RETURNS TO EFFICIENT UTILIZATION OF PROCESSING CAPACITY –EMPIRICAL EVIDENCE FROM MICRO LEVEL STUDY

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ABSTRACT

This paper has investigated the effect of capacity use on profitability of meat production through a case study on processing plant of NRCM. Different scenarios were worked out and were compared to find out the optimum capacity utilization. The study found that Investment of Meat processing plant is not feasible at current utilization of capacity but it will be feasible and profitable at higher capacity utilization with some additional investment. Results of the feasibility analysis revealed that, at optimum capacity of 150kg/day capacity, the plant would yield a net present value of over Rs.64 lakhs , an internal rate of return of 33% and BC ratio of 1.93 on an initial investment of Rs. 66.5 lakhs. Initial investment would be recovered in less than three years(2.42) years with average returns of Rs. 27.47 lakhs per year. Break even analysis showed that processing unit would break even at 66.47% of utilized capacity with 33.53% of margin of safety. The study has recommended for additional investment of Rs. 10.01 lakhs and increase of manpower for making the unit viable by utilizing the capacity at its optimum use. The results of this study indicated the effect of capacity on profits and viability and concluded that meat processing can be a financially viable business venture only when it is used at its best capacity.

Key words: meat processing, case study, Emulsion, products, meat, economics, feasibility, multiproduct unit

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Introduction

Capacity utilization is potentially a powerful driving force behind the business profits. Capacity planning has seen an increased emphasis due to the financial benefits of the efficient use of capacity plans within material requirements planning systems and other information systems. Insufficient capacity can quickly lead to deteriorating delivery performance, unnecessarily increase work-in-process, and frustrate sales personnel and those in manufacturing.

However, excess capacity can be costly and unnecessary. The inability to properly manage capacity can be a barrier to the achievement of maximum firm performance. In addition, capacity is an important factor in the organization's choice of technology.

A more usable definition of capacity would be the volume of output per elapsed time and the production capability of a facility. Capacity utilization is an important concept for any business and plays a big role in the cost of production for any given product as well as the profit that can be made on the sale of that product. Just about any business has a capacity, whether it is for manufacturing products, serving customers or completing projects. It is how this capacity can be utilized or maximized that is ultimately most important to making a business more profitable.

Capacity utilization represents the proportion of available capacity that is utilized, and is usually defined as the ratio of actual output to some measure of capacity output (Morrison, 1985a, 1985b; Nelson, 1989). Capacity utilization is a measure of the extent to which an enterprise or a nation uses its installed productive capacity (Hosen et al, 2011). It is difficult to operate a business at full capacity on a consistent basis, because problems can arise and the product might suffer.

Underutilization means not utilizing to the fullest capacity. Under-utilization of resources have an impact on profits of the company and hence are a matter of concern for the management. Under utilization can be in terms of machines, labor, raw materials, etc.

Machines designed for a particular capacity are face underutilization when the demand for the products to be produced on it decreases. This means that fixed cost per unit of product are higher in comparison to the price per unit of product. This has serious consequences on our business and in turn our operations. Thus, an asset is underutilized when the capital invested in it fails to create its anticipated use, instead creating unnecessary hindrances in capital budgets that would put a limitation on its capacity to invest in other areas. In times of recession when companies don't have projects, we generally see a lot of manpower sits idle, but they are still being paid. This is an example of under-utilization of manpower[1].

Capacity utilization can have an effect on every product a business produces. Any capacity utilization rate below 50-70 percent is inefficient and is often a sign of weak demand for the product or service the business produces. This leads to an inefficient use of space, resources, equipment and staffing, which can put pressure on the ability to make a profit. Since many costs that go into producing a product are fixed, the cost of producing each individual product will increase, which shrinks the profit margin[2].

Planning the use of manufacturing capacity to turn out the highest-quality products while maximizing profit is a key to the success of any business[3]. A failure to understand the critical nature of managing capacity can lead to chaos and serious business problems. If there is a mismatch between available and utilized capacity, adjustments should be made.

Capacity utilization studies were used in all the sectors including Energy, manufacturing, services. Different methodologies were used by different studies. Cost curves, programming techniques like Linear programming, financial methods like feasibility analysis, investment analysis were used in Optimization studies.

There is lot of literature (F. R. James , K. Dhouib etal, D. S. Matthew , R. Sarbapriya , M. Atri etal, S. Hemanta, Nwankwojike Bethrand Nduka, Sandeep etal, etc) on capacity utilization of manufacturing industries and its impact on production performance and efficiency. But almost all these studies focused on macroeconomic structure and are based on long term production and cost functions for providing information to a government administrative level for making investment policy. They are not useful for evaluating performance at the individual firm level and making operating policy.

There were few studies on capacity utilization at micro level using financial evaluation methods. Potential of using financial and economic analysis for optimization of operations have been demonstrated by many studies. Hosseini et al used technical, economic and the reliability indices to determine the optimal installation capacity of small hydro-power plants. By comparing the PF, the B/C, NPV, USCent/kWh, and the reliability index LOLE, optimal installation capacity of 3.75 MW has been obtained. Adegboye used financial and economic analysis for optimum installation and operation of small hydro power plant , and found 10 MW installation as optimum capacity.

With this back drop on importance of capacity use, an attempt has been made in this paper to analyse the effect of capacity use on profitability of processing units by taking case study of multiproduct meat processing unit of NRCM. Comparison was also made among the different scenarios of capacity use to find out the optimum capacity use for increased returns.

This is an important piece of study because previous all studies were focused on the macroeconomic perspective and study on the microeconomic perspective is very rare in the literature. It also differs form previous studied in such a way that it uses financial analysis for determining optimum capacity utilization

Data and Methodology

This paper focuses on the effect of capacity use on profitability of meat processing unit. A case study approach is used by taking NRCM processing plant as a model. NRCM is chosen for this study as it is producing the products at under utilization. This study intends to investigate NRCM in particular to assay the possibility of adopting Financial analysis to profit optimization. It intends to establish that it would be more profitable to use financial measures in determining the capacity use despite the additional cost of acquiring machines and additional manpower.

For achieving the objectives of the study Primary data pertaining to input use , output yield were collected to compute cost of processing, production and to work out selling price. Data on project cost, cash flows were used to find out the viability of investment. Secondary data was used for outlining baseline assumptions.

Financial efficiency measures like liquidity ratios, profitability ratios and investment ratios were employed for analysing financial viability of processing plant. Project evaluation techniques like NPV,IRR,BC ratio, payback period, ROI etc were employed for investment analysis of a technology that transforms Meat into value added chicken meat products.

Break even analysis was also carried out. Breakeven analysis was employed to estimate the level of production required to recover the fixed capital used on processing units. This concept is very important in the business as it indicates minimum amount of business necessary for operating business without loss. Sensitivity analysis was used to test the robustness of

predicted outcomes to shocks in raw material and product prices, fixed costs and capacity utilization.

Production process of value added Meat products

The processing unit of NRCM is initially set up for research purpose. This is a multiproduct processing unit. Three types of products Viz chicken nuggets, enrobed cuts, sausages are produced regularly in this facility.

Nuggets and sausages are the products prepared from emulsion. Emulsion is prepared by adding add salt, phosphates, ice flakes to the minced meat from boneless chicken or mutton and chopping to extract soluble proteins. Add onion garlic paste spice powders and binders and fillers one after the other as per the formulation and follow chopping till desired consistency of emulsion is achieved. One can prepare limitless no of products with this emulsion with good imagination and culinary practice and modification of ingredients in the formulation.

For the present study we have selected prime type of emulsion and economics were worked out for nuggets and sausages from emulsion group. From cured product group enrobed chicken cuts were selected. Flow chart of emulsion preparation and formulation for emulsion and spice mixture are presented in Annexures -1,2&3 and production process of Nuggets and Sausages are discussed here. All these products are produced as per the standards.

Nuggets are prepared by filling the emulsion into stainless steel moulds smeared with oil and then pressing it for uniform coverage of moulds without air and closing the moulds with lid and cooking in pressure cooker for 30 minutes. After cooking moulds are kept outside for one hour and chilled overnight under refrigerated temperature. The blocks are then removed and cut in the form of nuggets and packed.

Sausages are prepared by stuffing chicken emulsion inside the casings(natural or synthetic) either hand operated or hydraulic sausage stuffer and twisting with thread to obtain desired length and cooking for 20 minutes in boiling water with 2% salt till temperature reaches 80^0C. Sausages can also be prepared by smoking after preparation instead of cooking but for the study we have selected cooked sausages that are produced in this processing unit.

Enrobed chicken cuts are prepared by applying edible coating to the chicken cuts which are cured and cooked. It includes three distinct steps i.e pre-dusting, battering and breading (NRCM 2011). Process flow of Enrobed products and Composition of ingredients for curing, breading and battering mix were given in Annexures 4-7.

Results and discussion

As it is meant for research purpose, production of meat products is very small compared to its potential capacity. In order to find out whether the Meat Processing unit of NRCM is profitable or not at its current capacity utilization, profitability of current utilization / scenario is analysed and worked out different scenarios and their feasibility of investment is studied.

The financial analysis showed that the processing unit is not feasible in the current situation due to under utilization of capacity. Hence to work out the optimum capacity utilization where the unit becomes viable with reasonable selling prices that are comparable to market prices, different models/scenarios were considered by assuming different capacities and feasibility analysis was applied/done. Detailed discussion of results are given in the following sections

1.General/basic assumptions

Basic assumptions used in this study are given in table 1. These assumptions are same for all the models/scenarios.

Regarding production we have assumed processing capacity of 3.25kg, 10kg, 30kg, 50kg,100kg and 152kg/day for different scenarios. For working capital requirement, we have assumed 5days for raw material, 2 days for goods in process, 15 days for Finished products and 7 days for accounts receivable for all the three products. Regarding finance, 3:1 ratio is considered for banks and equity. Depreciation rate of 10% taken for building and miscellaneous assets and 20% for machinery. As purchase cost of land is not financed by the banks it is assumed that the processing unit will be built on the own land of the producer. However, banks will provide finance for land development cost. 70% of working capital was assumed to be provided by the banks @ 15% interest rate.

Table 1 :Basic assumptions used

Particulars			**Assumption**
Construction and Finance		***Working Capital***	
Source of Finance	25% Equity, 75% loan.	Raw Material	5 days
Bank interest	12%	Work in progress	2
Discount cashflow	12%	Finished products	15days
Escalation& Contingencies	10%of project cost excluding Preliminary expenses	Accounts receivable	7days
Land	Own land	Credit sales	50%
Production		Norm for bank assistance	70% of raw material cost

Capacity(final output)	3.25kg, 10kg,30kg,50kg,100kg and 152kg/day	***Depreciation***	
Capacity Utilization	60%, 70%, 80%, 90% in the 1st and 2nd , 3rd, 4thyears and levelling off at 100% from 5th year	Building	10%
Shifts/ day	1	Machinery	20%
No of working days/annum	300	Miscellaneous assets	10%

2.Capacity of processing plant

In the present scenario the unit is processing 1.93 kg/day(final product), in 70:25:5% of Emulsion Nuggets, Sausages and Enrobed Wings. This capacity is taken as 60% for the first year and it has been increased to 70%, 80%, 90% in the 2nd, 3rd and 4th years and 100% utilization has been considered from 5th year onwards.

After considering yields of individual products, the final output (mixed) yield is estimated as 92%. Considering this 92% yield, the final output at 100% utilization comes to 3.25kg from 3.5kg input.

Table 2: Capacity of processing plant under different scenarios

S.No	Particulars	Product mix			
		Nuggets	Sausages	Enrobed wings	Total
1	Percentage share	70%	25%	5%	100%
2	Product yield	90%	90%	129%	92%
3	Per day capacity (kg)	2.275	0.8125	0.1625	3.25
		7	2.5	0.5	10
		21	7.5	1.5	30
		35	12.5	2.5	50
		70	25	5	100
		106.4	38	7.6	152
4	Days	300	300	300	300

5	Annual output kg/yr (100% capacity)	682.5	243.75	48.75	975
		2100	750	150	3000
		6300	2250	450	9000
		10500	3750	750	15000
		21000	7500	1500	30000
		31920	11400	2280	45600

The capacity of output is represented in terms of final output at 100% utilization. For example output 3.25kg represents final output at 100% that comes to 1.93 kg/day at 60% which NRCM is producing at present. We have considered Eight years period is taken for the purpose of investment analysis.

Product yield of 90% is taken for nuggets and sausages after considering cooking loss of 10%, and 129% yield is considered for Enrobed wings after considering pick up due to enrobing. Considering 300 working days in a year and yield of the products, Product mix and Production at full capacity is given in table 2

For example in the current case it produces 2.27 kg of kg nuggets, 0.81kg sausages and 0.16kg enrobed wings totalling to 3.25kg (92%) of finished product. Considering 300 working days a year, the unit will process 682.5 ks of nuggets, 243.75 kgs of sausages and 48.75 kgs of enrobed wings totalling to 975kgs per year. With the given product mix, yields and working days the unit will have the annual output of 3000kgs, 9000kgs, 15000kgs,30000kgs and 45600 kgs of processing capacity per year.

3.Capacity utilization

Capacity utilization rate of 60%, 70%, 80%, 90% in the 2nd, 3rd and 4th years and 100% from 5th year onwards has been considered. The output at the given capacity utilization have been given in the table 3.

Table 3: Capacity utilization for processing plant under different scenarios(kg/day)

Scenario	Total/ Installed Capacity	Output at Utilized capacity							
		1	2	3	4	5	6	7	8
		60%	70%	80%	90%	100%	100%	100 %	100%
3.25	975	585	682.5	780	877.5	975	975	975	975
10	3000	1800	2100	2400	2700	3000	3000	3000	3000
30	9000	5400	6300	7200	8100	9000	9000	9000	9000
50	15000	9000	10500	12000	13500	15000	15000	15000	15000
100	30000	18000	21000	24000	27000	30000	30000	30000	30000
152	45600	27360	31920	36480	41040	45600	45600	45600	45600

4. Project set up costs/Capital Investment/Infrastructure required

Project cost comprises investment for establishing an enterprise. The significant elements of project cost are land and site development, building, machinery, other fixed assets, technical know-how expenses, preliminary and pre- operative expenses, including interest during construction period, working capital margin and contingency costs.

The main infrastructural facilities required and detailed breakdown of project set up costs for different scenarios has been given below in table 4**.**

Table 4: Project cost of Meat processing plant under different scenarios((Rs. Lakhs)

S. No	Description	Capacity					
		3.25	10	30	50	100	150
1	Land and Fencing	3.00	3.00	3.00	3.00	3.00	3.00
2	Building	8.80	8.80	8.80	8.80	8.80	10.40

3	Machinery and Equipment(M&E)	24.88	24.88	24.88	26.96	32.74	35.38
4	Miscellaneous Assets	2.49	2.49	2.49	2.70	3.27	3.54
5	Escalation &Contingencies	3.92	3.92	3.92	4.15	4.78	5.23
6	Preliminary&Pre operative Expenses	1.03	1.11	1.35	4.08	4.61	4.86
7	Working Capital Margin	0.29	0.49	1.06	2.06	3.23	4.09
	Total Project cost	**44.41**	**44.68**	**45.50**	**51.74**	**60.44**	**66.50**
	Per unit Project cost(Rs/kg)	**4555**	**1489**	**506**	**345**	**201**	**146**
	Means of Finance						
	Equity	11.10	11.17	11.37	12.94	15.11	16.63
	Subsidy	10.35	10.42	10.62	12.19	14.36	15.88
	Effective bank loan	22.96	23.09	23.50	26.62	30.97	34.00

Total area of processing unit i.e 2000sq. ft is considered for all types of capacities and built up area of 1100 sq.ft is considered for all capacities upto 100kg/day and 1300 sq.ft for 150kg/day as it requires more machinery and equipment. The remaining area is kept as uncovered area. Project cost for current scenario of capacity utilization was estimated as Rs.44.41 lakhs and it increases to 66.5 lakhs with increase in capacity from 3.25 to 150kg/day.

Regarding Per unit capital investment current scenario with capacity utilization rate of 3.25 kgs/day shows highest with Rs.4555/kg and this goes on decreasing with capacity to Rs. 146/kg.

It is clear from the investment pattern that machinery and equipment was the major item of cost contributing to 52.11% to 56.02% share followed by Buildings(14.56% to 19.82%). Further it is evident that share of all these items in total cost goes on decreasing with capacity except working capital and preliminary and preoperative expenses which shows increasing trend.

Overall investment pattern showed that positive relation is observed between total investment and capacity while negative relation is evident between per unit investment, share and capacity showing economies of scale.

5.Working capital

Working capital is the resources used to support a business until it is able to generate resources to support itself. Working capital varies with production level since it is directly related to variable operating expenses. Banks provide loans upto 70% of working capital requirement with an interest of 15%. The remaining 30% will be born by the owner in the form of equity. Working capital for different scenarios is presented in table 5.

Current scenario requires working capital of Rs. 0.76 lakhs which goes on increasing (Rs9.81 lakhs) as the capacity increases(150kg/day).

Table5:WorkingCapital requirement and contribution under different scenarios

Working capital (Rs.lakhs)	Capacity					
	3.25	**10**	**30**	**50**	**100**	**150**
Total	0.76	1.20	2.48	4.53	7.41	9.81
Bank	0.47	0.71	1.42	2.47	4.18	5.73
Equity	0.29	0.49	1.06	2.06	3.23	4.09

6.Cost of production and price structure

Cost structure : Cost of production and selling price decreases from Rs.1360 to 335 /kg and from 1497to 369 /kg for nuggets. Similarly for sausage production cost decreases from Rs.1560 to 390/kg. For enrobed cuts production cost decreases from Rs.894 to 420/kg.

Table6: Cost of production and price structure under different scenarios (Rs/kg)

Description	Product	Capacity					
		3.25	10	30	50	100	150
Variable cost per unit	Nuggets	337	295	283	296	275	263
	Sausages	391	349	333	349	327	315
	Enrobed Wings	424	394	384	394	379	371
Fixed cost	Nuggets	1023	357	151	138	96	72
	Sausages	1169	403	166	148	101	75
	Enrobed Wings	470	172	80	79	64	49
Total cost	Nuggets	1360	652	434	434	371	335
	Sausages	1560	753	499	496	428	390
	Enrobed Wings	894	567	464	473	444	420
Sales price per unit	Nuggets	1497	717	477	477	408	369
	Sausages	1716	828	549	546	470	429
	Enrobed Wings	983	623	510	520	488	462

These differences in the production costs among the different scenarios can be attributed to fixed costs which shows highest difference than variable costs. fixed costs shows difference of Rs. 951, 1094 and 421/kg where as variable costs shows Rs. 74, 76 and 53/kg between current capacity and highest utilization. We can say that variable costs were kept at more or less similar or least difference is observed for variable costs as they are not affected by the capacity utilization. But the effect of capacity on cost structure is evident through the fixed costs where highest total fixed costs is allocated/ distributed among the less no of units in current output resulting higher fixed costs (Rs.1023, 1169 and 470 /kg) in current scenario compared to higher capacities(Rs.72,75 and 49/kg).

Selling prices: Selling prices at 10% markup comes to Rs. 1497, 1716,983 /kg for nuggets, sausages and enrobed products in the current scenario. Similar to costs, prices also shows decreasing trend with capacity but reasonable and market price is arrived at higher capacities (Rs.369, 429 and 462/kg). Though Prices were kept on higher side in the present scenario, they represent unrealistic situation. The higher prices at lower capacities indicate that fixed costs are high due to underutilized capacity where fixed costs are spread among lesser quantities at present utilization. Hence capacity with 150kg/day is considered as optimum capacity for the processing unit under study.

7.Financial feasibility

7.1. Ratio analysis

From the table7 it is evident that feasibility of processing unit goes on decreasing with capacity as reflected by all profitability, investment and liquidity ratios. But one should not be mistaken that the feasibility of processing unit decreases with capacity. These highest estimates of feasibility ratios for current scenario was due to higher selling prices which were unrealistic. Hence feasibility can not be considered only with unrealistic market prices however greater they are.

To sum up, the financial viability indicators revealed that the processing capacity of 150kg/day is financially viable. It showed satisfactory performance on account of liquidity, profitability, investment.

Table 7:Financial feasibility Ratios under different scenarios

Financial feasibility Ratios	Capacity					
	3.25	10	30	50	100	150
Profitability Ratios						
Gross profit margin(%)	80.28	61.75	39.44	37.92	30.15	25.89

Operating Profit margin (%)	56.46	43.74	28.67	22.78	18.89	17.07
Profit margin %	47.02	36.67	24.39	19.50	16.40	14.93
Net Profit margin (%)	43.36	33.67	22.18	17.56	14.65	13.30
Net operating profit after taxes (NOPAT)(%)	47.93	37.19	24.45	19.47	16.18	14.64
Investment Ratios						
Return on Total investment	19.18	20.23	23.25	25.45	30.06	33.44
Return on Equity	76.70	80.94	93.00	101.80	120.26	133.75
Investment turnover ratio	10.36	8.59	6.14	5.09	4.01	3.49
Liquidity ratios						
Debt Equity Ratio	1.16	1.16	1.16	1.16	1.15	1.15
Debt to Capital Turn over	29.07	29.07	29.05	28.94	28.82	28.76
Debt Service Coverage Ratio	2.85	2.95	3.24	3.44	3.93	4.26
Operating ratio	43.54	56.26	71.33	77.22	81.11	82.93

7.2.Break Even Analysis

Break Even Analysis (for first year) indicates that BEP of output is 505 kgs which comes at 87% of utilized capacity and 51% of full capacity at present case. BEP is achieved at 66% and 39.9% of utilized and full capacity for higher capacities (150kg/day).Attainment of BEP at lesser time (Table 8) at higher levels of capacity utilization indicates that the plant is financially feasible at higher capacity utilization.

Margin of safety goes on increasing from 12.91 to 33.53 showing increased profitability along with capacity.

Table 8 :Break Even Analysis under different scenarios

Description	**Capacity**					
	3.25	10	30	50	100	150
Total output per year (@60%in 1st year)	580	1822	5465	9108	18216	27490
Break Even point	505	1516	4164	6792	12854	18272
Break Even point(% of utilized capacity)	87.09	83.25	76.20	74.57	70.57	66.47

Break Even point(% of Full capacity)		51.81	49.95	45.72	44.74	42.34	39.88
Break Even point	Nuggets	353	1062	2915	4755	8998	12791
	Sausages	126	379	1041	1698	3214	4568
	Enrobed Wings	25	76	208	340	643	914
Weighted average selling price		1526	740	497	497	428	389
Weighted average variable expenses		355	314	300	314	293	282
Weighted average contribution margin		1171	426	196	183	134	107

7.3.Economic feasibility

In the present study, economic feasibility of processing unit was measured using discounted measures such as NPV, BCR, IRR and Pay Back period.

Table 9: Economic Feasibility measures for different scenarios/ capacities

S.No	Feasibility measures	3.25	10	30	50	100	150
1	NPV(Undiscounted)	57.25	59.81	67.33	81.27	108.79	130.52
2	NPV(Discounted)	12.84	15.13	21.83	29.53	48.36	64.02
3	IRR(%)	18.79%	19.91%	23.03%	25.03%	29.86%	33.16%
4	BC	1.29	1.34	1.48	1.57	1.80	1.96
5	Average Returns(undiscounted)	12.27	12.79	14.34	17.24	22.95	27.47
6	Pay Back Period (Yrs)	3.62	3.49	3.17	3.00	2.63	2.42
7	Average Returns(Discounted)	1.60	1.89	2.73	3.69	6.04	8.00
8	DSCR	2.85	2.95	3.24	3.44	3.93	4.26

All the discounting measures (NPV, IRR, BC, Payback period, annual returns) were in favour of higher capacity utilization showing real picture of feasibility towards 150kg/day. The calculated average IRR of the project is 33.14% and Net Present Value (NPV) at 12% discount is

Rs. 64.02 lakhs. The project's initial investment will be fully recovered in less than three years(2.42 years) with average annual net returns of Rs.27.47 lakhs per annum. BC ratio of Rs.1.96 indicates that the processing unit generates Rs. 1.96 for every rupee of investment.

According to ratio analysis, feasibility measures and BEP all capacities of processing plants under study turned out to be economically viable projects. But if these feasibility measures are weighted against selling price, all the units / capacities upto 100kg will become unviable as the selling price does not reflect real/actual situation. Though the viability is ascertained/assured by feasibility measures, examination of price structure indicates that the prices are on higher side. The difference between market prices/ consumers willingness to pay for the products and the product prices is very high due to higher investment cost reflected in terms of higher fixed cost. Even if market/current product prices at NRCM are considered the investment becomes unviable as reflected by negative NPV and IRR. Only capacities 100 and 150kg/day are considered viable on all criteria(both selling price and feasibility measures) and 150 kg/day is considered more viable as it reflects real and feasible market prices. Hence it can be concluded that the processing unit at its present capacity is under utilized and investment is not feasible and hence it should be put to full utilization by making some additional investment in the form of machinery and labour.

8.Additional investment: Additional investment required for best/optimum utilization of processing unit is given in Annexure -8.

An additional investment of 10.01 lakhs is needed to put the processing unit at its best utilization. The total investment cost of machinery for processing 150kg/day of products at present product mix is estimated as 35.48 lakhs. Out of this 25.47 lakhs towards machinery is already invested in the existing situation.

Hence an additional investment of 10.01 lakhs towards machinery and investment for addition of two skilled workers and 6 unskilled workers on regular basis will make the processing unit feasible and profitable as reflected by change in NPV from negative(at current market prices) to positive (Rs.64 lakhs)and IRR from negative to 33% and BC ratio from less than 1 to Rs.1.96.

Summary and Conclusions

In the present study profitability of current utilization / scenario is analysed and worked out different scenarios and their feasibility of investment is studied for establishing the effect of capacity utilization on profitability and viability of the processing units.

- In the present study investment analysis for newly built processing unit of NRCM is carried
- The results revealed that the processing plant is under utilized and investment is not viable.
- The study found that at optimum and pofitable capacity utilization is beyond 100kg/day. 150kg/day capacity was found to be more optimum and feasible capacity than others.
- At 150kg/day the processing unit generates more feasible and viable returns. It generates NPV of Rs.64 lakhs with IRR of 33%, BCR of 1.96. The investment will be recovered in less than 2.42years with annual returns of Rs. 27.47 lakhs per year.
- Hence the study has recommended that an addition investment of 10.01 lakhs towards machinery and investment for addition of two skilled workers and 6 unskilled workers on regular basis will put the processing unit to optimum utilization thus making investment feasible.

We can conclude that the study has empirically established the effect of capacity utilization on profits and viability of the business. This research concludes that optimization of capacity utilization is important for achieving sustainable production performance. The study has successfully determined the optimal quantities of the meat products to be produced in order to maximize profit. Empirical relationship of capacity utilization with production in microeconomic perspective has been established. Economies of scale in the meat processing industry from microeconomic perspective has been successfully demonstrated.

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Annexure-I

Process Flow of Emulsion

Annexure-II

Composition of Spice mixture

S.No	Ingredients	Grams per litre of water
1	Anise(soant)	10
2	Black Pepper(kali mirch)	5
3	Capsicum(Mirch)	10
4	Caraway(Ajwain)	10
5	Cardamom(Elaichi)	4
6	Cinnamon(Dalchini)	4
7	Cloves(Laung)	2
8	Corriander(Dhania)	15
9	Cumin(Zeera)	20
10	Dry ginger(Sont)	10
11	Turmeric(Haldi)	10
	Total	**100**

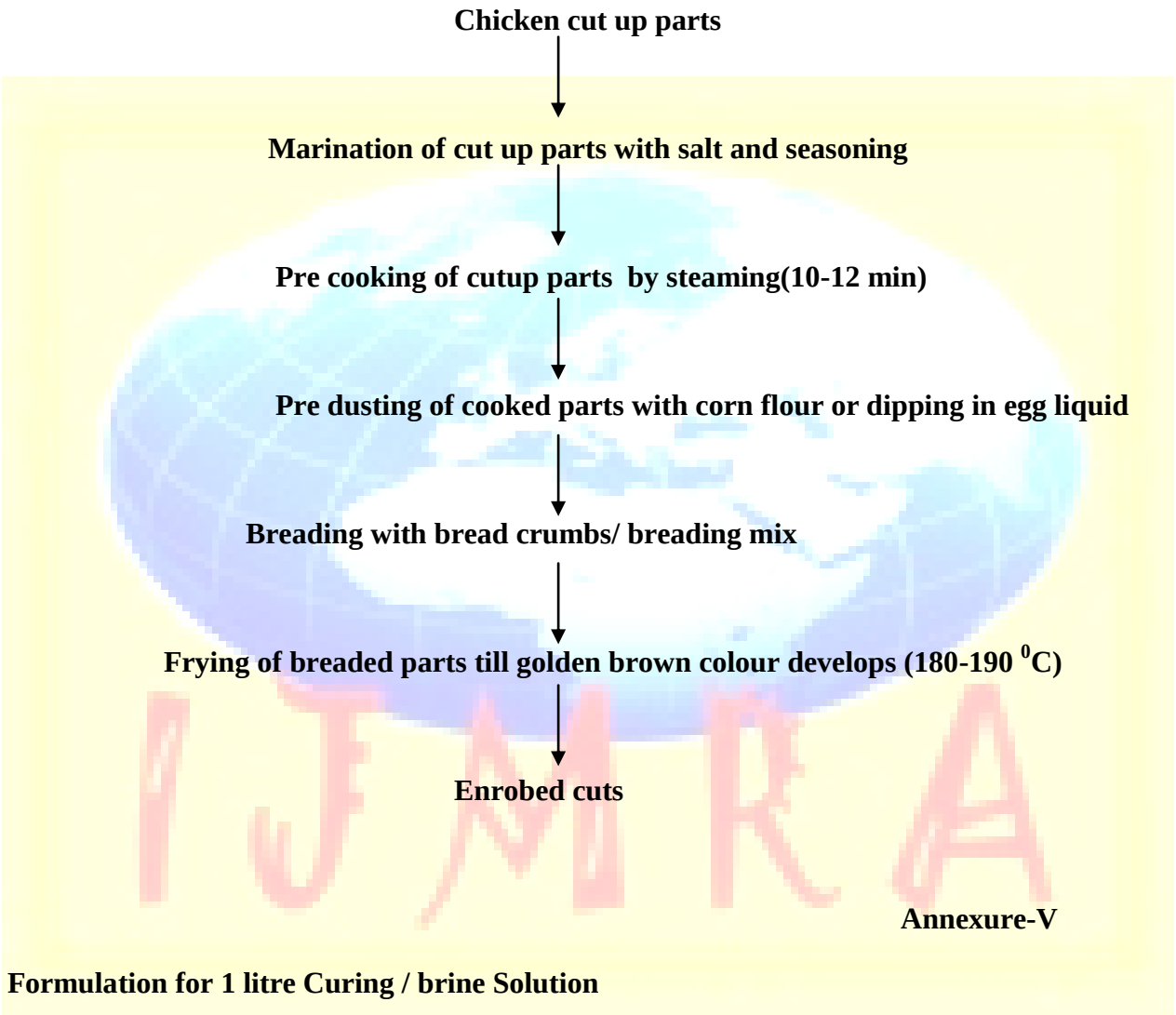
Annexure-III

Composition of ingredients for Emulsion

S.No	Ingredients	Percentage Composition		
		Prime	**Choice**	**Economy**
1	Deboned Chicken Meat	67	57	47
2	Chicken Fat	13	8	
3	SGH		15	15
4	Bottle Guard			5
5	Cabbage			5
6	Cooked Potato			5
7	Whole Egg Liquid			5
8	Maida	3	3	3
9	Spice mixture	1.5	1.5	1.5
10	Condiments	3.5	3.5	3.5
11	Ice flakes	9.7	9.7	7.6
12	Poly phospahtes	0.3	0.3	0.4
13	Salt	1.7	1.7	1.7
14	Sugar	0.3	0.3	0.3
15	Sodium nitrite	0.01	0.01	0.01
	Total	**100**	**100**	**100**

Annexure-IV

Process Flow of Enrobed cuts



Annexure-V

Formulation for 1 litre Curing / brine Solution

S.No	Ingredients	Grams per litre of water
1	Common Salt	65
2	Sugar	25
3	Sodium Nitrite	0.5
4	Sodium Ascorbate	1-2
5	Sodium tripoly phosphate	10

Annexure-VI

Composition of ingredients for Battering mix

S.No	Ingredient	%	Grams/kg
1	Corn flour	20	200
2	Wheat flour	20	200
3	Rice flour	20	200
4	Besan	20	200
5	Rusk	16.5	165
6	Salt	1.7	17
7	Spice Mix	1.8	18
	Total	**100**	**1000**

Annexure-VII

Composition of ingredients for Breading mix

	Ingredient	%	Grams/kg
1	Rusk powder	30	300
2	Cornflakes	37	370
3	Sugi	20	200
4	Til	10	10
5	Salt	1.5	1.5
6	Spice Mix	1.5	1.5
	Total	**100**	**1000**

Annexure-VIII

Additional investment required

S.No	Name of Machinery	Existing(Rs)	Additional cost(Rs)
1	Meat Mincer	150000	
2	Bowl Chopper	500000	
3	Commercial mixer/Grinder	12000	12000
4	Stainless Steel Tables	20000	30000
5	Refrigerator		
6	Vaccum packaging Machine	250000	
7	Ice flaking Machine	200000	
8	Chiller room	38000	190000
9	Refrigeration system for finished product	25000	250000
11	Three wheeler(Tempo)		300000
12	Miscellaneous items	93000	75000
13	Shelves for storage f other raw material		48000
14	Pressure Cookers/steam cooker	30000	30000
15	SS Moulds(Tiffin boxes)	4000	16000
16	Hydraulic Sausage Filler	250000	
17	Shrink Wrapping Machine	50000	
18	Deep fat fryer	5000	10000
19	Multineedle cure injector	400000	
20	Brine making equipment	20000	40000
21	Batter applicator	500000	
	Total(Rs)	**25,47,000**	**10,01,000**