addition;
- access the utility of emulsion technology;
- use extenders to reduce the cost of production without affecting the sensory quality of meat products; and
- calculate the production cost of your meat products.

3.1 INTRODUCTION

It is very important to get good quality raw meat to prepare good quality meat products. Value addition is necessary to make comparatively better benefits in the meat business. You can buy cheaper meat from spent animals and still make very good comminuted meat products through the use of emulsion technology. Economic formulation through the use of non-meat extenders can reduce the cost of production while improving the juiciness, flavour and textural quality of meat products. Some extenders also have health promoting effect. You should be in a position to calculate the input cost in an enterprise. It helps us to fix the price after adding the cost of marketing and profit margins. In this unit, we shall discuss all these factors in detail to prepare you as successful meat entrepreneurs.

3.2 FRESH MEAT – THE RAW MATERIAL

Meat should be derived from healthy animals that are slaughtered at the right age for their species and breed. You can prepare best quality meat product from such meat. This meat is most suitable for chunk type and curried meat products. However, many a times you may have to deal with meat derived

from spent animals. Such a meat is tough due to the presence of comparatively more connective tissue. It can be easily utilized for the preparation of comminuted meat products. The tough texture of such meat is destroyed by grinding it in a mincer or by further treating it in a bowl chopper to prepare a fine emulsion. Preparation of an emulsion brings about coating of fat droplets by soluble meat proteins, resulting in lower cooking losses.

Cooking method is selected by the type of raw meat and the qualities desired in meat products. Tender cuts of meat such as pork chops, leg, chops of lamb, ground meat etc. are cooked by dry heat (roasting, broiling or frying). The product yield is relatively high due to comparatively less shrinkage. Roasting is also practiced on pork shoulder and loin, shoulder, rack and loin of lamb and cured ham. Frying is especially suitable for thin cuts of meat such as sliced steaks, mutton chops, chicken meat pieces etc. Relatively tough cuts of meat should be cooked in moist heat. Pressure cooking, stewing, simmering etc. are popular moist cooking procedures. Higher cooking temperatures can be achieved in pressure cooking facilitating the tenderization of tough cuts of meat.

3.3 VALUE ADDITION

Sale of fresh meat ensures only a limited profit to the producer. If this meat is processed in products of good appearance, palatability and presented in attractive packaging, the sale price and profit margins are considerably increased. So you should equip yourself with meat processing techniques and produce the processed meat products to offer variety, quality and convenience to the consumers. Processing of meat accrue many advantages in terms of providing variety, increase demand and marketability, better utilization of different cuts, incorporation of non-meat ingredients for quality and economy and distribution to cover larger population.

Processes such as deboning, size reduction, tenderization, seasoning and emulsion preparation and a variety of cooking methods are employed to produce a variety of processed meat products. Since, these processes are labour intensive, we tend to get better returns. Meat from spent animals is fairly tough and less palatable but it is cheaper. Preparation of value added products, particularly from minced meat or emulsion based is advantageous. Incorporation of other non-meat ingredients can improve palatability and also reduce the cost of production. A variety of emulsion based products such as sausage patties, nuggets, meat balls, slices, kababs etc., have been developed utilizing extenders.

A number of factors affect the economics of value added products: Cost of production includes the cost of raw materials, processing cost, packaging cost, scale of operation, infrastructure and working capital, while the marketing, transportation and sale prices determine the results. Availability of adequate raw materials in the area of production and a good distribution and marketing network can fetch us higher returns.

3.4 CORE COST CONCEPTS

This section discusses various cost concepts and procedures for performing a cost analysis. In particular this chapter presents terminology, definitions, discussion of the relationship between various cost concepts and possible management responses to improve the efficient delivery of services.

Direct Cost: Direct costs are those that can be specifically assigned to the service being examined; for example, wages and benefits of employees who deliver the service, the cost of a vehicle used exclusively to deliver the service and the cost of services and supplies consumed while providing the service.

Indirect Cost: Indirect costs commonly called overhead costs are those that are necessary for the function of the organization but are not uniquely or easily assignable to a specific service, the cost of departmental leadership and the cost of administering the government treasury.

Additional Cost Concepts: The concepts of direct and indirect costs provide a basis for one approach to cost analysis, an approach that stress the organizational structure of the jurisdiction. Additional cost concepts which view cost from other prospective are also helpful. The following table lists various approaches widely used in performing cost analysis.

Core Cost Concepts

Concept	Definition
Direct Cost	A cost that can be assigned specifically to a given or particular service.
Indirect Cost	A cost necessary for the functioning of the organization as a whole, but which cannot be directly assigned to one service.
Total Cost	The sum of all costs, direct and indirect, associated with the provision of a given or particular service.
Fixed Cost	A cost that does not change with increases or decreases in the amount of service provided. (e.g. rent, depreciation of plant, depreciation of equipment, overhead cost.)
Variable Cost	A cost that increases or decreases with increases or decreases in the amount of service provided. (e.g. Wages, insurance, travel, training, fuel, maintenance, supplies)
Sunk Cost	A cost that has already been incurred (e.g. the cost of a previously purchased computer system)
Marginal Cost	The increase in total cost associated with an increase in the amount of service provided (e.g. if a new computer report was requested, its marginal cost would be predominantly the cost of the time it would taken to programme it – assuming the computer was a sunk cost).
Avoidable Cost	The amount of expense that would not occur if a particular decision was implemented (e.g. if a clerk is laid off and a community is self insured for unemployment compensation, the avoidable cost is total direct salary less payments for unemployment benefits plus savings in employee benefits.)
Life-cycle Cost	The total of all cost associated with ownership of an item, including acquisition, operation and maintenance, over the life of the equipment, less the resale value, if any.
Unit Cost	The cost of production of one unit of a given service.
Opportunity Cost	The benefit that would have been received if an alternative cost of action had been pursued.

Relevant Cost	The appropriate cost concept for the particular problem at hand. E.g. for full cost recovery, total cost is the most appropriate cost concept.
Cost	The amount of money or other consideration exchanged for property or services.
Expense	A decrease in net total assets. Expenses represent the total cost of operations during a period, regardless of the timing of related expenditure.
Expenditure	A decrease in net current assets.

Cost Analysis: Cost analysis is the combined process of;

- Defining a service,
- Establishing the volume of the service,
- Settling on the relevant cost concept to address the perceived problem, and
- Determining the cost of some alternative to the existing service delivery pattern.

Cost analysis is a tool that can be used to provide cost information crucial to effective management. Since such needs change with the problems being addressed, it is to be expected that the type of cost information will vary with the nature of the problem. If the issue being examined is pricing a service to recover all costs, the appropriate cost concept will be total cost, since only total cost includes all of the various costs incurred in the delivery of a service. If the issue is minimizing costs of equipment, life cycle costing provides a method for identifying and minimizing the total cost of equipment ownership. Identify which cost concept is the most effective tool for addressing a given management problem (i.e. determining the relevant cost concept) is the key step in cost analysis.

Cost accounting: That method of accounting which provides for assembling and recording all the elements of cost incurred to accomplish a purpose, to carry on an activity or operation, or to complete a unit of work or a specific job.

3.5 ECONOMIC FORMULATIONS OF MEAT PRODUCTS

Economic formulations can play a major role in reducing the cost of production of the products. Use of non-meat extenders at appropriate level can ensure reduction in the formulation cost. A lot of non-meat food items can be incorporated in meat products with the basic idea to reduce the cost besides getting specific benefits of binder, emulsifier, stabilizer etc. In developing countries soy products, potato starch, and flours of wheat, rice, pea, gram etc., are used as fillers to reduce the cost of formulations. Due to high cost, extension of meat should be taken up on large scale in order to ensure the availability of meat products to the masses.

Extension of several meat products with ingredients of plant origin has been worked out in research laboratories without any adverse effect on the sensory quality. However, it should be declared in the list of ingredients. Meat sausages

and patties can be easily extended with rehydrated (water soaked) texturized soy protein or *soya badi* by replacing lean meat upto 15% in the basic formulation of chicken nuggets to reduce the production cost. Rice flour, pea flour, gram flour, sorghum flour, barley flour etc. can be made wet with equal amount of water and can be incorporated in place of meat at 5% level in the formulation of meat loaves.

These days our society has become very much health conscious. Incorporation of dietary fibre through the use of extenders can protect them from several diseases, especially obesity, heart problems, colon cancer etc. Some gums like sodium alginate, carrageenan, gum arabic etc. may help in producing low fat meat products. Phosphates can be used at 0.4% level in the formulation to improve the quality of emulsion and cooking yield. In general, meat extenders or fillers have beneficial effects on emulsion stability and yield but negative effect on product firmness. So we should use extenders within limits in order to safeguard the sensory acceptability of the product. Further, it should be clearly understood that these items have to be made wet with equal amount of water before use, otherwise juiciness of the product may be affected. You can very well incorporate meat byproducts in the formulation to reduce the cost. Alternatively, you can prepare economic product with some sacrifice in firmness and sale it at comparatively lower prices.

3.6 YOU CAN INCREASE COOKING YIELD

Cooking yield of a product is important as it directly influences its economics and acceptability. Higher cooking yield not only decreases the production cost but also increases the palatability through less loss of water, fat, flavour components and other nutrients during cooking. Such products are good in appearance, more juicy and have better sliceability. Emulsion based products with more than 90% cooking yields are rated as good whereas that of 85-90% cooking yields are tolerable.

Following measures should be adopted to increase the cooking yield:

- i) We should use meat having good functional properties.
- ii) We should use correct product formulation having optimum lean meat to fat ratio.
- iii) Meat, fat and byproducts should have been stored at 0-5° C before the start of processing.
- iv) Frozen meat should be properly thawed before mincing.
- v) We should use slashed ice instead of water in the formulation.
- vi) We should maintain the proper sequence of addition of ingredients e.g. lean meat, salt, ice, polyphosphate, fat, seasoning, binder/extender.
- vii) We should standardize the optimum chopping time to desired particle size and follow it every time.
- viii) Emulsion temperature should not exceed 15°C at any time except cooking.
- ix) Cooking of the product should commence at 50°C. Proper temperature time scheduled should be followed.

3.7 CALCULATION OF PRODUCTION COST

Case Study – Chicken Nuggets

With economic factors already discussed, you can now calculate the production cost of meat products. Here, we will calculate the cost of chicken nuggets, assuming that 50 kg emulsion is prepared in a day in the processing unit.

Production cost of a meat product comprises of formulation cost and the overhead cost. The overhead production cost includes labour charges, electricity charges, equipment depreciation, cost of packaging, water charges etc. Cooking yield also plays an important role in the calculation of production cost.

I) Formulation Cost of 50 kg Emulsion for Chicken Nuggets

Ingredient	Rate (Rs/kg)	Basic Recipe		Recipe Extended with 10% Rice Flour	
		Quantity (kg)	Cost (Rs.)	Quantity (Kg)	Cost (Rs.)
Lean chicken meat*	145	33.5	4858	28.5	4133
Rice flour** (Hydrated 1:1)	6	–	–	5	30
Ice	3	6	18	6	18
Refined vegetable oil	50	5	250	5	250
Bread powder	35	2	70	2	70
Condiments	25	1.75	44	1.75	44
Table salt	6	1	6	1	6
Dry spices	200	0.75	150	0.75	150
Total		50	5396		4701

*

Cost of spent hen	= Rs. 60
Average live weight	= 1560g
Average dressed wt (65% of live wt)	= 1010g
Deboned meat wt (25% of live wt)	= 390g
Less income from sale of giblet and byproducts	= Rs. 5 per bird
Cost of 380g deboned chicken meat = Rs. 60 – 5	= Rs. 55
So cost of 1kg lean chicken meat	= Rs. 145

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Cost of broken white rice	= Rs. 8 per kg
Milling charges	= Rs. 4 per kg
Cost of rice flour	= Rs. 12 per kg
Cost of wet/hydrated (1:1) rice flour	= Rs. 6 per kg

II) Overhead Cost for approximately 50 kg Chicken Nuggets**1) Labour Charges:**

Skilled worker (one)	Rs. 120 per day
Unskilled worker (two)	Rs. 160 per day
	Total= Rs. 280 per day

2) Electricity Charges:

Equipment	Watt × hrs	KWH unit
Refrigerator	200 × 24	= 4.8
Scalder & defeatherer (88 birds)	2000 × 2	= 4
Mincer	750 × 1	= 0.75
Bowl Chopper	1000 × 1	= 1
Steam Cooker without Pressure	3 × 2000 × 1.25	= 7.5
Slicer	2000 × 2	= 0.4
Packaging Machine	500 × 1	= 0.5
		<hr/>
		Total KWH units = 19
		Electricity Charges = 19 × Rs. 4
		= Rs. 76

3) Equipment Depreciation

Equipment	Cost
Refrigerator	Rs. 10,000
Scalding tank	Rs. 15,000
Defeatherer	Rs. 20,000
Mincer	Rs. 40,000
Bowl chopper	Rs. 60,000
Cooking vats (three)	Rs. 9,000
Slicer	Rs. 12,000
Sealing machine	Rs. 3,500
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Total = Rs. 1,69,500	
Depreciation@10% per annum = Rs. 16,950	
Per day basis = Rs. 46	

4) Cost of Packaging Material :

(8" x 6" LDPE pouches) 200 × Rs. 0.20 = Rs. 40

5) Water Charges (300 liters):

Rs. 6

Total overhead cost = Rs. 448

III) Production Cost of Chicken Nuggets

Total production of chicken nuggets = Formulation cost + Overhead cost
obtained from 50 kg emulsion

- i) With Basic recipe = Rs. 5396 + Rs. 448
= Rs. 5844

- ii) With 10% rice flour extension = Rs. 4701 + Rs. 448
= Rs. 5149

Yield of chicken nuggets from 50 kg emulsion

- i) Basic recipe = 47.5 kg (Average yield 95%)
ii) Recipe with 10% rice flour extension = 48 kg (Average yield 96%)

Production cost of 1 kg chicken nuggets

- i) Basic recipe = $5844/47.5 = \text{Rs. } 123$
ii) Recipe with 10% rice flour extension = $5149/48 = \text{Rs. } 107$

Check Your Progress 1

1) Answer in True/False

- i) Spent animals are those animals that have already completed their economic productive life. (.....)
ii) Each meat species has a right age or weight for slaughter. (.....)
iii) Processing adds value to the raw meat. (.....)
iv) Cost of raw material does not affect the production cost. (.....)
v) Meat extenders generally increase the production cost. (.....)
vi) The cooking yield should be at least 90% for the economic viability of emulsion based products. (.....)
vii) Excessive use of extenders affects the texture of a product. (.....)
viii) Texturized soya protein (TSP) has very good compatibility with meat in comminuted products. (.....)

2) Fill in the blanks:

- i) In general, meat from spent animals has a texture.
ii) Tough cuts of meat should be cooked in heat.
iii) Emulsion based products have cooking yield.
iv) Production cost comprises of formulation cost and cost.
v) Overhead production cost includes,, etc.
vi) Equipment depreciation cost is generally % of the total cost.
vii) 1 Kilo Watt Hour (KWH) consumption is equal to the use of 1000 watt equipment for hour or 100 watt equipment for hrs.
viii) Marketing cost and desired profit margins are important considerations while deciding the of a particular product.

3.8 LET US SUM UP

Raw meat for processing should invariably be obtained from healthy animals. Type and cuts of meat and product desired should determine the method of cooking. Value addition of meat offers variety, quality and convenience to consumers. Comminuted meat products can be prepared from lower cuts, trimmings and the tough meat of spent animals. Preparation of emulsion can increase the cooking yield and juiciness of meat products. We can increase profit margins by using low cost extenders of plant origin in the formulation. Most of the extenders also increase the binding, flavour, juiciness and cooking yield of meat products. Final yield of a product can be improved by using good meat, optimum meat to fat ratio, slashed ice in place of water, proper sequence of addition of ingredients and following the right temperature-time schedule during cooking. You can calculate the cost of production of a product by working out the formulation cost and the overhead cost. This will help in fixing the right price for your product. You can also calculate the expected monthly turnover.

3.9 KEY WORDS

- Broiling** : Cooking by exposing food to direct radiant heat, either on a grill over live coals or below a gas burner or electric coil. The temperature is set around 550° F (288° C).
- Economic Formulation** : It can be described as least expensive formulations that satisfy the product specifications and make best use of available raw materials. It ensures lowest possible cost of production.
- Roasting** : Cooking method that uses dry heat, whether an open flame, oven, or other heat source. Roasting usually causes caramelization of the surface of the food, which is considered a flavour enhancement. Temperature ranges from 200-400° F.
- Simmering** : Cooking technique in which foods are cooked in hot liquids kept at or just barely below the boiling point of water i.e. 100°C.
- Stewing** : Cooking solid food ingredients in water or other water-based liquid, typically by simmering, and that are then served without being drained.
- Value Added Products** : A raw product grown by the farmer/producer and modified, changed and/or enhanced in order to turn it into another product with a higher net worth.

3.10 SOME USEFUL BOOKS/REFERENCES

Barbut, Shai. *Poultry Products Processing*. CRC Press, Boca Raton, Florida.

Pearson, A.M. and Gillet, T.A. (1999). *Processed Meats*, 3rd edition, An Aspen Publication, inc., Gaithersburg, Maryland.

Ranken, M.D. (2001). *Handbook of Meat Products Technology*. Blackwell Science Ltd.

3.11 ANSWERS TO CHECK YOUR PROGRESS

1) True / False

- i) True ii) True (iii) True
iv) False v) False (vi) True
vii) True viii) True

2) Fill in the blanks

- i) tough ii) moist iii) higher iv) overhead
v) labour cost, electricity cost, equipment depreciation, packaging cost,
water charges
vi) 10% vii) 1,10 viii) price