CHAPTER IV

COST EFFECTIVENESS ANALYSES

Research Question: *What are the types of gear that are economically effective to recover all the cost including the opportunity cost of labor?*

COST EFFECTIVENESS ANALYSIS

4.1 INTRODUCTION

The practice of fish culture is said to have originated in Asia sometimes in the distant past when fishes were raised for ceremonial religious purposes (Pantulu, 1974). Even today, it remains some of its esoteric aura, at least in a few countries of the region where fish culture continues to remain a strictly private enterprise, and the entrepreneurs seldom reveal accurate details of either his modus operandi or benefit and cost structure of his operations.

Large-scale development of intensive fish culture or proper management of fisheries requires having a thorough knowledge about the economic aspects. Operation of fishing gears relate mostly with the economics of the fishery management sector. Low yield and the consequent decrease in returns in operation by a particular fishing gear demand the adoption of diversified methods of fishing. A comparative benefit-cost study would help a fish farmer in arriving at intelligent decision in regard to enterprise itself and the expenditures to be incurred on various inputs including capital costs and operating costs.

4.2 REVIEW OF LITERATURE

Few studies exist on the comparative economics of fishing gears and other implements necessary for fish culture. Krishna Iyear (1968) studied on comparative fishing ability and economic efficiency of mechanized trawlers operating along the Kerala coast and concluded that the vessels of '11m class' are better than '10m class' both from the consideration of catch / unit effort and also total effort / year with better

percentage (%) return of capital. In 1972, Naidu and George worked on fishing experiments with frame nets in Hirakud river of Orissa and showed that the net with 1.75m frames gave the highest catch. A thorough study on economic evaluation of fish culture enterprises was worked out by Pantulu (1974). He suggested that application of certain economic indicators such as "Benefit-Cost Ratio" and "Internal Rate of Return" in fish culture enterprise removes the elements of uncertainty, regarding the relative economic status of various developmental projects.

Krishna Kartha (1978) worked on economics of the indigenous fishing units at Cochin: a case study. By using various economic indicators such as Profitability, Rate of Return (ROR), Turnover Ration (TR), Pay Back Period (PBP) etc. he drew the conclusion that *Thanguvala* unit (Profitability, 20.512%) is economically most effective over the *Ayila* unit (Profitability, 12.02%).

Similar works on economic efficiency on '9.82m and 11m fishing trawlers' along Kerela cost was carried out by Krishna Iyer (1983). By using cost benefit analysis of both the fishing, trawlers he concluded that with the increase in the number of fishing tripd, the profit also increase for both the sizes of trawlers. Further, he found the Break Even - Point (BEP) to be 185 and 210 fishing trips for 9.82 and 11m trawlers respectively. An economic analysis on 22m and 23m deep-sea trawlers was worked out by Unithan (1985), and he reported the profit on capital investment of 18% for a '23m trawler'. Likewise, Sadanandan (1988) has worked on economics of gill netting and two boat mid water trawling and came to the conclusion that gill netting is profitable at 17.5 to 25.2% while two mid water trawling was profitable at18.5%. Day and Kar (1989) have made an attempt on measuring efficiency of different

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fishing gears at Sone beel, Assam; in terms of their cost of fabrication and CPGH, and in that *Dori* (trap) was found to be the most efficacious (CPGH 0.050 + 0.021 kg) over the other gear types.

Datta, et al., 1989 have carried out "an economic analysis of different type of bag net (Behundi jal) units in West Bengal coast. By using various economic indicators such as the B-C ratio, the NPW, the IRR and N-K ratio, it has been observed that all types of units were economically feasible, and yielded reasonably good profit margin. Further, they found that and non-mechanized units provided maximum benefit at least coast as compared to the mechanized units. In 1992, Trinos studied the technological and socioeconomic assessment of the Magat Reservoir fishery, Phillipines and reported that the annual average fish catch was dependent on the type of gear and boat used and upon the fishing effort in terms of the number of hours per day.

Amarasinghe (1992) worked on evaluating efficiency of different fishing methods in tropical, shallow reservoir in Sri Lanka and indicated that gill netting would not have an adverse effect on fish stocks but seining seemed to lead to diminished returns. He further stated that the efficiency of the other fishing methods (water beating, beach seining on cast netting) were higher than normal gill netting.

Economics of fishing units in the backwater of Kerala was done by Silubhai Raj, et al. (1992). They studied the cost benefit analysis of crafts and gears used for stack net, cast net, bag net and ring net. The study reveals that the rates of return for capital employment were 67.94% for gill net, 5.32% for bag net, and 20.78% for ring net. In spite of high rate of return, net income of fishing units were low.

Sathiadhas, et al., 1993 studied economics of traditional gill net fishing using wind energy along Tamil Nadu coast. The key economic indicators such as initial investment, rate of return, cost of production, net returns etc. had been worked out, which indicated that utilization of wind energy is most suitable and economically viable for the traditional fishermen operating gill nets in Tamil Nadu coast.

Likewise, Tewari, (1994) from the study on "economic of input resource management in Reservoir fisheries" concluded that gear weight (Kg), fishing effort (number of annual fishing days) fishing experience (years) seemed to influence fishing activity. He further opined that under existed working capital constraints, increase in fishing effort should be accompanied with reduction in gear weight to optimize the returns.

From the study of previous research activities following drawbacks have been observed:

1. Most of the works on the efficiencies of fishing gears in India and abroad have been conducted in a single or two water bodies (reservoir fisheries). But the present study has been conducted in 57 nos. of beels(13% of the total regd. beels).
2. The cost and return analysis of fishing gears have been worked out in marine waters, riverine fisheries or large reservoir fisheries. But no such extensive work has been carried out in the flood plain lakes (beels). Due to changed hydrological conditions of flood plain beels in comparison to the reservoir fisheries the efficiencies of fishing gears will also vary greatly.
3. Though a few literatures have considered cost and return aspect while analyzing the effectiveness of a particular gear they have fail to incorporate the opportunity cost of labor, which is significantly high in the riverine form. Moreover, the costing methods used in analysis is too traditional, the modern costing methods currently used by the professional organizations are not being used by any of the literature. Hence, their conclusions are in question.
4. By the same token none of the above study measure the effectiveness based on the modern concept of productivity (Productivity = Value of total catch / Total Cost (Capital cost + Operational cost). Measuring productivity in this fashion may lead to the conclusions, which differs from the conclusions of the above studies.

In the light of above, the present work has been carried out to evaluate the costs return analysis of the fishing gears (which are being in use in the flood plain beel fisheries of Assam) using more sophisticated evaluation techniques.

4.3. MATERIALS AND METHODS

A pilot survey was carried out in 1996 in different beels of Assam for selecting sample centers for an in depth study. Based on the investigation, 57 numbers of beels, located in 13 districts of Assam (Appendix-II) were selected randomly for detailed study.

Data on day- to- day costs and earnings were collected from selected units with the help of the questionnaire (Appendix-1) and through the verification of documents and survey method in the year 1995-1996.

Seven criteria were used to work out economic feasibility of investment on the fishing gears as mentioned below:

(1) **Capital Turn Over Ratio (CTOR):** The capital turnover ratio i.e. the income generated for each rupee invested is obtained by dividing the total revenue with the capital investment.

(2) **Rate of return (ROR):** The rate of return to capital is obtained by dividing the profit after tax with the capital investment.

(3) **Pay back period (PBP):** It indicates the recovery period of the capital investment and is obtained by dividing the capital investment with profit after tax plus depreciation.

(4) **Benefit-cost ratio (B-C ratio):** It is the ration of present value of benefit streams and the present value of cost stream.

(5) **Net present worth (NPW):** It is also known as net present value (NPV) and is equal to the present value of future returns, discounted at the marginal cost of capital, minus the present value of the cost of the investment. In an economic study, projects are expressed, as far as practicable in monetary terms. One of the main considerations in such studies is determining whether an enterprise is economical in the long run. Hence it is necessary to recognize the time value of money. A productive investment of capital results in the realization of economic returns. So, a given unit of money is worth more now than the prospect of the same unit next year or at some later date. The investment made in a fishing operation should be recoverable with sufficient attractive returns over a given period of time. Thus investment or loan "is the amount necessary to secure the promise of future payment or series of payments, with interest at a given rate"(Grant and Ireson, 1960). To the investor or the borrower the present worth represents the present sum required to secure promise of such future payment or payments.

(6) **Internal rate of return (IRR):** It is defined as the interest rate that equates the present value of the expected future cash flows or receipts, to the initial cost outlay. Sometimes only IRR is used instead of benefit cost ratio for economical evaluation. Stated simply, internal rate of return is that rate of return or that rate of interest on investment where the benefit cost ratio is unity. As a first step in the computation of IRR, benefit cost ratios at three or four different assumed trial rates of interest are calculated. By fitting a regression line to the scatter of B-C ratios against the respective trial rates of interest, the interest rate where B/C ratio is unity is easily determined.

(7) **Net benefit-investment ratio (N-K ratio):** It is the present value of net cash flows in each year after the stream has positive return to the present value of incremental net cash flow in the initial year when the stream is negative.

(8) **Opportunity Cost:** The opportunity cost of man-day of labour is what he would otherwise have earned in other best alternative occupation. The best alternative occupation in the case of the most of the fishermen is the daily wage labourer, hence the daily wage rate prevailing in that area has been taken as opportunity cost of labour.

The B-C ratio, the NPV, the IRR and the N-K ratio had been worked out by conventional methods (Gittinger, 1982) as follows:

$$\text{Benefit-cost ratio (B-C ratio)} = \frac{\sum_{t=1}^{t=n} \frac{Bt}{(1+i)^t}}{\sum_{t=0}^{t=n} \frac{Ct}{(1+i)}}$$

$$\text{Net present worth (NPV)} = \sum_{t=1}^{t=n} \frac{Bt}{(1+i)^t} - \sum_{t=0}^{t=n} \frac{Ct}{(1+i)^t}$$

$$\text{Internal rate of return (IRR)} \Rightarrow \sum_{t=1}^{n} \frac{Bt}{(1+I)^t} = \sum_{t=1}^{n} \frac{Ct}{(1+I)^t}$$

$$\text{Net benefit-investment ratio (N-K ratio)} = \sum_{t=1}^{n} \frac{Nt}{(1+i)^t} \Big/ \sum_{t=0}^{n} \frac{Kt}{(1+i)^t}$$

Where,

Bt = benefit* from investment in the year 't'

Ct = investment** in year 't'

Nt = incremental net cash flow in each year after the stream has return positive

Kt = incremental net cash flow in the initial year when the stream is negative

N = life of boat/gear

i = interest (discount) rate.

I = IRR

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* Benefits are evaluated from the stand point of the economy of the individual or individuals running the enterprise. Benefits to be reckoned which should be tangible and capable of being estimated in financial terms. Secondary benefits or intangible benefits should be considered only as a supplementary justification of the project. Benefits are generally expressed as an annual equivalent over the established period of analysis. Usually in new ventures, there is a time lag between the commencement of the project and the realization of the optimum benefits. Hence, benefits increase gradually till they reach an optimum figure.

** The economic costs in fishing operation is segregated into installation cost or capital investment and operational or variable costs, which have been described below:

(i) **Installation:** It is also known as capital investment (CI) and includes the total amount needed to install fishing implements such as cost of gear and cost of Boat.

(ii) Fixed cost: It is the depreciation value of the capital investment, i.e. the depreciation of gears and boats in this case. Fixed cost also includes interests incurred for the capital investment if the amount is taken as loan from bank or some other financial agency. Fixed cost (depreciation) is determined by dividing the capital investments of various items with their life span.

(iii) Variable cost:

It is also known as operational costs and is the amount needed at the time of fishing. It includes various costs such as wages of labor, repair cost of gear, repair cost of boats etc.

The feasibility analysis is based upon the following assumption:

(i) The life expectancy of boat is 12 years
(ii) Cost and return remain at level obtained in the initial year
(iii) The effect of future price inflation is not taken into account
(iv) The weighted average value of fish does not indicate the market price but prices at beel site only.

4.4 OBSERVATION

4.4.1 ECONOMIC ANALYSIS OF MUSARIJAL

Musharijal, which is also known *Mahajal* or *Moharijal* is used sometime as encircling net sometime as drag net and also sometime as *Katal* net during *Katal* fishing which is an indigenous fishing method (Yadav, 1981) of Assam. The fishing by this gear is more intensive and widespread in commercial practices than any other type of fishing gears.

Keeping in view the importance of *Musharijal* that was observed in 51 beels of Assam, an attempt has been made to evaluate economic analysis on the following objectives:

(a) To examine the costs and return of the gear in different beels;
(b) To work out economic feasibility of investment on the unit; and
(c) To work out its efficiency on the basis of selected economic indicators.

4.4.1.1 Catch and Effort

Average catch and effort per fishing day were shown in table-4.1 along with the number of days of operation. In Gopherahang beel (Cachar) the daily catch was recorded at 82 kg and hence the average annual catch is found higher (17,220kg) than other beels of Assam. On the other hand, Satiyan and Brahmamaijan beel exhibited a minimum annual catch recorded with 2,400 kg. The number of fishing days is found to be minimum (60 days) in Digar bakri beel but Sone beel enjoyed 270 days of fishing that is maximum amongst the surveyed beel. The average annual catch in the operation of *musarijal* is found to be 5514 kg with the average CPGH of 0.1187 kg.

4.4.1.2 Capital Investment and Depreciation

The average initial investment or capital investment for acquisition of boats and gears in different beels of Assam has been worked out at Rs.39558/- (Table-4.1). The total capital investment is found maximum in Sibnarayanpur Anua with Rs.74, 000/-where as minimum in Lakhanabandha and Sagmara beel i.e. Rs.19, 500/-. The difference was mainly due to size of nets and different acquisition price at different places. The depreciation of boats and gears ranges between Rs.2150/- (Sagmara) and Rs.14500/- (Sibnarayanpur) with an average of Rs.6456/-.

4.4.1.3 Total Cost

The total costs have been segregated into fixed and variable costs in the operations of *Musharijal* in different beels. The distinction between fixed and variable costs is made due to the fact that while fixed costs need to be incurred even if the fisherman do not go for fishing and the variable costs are incurred only when there is fishing.

Fixed cost: Fixed costs include depreciation of both crafts and gears, which has been described under the subhead 4.4.1.2.

Variable cost: Among the variable costs, wage for labor; repair of gears; repair of boats and maintenance of boats and gears are the major components. The labor costs were calculated according to the daily wages and total number of days of operation. The variable costs can also be expressed as operational costs. The total operational cost was maximum in Sone beel Rs.135400/- mainly due to maximum days of operation (270 days) and minimum in Sagar beel i.e.Rs.17100/- with only 90 days of operation with an average of Rs.60137/-.

The total cost (fixed cost plus variable costs) ranges from Rs.21450/- (Sagmara beel) to Rs.142386/- (Sone beel) with the average of Rs.66136/- per year.

4.4.1.4 Revenue

The data on catch in terms of quality and value realized were observed on daily basis but calculated for annual basis in different beels of Assam. The fishermen sold the fishes at beel site. The average prices of the fish species were much lower at the beel site in comparison to market price and did not exceed Rs.25/kg. Gross revenue on total catches and its price realized per kg the revenue has been worked out.

Annual gross revenue is found maximum (Rs.430500/-) in Gopharchang (Cachar) compared to other beels of Assam. This may be attributed mainly due to fishing days as well as good ground for quality fishes. On the other hand, Sagmara beel exhibits the minimum revenue (Rs.28125/-) generation from the fishing with *musarijal* indicating inefficiency of the gear from the economic viability point of view. As a large part of the beel area is manifested by thick vegetations the gear is seem to be non efficient in this beel.

4.4.1.5 Economic Viability

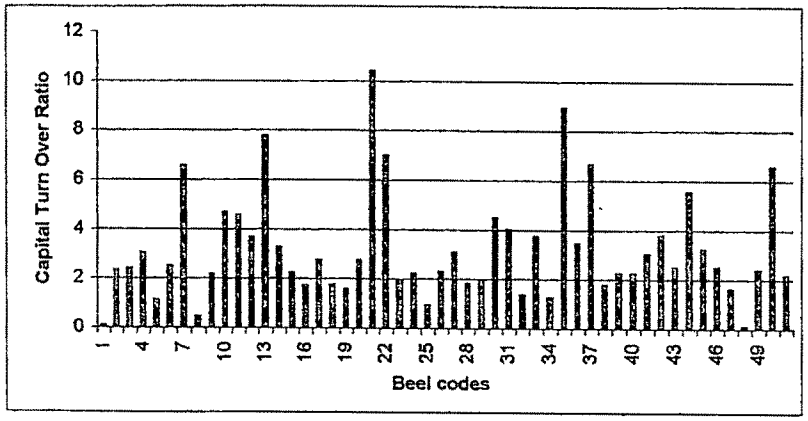
Using the information in the earlier part of the analysis regarding various components of cost, life expectancy of craft and gear, gross revenue on total catches and its price realized per kg the viability of investment ha been worked out (Table-4.1 and Fig.4.1.

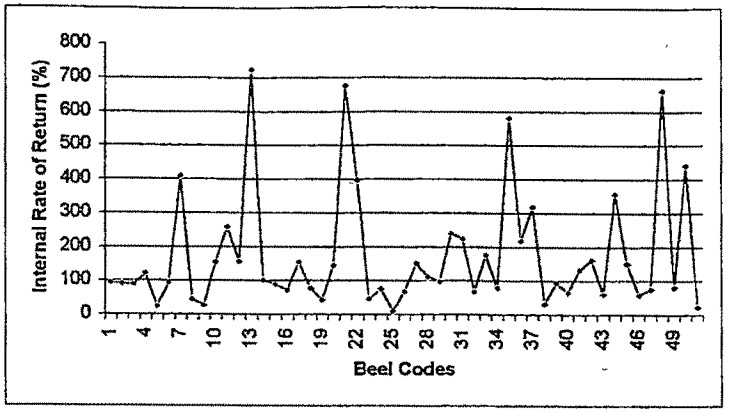
Table-4.1 Economic Indicators of Musarijal

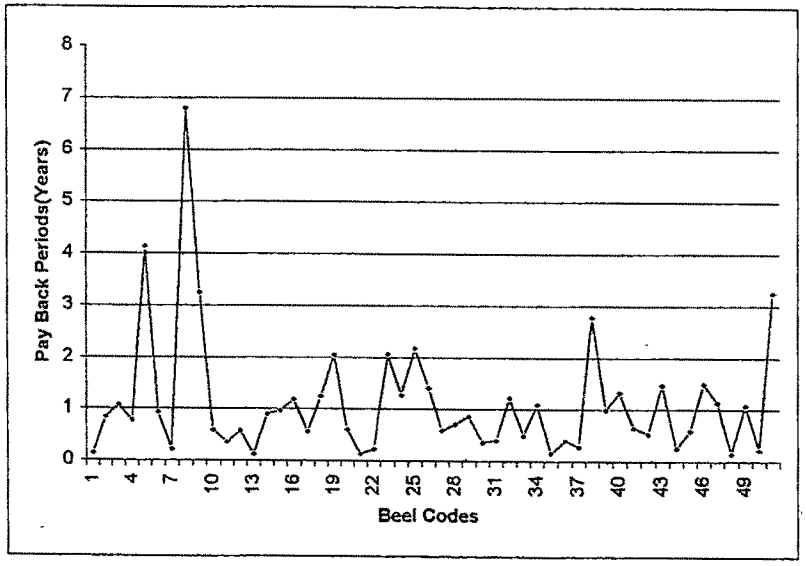
Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidanga	36000	5333	129200	134533	393750	259217	0.09	7.2	264550	0.14	15750	210	0.156	1591432.5	35.49	93	45.2
Hakama	45000	5833.33	50800	56633.33	105000	48366.67	2.33	1.07	54200	0.83	4200	120	0.109	274907	6.8	90	7.11
Harinchora	28000	3733.32	41800	45533.32	67500	21966.68	2.41	0 78	25700	1.08	2700	120	0.087	125003.8	4.7	87	5.46
Barundanga	27000	3650	47800	51450	82250	30800	3.04	1.14	34450	0.78	3290	140	0.092	180166.3	6.45	120	7.6
Bhoispuri	44000	6000	.40600	46600	51250	4650	1.16	0.1	10650	4,13	2.25	90	0.071	11791.5	1.21	23	1.26
Jogra	55000	8750	79500	88250	138750	50500	2.52	0.91	59250	0.93	5550	150	0.096	285772.5	4.5	94	6.19
Chandakhal	39000	5750	76200	81950	256500	174550	6.58	4.47	180300	0.22	10260	180	0.178	1061466	20.44	410	28.22
Sagmara	19500	2150	19300	21450	28125	6675	0.47	0.34	- 8825	6.8	1125	45	0.078	32847.05	2.56	44	2.68
Borbilla	37500	4875	70700	75575	82250	6675	2.19	0.17	11550	3.25	3290	140	0.061	26395.5	1.58	26	1.7
Botua-kamakhya	24000	3111	71900	75011	112875	37863.91	4.7	1.57	40975	0.58	4515	210	0.083	221320.05	7.85	154	10.22
Siligurijan	41000	6450	73000	79450	187500	108050	4.57	2.63	114500	0.36	7500	125	0.133	6703.9	1.3	257	1.41
Deepar	39000	5750	76200	81950	144900	62950	3.7	1.61	68700	0.57	6900	230	0.078	384693.9	7.78	156	10.5
Mori	21000	25883.33	47400	49983.33	213750	163766.7	7.79	10.2	166650	0.12	8550	190	0.234	1002470.1	37.8	724	48.7
Bormonoha	45000	5833	98900	104733	148750	44017	3.3	0.98	49850	0.9	5950	170	0.078	247980.5	5.09	100	6.51
Jaluguti	50500	8097.22	61900	69997.22	114000	44002.78	2.26	0.87	52100	0.97	4560	120	0.098	242895.8	4.05	87	3.85
Kasodhora	57500	9652.77	51300	60952.77	100000	39047.23	1.74	0.68	48700	1.18	4000	100	0.104	207574	3.21	71	4.6
Kujibalipatti	49000	7555 5	47600	55155.5	135000	79844.5	2.75	1.63	87400	0.56	5400	120	0.156	466021	7.21	153	10 51
Deora	44000	6000	42500	48500	78000	29500	1.77	0.67	35500	1.24	3120	120	0.101	165613	4 06	76	4.76
Thekera	42500	6875	46700	53575	67500	13925	1.59	0.32	20800	2.04	2700	90	0.078	65464	2.03	42	2.54
Udori	42000	6000	46200	52200	115500	63300	2.75	1.5	69300	0.6	4620	110	0.131	368257.8	7.06	145	9.77
Nandini-karmari	34500	5043.33	103800	108843.35	360000	251156.7	10.4	7.27	256200	0.13	14400	180	0.178	1539405.1	34.12	675	46.27
Lakhanabandha	19500	1958.33	52000	53958.33	136500	82541.67	7	4.23	84500	0.23	5460	210	0 135	497838 3	20.74	396	26.53
Satiyan	30500	2300	45200	47500	60000	12500	1.97	0.4	14800	2.06	2400	120	0.069	53295.7	2.39	45	2.75
Siyalekhaity	37500	4875	54200	59075	84012.5	24937.5	2.24	0.66	29812.5	1.26	3360.5	120	0 087	139443.47	4.09	75	4.71
Dighali-patali	40000	2916.66	30550	33466.66	38250	4783.34	0.96	0.12	16100	2.17	1530	90	0.066	-5002	0.9	9	0 87
Brahmamaijan	26000	3566.66	41600	45166.66	60000	14833.34	2.31	0.57	18400	1.41	2400	120	0.078	81817	3.55	67	4.15
Salchapra	42500	7589.28	58200	65789.28	131625	65835.72	3.09	1.55	73425	0.58	5265	90	0.13	391212.75	7.18	150	10.21

Sibnarayanpur	74000	14500	34100	48600	135750	87150	1.83	1.17	101650	0.72	5430	60	0.235	503243.5	4.99	112	7.8
Baskandi	59000	9777.77	48700	58477.77	117000	58522.23	1.98	0.99	68300	0.86	4680	90	0.135	327398	4.43	97	6.55
Auti-bauti	45000	8303.57	77200	85503.57	202500	116996.4	4.5	2.59	125300	0.36	8100	180	0.14	707220.5	11.34	239	16.72
Tapang	28000	4333.32	41700	46033.32	112500	66466.68	4.02	2.37	70800	0.39	4500	120	0.146	397779.2	10.83	222	15.21
Digar-bakri	51000	10321.41	28800	39121.41	70500	31378.59	1.38	0.61	41700	1.22	2800	60	0.163	175941	3.14	68	4.44
Ranimegna	45000	8303.57	77000	85303.57	168750	83446.43	3.75	1.85	91750	0.49	6750	150	0.117	499546	8.3	175	12.1
Sagar	47500	8125	17100	25225	60750	35525	1.28	0.75	43650	1.09	2430	90	0.105	262895	3.7	79	5.19
Gopharchang	48000	8857.14	106300	115157.14	430500	315342.9	8.96	6.5	324200	0.15	17220	210	0.213	1933852.4	27.5	580	41.28
Angang	45500	6986.11	41800	48786.11	157500	108713.9	3.46	2.39	115700	0.39	6300	90	0.218	646776.8	10.31	218	15.21
Sone	45500	6986.11	135400	142386.11	303750	161363.9	6.67	3.5	168350	0.27	12150	270	0.117	972680.3	15.01	317	22.38
Rata	46000	6888.88	64700	71588.88	81250	9661.12	1.77	0.21	16550	2.78	3250	130	0.065	33577.7	1.49	31	1.73
Pungani	30500	3652.77	37900	41552.77	68750	27197 29	2.25	0.89	30850	0.99	2750	110	0.097	152146.3	4.92	94	5.99
G.B.Jopora	52000	9142.85	78600	87742.85	118125	30382.15	2.27	0.58	39525	1.32	4725	135	0.078	166674.75	3.13	66	4.2
Merkolaberia	41000	7464.32	62100	69564.32	125000	55435.68	3.05	1.35	62900	0.65	5000	125	0.104	327563	6.3	132	8.99
Tinsuliborbil	41000	6319.44	78600	84919.44	155250	70330.56	3.79	1.71	76650	0.53	6210	135	0 102	412675.5	7.68	161	11.06
Moridisoi	25000	3250	45500	48750	62500	13750	2.5	0.55	17000	1.47	2500	100	0.071	75164	3.49	60	4
Botalikhosa	27000	4678.5	39900	44578.5	150000	105421.5	5.56	3.9	110100	0.25	6000	80	0.195	642046.2	17.26	356	24.78
Bihdia	28000	4000	43350	47350	91000	43650	3.25	1.56	47250	0.59	3640	130	0.109	254480.7	7.28	149	10.08
Teliadanga	25000	3472.22	45700	49172.22	62500	13327.78	2.5	0.53	16800	1.49	2500	100	0.078	68598	2.94	59	3.74
Moridikhow	54000	8666.66	39600	48266.66	87500	39233 34	1.62	0.73	47900	1.13	3500	100	0.121	211319	3.99	75	4.91
Batha	38000	5333	129200	134533	393750	259217	0.09	7.2	264550	0.14	15750	190	0.181	1591965	35.91	662	42.89
Mailata-diplinga	28000	3733.32	41800	45533.32	67500	21966.68	2.41	0.78	25700	1.08	2700	70	0.082	129836	3.93	81	5.64
Raumari	39000	5750	76200	81950	256500	174550	6.58	4.47	180300	0.22	10260	120	0.163	1069458	23.95	440	28.42
Gathia	37500	4875	70700	75575	82250	6675	2.19	0.17	11150	3.25	3290	100	0.073	23856	1.35	22	1.49
Average	**39559**	**6455.935**	**60137.3**	**66136.328**	**138332**	**72195.29**	**3.2**	**1.98**	**78349.3**	**1.117**	**5514.37**	**130.5**	**0.1186863**	**416734.89**	**9.163**	**173.8**	**12.14**

Fig.-4.1 Economic Indicators of Musarijal.







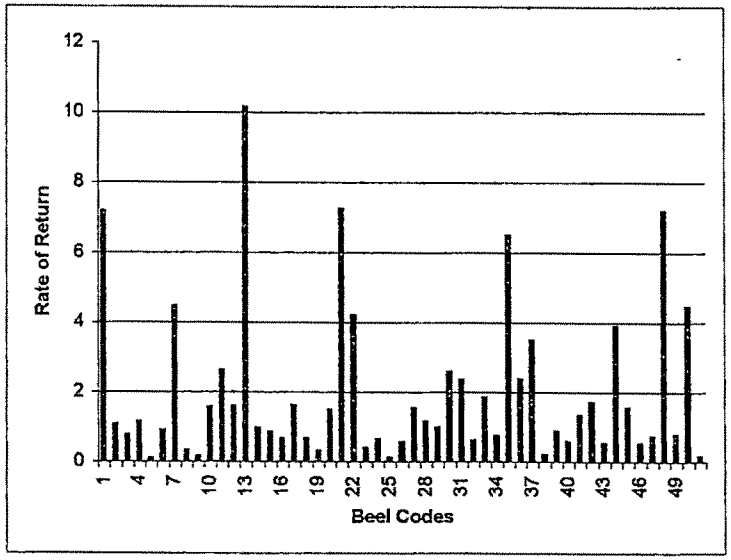


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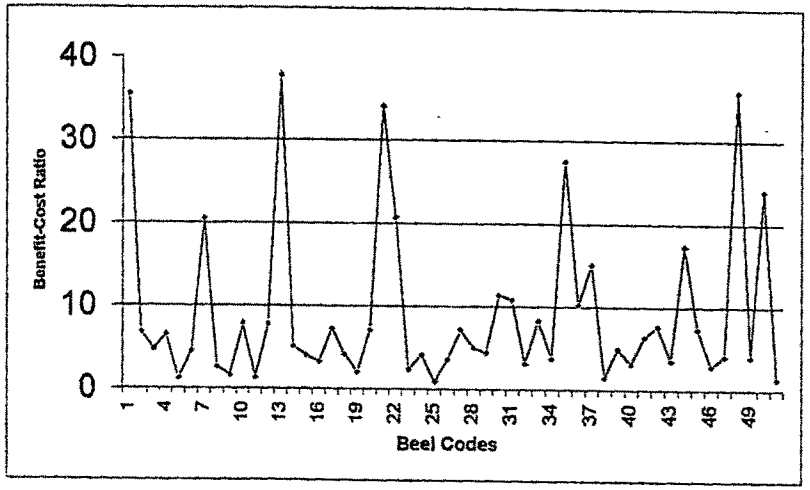
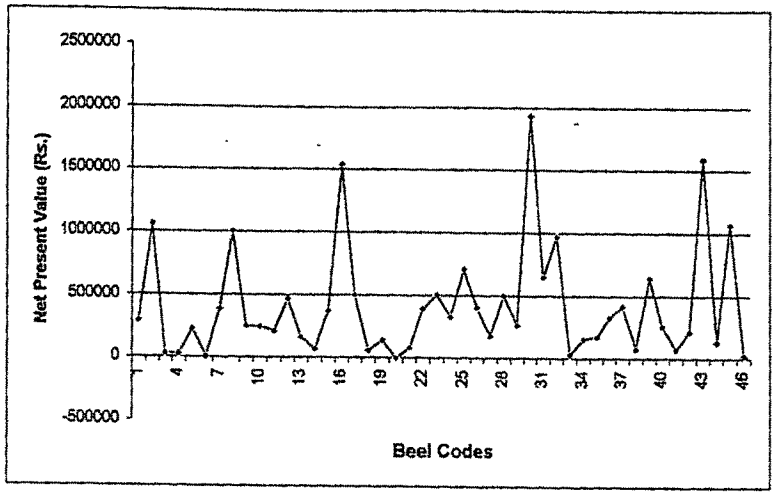
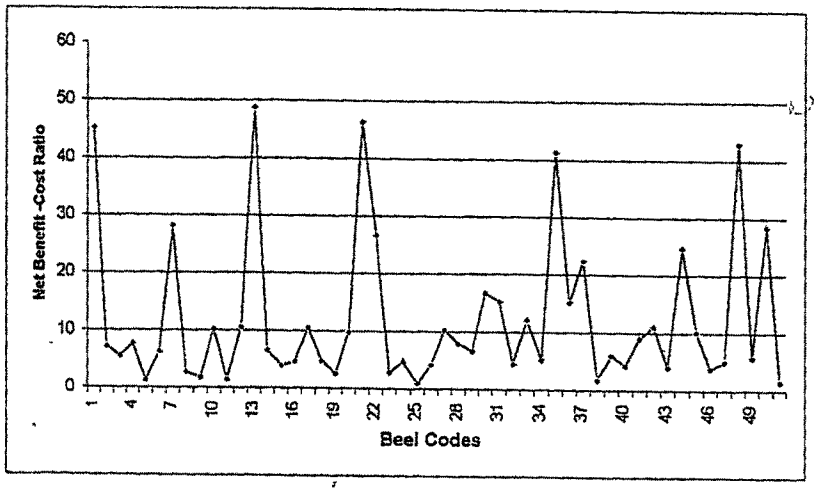
Fig.-4.1 Economic Indicators of Musarijal.







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kalidanga	22	Lakhanabandha	43	Mondisoi
2	Hakama	23	Satyan	44	Botalikhosa
3	Hannchora	24	Siyalekhaity	45	Bhdia
4	Barundanga	25	Dighali-patali	46	Telladanga
5	Bholapun	26	Brahmamaijan	47	Mondikhow
6	Jogra	27	Salchapra	48	Batha
7	Chandakhal	28	Sibnarayanpur	49	Mallata-dipinga
8	Sagmara	29	Baskandi	50	Raumari
9	Borbila	30	Auti-beuti	51	Gathia
10	Botua-kamakhya	31	Tapang		
11	Siligurijan	32	Digar-bakri		
12	Deeper	33	Ranimegna		
13	Mori	34	Sagar		
14	Bormoncha	35	Gopharchang		
15	Jakuguti	36	Angang		
16	Kasodhora	37	Sone		
17	Kujbalipatti	38	Reta		
18	Deora	39	Pungani		
19	Thekera	40	G B Jopora		
20	Udori	41	Merkolaberia		
21	Nandira-kamran	42	Tinsulibortal		

Capital Turn Over Ratio (CTOR): The capital turn over ratio is found maximum in Nandini-Karmari beel (10.43) mainly due to very low capital investment in comparison to total revenue earned. In 40 cases the ratio is found in the range between 0.09 to 3.79 times of which in 4 cases it below the viable range (i.e. below 1) while in other 11 cases the ratio is found above 4.02 times. The average of all cases is found to be 3.203 times which indicates the viability of the gear from the economic point of view.

Rate of Return (ROR): Rate of return to capital should be 12% or above to become economically feasible. It is found in the viable range in all the beels with an average of 198% except Bhoispuri beel (10%).

Pay Back Period (PBP): A pay back period indicates the recovery period of the capital investment. When two projects are compared based on the pay back period (PBP) the one having less PBP is preferred over the others. Since, the objective here is not to find the preference of a gear over others, but to assess the feasibility of a particular gear, the feasibility has been assessed by comparing the PBP of a gear against the logically determined PBP (standard pay back period). The standard PBP is determined based on the physical life of the gear under consideration. Since, the physical life of the most of the gear is between 4 to 6 years, the study has considered 2 years as standard PBP for comparison purpose. The assumption is that original investment would be recovered within 2 years and earn the benefits in the remaining life of the gear after PBP. In case of *musarijal* the physical life is 4-6 years and hence the pay back period should be less than two years. As shown in table 4.1 in most of the cases (88.23%) the pay back is below 2 years. Only 11.77% of the total beel surveyed showed above 2 years. Hence, the recovery period of the capital investment *musarujal* is satisfactory. The average of PBP is found at 1.12 year, which indicates the viability of the gear.

Benefit-Cost Ratio (B-C Ratio): For economic viability, the B-C ratio should be more than or equal to one. In case of *musarijal* the ratio exceeds unity (1.21 to 35.49) in 50 beels (98.03%) and in only one beel (Dighali-patali) it is below the viable range

(0.9). In 39 cases the ratio is found below 10, in 5 cases in the range of 10 to below 20, and in 7cases in the range of 20 to below 40 (fig. 4.1). The average value of the ratio is found to be 9.13, therefore, the gear may be considered economically feasible.

Net Present Value (NPV): The net present value (NPV) also should be equal to or more than one. The study reveals that the NPV of *musarijal* is positive in 50 beels (98.03%) of the total surveyed beels. But the gear exhibited a negative result in Dighali-patali beel (Rs.-5002/-). In 37 cases it is found from Rs.0 to below Rs.500000/-, in 7 cases from Rs.500000/- to below Rs.1000000/-, in 3 cases from Rs.1000000/- to below Rs.1500000/-, and in 3 cases from Rs.1500000/- to Rs.2000000/-. The average value is found to be Rs.416735/-, which indicates the economic viability of the gear.

Internal Rate of Return (IRR): It should be more than 12% to become economically feasible. In the case of musarijal it is found above 12% in 50 beels out of 51 (i.e. 98.03%) in the range from 22% to 724%. In Dighali-patali beel it is found below the viable range (9%). In 38 beels it is found from 0 to below 200%, in 7 beels from 200 to below 400%, in 3 beels from 400 to below 600% and in 3 beels it is found from 600 to below 800% (Fig.4.1). The average value is 174%, which is far above the viable range.

Net benefit Investment Ratio (N-K ratio): It should be more than or equal to one. In case of *musarijal* it is found within the economic viable range (1.49 to 48.7) in all the cases except Dighali-patali beel where it is 0.87. The N-K Ratio is found below 10 in 31 beels, from 10 to below 20 in 10 beels, from 20 to below 30 in 5 beels and from 30 to below 50 in 5 beels. The average of the ratio is found at 12.14, which suggests the over all viability of the gear.

Thus above analyses indicate that *musarijal* is economically feasible as far as the present sample survey is concerned. On the basis of B-C ratio and N-K ratio, it is clear that the gear is able to provide maximum benefits at least cost.

4.4.2 ECONOMIC ANALYSIS OF DOLIJAL

Dolijal or *Moijal* is a small trawl net used for dragging shallow waters and used during September to march. As far as the present study is concern the operation of *Dolijal* or *Moijal* has been found in only 8 (eight) beels out of 55 beels of Assam.

The economic evaluation (Table-4.2 and Fig. 4.2) of the net has been worked out with the same objective as mentioned earlier in this chapter and the result of analysis has been described under the following subheads:

4.4.2.1 Catch and Effort

The catch and effort record of *Dolijal* in different beels have been shown in table-4.2. From the record it has been ascertained that catch per day of *Dolijal* may range from 22.5 kg (Deora beel) to 95.0kg (Nandini beel). The lowest catch in Deora beel may be due to high density of vegetation. In Siligurijan beel the gear is operated only 90 days but Kalidanga beel enjoyed 210 days of operation. But total catch per annum is found to be maximum in Nandini beel (19000 kg) with 200 days of operation while Deora showed a minimum total catch/year of 2700 kg in 120 days of operation. The average catch is found to be 8574 kg with 141 days of operation. The CPGH is found in the range between 0.087 to 0.247 Kg with an average of 0.1354 Kg.

4.4.2.2 Capital Investment and Depreciation

The average acquisition cost for the operation of *Dolijal* is found maximum in Nandini beel with Rs.58000/-, which includes capital investment on boats and gears. On the other hand in Deora beel it is minimum with Rs.39000/- only as a capital investment. Depreciation of gear and boat accordingly are maximum in Nandini

(Rs.8333.32) and minimum in Deora beel (Rs.5000/-). The average capital investment is Rs.48812/- with Rs.7569/- as its depreciation.

4.4.2.3 Total Cost

The total cost for operation of *Dolijal* is segregated into fixed costs and operational costs or variable costs. Fixed cost relates with the depreciation of boat and gear while variable cost includes labor cost, repair of gear and repair of boat.

Fixed costs: The fixed cost i.e. the depreciation of boats and gear has been illustrated under the sub head 4.4.2.2.

Variable costs: Variable costs or the total cost of operation is maximum in Kalidanga beel (Rs.130500) but Deora beel shows a minimum variable cost (Rs.47000/-) with an average of Rs75325/- in a year. In comparison to other beels, Siligurijan beel shows high operational costs i.e. Rs.75200/- in only 90 days of operation, which is due to engagement of more labors.

The total cost accordingly, ranges from Rs.47000/- (Deora beel) to Rs.108833/- (Nandini beel) with an average of Rs.82894/-.

4.4.2.4 Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and calculated for per annum in different beels. The fish was found sold at beel site to the middleman and average weighted fish value was found to be Rs.25/kg. The annual gross revenue earned by operating the *Dolijal* as shown in table-4.2, is found maximum of Rs.475000/-(Nandini beel) and minimum in Deora with Rs.67500/- with an annual average of Rs.214344/-.

4.4.2.5 Economic Viability

Using the information in the earlier part of analysis regarding various components of cost, life span of boat and gear, gross revenue on total catches and its price realized per kg the viability of investment has been worked out (Fig. 4.2).

Capital Turn Over Ratio (CTOR): The CTOR is found highest in *Nandini* (8.19 times) but lowest in *Jaluguti* beel (1.58 times) with an average of 4.229. The ratio should be equal to or more than one to become economically viable. In this case the gear is found above the viable range in all the beels. Moreover, it is found below 2 times in 3 beels and from 2 to below 10 in 5 beels.

Rate of Return (ROR): The ROR to the capital is better in *Kalidanga* beel (521%) while in *Jaluguti* it is very poor (28%) with the average of 254%. The ratio should be 12% or more to become economically viable. In this case the gear is found viable in all the beels showing a very high ROR.

Pay Back Period (PBP): For economic viability, the PBP should be less than 2 years. The study indicates that out of 8 beels in 7 beels the PBP is economically viable, which is found between 0.19 to 1.53 years. But in one case (i.e. Jaluguti beel) the PBP is found 2.29 years. The annual average PBP is found 0.84 years, which indicates the over all viability of the gear. (vide page no.80)

Benefit-Cost Ratio (B-C Ratio): In the case of *dolijal* B-C ratio is found above the feasible range i.e. one, in all the samples under study and ranges in between 1.71 (Jaluguti beel) to 31.67 (Nandini beel) with an average of 11.03 times. In Kalidanga and Nandini beel the ratio shoots up to 25.89 and 31.67 respectively, which indicates higher viability of the gear in these beels.

Net Present Value (NPV): The net present value (NPV) also should be equal to or more than one. The study reveals that the NPV of *dolijal* is positive in all the beels. In

5 cases it is found from Rs.0 to below Rs.500000, in 1 case from Rs.500000 to below Rs.1000000, and in 2 cases from Rs.1000000 to below Rs.2500000/-. The average value is found to be Rs.711699/-, which indicates the economic viability of the gear.

Internal Rate of Return (IRR): It should be more than 12% to become economically feasible. In the case of *dolijal* it is found above 12% in all the cases and ranges from 37% (Jaluguti beel) to 604% (Nandini beel). In 5 beels it is found from 0 to below 200%, in 1 beel from 200 to below 400%, and in 2 beels from 400 to 604% with an average of 220%.

Net benefit Investment Ratio (N-K ratio): It should be more than or equal to one. In case of *dolijal* it is found within the economic viable range (2.13 to 39.71) in all the cases. The N-K Ratio is found below 10 in 4 beels, from 10 to below 20 in 2 beels, and from 20 to below 40 in 2 beels. The average of the ratio is found at 14.68, which suggests the over all viability of the gear.

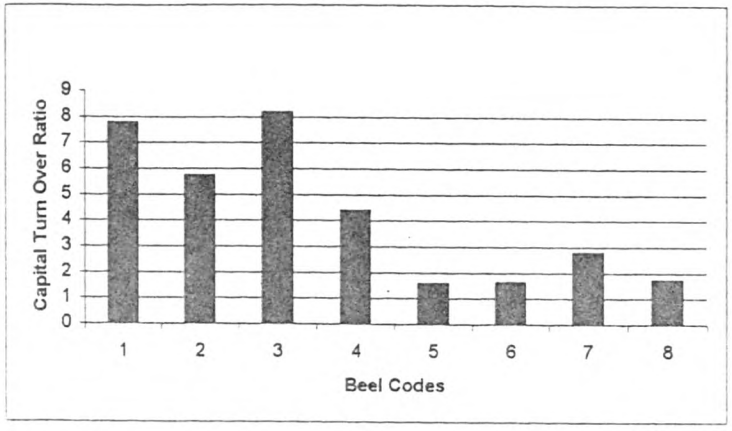
Thus above analyses indicate that *dolijal* is economically feasible as far as the present sample survey is concerned. On the basis of B-C ratio and N-K ratio, it is clear that the gear is able to provide maximum benefits at least cost.

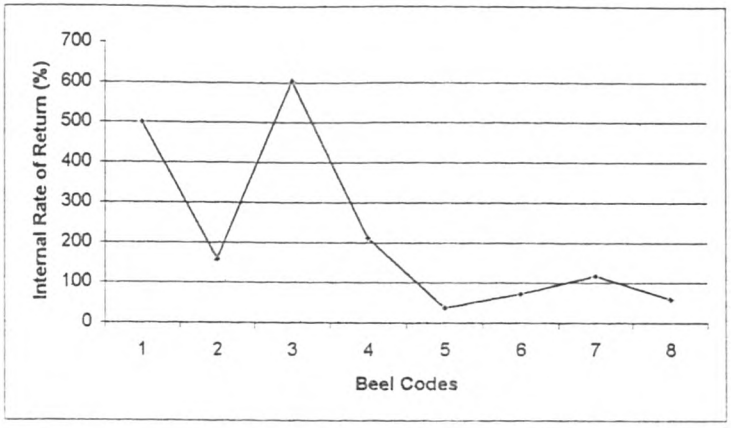
Internal Rate of Return (IRR): Likewise, the IRR was recorded above 12% in all the sample sites, which ranged from 37 (Jaluguti) to 604 (Nandini).

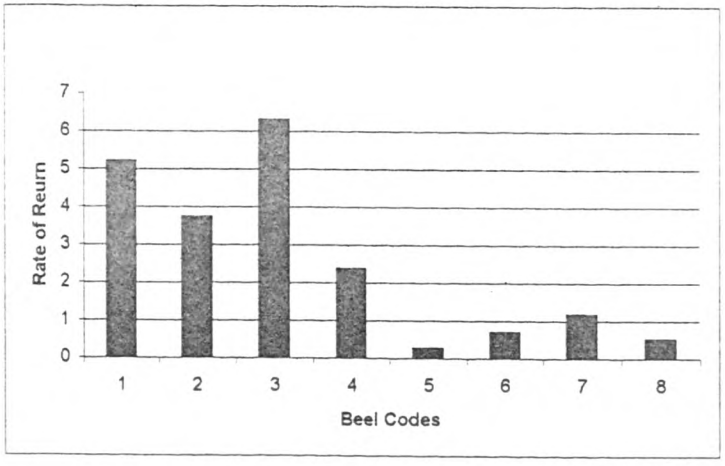
Net benefit-investment Ratio (N-K Ratio): Similarly, the N-K ratio was found above the feasible range and ranged from 2.13 (Jaluguti) to 39.71 (Nandini).

Thus above analysis indicates that the gear is economically feasible and is able to provide sufficient benefits at least cost.

Fig.- 4.2 Economic Indicators of Dolijal







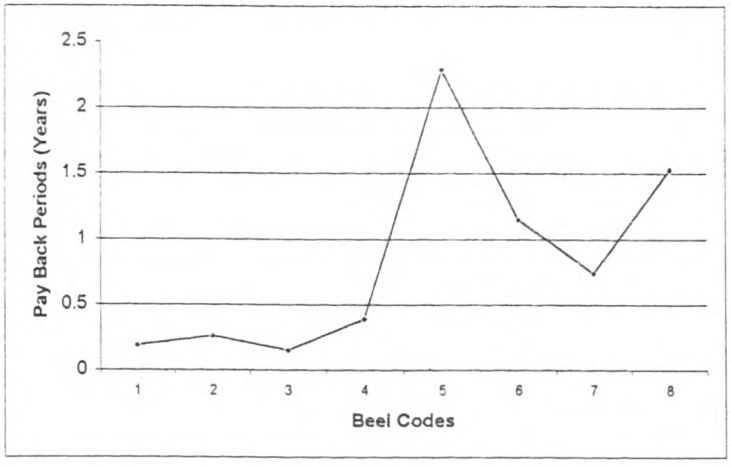


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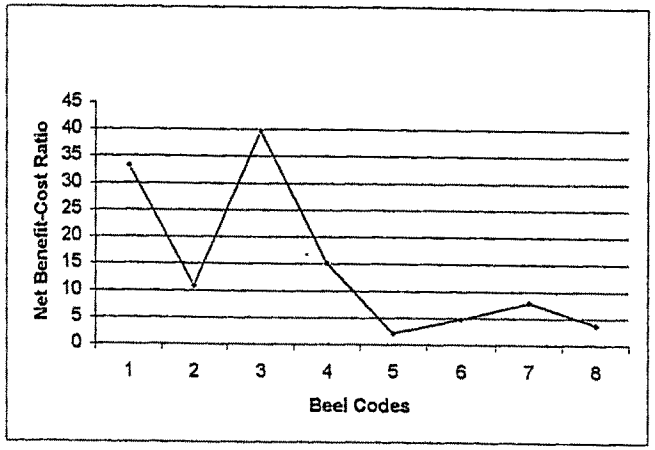
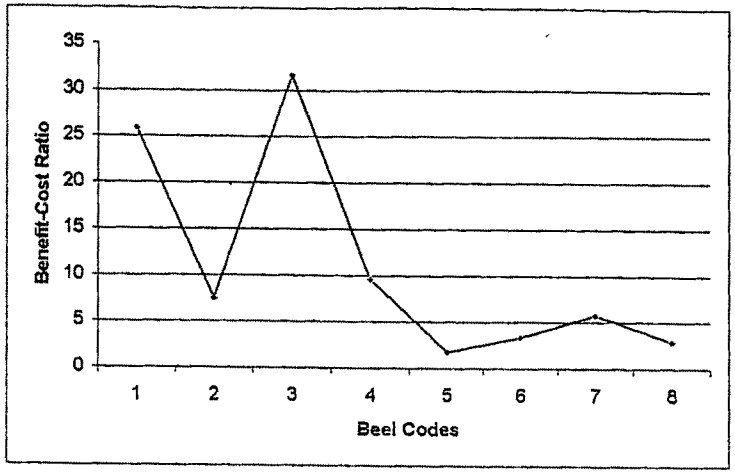
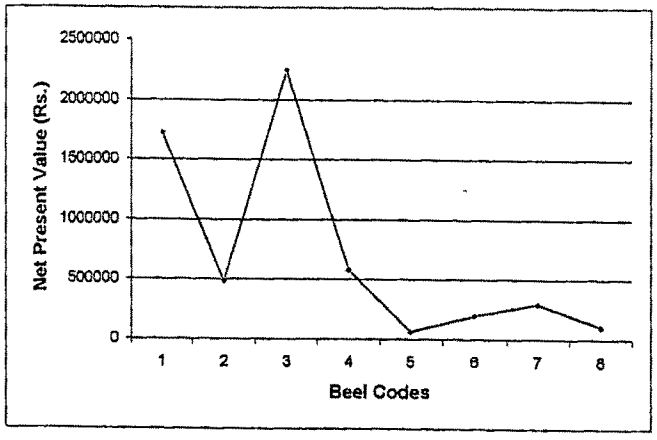
Fig.- 4.2 Economic Indicators of Dolijal







BEEL CODES	NAME OF THE BEELS
1	Kalidanga
2	Hakama
3	Nandini
4	Siliguriian
5	Jaluguti
6	Kasodhora
7	Kujibalipatti
8	Deora

4.4.3. ECONOMIC ANALYSIS OF BER JAL

Berjal (encircling gear) is also known as *borjal, tanajal, purjal* or *paonajal* and is an indigenous fishing gear of Assam. The fishing practices are done mostly during October to February, i.e. five months in a year; but their operation is more extensive and wide spread in comparison to other gears. Out of 55 beels surveyed, berjal is found to be used in 25 beels. Hence, the analysis was based on the data collected from 25 beels and the same is shown in the table-4.3.

4.4.3.1. Catch and Effort

The annual catch and effort data (Table-4.3) shows that *berjal* was operated from 80 days (Pungani, Ganak-Dubai-Duba and Botalikhosa) to a maximum of 190 days in a year (Baskandi) with an average of 106 days. The maximum total catch is 12065 Kg (Baskandi beel) while Dighalipatali showed the minimum catch record with just 2025 Kg with an average total catch of 3859 Kg. The CPGH, on the other hand, is found maximum in Nandini beel (0.236 Kg) and minimum in Tapang and Auti-bauti beels (0.074 Kg) with an average of 0.13 Kg. The result shows that the total annual catch does not necessarily depends on only CPGH but certain other factors also such as total number of days of operation, fish density, and so on.

4.4.3.2. Capital Investment and Depreciation

The average annual capital investment for the operation of berjal is Rs.43400/-, which is found maximum in Salchapra beel (Rs.77000/-) and minimum in Barundanga beel (Rs.24000/-). The differences in capital cost is mainly due to the size of the gear; number of boats used in operation and local rate of selling prices of crafts and nets. Accordingly, fixed costs (depreciation of boats and gears) is found to vary from Rs.3250/ (Barundanga) to Rs.12875/ (Salchapra) with the average of Rs.6711/- as shown in table-4.3.

4.4.3.3. Total Cost

The total cost in the operation of the gear can be broken down in terms of fixed and variable costs as described below:

Fixed Cost in this case is the depreciation of gears and boats only, which has been described in the earlier subhead (4.4.3.2).

Variable Cost includes wages of labor and repair and maintenance of boats and gears. It is found to be maximum in Baskandi beel (Rs.97600/) and minimum in Ganak-Dubai-Duba beel (Rs.27300/) with the average value of Rs.52738/-. The high fluctuation in total operational costs is mainly due to the number of labor engaged and number of total days of operation.

Thus, the total costs (variable cost + fixed cost) are found in between Rs.31176.66 (Ganak-Dubai- Duba) and Rs.109600/ (Baskandi beel) with an average of Rs.59449/-. The relevant cost figures are shown in table-4.3.

4.4.3.4. Total Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and then calculated to annual basis. The fishes were found t be sold at beel site by the fishermen to the middlemen who carried them to market for retail sale. The average prices of fish species were much lower at the beel site in comparison to market and it did not exceed Rs.25/Kg.

The total revenue has been calculated based on the catch recorded by fishermen and the selling price at the beel site during fishing period. Accordingly, the total revenue per annum on operation of *berjal* is found between Rs.43875/ (Rani megna) to Rs.301625/ (Baskandi) per annum with the average value of Rs.96760/-.

4.4.3.5. Economic Viability

Based on the analysis of various cost components, life expectancy of boat and gear, gross revenue from their operation, viability of investment has been worked out using the seven criteria mentioned earlier. The relevant parameters regarding economic viability of *berjal* have been described below:

Capital Turn Over Ratio (CTOR): The capital turn over ratio i.e. the income generated for each rupee invested in berjal operation varies from 0.75 times (Digar bakri) to 4.54 times (Harinchora) with an annual average of 2.437 times (Fig.-4.3). Higher the capital turn over ratio, higher is the efficiency with which the fishermen are using the gears. Since, in most of the cases (21 out of 25 samples, i.e. 84%) in the operation of *berjal,* the capital turn over ratio is more than one, the gear may be considered to be an efficient gear.

Rate of Return (ROR): An investment is considered to be financially viable if the rate of return is more than cut off rate. Generally, the cut off rate is 12% as suggested by the planning commission (1984). The average rate of return in the case of *berjal* is more than 12%. Hence the gear may be considered as financially viable. There are, however, few exceptions are also recorded during investigatioin. The rate of return is found negative in three samples (Auti bauti, Tapang,and Digarbakri); and in another three beels (Bhoispuri, Rani megna and Gopharchang), it is less than 12%.

Pay Back Period (PBP): Pay back period indicates the recovery period of the capital investment. A gear may be considered to be feasible if the pay back period is much lesser than the life of the gear. In case of *berjal* life span is 4 years, and hence the pay back should be less than 2 years. As shown in table-3 in most of the cases (70%) pay back period is below 2 years. Hence, the recovery period of the capital investment is satisfactory. But the exceptions were recorded in seven beels (30 %) where pay back period was above 2 years. The average PBP is found to be 4.86 years, which indicates

that in over all cases the gear is not viable as far as the pay back period analysis is concerned. (vide page no.80)

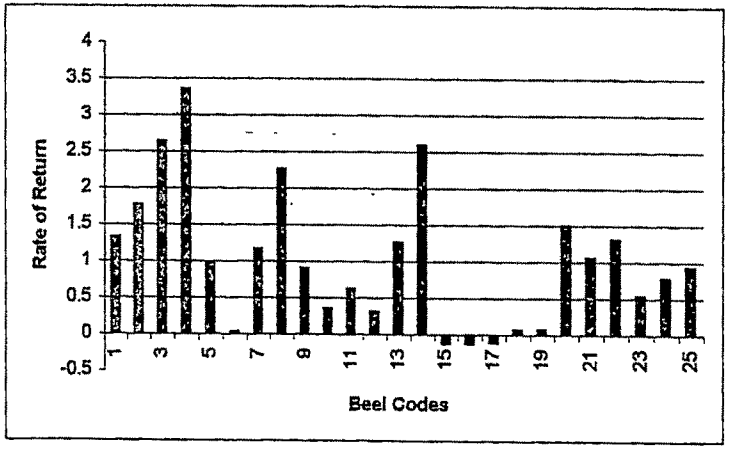
Benefit-Cost Ratio (B-C Ratio): For economic viability, the B-C ratio should be more than or equal to one. In this case the B-C ratio exceeded unity in 20 cases out of 25 total surveyed beels. It is found to be maximum in Nandini beel (13.61) and minimum in Rani-megna beel with an average of 4.807. But in five cases, such as Bhoispuri (0.83), Auti bauti (0.24), Tapang (0.17), Digar bakri (0.32) and Gopharchang (0.41), the ratio is found below the viable range.

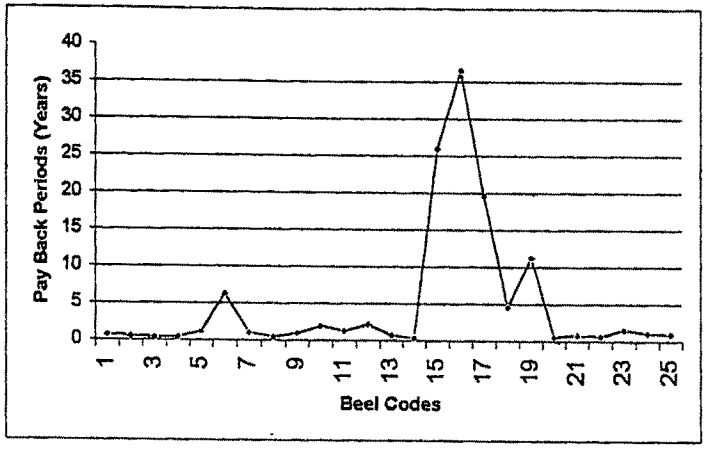
Net Present Value (NPV): The NPV or Net Present Worth (NPW) should be more or equal to zero. The NPV of berjal is found financially viable in most of the cases (80%) except in Bhoispuri (Rs.-7911/-), Auti-bauti (Rs.-80498/-), Tapang (Rs.-86795/-), Digrbakri (Rs.-73891/-) and Gopharchang (Rs.660657/-) where NPV showed a negative trend. The average NPV is found to be Rs.182525/-, which indicates the over all viability of the gear.

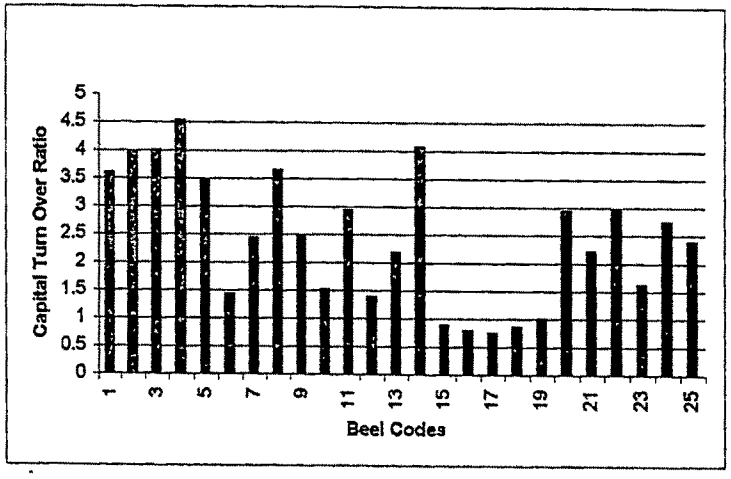
Internal Rate of Return (IRR): The internal rate of return (IRR) should be more than 12% to become economically feasible. In the case of *berjal* it is found above 12% in 23 samples out of 25 cases except Bhoispuri (7%) and Gopharchang (8%). The average value of IRR is found to be 95%, which indicate the over all viability of the gear.

Net benefit-Investment Ratio (N-K Ratio): The net benefit investment ratio (NKR) also should be more than or equal to one. In case of *berjal* the N-K ratio is found within the economic viable range i.e. from 1.04 (Rani-megna) to 16.99 (Nandini beel) in 20 cases out of 25 cases. But in two cases like Bhoispuri (0.79) and Gopharchang (0.21) the ratio is found below the viable range. Moreover, in three cases such as Autibauti (-0.11), Tapang (-0.17), Digarbakri (-0.04), the ratio is found to be negative. The average value of the ratio is found to be 6.29, which indicates the over all viability of the gear.

Fig.-4.3 Economic Indicators of Berjal.







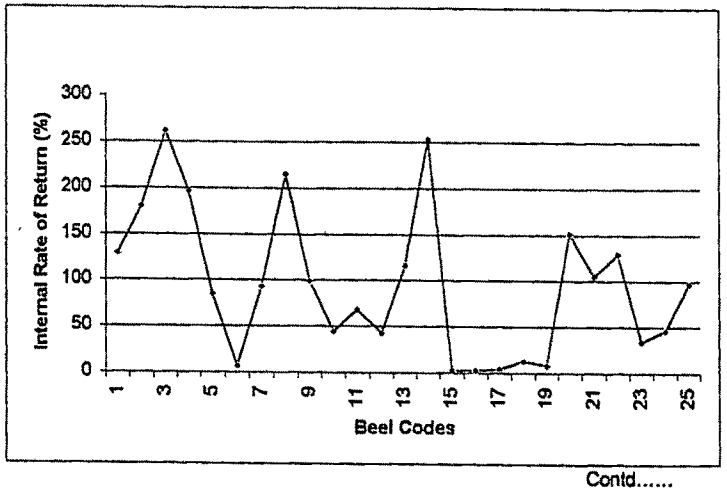


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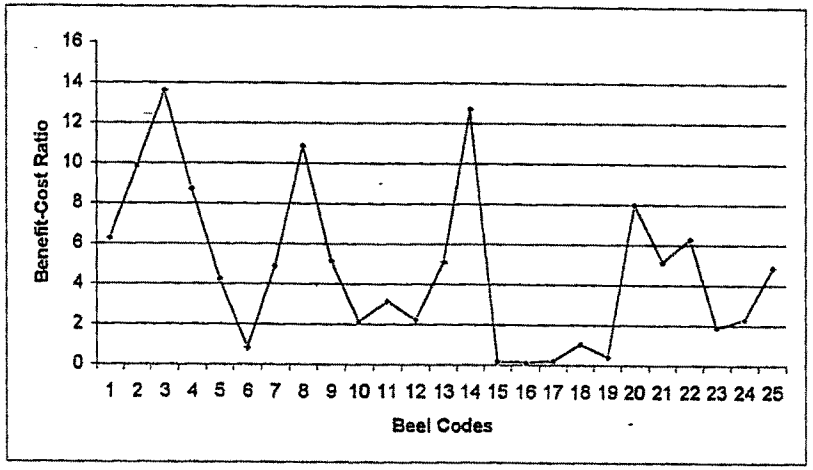
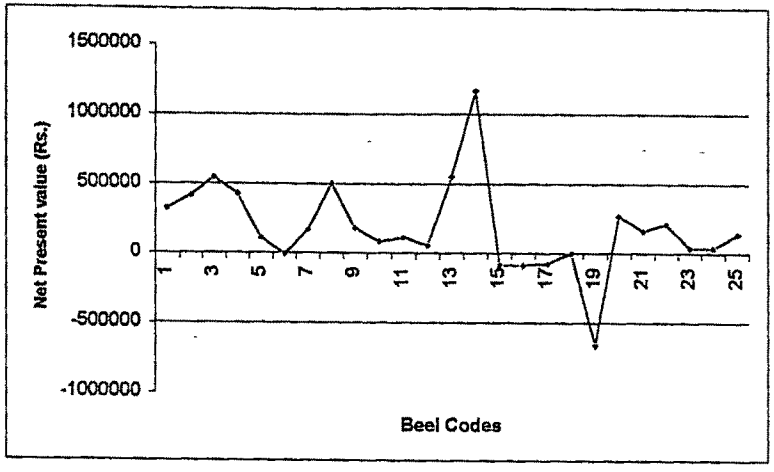
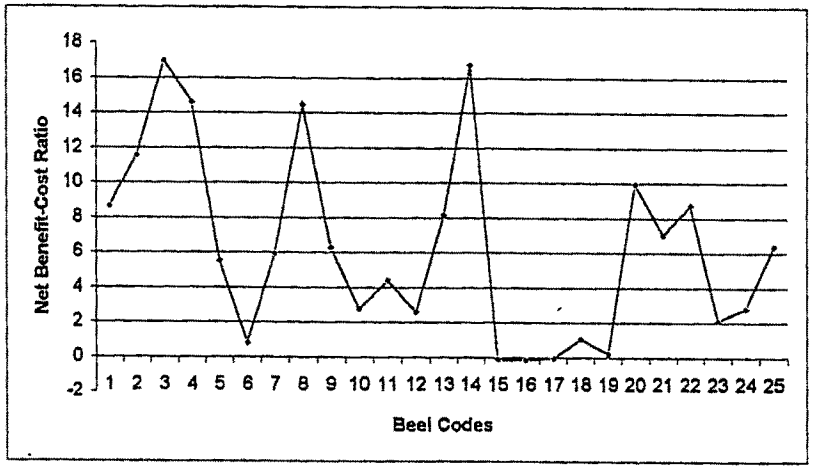
Fig.-4.3 Economic Indicators of Berjal.







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kaldanga	21	Ganak- D Duba
2	Haksma	22	Botalikhosa
3	Nandini	23	Bihdia
4	Harinchora	24	Teladanga
5	Barundanga	25	Mondikhow
6	Bholspuri		
7	Jogra		
8	Chandalchal		
9	Deepar		
10	Thekera		
11	Satyan		
12	Dighali-patali		
13	Salchapra		
14	Baskandi		
15	Auti-Bauli		
16	Tapang		
17	Digar-Bakri		
18	Rani-Megna		
19	Gopherchang		
20	Pungani		

Thus from the above economic analysis it is evident that *Berjal* is economically feasible as far as the present sample study is concern. Moreover, from the study of B-C ratio and N-K ratio it is clear that the gear can provide maximum benefit at least cost. Therefore, the use of *Berjal* may be encouraged.

4.4.4 ECONOMIC ANALYSIS OF PHANSIJAL

It is a rectangular gill net provided with head and footropes. Generally the footrope is devoid of sinkers. *Phansijals* are made of nylon or cotton and mostly operated as surface set. The gear is found to be used extensively (52 beels out of 55 total surveyed beels) in the beel fisheries of Assam for commercial purposes. An attempt has been made to evaluate its economic viability (Table-4.4) with the same objectives as mentioned earlier in this chapter. The different economic parameters as evaluated (Fig. 4.4) has been described below:

4.4.4.1 Catch and Effort

The operation of *phansijals* ranges from 60 days (Sibnarayanpur) to 210 days (Siyalekhaity and Gopharchang) with an average of 139 days. The total catch per year is found in Pungani beel with 910 kg but it is only 225 kg in Sibnarayanpur. The average catch in year from the operation of *phansijal* is found to be 497.5 Kg. The CPGH is on the other hand found minimum in Tapang beel (l0.05 Kg) and maximum in Botalikhosa beel (0.222 Kg) with an average of 0.10786 Kg. The study reveals that the total annual catch does not necessarily depend on the CPGH value.

4.4.4.2 Capital Investment and Depreciation

The capital investment in acquisition of *phansijal* along with boat ranges from Rs.3800/- (Barundanga) to Rs.6000/- (Siligurijan) with an average of Rs.4910/-.

Accordingly, Barundanga shows a minimum depreciation of Rs.366.66, but the maximum depreciation is found in Auti-Bauti (Rs.958.32) against a capital investment of Rs.5500/- instead of Siligurijan beel (Rs.777/-). This is due to the longer life expectancy of gears in Siligurijan beel in comparison to Barundanga beel.

4.4.4.3 Total Cost

The total cost in operation of *phansijal* has been segregated into two fixed cost and variable costs, which are as follows-

Fixed cost: The fixed cost in the operation of *phansijal* is the depreciation of boats and gears, which has been described under Capital Investment and Depreciation.

Variable cost: It is also called as total operation cost and includes wages of labor and repair and maintenance of crafts and gears. Variable cost for *phansijal* ranges from Rs.4250/-(Nandini) to 17,300/-(Gopharchang) with an average of Rs.7197/- in a year. The vast difference in variable cost is due to variation in number of labors employed and number of days of operation.

The total cost, i.e., fixed cost and operating cost is found between Rs.4783/- (Nandini beel) to Rs.17808/- (Gopharchang beel) with an average of Rs.7612/-.

4.4.4.4 Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and calculated for per year according to the number of days of operation in different beels of Assam. The fish values were calculated by taking the average weighted value of different fish species set by the middlemen at beel site.

The total revenue from the operation of the net is found maximum of Rs.20, 020/- in Pungani beel. But Sibnarayanpur exhibits a poor revenue of just Rs.4, 950/-. The total revenue from the operation of phansijal shows a great fluctuation due to the fact that the total catch is too high in Pungani beel (910 Kg) in comparison to Sibnarayanpur (225 Kg). Moreover, the number of operating days in Sibnarayanpur is also very less (60 days) in comparison to Pungani beel (130 days).

4.4.4.5 Economic Viability:

Using the relevant data, which were recorded at beel site, economic viability in the operation of *phansijal* has been worked out for different beels of Assam and shown in Table -4.4 and Fig. 4.4.

(i) Capital Turn Over Ratio (CTOR): From the economic analysis it is observed that the capital turn over ratio (COTR) i.e. the income generated for each rupee invested is higher in Gopharchang beel (4.45 times) in comparison to other beels. In 2 beels it is found below the viable range while in other 49 beels found above the unity with an average of 2.16 times. The ratio is found above 3 times in 7 beels but in most of the beels (42 beels) it is found between 1 to 3 times, which indicates the viability of the gear.

(ii) Rate of Return (ROR): The rate of return to capital is found better in Baskandi (218%) due to its low capital investment in relation to profit after tax generated. It is found below 50% in 21 beels, from 50 to below 100% in 17 beels, from 100 to below 150% in 11 beels and from 150 to below 250% in 2 beels. The average ROR is found to be 67.8%, which indicates an over all viability (12% or above) of the gear from the economic point of view.

(iii) Pay Back Period (PBP): It is found in between 0.43 (Baskandi beel) to 5.92 years (Bihdia beel). To become economically viable it should be below 2 years. In maximum beels (31numbers) the PBP is found below 2 years while in other 20 cases

it is found to be above the viable range. The average PBP is found to be 1.80 year, which suggests the economic viability of the gear. (vide page no.80)

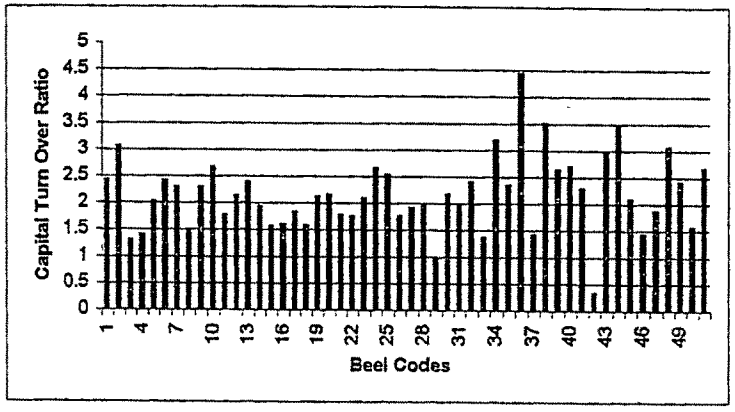
(iv) Benefit-Cost Ratio (B-C Ratio): The benefit-cost analysis in case of *phansijal* is found within the feasible range i.e. above the unity and is found between 1.09 (Pungani beel) and 13.03 (Autibauti beel). Out of 51 cases in 33 cases the ratio is found up to 5 and in another 18 cases it ranges from 5 to below 10. Moreover, in one beel (Auti-bauti) the ratio is found above 10 (Fig-4.4). The average of the ratio is 4.29, which indicates the economic viability of the gear.

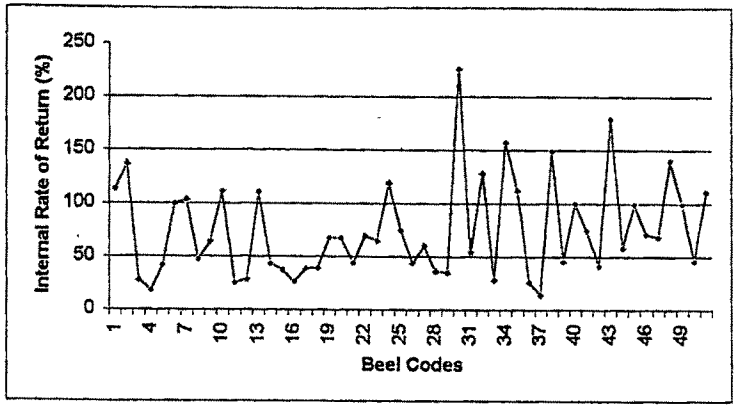
(v) Net Present Value (NPV): It should be zero or above to become economically viable, which is found positive in all the cases under study. In most of the beels (33 numbers) it is found up to Rs.20000/- whereas in 14 beels it is in the range of Rs.20000/- to Rs.40000/-. In 3 beels the NPV is found in the range of Rs.40000/- to Rs.60000/- but in one beel it is above 60000/- (Fig-4.4). The annual average of NPV is found to be Rs.18720/-, which suggests the viability of the gear.

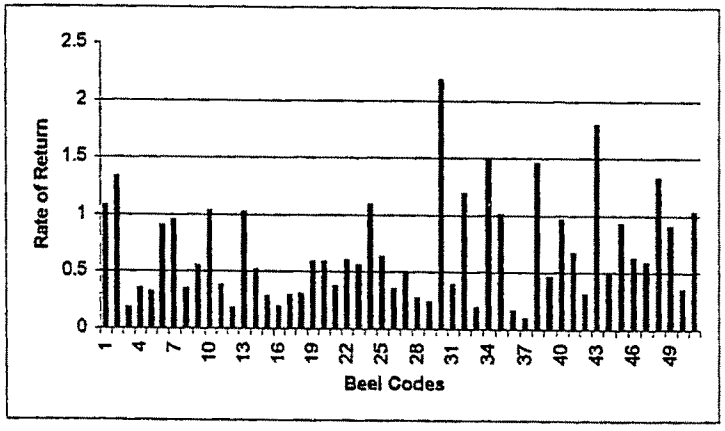
(vi) Internal Rate of Return (IRR): It should be 12% or above to become economically viable. Fig-1 shows that out of 51 beels in 21 beels the IRR is up to 50%, in 14 beels it is up to 100%, in 12 beels it is up to 150%, in 3 beels it is up to 200% and in only one beel it is found above 200%. The average IRR of 51 beels is found to be 74.8%, which supports the viability of the gear.

(vii) Net benefit-Investment Ratio (N-K Ratio): The N-K ratio should be one or more to become economically feasible, which is found above the viable range in all the beels under study. In maximum beels (33 numbers) the ratio is found up to 5 whereas in in 16 beels it is found up to 10. Moreover, in two beels the ratio is found above 10. The annual average of the ratio is found to be 4.72, which indicates the economic feasibility of the gear as far as the present study is concern.

Fig.- 4.4 Economic Indicators of Phansi jal.







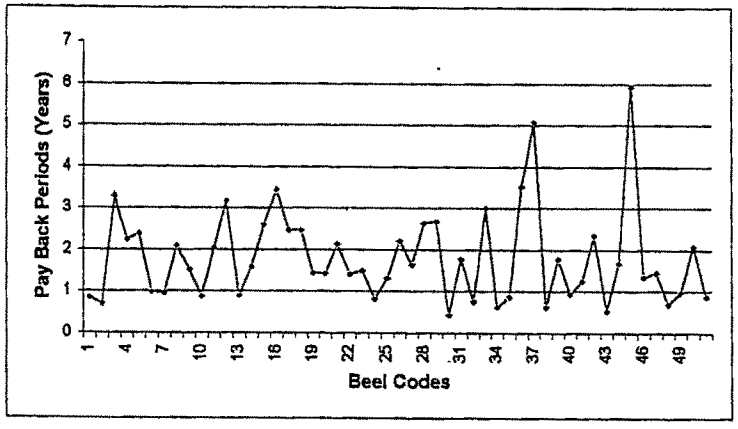


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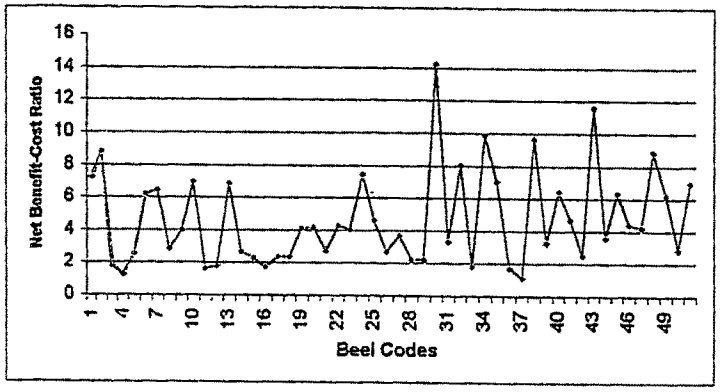
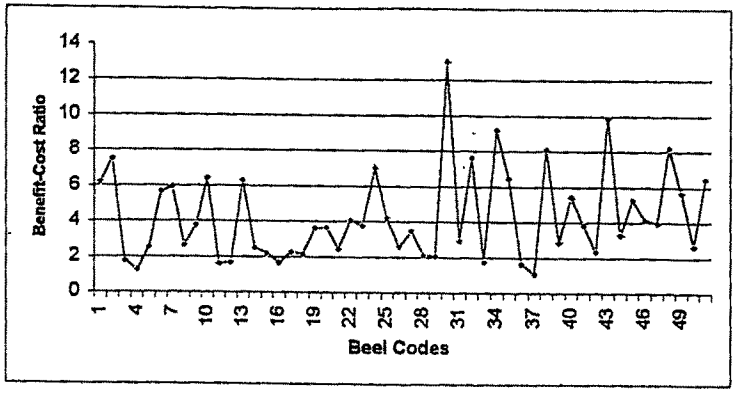
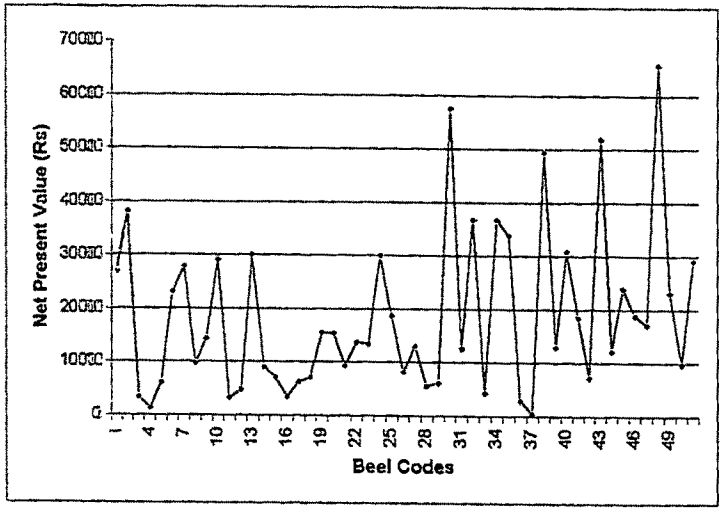
Fig.-4.4 Economic Indicators of Phansi jal.







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kalidanga	22	Udon	43	Tinsulborbil
2	Hakama	23	Nandini-karmari	44	Moridisol
3	Nandini	24	Lakhanabandha	45	Botalikhosa
4	Hannchora	25	Satiyan	46	Bihdia
5	Barundanga	26	Siyalekharly	47	Telladanga
6	Bhoispuri	27	Dighali-patali	48	Moridikhow
7	Jogra	28	Brahmamaijan	49	Batha
8	Chandakhal	29	Salchapra	50	Mailata-Dipling
9	Sagamara	30	Sibnarayanpur	51	Raumari
10	Borbilla	31	Baskandi	52	Gathia
11	Botua-kamakhya	32	Auti-bauti		
12	Siligurijan	33	Tepang		
13	Deepar	34	Digar-bakn		
14	Solmari	35	Rani-magna		
15	Mori	36	Sagar		
16	Bormon	37	Gopharchang		
17	Jatugurl	38	Angang		
18	Kasodhora	39	Pungani		
19	Kujbalipatti	40	G D duba		
20	Deora	41	G B Jopora		
21	Thekera	42	Merkolaberia		

Thus from the above economic analysis it is evident that *phansijal* is economically feasible as far as the present sample study is concern. Moreover, from the study of B-C ratio and N-K ratio it is clear that the gear can provide maximum benefit at least cost. Therefore, the use of *phansijal* may be encouraged.

4.4.5 ECONOMIC ANALYSIS LANGIJAL

Langijal (gill net) is a rectangular net, which is provided with head and footrope. Unlike *phansijal*, generally it is provided with sinkers. *Langijal* is used extensively in the beels of Assam for commercial purposes; therefore, an attempt has been made to evaluate its economic viability (Table – 4.5 and Fig. 4.5).

4.4.5.1 Catch and Effort

The total days of operation of *langijal* in a year is found maximum in Sone beel (270 days) with a maximum catch record per annum (1215 Kg.). But catch per day record shows better in Jaluguti and Kasodhora beel with 7.0 Kg. On the other hand though Borbilla also enjoyed 270 days of operation but the total catch/year is only 756 Kg with 2.8 Kg/day catch. The annual average catch in a year is found to be 547 Kg in 147 days of operation.

4.4.5.2 Capital Investment and Depreciation

The study reveals that the capital investment to operate the gear may range from Rs.3850/- (Lakhanabandha beel) to Rs.5600/- (Tapang) with an average of Rs.4636/-. Accordingly, the depreciation is found to be minimum in Lakhanabadha (Rs.391.66) and maximum in Tapang (Rs.689.28). In Solmari beel the capital investment is found very low in comparison to other beels (Rs.250/-), because the fishermen need no boat for the operation of the gear, hence, the depreciation is also just Rs.125/- in a year.

4.4.5.3 Total Cost

The total cost in operation of *langijal,* which includes the fixed cost and variable costs or the operating cost has been studied on annual basis.

Fixed Cost: In case of *langijal* fixed cost includes only the depreciation of crafts and gears, which mainly depends on the capital investment that has been described under the sub head 4.4.5.2.

Variable Cost: Variable costs or the total operational costs, which includes the wages of fishermen, and the repair and maintenance of gears and boats, range from Rs.4391.43 (Teliadanga) to Rs.22500/- (Sone) with an average of Rs.8142/-. High fluctuation of variable costs has been observed in different beels due to differences in the number of days of operation and the numbers of labors employed for fishing.

Thus, the total cost, which includes both the depreciation and variable costs, is found to be maximum of Rs.22958/- in Sone beel, while it is observed minimum of Rs.5280/- in Teliadanga beel with the average of Rs.8661/- in a year.

4.4.5.4 Revenue

The fishes sold at beel site and carried to the market by middlemen. The average weighted price of fishes did not exceed Rs.22/Kg at beel site. A maximum record of total revenue of Rs.26730/- is recorded in Sone beel but is found minimum of Rs.5280/- in Teliadanga beel with an average of Rs12079/-. The lower revenue generation in Teliadanga beel is mainly due to less number of operating days (80 days) in a year.

4.4.5.5 Economic Viability

Economic viability of *langijal* has been worked out by using the relevant data recorded during field study. Table-4.5 shows the important economic parameters, which have been worked out for different beels.

(i) Capital Turn Over Ratio (CTOR): The capital turn over ratio is found better in Sone beel with 6.68 times but minimum in Teliadanga beel with 1.04 times. It shows the viability (above unity) of the gear in all beels with an average of 3.23 times. The ratio is found below 5 times in most of the beels (49 beels) but in Sone beel it is above 6 times. Moreover, the ratio is found very high in Solmari beel (36 times) due to low capital investment in comparison to other beels (fig-4.5).

(ii) Rate of Return (ROR): An investment is considered to be financially viable if the rate of return is more than cut off rate. Generally, the cut off rate is 12% as suggested by the planning commission (1984). It is found in between 9% (Ranimegnna beel) and 187% (Kasodhora and Udori beel) with an average of 85%. The exception is found in the case of Solmari beel where it is 660% due to very low capital investment.

(iii) Pay Back Period (PBP): Pay back period indicates the recovery period of the capital investment. A gear may be considered to be feasible if the pay back period is much lesser than the life of the gear. In case of langijal life span is 4 years, and hence the pay back should be less than 2 years. As shown in table-4.5 in most of the cases (40 beels) pay back period is below 2 years. But in 12 beels it is found to be above 2 years. The average PBP is found to be 1.68 years, which indicates that in over all cases the gear is economically feasible as far as the present study is concern.
(vide page no.80)

(iv) Benefit-Cost Ratio (B-C Ratio): For economic viability, the B-C ratio should be more than or equal to one. In this case the ratio exceeded unity in all the cases. It is found to be maximum in Udori beel (9.88) and minimum in Rani-megna beel (1.11)

with an average of 4.57. The ratio is found up to 5 in 32 beels out of 52 total surveyed beels, whereas in 19 beels it is found up to 10. In one exceptional case i.e. in Solmari beel, it is found to be 17.04 (fig-5).

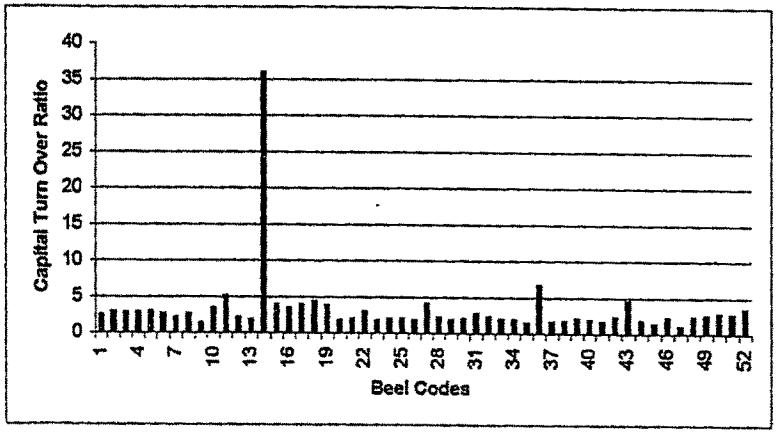
(v) Net Present Value (NPV): The NPV or Net Present Worth (NPW) should be more or equal to zero. The NPV in the case of *langijal* is found financially viable in all the cases, which is found in the range between Rs.628/- (Rani-megna) and Rs.60849/- (Harinchora beel). As shown in fig.4.5 the NPV is found below Rs.2000/- in 30 beels, from Rs.2000/- to below Rs.4000/- in 15 beels from Rs.4000/- to Rs.6000/- in five beels and finally, Rs.6000/- or above in only one beel. The average NPV is found to be Rs.19417/-, which indicates the over all viability of the gear.

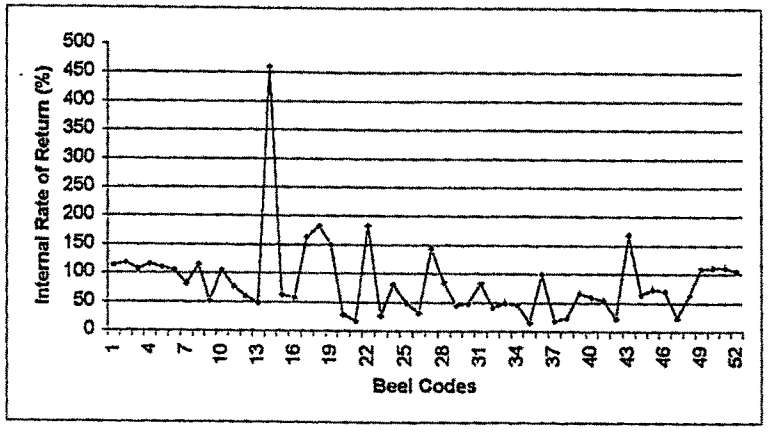
(vi) Internal Rate of Return (IRR): The internal rate of return (IRR) should be more than 12% to become economically feasible. In the case of *langijal* the maximum IRR is recorded in Solmari beel (460%) due to its very low capital investment. On the other hand the minimum value is recorded in Ranimegna beel (15%) due to its very low revenue generation. The average value of IRR is found to be 86%, which indicate the viability of the gear.

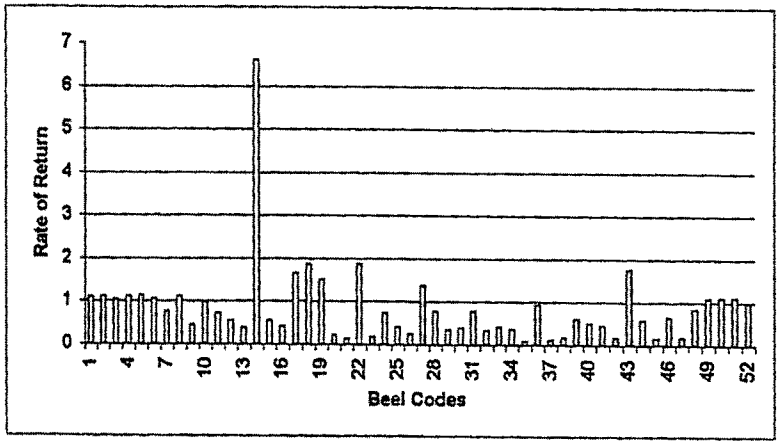
(vii) Net benefit-Investment Ratio (N-K Ratio): The net benefit investment ratio (NKR) also should be more than or equal to one. In case of *langijal* the N-K ratio is found within the economic viable range i.e. from 1.14 (Rani-megna) to 12.06 (Kasodhora beel) with an average of 5.74. Fig.4.5 indicates that in most of the cases (46 beels) the ratio is found below10; in 5 beels it is recorded in the range of 10 to below 20; but in one case i.e. Solmari beel the ratio is found above 40.

Thus from the above economic analysis it is evident that *langijal* is economically feasible as far as the present sample study is concern. Moreover, from the study of B-C ratio and N-K ratio it is clear that the gear can provide maximum benefit at least cost. Therefore, the use of *langijal* may be encouraged in the beel fisheries of Assam. In the case of Solmari beel all the economic parameters show very high range of

Fig.- 4.5 Economic Indicators of Langljai







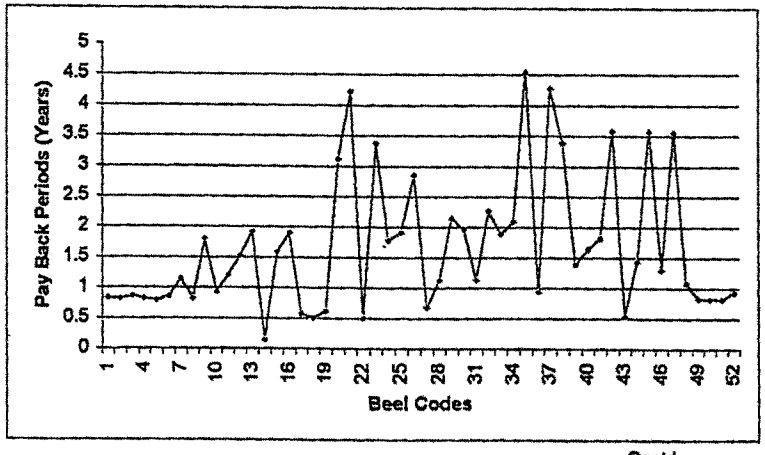


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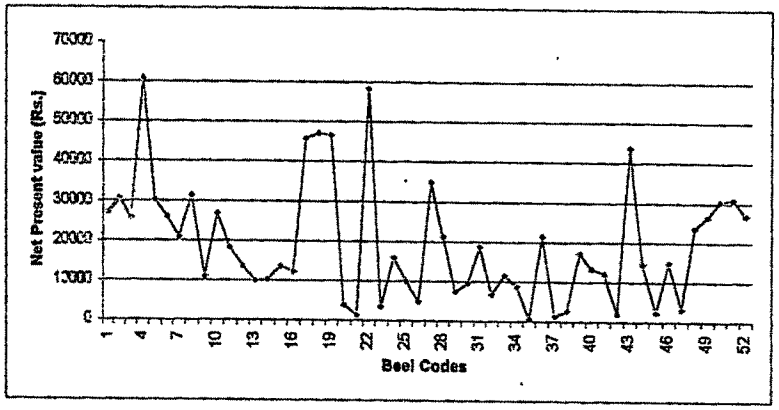
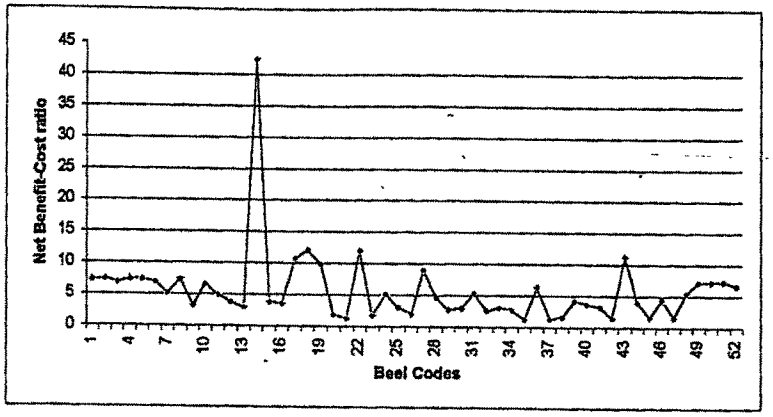
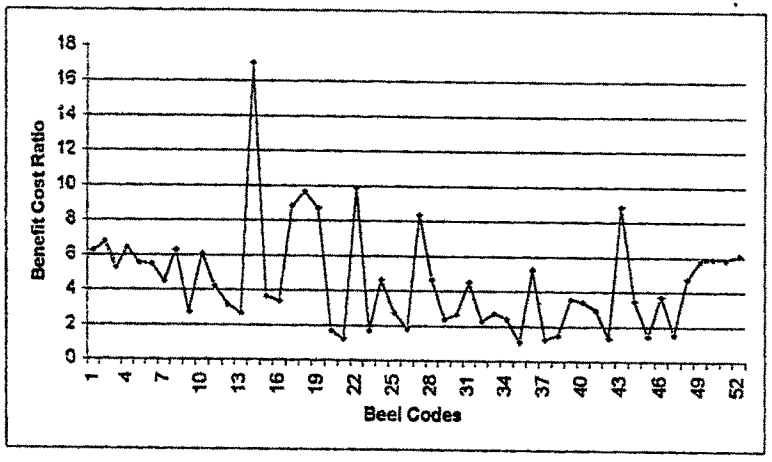
Fig.- 4.5 Economic Indicators of Langjai







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kaldanga	22	Udori	43	Tinsuli-borbil
2	Hekama	23	Nandini-karman	44	Moridisoi
3	Nandini	24	Lakhanabandha	45	Botalikhesa
4	Hannchora	25	Satiyan	46	Bhdia
5	Barundanga	26	Siyalekhaity	47	Teliadanga
6	Bholapuri	27	Dighali-patali	48	Moridikow
7	Jogra	28	Brahmamayan	49	Batha
8	Chandakhal	29	Salchapra	50	Mailatadipling
9	Sagamara	30	Sibnarayanpur	51	Raumari
10	Borbila	31	Baskandi	52	Gathia
11	Botua-kamakhya	32	Auti-bauti		
12	Siligunjan	33	Tepang		
13	Deepar	34	Digar-bakri		
14	Solmari	35	Rani-megna		
15	Mori	36	Sone		
16	Bormon	37	Rata		
17	Jaluguti	38	Saitali		
18	Kasodhora	39	Pungani		
19	Kujibalipatti	40	Ganak-Dubai-Duba		
20	Deora	41	Gorolmari-B Jogora		
21	Thekara	42	Merkolaberia		

viability because the capital investment is found very low in comparison to other beels. As the beel is very shallow the fishermen need not to use boat for the operation of this gear.

4.4.6 ECONOMIC ANALYSIS OF KHEWALIJAL

Khewalijal or *'Asrajal'* is the commonest form of net used all over the state. The net is operated mostly in shallow water and boat may or may not be used. The economic analysis (Table-4.6) of *khewalijal* has been worked out for 52 beels with the same objective as mentioned earlier in this chapter and is described below:

4.4.6.1 Catch and Effort

Khewalijal is observed to be operated from 60 days (Sibnarayanpur) to 270 days (Siyalekhaity, Baskandi and Sone beel). The maximum catch per day is recorded as 12.5 Kg in Udori beel followed by 8.0 Kg in Moridikhow beel. But in other beels the catch per day was recorded between 1.5 (Satiyan beel) to 6.5 Kg (Bormonoha and Jaluguti beel). Thus, the annual catch record has been calculated to be the maximum of 1350 Kg (Sone beel) whereas a minimum of 180 Kg (Raumari) with an average of 505 Kg in 149 days of operation in a year. But in Udori beel the total catch is much higher (1625 Kg) in comparison to other beels.

4.4.6.2 Capital Investment and Depreciation

The total acquisition cost or the capital investment for *khewalijal* is found between Rs.4100/- (Lakhanabandha) to Rs.7000/-(Siligurijan) with an average of Rs.5250/-. In certain cases like Brahmamaijan, Deora, Nandini and Bhoispuri beel no boat was needed for the operation of the gear, hence, their capital investment is very low and is found Rs.950/-, Rs.900/- and Rs.800/- respectively. In the cases where boat was required the depreciation is recorded a maximum of Rs.1000/- (Siligurijan beel) and a

minimum of Rs.424.99 (Lakhanabandha). On the other hand where no boat was required the fixed cost is negligible and ranged between Rs.228.57 (Nandini and Bhoispuri) to Rs.271.42 (Brahmamaijan). The average depreciation is found Rs.520/- in a year.

4.4.6.3 Total Cost

The total cost of operation of the gear can be broken down into fixed cost (depreciation) and variable costs, which are described below:

Fixed cost: As has been described in 4.4.6.2.

Variable cost

The variable costs differ greatly to the differences in the number of operating days. Thus, the total operating costs of *khewalijal* is recorded as maximum in Sone beel (Rs.22500/- whereas Sibnarayanpur shows a minimum operating cost (Rs.3000/-) with an average of Rs.7548/-. Accordingly, the total cost is found as maximum of Rs.23105.94 and as minimum of Rs.3547.61 in Sone beel and Sibnarayanpur beel respectively. The annual average total cost for the operation of khewalijal is found as Rs.8069/-.

4.4.6.4 Revenue

The fishes sold at beel site and carried to the market by middlemen. The average weighted price of fishes did not exceed Rs.22/Kg at beel site. The total revenue earned from the operation of the gear is found between Rs.3960/- (Raumari and Sagmara beel) to Rs.35750/- (Udori beel) with an average of Rs.11207/-.

4.4.6.5 Economic viability

The relevant data for cost and return analysis was recorded at beel site to evaluate the economic viability of *Khewalijal*. All the relevant data on per day basis was recorded

at beel site and then converted as per annum to find out the economic viability of *khewalijal.* The different economic indicators (Table-4.6 and Fig. 4.6) has been described below:

(i) Capital Turn Over Ratio (CTOR): The study shows a maximum of capital turn over ratio of 11.88 times in Bhoispuri beel, which is comparatively higher in comparison to other beels due to very low capital investment. On the other hand it is recorded a minimum of 0.78 times in Teliadanga beel. The average CTOR is found at 3.15 times in a year. The CTOR should be equal to or above the unity to become economically viable. In case of this gear the ratio is found above the unity in 48 beels out of 52 beels. In case of Sagmara, Tinsuli borbil, Teliadanga and Raumai beel the raio is found below the viable range. Out 48 beels in 17 beels the ratio is recorded from one to below 2 times, whereas in 19 beels the ratio is found from 2 to below 4 times. Moreover, in 12 beels the CTOR is found from 4 to below 12 (fig.4.6).

(ii) Rate of Return (ROR): The rate of return, which should be 12% or more to become economically viable, is found maximum in Udori beel (461%). Out of 52 cases (fig.6) the ratio is found above the economic viable range in 41 beels. But in six cases like, Sagmara (6%), Kujibalipatti (2%), Rani-megna (7%), Angang (9%), Bihdia (5%), and Raumari beel (6%) the ratio is recorded below the viable range. Moreover, in five cases like Satiyan (-4%), Borbilla (-26%), G.B.Jopora (-26%), Teliadanga (-2%), and Gathia beel (-26%) the rate of return is found to be negative. The annual average ROR is found to be 86%, which is of course above the viable range.

(iii) Pay Back Period (PBP): The pay back period shows a positive indication of the operation of *khewalijal* in most of the cases (32 beels out of 52) where it is found below 2 years (fig.4.6). But in another 20 cases it is recorded above 2 years. The average PBP is found 12 years, which is found to be economically not viable as far as the analysis of PBP is concerned. (vide page no.80)

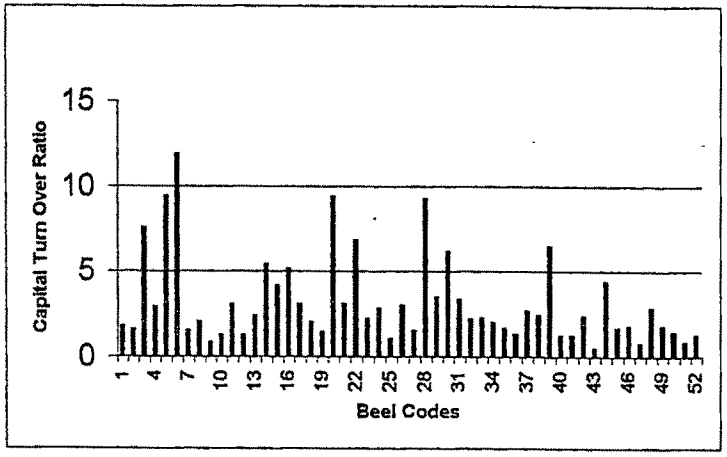
(iv) Benefit-Cost Ratio (B-C Ratio): The B – C ratio exceeded unity in 43 samples (82.69% of the total surveyed beels) but in 9 cases it is recorded below the feasible range of which in three cases like, Satiyan (-2.21), G.B.Jopora (-1.23), and Gathia beel (-1.15) show a negative result of the use of the net. Out of 43 beels, where the ratio is recorded within the viable range, in 26 beels the ratio is found between 1 to below 5, in 12 beels it is from 5 to below 10 and in another 4 beels the ratio is recorded from 10 to below 25 (fig.4.6). The annual average of B-C Ratio is found to be 4.37, which shows the over all viability of the gear in the beel fisheries of Assam.

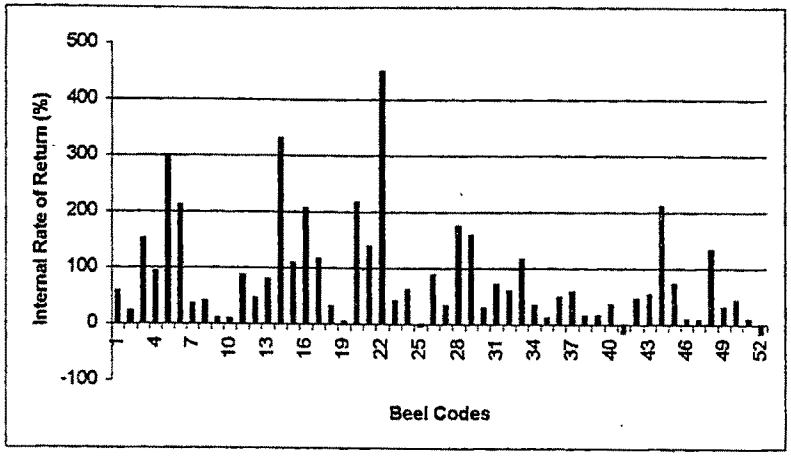
(v) Net Present Value (NPV): The NPV is also found within the feasible range in 82.69% (43 beels out of 52 surveyed beels) of the total cases under study, whereas in 9 cases, like Sagmara (Rs.-413/-); Borbilla (Rs.-780/-); Kujibalipatti (Rs.-1878/-); Satiyan (Rs.-15652/-); G.B.Jopora (Rs.-11114/-); Bihdia (Rs.-485/-); Teliadanga (Rs.-3191/-); Raumari (Rs.-413/-); and Gathia beel (Rs.-6675/-) it is found as negative. The average NPV is found to be Rs.15606/-, which indicates the viability of the gear.

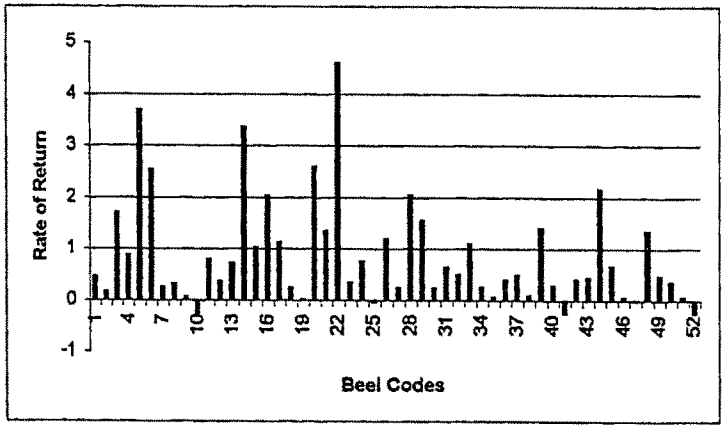
(vi) Internal Rate of Return (IRR): The IRR found within the feasible range in 43 cases out of 52 total surveyed beels. But in 9 beels it is found below 12% of which in three cases like Satiyan(-3.5%); G.B.Jopora (-14%); and Gathia beel (-15%) the IRR is found to be negative. Of the 43 viable cases in 27 beels the IRR is found from 12 to below 100%; in 8 cases it is from 100 to below 200%; in 5 cases it is from 200 to below 300%; in 2 cases the IRR is found from 300 to below 400%; and in one case (i.e. Udori beel) it is found to be 450%. The annual average IRR is found to be 84%, which indicates over all viability of the gear.

(vii) Net benefit-investment Ratio (N-K Ratio): The N-K ratio also shows the viability in 43 cases out of 52 total surveyed beels. But it is found below unity in the remaining 9 beels of which in three beels like, Satiyan (-2.29); G.B.Jopora (-1.09); and Gathia beel (-1.02) the ratio is found to be negative. Of the 43 viable cases in the maximum cases (24 beels) the ratio is found from 1 to below 5; in 9 beels from 5 to below 10; in 5 cases it is recorded from 10 to below 15; and in another 5 beels the

Fig.-4. 6 Economic Indicators of Khewali Jal







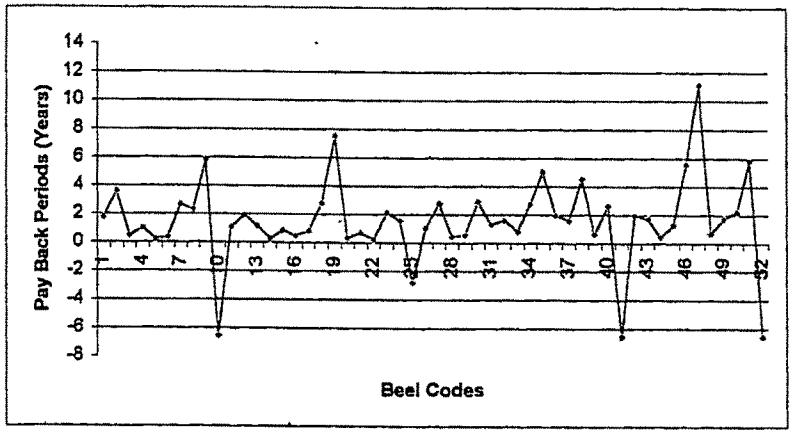


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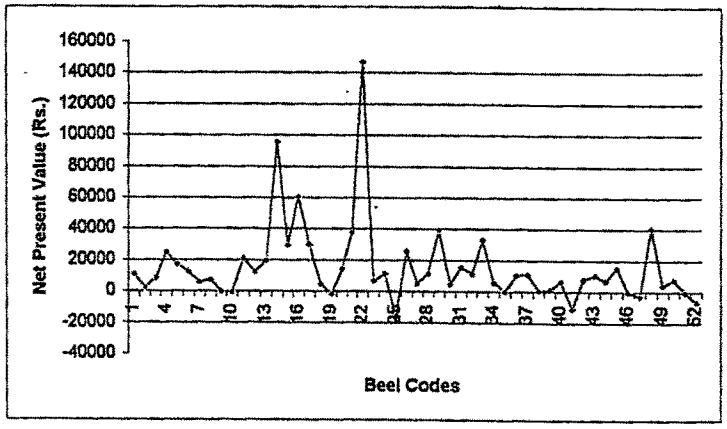
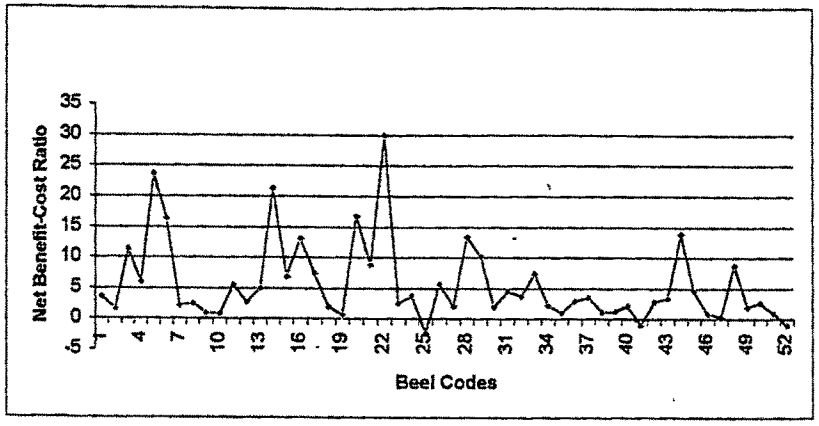
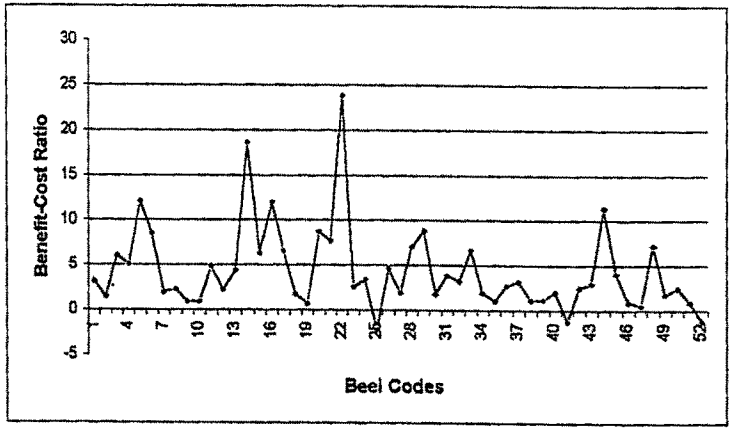
Fig.-4. 6 Economic indicators of Khewali jal







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kalidang	22	Udori	43	Tinsukuborbil
2	Hakama	23	Nandini-kamari	44	Mondisa
3	Nandini	24	Lakhansbandha	45	Botalkhosa
4	Hann	25	Satiyan	46	Bihdia
5	Barun	26	Siyala	47	Telladanga
6	Bhos	27	Dighali-patali	48	Mondikow
7	Jogra	28	Brahmamaijan	49	Batha
8	Chanda	29	Salchap	50	Mallata dipling
9	Sagamara	30	Sibnaray	51	Rauman
10	Borbda	31	Baska	52	Gathia
11	B kamak	32	Autibauti		
12	Siligun	33	Tapang		
13	Deepar	34	Digarbakri		
14	Solmari	35	Ranmagna		
15	Mori	36	Sagar		
16	Bormon	37	Gophar		
17	Jakuguri	38	Angang		
18	Kaso	39	Sona		
19	Kuji	40	Rata		
20	Deora	41	Gorokmari B Jopora		
21	Thekera	42	Merkolabera		

ratio is found to be from 15 to below 30. The annual average of the ratio is found to be 5.66, which indicates the viability of the gear in most of the beel fisheries of Assam.

Thus from the study of economic viability analysis it is clear that the net may be used after proper study of the sample site which depend on the depth of the beel, vegetation density, fish density, types of fish species present in the beel and so on.

4.4.7 ECONOMIC ANALYSIS OF HOOK AND LINE FISHING

Hooks and line fishing was found to be operated in almost all beels of Assam under study. But for commercial purposes it was found to be operated in 49 beels. Only those fishermen of very poor socio-economic status used the gear for commercial purposes. The present study deals with the economic viability of the use of the gear (Table-4.7 and Fig.4.7).

4.4.7.1 Catch and Effort

Hooks and line fishing is found to be operated from 60 days (Thekera) to 270 days (Sone beel) with an average of 137 days in a year. The catch/day is found in between 1.0 Kg (Nandini karmari) to 4.5 Kg (Kalidanga). Thus the maximum catch per annum is found to be 720 Kg (Kalidanga) where as the minimum of 120 Kg (Thekera). The annual average total catch is 315 Kg with the average CPGH of 0.0622 Kg.

4.4.7.2 Capital Investment and Depreciation

The capital investment in acquisition of the gear is found to be maximum of Rs.4450/- (Moridisoi beel) and minimum of Rs.3250/- (Sibnarayanpur anua) with an average of Rs.3577/-. Accordingly, the depreciation is recorded as maximum of

Rs.433/- (Mori disoi) and minimum of Rs.90/- (Kalidanga) with an average of Rs.362/-.

4.4.7.3 Total Cost

The data on catch record and average weighted value of fish group was recorded on daily basis and then converted into per annum. The total cost in operation of hooks and line can be broken down as fixed cost and variable cost, which are described below:

Fixed cost: The fixed cost has been described under the subhead 4.4.7.2.

Variable cost: The variable costs, which include the labor costs and the costs required for the maintenance of gears and boats is found between Rs.2825/- (Thekera) to Rs.11250/- (Sone beel) with an average of Rs.5964/-.

Thus, the total cost, which includes depreciation and variable costs, is found as maximum in Sone beel (Rs.11612/-) and minimum in Thekera beel (Rs.3150/-). The annual average total cost is found at Rs.6329/-.

4.4.7.4 Revenue

The fishes sold at beel site and carried to the market by middlemen. The average weighted price of fishes did not exceed Rs.18/Kg at beel site. From the study it is evident that the gear is able to earn gross revenue in between Rs.2400/- (Thekera) to Rs.14400/- (Kalidanga) with an average of Rs.6293/-per year.

4.4.7.5 Economic viability

The relevant data for cost and return analysis was recorded at beel site to evaluate the economic viability of *Hooks and line fishing*. All the relevant data on per day basis was recorded at beel site and then converted as per annum to find out the economic viability of the gear. The different economic indicators (Table-4.7) has been described below:

(i) Capital Turn Over Ratio (CTOR): The study of capital turn over ratio shows that 85.71% (42 beels out of 49) of the total surveyed beels exceeded the unity. But in 7 cases such as Nandini (0.94 times); Barundanga (0.94 times); Bhoispuri (0.72 times); Deora (0.73 times); Udori (0.88 times); Sibnarayanpur (0.99 times); and Batha (0.94 times) it is found below the feasible range. Of the 42 beels where the ratio is above the unity in 27 cases the ratio is found from 1 to below 2 times, in 12 cases it is from 2 to below 3 times, in 2 cases it is from 3 to below 4 times and finally, in only one case (Kalidanga beel) the ratio is found above 4 times. The annual average of the ratio is found at 1.76 i.e. just above the unity.

(ii) Rate of Return (ROR): The rate of return, which should be 12% or above to be economically feasible is found below the feasible range in 31 sample sites (i.e. 63.26% of the total surveyed beel). Fig-4.7 shows that out of 49 total surveyed beels the ROR is found negative in 23 beels. Moreover, the ratio is recorded from 0 to below 12% in 8 cases such as Harinchora (6%); Botuakamakhya (10%); Deepar beel (11%); Rani-megna (10%); Sagar (10%); Gopharchang (8%); Batha (9%); and Mailata-diplinga (7%). Out of 49 cases only in 8 cases the gear is found to be economically viable of which in most of the cases (19 beels) the ratio is recorded from 12 to below 50%. In another 7 beels the ROR has been found from 50 to below 200%. The annual average ROR is found to be negative (-1%), which indicates the inefficiency of the gear from the economic point of view.

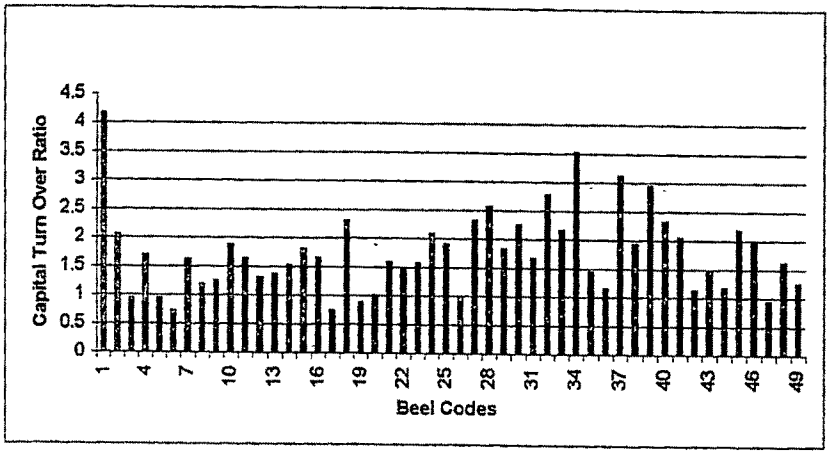
(iii) Pay Back Period (PBP): It is found above the viable range in only 9 cases (18.36% of the total surveyed beel) such as Kalidanga (0.46 year); Hakama (1.82 year); Thekera (1.55 year); Baskandi (1.97 year); Auti-bauti (1.63 year); Pungani (0.82 year); G.B.Jopora (0.88 year); Merkolaberia (1.52 year); and Tinsuliborbil (1.33 year). In 17 cases (34.69%) it is recorded above 2 years, which is not considered as feasible and in another 23 cases (46.94%) exhibited negative results of the use of the gear. (Negative pay back period means annual cash in flow of the gears are negative in the entire life of the gear. Hence, the original amount invested is not recoverable in the lifetime of the gear. Therefore, the question of the pay back period does not arise in this case and the gears are not viable).

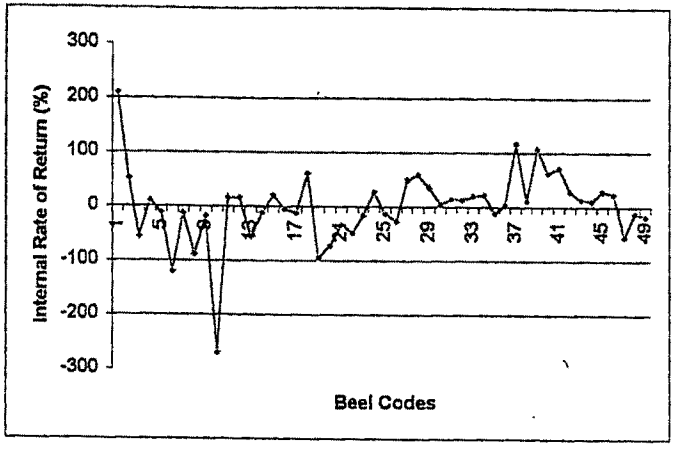
(iv) Benefit-Cost Ratio (B-C ratio): The B-C ratio, which should be equal to unity to become feasible shows that the hook and line fishing is viable in only 22 cases (44.89%) where the ratio exceeded the unity and found below 5 in 19 beels, from 5 to below 10 in 2 beels and from 10 to below 15 in only one beel. In another 27 sample sites it is recorded below one of which 20 cases show the result in negative. The average of the ratio is also recorded below the economic viable range (0.44) indicating the inefficiency of the gear in the beel fisheries of Assam from the economic point of view.

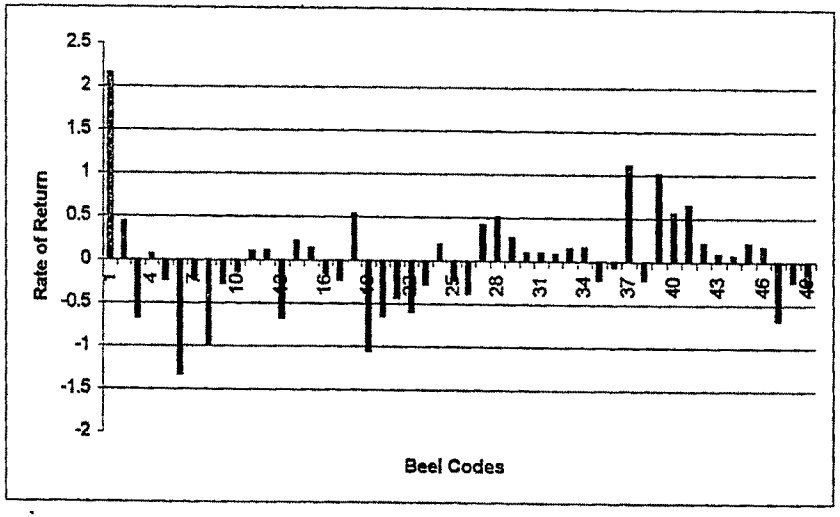
(v) Net Present Value (NPV): The NPV of Hook and line fishing (fig-4.7) is found above the economic viable range in 22 beels out of 49 total surveyed beels. It is recorded below Rs.10000/- in 17 cases, from Rs.10000/- to below Rs.50000/- in 5 beels. Of the negative cases in 18 beels the NPV is found up to Rs.-10000/- whereas in another 9 beels it ranges up to Rs.-30370/-. The average NPV is found to be Rs.-1985/-, which indicates the negative result of the use of the gear for commercial purposes.

(vi) Internal Rate of Return (IRR): The IRR study also depicts the same result by indicating that hook and line fishing is viable in only 22 sample sites. In another 27 cases it is recorded below 12%. Of the viable cases in 19 beels it is found below 100%, and in three beels it is found up to 200%. The average IRR is also found below the economic viable range (0.8%), which indicates the inefficiency of the gear from the economic point of view.

Fig.- 4. 7 Economic Indicators of Hook and line Fishing







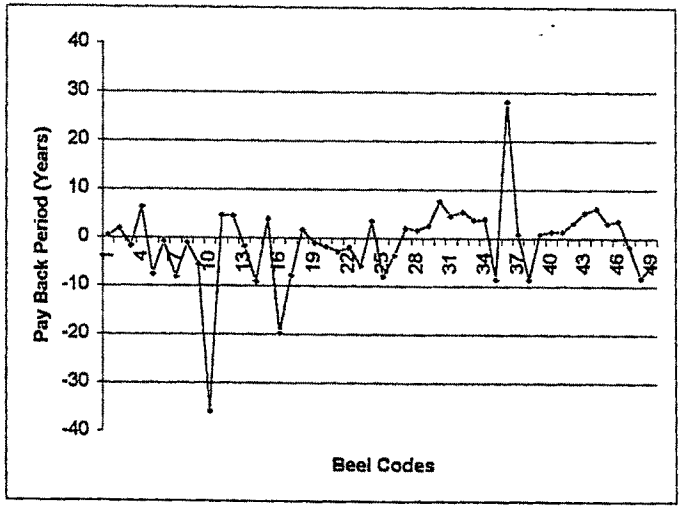


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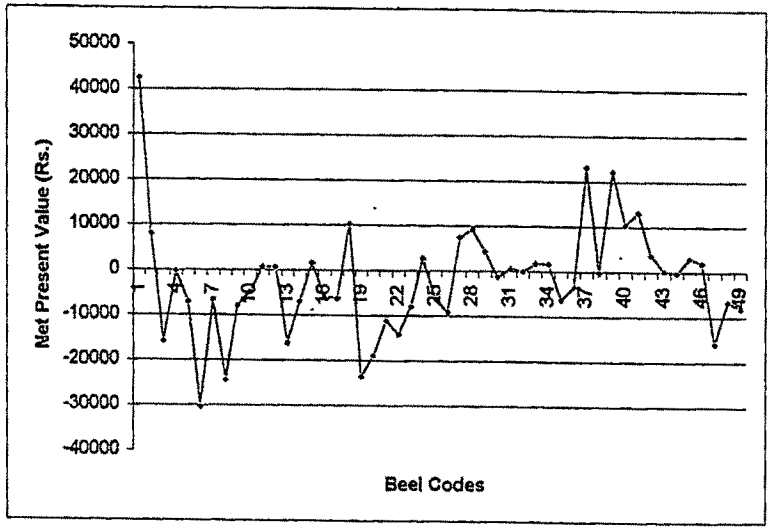
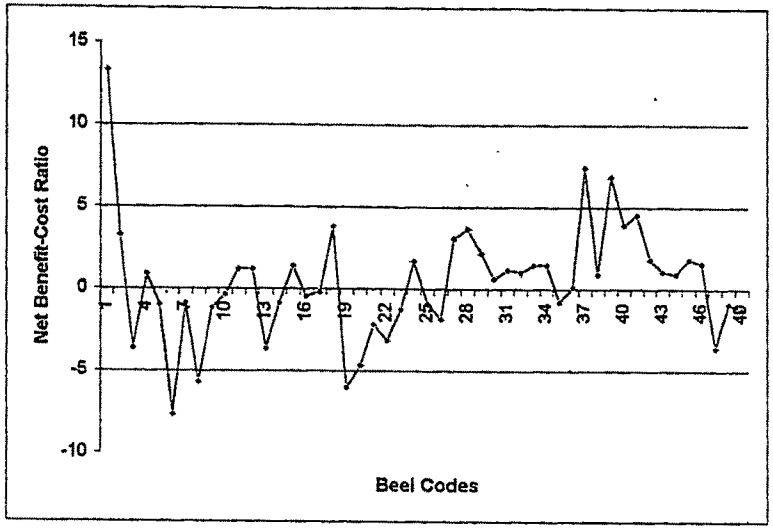
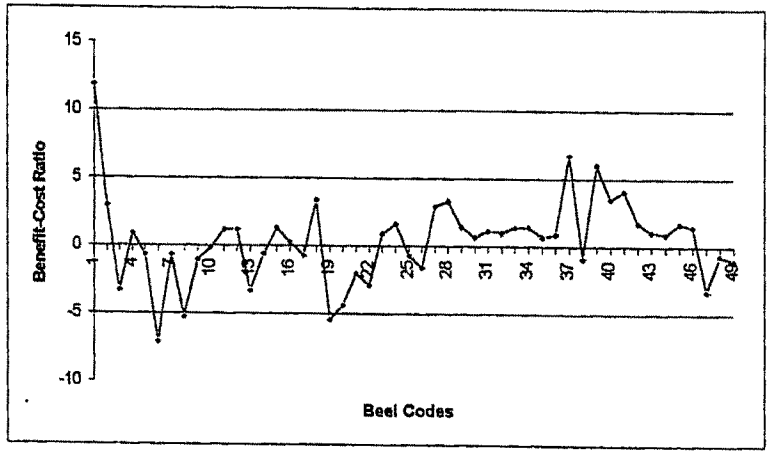
Fig.- 4. 7 Economic Indicators of Hook and line Fishing







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Kalidang	22	Siyale	43	B khosa
2	Hakama	23	D patail	44	Bhdia
3	Nandini	24	B maija	45	T danga
4	Harin	25	Selchap	46	M dikhow
5	B danga	26	Sibnaray	47	Batha
6	Bhols	27	Baskandi	48	M dipling
7	Jogra	28	A basti	49	Raumari
8	Chanda	29	D.bakri		
9	Segmara	30	R.megna		
10	Borbila	31	Segar		
11	B.kamak	32	Gopher		
12	Deepar	33	Angang		
13	Jalugui	34	Sone		
14	Kasod	35	Rata		
15	Kuji	36	Sartell		
16	Deora	37	Pungani		
17	Thekera	38	G D duba		
18	Udori	39	G B Jop		
19	N karmar	40	M berta		
20	L.bandha	41	T borbil		
21	Satiyan	42	M disoi		

(vii) Net benefit-Investment Ratio (N-K Ratio): The net benefit investment ratio indicates that the gear is not feasible in 27 cases of which 22 cases show the result in negative. Of the viable cases in 19 beels the ratio is found up to 5 whereas in another 3 beels it is recorded up to 13.32. The annual average of the ratio is recorded 0.417, which suggest that the gear is not economically feasible in most of the beel fisheries of Assam.

Thus, from the above analysis it is evident that the gear is not able to provide benefits in relation to the costs incurred for the operation.

4.4.8 ECONOMIC ANALYSIS DHENKIJAL

It is a large triangular net stretched across two bamboos tied near the thick ends. The net is balanced in front of a bamboo platform raised in the bed of the beel about 6 feet above the level of the water from where the operation is done. Almost all kinds of fishes are caught in this net.

The economic efficiencies of *Dhenkijal* (table-4.8) has been worked out for 31 beels out of 56 total surveyed beels with the same objective as described earlier in this chapter. In another 15 beels data were not sufficient for the economic evaluation. The results of the analysis carried out for 31 beels have been described below:

4.4.8.1 Catch and Effort

Table – 4.8 shows the catch and effort data of *dhenkijal* which indicates that the maximum catch per year is 1530 Kg in Siyalekhaity beel with 180 days of operation. On the other hand the minimum catch per year is recorded as 240 kg in Brahmamaijan beel with 80 days of operation. In Bormonoha beel total number of operating days were 45 days but Siyalekhaity beel enjoyed 180 days of operation,

which is higher in comparison to other beels. The average fish catch is found to be 543.8 Kg in a year with an average of 92.3 days of operation.

4.4.8.2 Capital Investment and Depreciation

Total cost for *ghatjal* operation ranged from Rs.4700/- to Rs.8000/- with an average of Rs.5711/-. Accordingly, the depreciation of gear and boat is found to be maximum as Rs.1222/- (Siyalekhaity and Dighalipatali beel) and minimum as Rs.547/- (Moridisoi beel) with an average of Rs.787/- in a year.

4.4.8.3 Total Cost

The total cost for the operation of the gear has been segregated into fixed cost and variable costs, which are described below:

Fixed Cost: Fixed cost, which is also known as depreciation has been described under 4.4.8.2.

Variable Costs

Variable cost includes wages of labor and repair and maintenance of gear and boat. It is recorded with Rs.15050/- as maximum in Siyalekhaity beel where as Rs.4330/- in Bormononha beel with an annual average of Rs.8300/-.

Thus the total cost for the operation of *dhenkijal* is recorded maximum with Rs.16272.21 (Siyalekhaity) and minimum with Rs.4410.57 (Bormonoha). The average of the total cost is found to be Rs.9064/-, which includes the depreciation and variable costs.

4.4.8.4 Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and calculated for per annum in different beels of Assam. The catch composition comprises of minor, intermediate and major groups of fish species and their average weighted values were recorded in between Rs.21/- to Rs.24/- at beel site. The gear is found to generate gross revenue in between Rs.5760/- (Brahmamaijan) to Rs.32130/- (Siyalekhaity) with an annual average of Rs.11687/-.

4.4.8.5 Economic viability

Economic viability of *dhenkijal* has been worked out by using the relevant data recorded during field study. Table-4.8 shows the important economic parameters, which have been worked out for different beels.

(i) Capital Turn Over Ratio (CTOR): The capital turn over ratio found between 1.02 times (Bormonoha) to 14.01 times (Siyalekhaity) with an average of 2.35 times, which indicates viability if the gear in all the beels under the present study. A fig-4.8 show that in maximum cases (19 beels) the ratio is found below 2 times, whereas in 10 cases it is from 2 to below 4 times. Out of 31 beels in one beel (Moridisoi beel) the ratio if recorded above 14 due to low capital investment against the revenue generation in comparison to other beels.

(ii) Rate of Return (ROR): The rate of return is found within the viable range in 20 beels. In another 11 beels (35.48% of the total surveyed beel) the rate of return is recorded below the feasible range of which 8 beels such as Brahmamaijan (-43%); Rani-megna (-38%); Sagar (-33%); Gopharchang (-9%); Anganng (-34%); Saitali (-2%); Pungani (-25%); and Botalikhosa (-12%) show the negative results as far as the study of ROR is concern. Of the viable cases (20 beels) it is found from 12 to below 50% in 8 beels, from 50 to below 100% in 7 beels, from 100 to below 200% in 3 beels and finally in one beel it is recorded the maximum at above 250%. The average

ROR is found to be 42%, which of course, shows the over all economic viability of the gear.

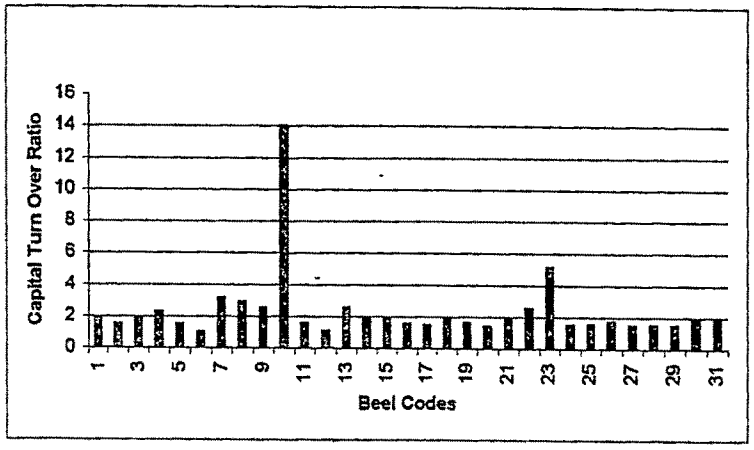
(iii) Pay Back Period (PBP): The pay back period, which should be below 2 years in this case is recorded below the viable range in 9 beels (29.03% of the total surveyed beels), which includes four negative results such as in the case of Brahmamaijan (-3.49); Rani-megna (-4.27); Sagar (-4.6); and Pungani (-7.35). (vide page no.80)

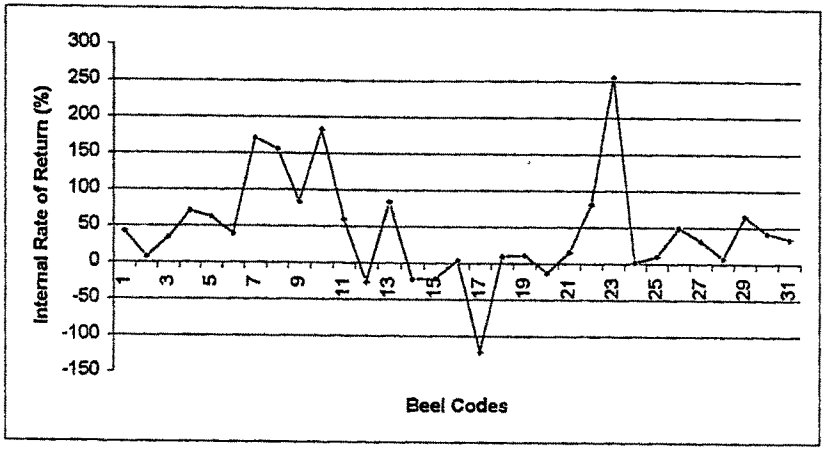
(iv) Benefit-Cost Ratio (B-C Ratio): The B-C ratio, which should be equal to or more than one is found within the feasible range in 61.29% cases of the total surveyed beels. In 12 cases it is found below the economic viable range of which 5 cases, such as Brahmamaijan (-1.31); Rani-megna (-1.14); Sagar (1.13); Angang (-1.04) and Pungani (-0.69), are found as negative. The ratio is found from 1 to below 4 in 12 beels whereas in 6 beels it is recorded from 4 to below 10. In one beel (Moridisoi) it is found as maximum (14.32) in comparison to other beels. The average of the B-C Ratio is found to be 2.6 in a year, which of course suggests the viability of the gear in over all cases.

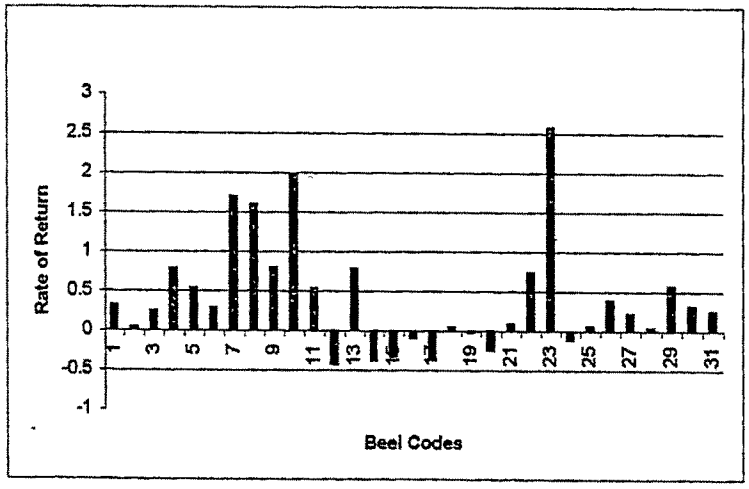
(v) Net Present Value (NPV): The NPV, which should be positive, is recorded as negative in 12 beels out of 31 total surveyed beels. Of the viable cases it is recorded below Rs.20000/- in 10 beels, from 20000/- to below Rs.40000/- in 4 beels, from 40000/- to below Rs.80000/- in 3 beels, and finally, in one case (Siyalekhaity beel) it is found more than Rs.93000/-. The annual average NPV is found to be Rs.13387/-, which indicates the viability of the gear.

(vi) Internal Rate of Return (IRR): Fig-4.8 shows that the IRR in case of *ghatjal* is found below the economically feasible range in 12 beels of which in 5 beels, such as Brahmamaijan (-26%); Rani-megna (-22%); Sagar (-21%); Angang (-122%) and Pungani (-13%), are found as negative. Of the viable cases the IRR is recorded below 100% in most of the cases (15 beels). In 3 beels it is found from 150 to below 200% but in one case (Moridisoi beel) it is recorded up to 256%. The annual average IRR is

Fig.-4. 8 Economic Indicators of Dhenki jal







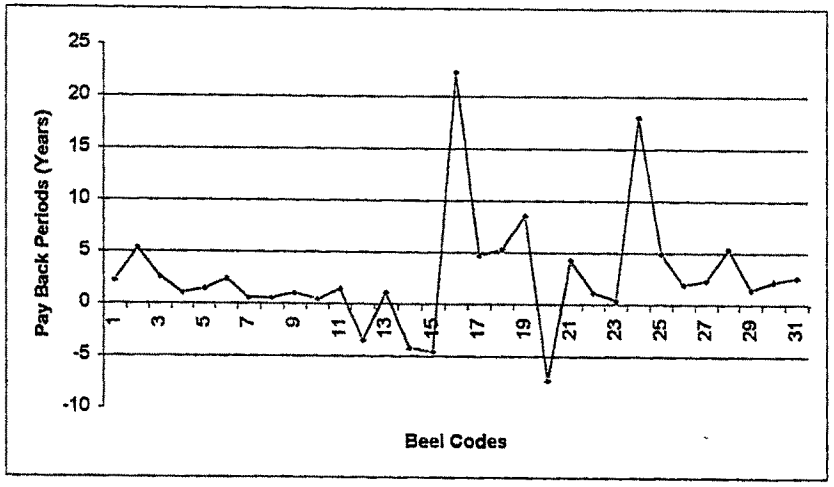


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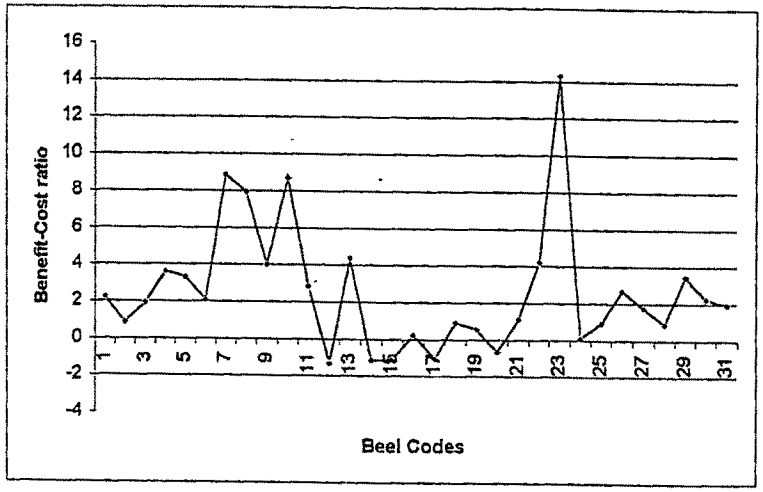
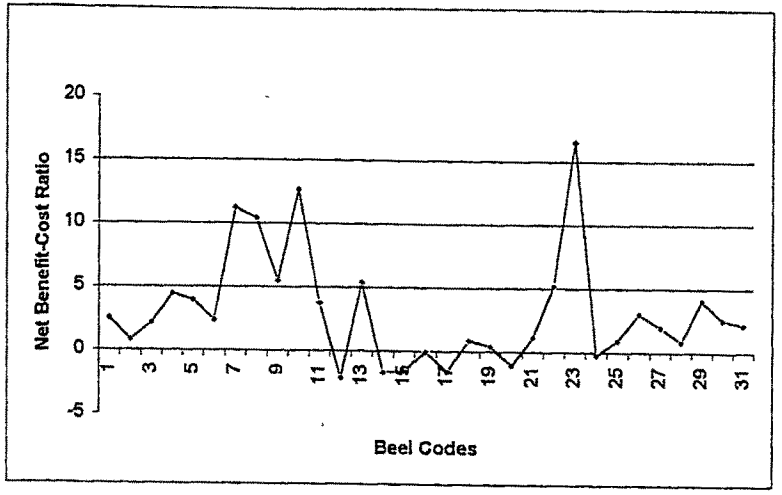
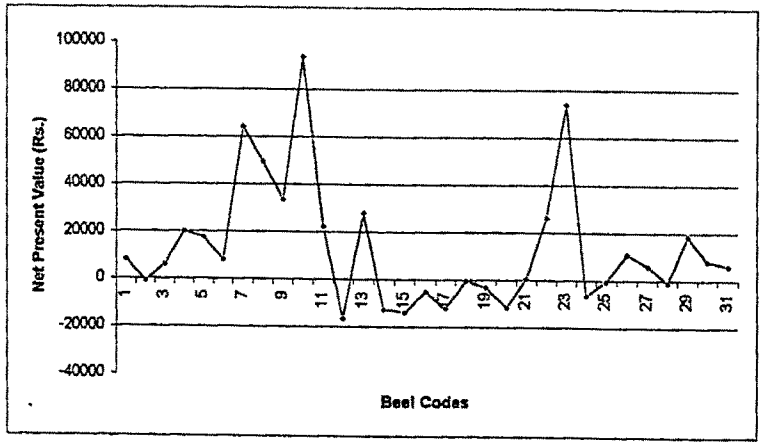
Fig.-4. 8 Economic Indicators of Dhenki jal







BEEL CODES	NAME OF THE BEELS	BEEL CODES	NAME OF THE BEELS
1	Sagamara	22	Gorolmari-Bihdia-Jop.
2	Borbila	23	Mondisol
3	Botuakamakhya	24	Botalikhosa
4	Deepar	25	Bihdia
5	Mori	26	Telladanga
6	Bormon	27	Mondikhow
7	Udori	28	Batha
8	Nandini-kanmari	29	Mailatadipinga
9	Satyan	30	Raumari
10	Siyale	31	Gathia
11	Dighali-patali		
12	Brahmamajan		
13	Digarbakri		
14	Ranimegna		
15	Segar		
16	Gopharcheng		
17	Angang		
18	Sona		
19	Sartail		
20	Pungani		
21	Ganak-Dubai-Duba		

Table-4.2 Economic Indicators of Dolijal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidanga	54000	8000	130500	138500	420000	281500	7.78	5.21	289500	0.19	16800	210	0.166	1722807	25.89	500	33.16
Hakama	49000	7555.55	90700	98255.55	281250	182994.5	5.74	3.73	190550	0.26	11250	180	0.162	485519	7.47	158	10.91
Nandini	58000	8333.33	100500	108833.32	475000	366166.7	8.19	6.31	374500	0.15	19000	200	0.247	2244957	31.67	604	39.71
Siligurijan	41000	7027.77	75200	82227.77	180000	97772.23	4.39	2.38	104800	0.39	7200	90	0.125	580687.6	9.54	211	15.16
Jaluguti	54000	8666.66	61900	70566.66	85500	14933.34	1.58	0.28	23600	2.29	3420	120	0.074	60902	1.71	37	2.13
Kasodhora	52500	8541.66	40000	48541.66	85500	36958.34	1.63	0.7	45500	1.15	3420	90	0.118	197963	3.36	73	4.77
Kujibalipatti	43000	7428.5	61800	69228.5	120000	50771.5	2.79	1.18	58200	0.74	4800	120	0.104	297509.4	5.74	118	7.92
Deora	39000	5000	42000	47000	67500	20500	1.73	0.53	25500	1.53	2700	120	0.087	103254	2.89	58	3.65
Average	**48813**	**7569.184**	**75325**	**82894.183**	**214344**	**131449.6**	**4.23**	**2.54**	**139019**	**0.838**	**8573.75**	**141.3**	**0.135375**	**711699.88**	**11.03**	**219,88**	**14.68**

Table-4.3 Economic Indicators of Berjal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidanga	42000	6000	90100	96100	151875	55775	3.61	1.33	61775	0.68	6075	135	0.117	321678.05	6.29	129	8.65
Hakama	39000	5000	79900	84900	154000	69100	3.95	1.77	74100	0.53	6160	160	0.133	412080	9.84	180	11.57
Nandini	34000	4933.32	41700	46633.32	136500	89866.68	4.01	2.64	94800	0.36	5460	120	0.236	543693.2	13.61	261	16.99
Harinchora	31000	6333.32	63600	69933.32	140625	70691.68	4.54	3.36	77025	0.4	5625	90	0.162	422099.75	8.72	196	14.61
Barundanga	24000	3250	60400	63650	83250	19600	3.47	0.98	22850	1.05	3330	120	0.096	108086.9	4.24	85	5.5
Bhoispuri	39000	5000	50000	55000	56250	1250	1.44	0.03	6250	6.24	2250	90	0.086	-7911.5	0.83	7	0.79
Jogra	34000	4933.32	49100	54033.32	83125	29091.68	2.44	1.17	34025	0.99	3325	95	0.121	167495.95	4.88	93	5.93
Chandakhal	37000	4888.88	46400	51288.88	135000	83711.12	3.65	2.26	88600	0.42	5400	90	0.208	497921.8	10.86	215	14.46
Deepar	34000	4933.32	49100	54033.32	85120	31086.68	2.5	0.91	36020	0.94	3040	95	0.111	179845	5.17	99	6.29
Thekera	47000	8075	46700	54775	72000	17225	1.52	0.36	25300	1.88	2880	90	0.111	83122	2.13	45	2.75
Satiyan	33000	5250	71200	76450	97500	21050	2.95	0.63	26300	1.25	3900	120	0.096	111087.8	3.15	68	4.37
Dighali-patali	35000	5250	32500	37750	48600	10850	1.39	0.31	16100	2.17	2025	90	0.117	54527	2.21	43	2.56
Salchapra	77000	12875	57900	70775	168750	97975	2.18	1.26	110850	0.69	6750	90	0.223	551994.5	5.11	116	8.17
Baskandi	74000	12000	97600	109600	301625	192025	4.07	2.59	204025	0.36	12065	190	0.218	1163584.7	12.71	253	16.72

Auti-Bauti	72000	11875	61700	73575	64500	-9075	0.89	-0.1	2800	25.89	2580	120	0.074	-80498	0.177	3.5	-0.11
Tapang	74000	12000	57100	69100	59125	-9975	0.8	-0.1	2025	36.54	2365	110	0.074	-86795.2	0.126	2.5	-0.17
Digar-Bakri	71000	11749.99	49800	61549.99	53425	-8124.99	0.75	-0.1	3625	19.57	2137.5	95	0.078	-73891.25	0.23	4.6	-0.04
Rani-Megna	51000	7749.99	32800	40549.99	43875	3325.01	0.86	0.07	11075	4.6	1755	90	0.101	2356.25	1.04	13	1.04
Gopharchang	67500	10875	61500	72375	67500	-4875	1	0.07	6000	11.25	2700	120	0.078	-660657	0.41	8	0.21
Pungani	30500	3652.77	40500	44152.77	90000	45847.23	2.95	1.5	49500	0.62	3600	80	0.156	268089.8	7.99	151	9.94
Ganak- D. Duba	27000	3876.66	27300	31176.66	60000	28823.34	2.22	1.06	32700	0.83	2400	80	0.156	162940.2	5.13	105	7.03
Botalikhosa	27000	4678.5	39900	44578.5	80000	35421.5	2.96	1.31	40100	0.67	3200	80	0.138	208746.2	6.29	129	8.73
Bihdia	34000	4933.32	32000	36933.32	55125	18191.68	1.62	0.54	23125	1.47	2205	90	0.127	38124.95	1.88	34	2.12
Teliadanga	25000	3472.22	45650	49122.22	68750	19627.78	2.75	0.78	23100	1.08	2750	110	0.104	35394	2.29	46	2.83
Moridikhow	26000	4190.46	34000	38190.46	62500	24309.54	2.4	0.93	28500	0.91	2500	100	0.13	140021	4.85	97	6.38
Average	**45750**	**7112.972**	**49137.5**	**56250.472**	**87638.5**	**31388.03**	**2.07**	**0.77**	**38501**	**5.919**	**3491.38**	**101.3**	**0.12535**	**137774.91**	**3.873**	**76.63**	**5**

Table-4.4 Economic Indicators of Phansijal.

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidanga	4350	480.54	5370	5850.54	10560	4709.46	2.43	1.08	5190	0.84	480	120	0.148	26942.62	6.19	113	7.26
Hakama	4900	590.47	7950	8540.47	15048	6507.53	3.07	1.33	7098	0.69	684	180	0.14	38101.16	7.5	137	8.77
Nandini	4250	505.94	4250	4755.94	5544	788.06	1.3	0.18	1294	3.28	252	90	0.103	3379.91	1.73	27	1.79
Harinchora	4500	458.33	4325	4783.33	6336	1552.67	1.41	0.35	2011	2.24	288	90	0.118	1238.39	1.24	18	1.27
Barundanga	3800	366.66	6100	6466.66	7700	1233.34	2.03	0.32	1600	2.38	350	140	0.092	5952.02	2.5	42	2.56
Bhoispuri	4450	502.77	6250	6752.77	10780	4027.23	2.42	0.9	4530	0.98	490	140	0.129	23109.43	5.68	99	6.19
Jogra	5100	553.33	6300	6853.33	11704	4850.67	2.29	0.95	5404	0.94	532	140	0.14	27793.5	5.91	103	6.45
Chandakhal	5250	690.47	5400	6090.47	7920	1829.53	1.51	0.35	2520	2.08	360	120	0.111	9715.55	2.65	47	2.85
Sagmara	4850	503.33	7920	8423.33	11088	2664.67	2.29	0.55	3168	1.53	504	180	0.103	14379.31	3.75	64	3.99
Borbilla	4900	513.33	7520	8033.33	13090	5056.67	2.67	1.03	5570	0.88	595	170	0.129	29122.36	6.43	111	6.94
Botua-kamakhya	4950	523.33	6350	6873.33	8750	1876.67	1.77	0.38	2400	2.06	350	140	0.092	3234.73	1.59	25	1.65
Siliguriјari	6000	777.77	10980	11757.77	12870	1112.23	2.14	0.18	1890	3.17	585	130	0.083	4685.9	1.67	28	1.78
Deepar	5100	553.33	6300	6853.33	12075	5221.67	2.4	1.02	5775	0.89	525	140	0.138	30089.99	6.32	110	6.89
Mori	5450	565	7150	7715	10560	2845	1.94	0.52	3410	1.59	480	160	0.111	8986.63	2.51	43	2.65
Bormonoha	5450	565	6375	6940	8470	1530	1.56	0.28	2095	2.6	385	140	0.101	7036.78	2.18	37	2.29

Jaluguti	4800	493.33	6300	6793.33	7700	906.67	1.6	0.19	1400	3.43	350	140	0.092	3460.72	1.66	26	1.72
Kasodhora	4400	471.66	6300	6771.66	8085	1313.34	1.84	0.29	1785	2.47	385	140	0.101	6193.21	2.27	39	2.41
Kujibalipatti	5300	535	6320	6855	8470	1615	1.59	0.3	2150	2.47	385	140	0.101	7176.98	2.17	39	2.35
Deora	4950	523.33	7110	763.33	10560	2926.67	2.13	0.59	3450	1.43	480	160	0.111	15468.08	3.63	67	4.16
Thekara	4900	513.33	7120	7633.33	10560	2926.67	2.16	0.59	3440	1.42	480	160	0.111	15520.04	3.66	67	4.17
Udori	5450	565	7120	7685	9680	1995	1.78	0.37	2560	2.13	440	160	0.101	9347.07	2.45	44	2.71
Nandini-karmari	4150	454.16	4380	4834.16	7315	2480.84	1.76	0.6	2935	1.41	332.5	95	0.129	13688.36	4.06	69	4.29
Lakhanabandha	4400	471.66	6300	6771.66	9240	2468.34	2.1	0.56	2940	1.49	420	140	0.111	13342.66	3.75	65	4.03
Satiyan	4650	549.99	6725	7274.99	12375	5100	2.66	1.09	5650	0.82	562.5	150	0.138	29994.21	7.02	119	7.45
Siyalekhaity	5200	676.18	9200	9876.18	13167	3290.82	2.53	0.63	3967	1.31	598.5	210	0.052	18747.81	4.23	74	4.61
Dighali-patali	4800	493.33	6300	6793.33	8470	1676.67	1.76	0.35	2170	2.21	385	140	0.101	8227.02	2.58	44	2.71
Brahmamaijan	4800	493.33	6310	9803.33	9240	2436.67	1.92	0.5	2930	1.64	420	140	0.111	12931.42	3.48	60	3.69
Salchapra	4450	481.66	7110	7591.66	8800	1208.34	1.98	0.27	1690	2.63	400	160	0.092	5529.83	2.12	36	2.24
Sibnaraypur	5100	700	3050	3750	4950	200	0.97	0.24	1900	2.68	225	60	0.069	6103.74	2.07	35	2.19
Baskandi	4350	574.99	7750	8324.99	17820	9495.01	2.18	2.18	10070	0.43	810	180	0.083	57552.69	13.03	226	14.23
Auti-Bauti	5500	958.32	7800	8758.32	10890	2131.68	1.98	0.39	3090	1.78	495	180	0.05	12613.9	2.94	54	3.29
Tapang	5200	608.33	5700	6308.33	12540	6231.67	2.41	1.19	6840	0.76	570	120	0.175	36778.79	7.62	128	8:07
Digar-bakri	5200	733.33	5400	6133.33	7128	994.67	1.37	0.19	1728	3	324	120	0.1	4269.4	1.74	28	1.82
Rani-megna	4150	508.32	6550	7058.32	13200	6141.68	3.18	1.48	6650	0.62	600	150	0.074	36684.21	9.18	157	9.84
Sagar	5600	741.66	6750	7491.66	13200	5708.34	2.35	1.01	6450	0.87	600	150	0.074	33768.24	6.48	112	7.03
Gopharchang	4100	508.32	17300	17808.32	18480	671.68	4.45	0.16	1180	3.52	840	210	0.074	2874.91	1.65	26	1.7
Angang	4450	481.66	5460	5941.66	6336	394.34	1.42	0.09	876	5.08	288	120	0.088	491.19	1.09	14	1.11
Pungani	5700	717.85	10980	11697.85	20020	8322.15	3.51	1.46	9220	0.62	910	130	0.129	49363.15	8.1	149	9.66
G.D.duba	5700	615	11900	12515	15120	2605	2.65	0.46	3220	1.77	630	140	0.083	12984.52	2.87	45	3.28
G.B.Jopora	5700	615	9300	9915	15400	5485	2.7	0.96	6100	0.93	700	100	0.129	30811.72	5.43	100	6.41
Merkolaberia	5000	666.66	7450	8116.66	11495	3378.34	2.29	0.67	4045	1.24	522.5	95	0.101	18479.45	3.82	74	4.69
Tinsuliborbil	4700	531.66	11850	12381.66	13860	1478.34	0.34	0.31	2010	2.34	630	140	0.083	7133.88	2.34	41	2.52
Moridisoi	4900	558.33	5200	5758.33	14520	8761.67	2.96	1.79	9320	0.53	660	110	0.222	51855.34	9.88	179	11.58
Botalikhosa	4700	531.66	13500	14031.66	16320	2288.34	3.47	0.49	2820	1.67	680	160	0.078	12147.88	3.28	58	3.58
Bihdia	4500	577.36	8700	5277.36	9460	4182.64	2.1	0.93	760	5.92	650	100	0.12	23925	5.31	99	6.32

Teliadanga	5500	660.71	3855	4515.71	7920	3404.29	1.44	0.62	4065	1.35	360	80	0.083	18821.49	4.13	71	4.42
Moridikhow	5350	545	6310	6855	10010	3155	1.87	0.59	3700	1.45	455	140	0.12	17122.39	3.96	68	4.2
Batha	4900	590.47	7950	8540.47	15048	6507.53	3.07	1.33	7098	0.69	684	185	0.137	65630.25	8.2	140	8.87
Mailata-Dipling.	4450	502.77	6250	6752.77	10780	4027.23	2.42	0.9	4530	0.98	288	100	0.106	23109.43	5.68	99	6.19
Raumari	5250	690.47	5400	6090.47	7920	1829.53	1.57	0.35	2520	2.08	360	120	0.111	9715.55	2.65	46	2.85
Gathia	4900	513.33	7520	8033.33	13090	5056.67	2.67	1.03	5570	0.88	595	180	0.123	29122.38	6.44	111	6.94
Average	**4910.8**	**568.6816**	**7197.25**	**7611.6227**	**11013**	**3305.906**	**2.16**	**0.68**	**3819.29**	**1.808**	**497.549**	**138.9**	**0.1078627**	**18720.69**	**4.291**	**74.765**	**4.719**

Table-4.5 Economic Indicators of Langijal.

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidanga	4300	468.77	5380	5848.77	10560	4711.23	2.46	1.09	5180	0.83	480	120	0.148	26932.68	6.24	113	7.26
Hakama	4800	561.9	7980	8511.9	13860	5348.1	2.88	1.11	5910	0.81	630	180	0.129	30644.2	6.76	117	7.38
Nandini	4400	548.8	7200	7748.8	12320	4571.2	2.8	1.03	5120	0.86	560	160	0.129	25738.34	5.28	107	6.85
Harinchora	4850	545.83	7950	8495.83	13860	5364.17	2.86	1.1	5910	0.82	630	180	0.129	60849.41	6.38	115	7.36
Barundanga	4700	558.32	7940	8498.32	13860	5361.68	2.95	1.14	5920	0.79	630	180	0.129	30050	5.56	110	7.39
Bhoispuri	4400	491.66	6420	6911.66	11550	4638.34	2.63	1.05	5130	0.86	525	140	0.138	25933.6	5.45	105	6.89
Jogra	4950	570.83	6450	7020.83	10780	3759.17	2.17	0.76	4330	1.14	490	140	0.128	20865.27	4.51	82	5.21
Chandakhal	4950	544.44	7170	7714.44	13200	5485.56	2.67	1.11	6030	0.82	600	160	0.138	31388.27	6.28	114	7.34
Sagamara	4900	533.33	4250	4783.33	6930	2146.67	1.41	0.44	2680	1.8	315	90	0.064	10887.1	2.72	52	3.22
Borbilla	4800	441.66	11450	11891.66	16632	4740.34	3.46	0.98	5182	0.93	756	270	0.051	26802.88	6.08	104	6.58
Botua-kamakhya	4650	495.83	19900	20395.83	23760	3364.17	5.1	0.72	3860	1.2	1080	240	0.083	18217.05	4.2	77	4.92
Siligurijan	4900	558.83	7350	7908.33	10560	2651.67	2.16	0.54	3210	1.53	480	160	0.111	13548.8	3.14	59	3.76
Deepar	4950	570.83	6450	7020.83	9000	1979.17	1.8	0.39	2550	1.92	360	120	0.111	9847.07	2.65	48	2.98
Solmari	250	125	7225	7350	9000	1650	36	6.6	1775	0.14	360	180	0.074	10342.5	17.04	460	42.37
Mori	4800	450	15790	16240	18810	2570	3.92	0.54	3020	1.59	855	190	0.083	13581.98	3.65	62	3.83

Bormon	5300	552.78	15920	16472.78	18700	2227.22	3.53	0.42	2780	1.9	850	190	0.092	12096.38	3.36	57	3.52
Jaluguti	4700	508.78	10170	10678.33	18480	7801.67	3.93	1.66	8310	0.57	840	120	0.129	45633.6	8.86	164	10.71
Kasodhora	4250	458.32	10135	10593.32	18480	7886.68	4.35	1.87	8345	0.51	840	120	0.129	47026	9.65	182	12.06
Kujibalipatti	5250	541.66	11725	12266.66	20020	7933.34	3.81	1.51	8475	0.62	910	140	0.12	46430.7	8.7	150	9.84
Deora	4900	558.33	7230	7788.33	8800	1011.67	1.79	0.21	1570	3.12	400	160	0.092	3882.24	1.66	28	1.79
Thekera	4600	504.75	7820	8324.75	8910	585.25	1.94	0.13	1090	4.22	405	90	0.083	1199.7	1.21	17	1.26
Udori	5300	575	5360	5935	15840	9905	2.99	1.87	10480	0.51	720	120	0.111	58308	9.88	183	12
Nandini-karmari	4450	563.08	6380	6943.08	7700	759.92	1.73	0.17	1320	3.37	350	140	0.092	3389.37	1.7	27	1.75
Lakhanabandha	3850	391.66	4150	4541.66	7425	2883.34	1.93	0.74	3275	1.78	337.5	90	0.069	15869.6	4.6	81	5.12
Satiyan	4850	576.18	7140	7716.18	9680	1963.82	2	0.4	2540	1.91	440	160	0.101	9989.11	2.74	49	3.06
Siyalekhaity	4900	558.33	7080	7638.33	8800	1161.67	1.79	0.24	1720	2.85	400	160	0.092	4811.34	1.82	31	1.98
Dighali-patali	4350	433.33	11450	11883.33	17820	5936.67	4.09	1.36	6370	0.68	810	270	0.111	34716.51	8.36	143	8.98
Brahmamaijan	4900	590.47	6410	7000.47	10780	3779.53	2.2	0.77	4370	1.12	490	140	0.129	21214.84	4.64	84	4.64
Salchapra	4400	548.8	6420	6968.8	8470	1501.2	1.92	0.34	2050	2.15	385	140	0.101	7354.04	2.38	44	2.67
Sibnarayanpur	4900	558.33	7190	7748.33	9680	1931.67	1.98	0.39	2490	1.97	440	160	0.101	9577.64	2.64	48	2.95
Baskandi	4400	516.66	7990	8506.66	11880	3373.24	2.7	0.77	3890	1.13	540	180	0.111	18743.64	4.51	83	5.26
Auti-bauti	4850	504.16	7980	8484.16	9900	1415.84	2.27	0.33	1920	2.27	450	180	0.092	6651.31	2.27	41	2.53
Tapang	5600	689.28	8125	8814.28	11088	2273.72	1.98	0.41	2963	1.89	504	180	0.103	11597.63	2.72	50	3.07
Digar-bakri	5100	608.33	7250	7858.33	9680	1821.67	1.89	0.36	2430	2.1	440	160	0.101	8798.38	2.41	45	2.72
Rani-megna	4450	563.08	5620	6183.08	6600	416.92	1.48	0.09	980	4.54	300	120	0.092	628.77	1.11	15	1.14
Sone	4000	458.32	22500	22958.32	26730	3771.68	6.68	0.94	4230	0.94	1215	270	0.083	21394.2	5.25	99	6.35
Rata	4100	463.08	5640	6103.08	6600	496.92	1.61	0.12	960	4.27	300	120	0.092	1218.78	1.25	18	1.29
Saitali	4450	563.08	6390	6953.08	7700	746.92	1.73	0.17	1310	3.39	350	140	0.092	2671.47	1.49	24	1.6
Pungani	5350	563.88	7375	7938.88	11220	3281.12	2.09	0.61	3845	1.39	510	85	0.111	17108.4	3.56	66	4.19
G.D.duba	5000	517.85	6200	6717.85	9240	2522.15	1.85	0.5	3040	1.64	420	140	0.111	13297.9	3.41	59	3.66
G.B. Jopora	5300	552.78	5550	6102.78	8470	2367.22	1.59	0.45	2920	1.82	385	110	0.064	11943.28	2.95	53	3.25
Merkolaberia	4300	469.44	8700	9169.44	9900	730.56	2.3	0.17	1200	3.58	450	100	0.083	1864.8	1.33	23	1.43
Tinsuli-borbil	4300	469.44	11330	11799.44	19305	7505.56	4.49	1.75	7975	0.54	877.5	135	0.12	43802.05	8.87	168	11.18
Moridisoi	4700	533.33	5200	5733.33	8470	2736.67	1.8	0.58	3270	1.44	385	110	0.064	14436	3.48	65	4.07
Botalikhosa	4250	506.66	4750	5256.66	5940	683.34	1.39	0.16	1190	3.57	270	100	0.1	2336.55	1.46	73	1.55

Bihdia	4250	541.66	6200	6741.66	9460	2718.34	2.22	0.64	3260	1.3	430	70	0.113	14745.15	3.71	70	4.46
Teliadanga	5100	546.43	3845	4391.43	5280	888.57	1.04	0.17	1435	3.56	240	80	0.111	3159.01	1.55	24	1.62
Moridikow	5200	530.55	7330	7860.55	12155	4294.45	2.34	0.83	4825	1.08	552.5	85	0.12	23555.26	4.74	64	5.53
Batha	4300	468.77	5380	5848.77	10560	4711.23	2.46	1.09	5180	0.83	480	120	0.148	26501	5.76	110	7.16
Mailatadipling	4850	545.83	7950	8495.83	13860	5364.17	2.86	1.1	5910	0.82	630	170	0.137	30390.75	5.91	111	7.27
Raumari	4950	544.44	7170	7714.44	13200	5485.56	2.67	1.11	6030	0.82	600	160	0.138	30925.65	5.83	111	7.31
Gathia	4800	441.66	11450	11891.66	16632	4740.34	3.46	0.98	5182	0.93	756	140	0.1	26802.88	6.08	104	6.58
Average	**4636.5**	**518.9335**	**8142.5**	**8660.8383**	**12079.6**	**3422.237**	**3.23**	**0.85**	**3941.1**	**1.676**	**547.183**	**147.4**	**0.1054423**	**19417.328**	**4.573**	**86.327**	**5.748**

Table-4.6 Economic Indicators of Khewalijal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidang	4250	506	5130	5636	7590	1954	1.79	0.46	2460	1.73	345	115	0.02	10817	3.15	57	3.54
Hakama	4850	576.19	6350	6926.19	7700	773.81	1.59	0.16	1350	3.59	350	140	0.016	2623	1.46	23	1.54
Nandini	800	228.57	4450	4678.57	6050	1372	7.56	1.71	1600	0.49	275	110	0.016	8279	6.07	152	11.35
Harin	5000	619	9550	10169	14520	4351	2.9	0.87	4351	1	660	220	0.02	24725	5.09	93	5.94
Barun	750	214.28	4050	4264.28	7040	2775.72	9.39	3.7	2990	0.25	320	100	0.021	16978	12.1	300	23.64
Bhois	800	228.57	7250	7478.57	9504	2025.43	11.9	2.53	2254	0.35	432	180	0.016	12320	8.55	212	16.4
Jogra	4900	590.47	5550	6140.47	7392	1251.53	1.51	0.26	1842	2.66	336	120	0.018	5566	1.95	35	2.14
Chanda	4850	545.83	7800	8345.83	9900	1554.17	2.04	0.32	2100	2.3	450	180	0.016	7265	2.26	41	2.49
Sagamara	4700	488.88	3150	3638.88	3960	321.12	0.84	0.06	810	5.8	180	60	0.02	-413.68	0.92	10	0.91
Borbilla	5400	575	7750	8325	6930	-1395	1.28	-0.3	-820	–	315	180	0.011	-780.14	0.87	9	0.86
B.kamak.	47000	488.88	10250	10738.88	14520	3781.12	3.08	0.8	4270	1.1	660	240	0.018	21004	4.87	87	5.47
Siliguri	7000	1000	5220	6220	8855	2635	1.26	0.37	3635	1.92	402.5	115	0.023	12382	2.22	46	2.77
Deepar	4850	545.83	7800	8345.83	11880	3534.17	2.4	0.73	4080	1.18	540	180	0.02	19521	4.4	79	5.02
Solmari	4700	473.34	8910	9383.34	25200	15816.66	5.4	3.36	16290	0.29	840	210	0.026	95407	18.58	331	21.29
Mori	5000	486.11	15265	15751.11	20900	5148.89	4.18	1.02	5635	0.88	950	190	0.033	29361	6.32	109	6.87
Bormon .	5000	486.11	15075	15561.11	25740	10178.89	5.15	2.03	10665	0.47	1170	180	0.043	60497	11.96	207	13.09

Jaluguti	4650	477.77	8600	9077.77	14300	5222.23	3.07	1.12	5700	0.82	650	100	0.043	29957	6.62	117	7.44
Kaso	4450	529.16	7200	7729.16	8800	1070.84	1.98	0.24	1600	2.78	400	160	0.016	4466	1.82	32	2
Kuji	5400	632.14	7200	7832.14	7920	87.86	1.47	0.02	720	7.5	360	160	0.015	-1878.66	0.7	4	0.65
Deora	900	257.14	5880	6137.14	8470	2332.86	9.41	2.59	2590	0.35	385	140	0.018	14197	8.73	217	16.77
Thekera	4800	533.33	7850	8383.33	14850	6466.67	3.09	1.35	7000	0.69	675	180	0.025	37698	7.69	138	8.85
Udori	5250	541.66	10980	11521.66	35750	24228.34	6.81	4.61	24770	0.21	1625	130	0.083	146892	23.83	450	29.98
N.karmari	4250	541.66	7370	7911.66	9350	1438.34	2.2	0.34	1980	2.15	425	85	0.033	6822	2.55	42	2.6
L.bandha	4100	424.99	8950	9374.99	11550	2175.01	2.82	0.75	2600	1.58	525	210	0.016	11370	3.41	61	3.77
Satiyan	4750	500	6650	7150	4950	-2200	1.04	-0	-1700	–	225	150	0.01	-15652.95	-2.21	-3.5	-2.29
Siyale	5500	666.66	11350	12016.66	16632	4615.34	3.02	1.19	5282	1.04	756	270	0.012	25636	4.63	88	5.66
D.patali	4750	500	5550	6050	7260	1210	1.53	0.25	1710	2.78	330	120	0.018	5055	1.91	33	2.06
B.maijan	950	271.42	6590	6861.42	8800	1938.58	9.26	2.04	2210	0.43	400	160	0.016	11742	7.06	175	13.36
Salchap	4250	541.66	7700	8241.66	14850	6608.34	3.49	1.55	7150	0.59	675	180	0.025	39229	8.79	159	10.23
Sibnaray	4750	547.61	3000	3547.61	4620	1072.39	6.16	0.23	1620	2.93	210	60	0.023	4498	1.81	30	1.94
Baska	4450	563.08	11450	12013.08	14850	2836.92	3.34	0.64	3400	1.31	675	270	0.016	15608	3.87	71	4.51
A.bauti	4250	505.94	6600	7105.94	9240	2134.06	2.17	0.5	2640	1.61	420	150	0.018	11312	3.25	59	3.66
Tapang	5150	591.66	5500	6091.66	11800	5708.34	2.29	1.1	6300	0.82	540	120	0.03	33171	6.69	117	7.44
D.bakri	4750	604.75	8080	8684.75	9900	1215.25	2	0.25	1820	2.72	450	180	0.016	5528	1.96	34	2.16
R.megna	4400	548.8	6550	7098.8	7425	326.2	1.68	0.07	875	5.03	412.5	150	0.018	81	1.01	12	1.02
Sagar	5250	589.28	4250	4839.28	6930	2090.72	1.32	0.39	2680	1.96	315	90	0.023	10559	2.75	49	3.01
Gophar	4250	505.94	8900	9405.94	11500	2094.06	2.7	0.49	2600	1.63	525	210	0.016	11064	3.19	58	3.6
Angang	4600	605.94	10200	10805.94	11220	414.06	2.44	0.09	1020	4.51	510	120	0.028	570	1.09	15	1.12
Sone	4600	605.94	22500	23105.94	29700	6594.06	6.46	1.4	7200	0.64	1350	270	0.033	1091	1.17	17	1.23
Rata	5400	555	4550	5105	6600	1495	1.22	0.28	2050	2.63	300	100	0.02	6354	2	36	2.17
G.B.Jop.	5300	552.78	7350	7902.78	6545	-1357.78	1.23	-0.3	-805	–	297	85	0.023	-11114.47	-1.23	-14.47	-1.09
M.beria	4200	447.22	7770	8217.22	9900	1682.78	2.36	0.4	2130	1.97	450	90	0.033	7879	2.48	46	2.87
T.borbil	4450	563.08	7150	7713.08	9680	1966.92	0.46	0.44	2530	1.76	440	160	0.018	10431	2.99	54	3.34
M.disoi	5200	573.33	11050	11623.33	22880	11256.67	4.4	2.16	11830	0.44	1040	260	0.026	6678	11.36	211	13.84
B.khosa	4250	479.16	3750	4229.16	7040	2810.84	1.66	0.66	3290	1.29	320	80	0.026	15335	4.05	73	4.61
Bihdia	4450	563.08	7120	7683.08	7920	236.92	1.78	0.05	800	556	360	160	0.015	-485.54	0.91	10	0.89

T.danga	5300	603.57	3650	4253.57	4125	-128.57	0.78	-0	415	11.16	187.5	75	0.016	-3191.27	0.48	8.5	0.39
M.dikow	5300	575	7320	7895	14960	7065	2.82	1.33	7640	0.69	680	85	0.053	40728	7.21	133	8.68
Batha	4250	506	5130	5636	7590	1954	1.79	0.46	2460	1.73	345	110	0.02	4008	1.79	31	1.94
M.dipling	4500	458.33	4325	4783.33	6336	1552.67	1.41	0.35	2011	2.24	288	90	0.021	7428	2.48	43	2.65
Raumari	4700	488.88	3150	3638.88	3960	321.12	0.84	0.06	810	5.8	180	65	0.018	-413.68	0.92	10	0.91
Gathia	5400	575	7750	8325	6930	-1395	1.28	-0.3	-820		315	180	0.011	-6675.94	-1.15	-14.86	-1.02
Average	**5250**	**520.7696**	**7548.37**	**8069.135**	**11208**	**3138.838**	**3.15**	**0.86**	**3646.54**	**12.14**	**505.125**	**148.6**	**0.0228462**	**15606.263**	**4.373**	**84.455**	**5.659**

Table- 4. 7 Economic Indicators of Hooks and Line Fishing

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Kalidang	3450	90	6900	6990	14400	7410	4.17	2.15	7500	0.46	720	160	0.125	42507	11.85	209	13.32
Hakama	3500	391.66	5275	5666.66	7200	1533.34	2.06	0.44	1925	1.82	360	120	0.083	7896	2.96	52	3.26
Nandini	3450	350	5220	5570	3240	-2330	0.94	-0.7	-1980	-	162	120	0.037	-15934.17	-3.33	-56	-3.6
Harin	3400	323.8	5220	5543.8	5760	216.2	1.69	0.06	540	6.29	288	120	0.066	-265.28	0.93	10	0.92
B.danga	3600	400	3875	4275	3400	-875	0.94	-0.2	-475	-	170	85	0.055	-7163.88	-0.69	-11	-0.99
Bhois	3500	392.85	6820	7212.5	2520	-4692.85	0.72	-1.3	-4300	-	266	140	0.052	-30370.3	-7.09	-121	-7.67
Jogra	3450	362.5	6020	6382.5	5600	-782.5	1.62	-0.2	-420	-	280	140	0.055	-6517.53	-0.66	-12	-0.89
Chanda	3650	379.16	7625	8004.16	4320	-3684.16	1.18	-1	-3305	-	216	180	0.033	-24335.92	-5.27	-89	-5.67
Sagmara	3650	379.16	5220	5599.16	4560	-1039.16	1.25	-0.3	-660	-	228	120	0.052	-7963.37	-1.05	-18	-1.18
Borbila	3600	400	6820	7220	6720	-500	1.87	-0.1	-100	-	240	160	0.041	-4842.64	-0.15	-271	-0.35
B.kamak	3650	379.16	5220	5599.16	6000	400.84	1.64	0.1	780	4.6	300	120	0.069	710	1.17	16	1.19
Deepar	3600	400	3875	4275	4675	400	1.3	0.11	800	4.5	212.5	85	0.069	728	1.17	16	1.2
Jaluguti	3500	375	6815	7190	4800	-2390	1.37	-0.7	-2015	-	240	160	0.041	-16226.15	-3.32	-56	-3.64
Kasod.	3800	416.66	6220	6636.66	5800	-836.66	1.53	0.22	-420	-	290	145	0.055	-7023.44	-0.59	-11	-0.85
Kuji	3850	429.16	6020	6449.16	7000	550.84	1.81	0.14	980	3.93	350	140	0.069	1540	1.34	20	1.4
Deora	4050	401.66	6925	7326.66	6720	-606.66	1.66	-0.2	-205	-	320	160	0.055	-5890.62	0.27	-5	-0.45
Thekera	3300	325	2825	3150	2400	-750	0.73	-0.2	-425	-	120	60	0.055	-6242.54	-0.73	-13	-0.17
Udori	3650	412.5	6050	6462.5	8400	1937.5	2.3	0.53	2350	1.55	420	140	0.083	10221	3.36	61	3.8
N.karmar	3350	337.5	6150	6487.5	2940	-3547.5	0.88	-1.1	-3210	-	140	140	0.027	-23498.53	-5.47	-94	-6.01

L.bandha	3350	327.77	5220	5547.77	3360	-2817.77	1	-0.7	-1860		168	120	0.038	-18940.41	-4.37	-73	-4.65
Satiyan	3550	354.16	6820	7174.16	5600	-1574.16	1.58	-0.4	-1220		280	160	0.048	-11279.11	-2.03	-34	-2.18
Siyale	3400	350	6740	7090	5040	-2050	1.48	-0.6	-1700		252	140	0.05	-14125.64	-2.92	-49	-3.15
D.patali	3600	400	6220	6620	5600	-1020	1.56	-0.3	-620		280	140	0.055	-8061.44	0.91	-16	-1.24
B.maija	3850	379.16	6950	7329.16	8064	734.84	2.09	0.19	1114	3.46	448	160	0.077	2682	1.64	26	1.69
Salchap	3350	337.5	6825	7162.5	6400	-762.5	1.91	-0.2	-425		320	160	0.055	-6344.54	-0.71	-12	-0.89
Sibnaray	3250	312.5	4150	4462.5	3240	-1222.5	0.99	-0.4	-910		180	90	0.055	-9142.75	-1.6	-27	-1.83
Baskandi	3550	354.16	6420	6744.16	8250	1475.84	2.32	0.42	1800	1.97	412.5	150	0.076	7414	2.89	50	3.08
A.bauti	3500	361.11	6850	7211.11	9000	1788.89	2.57	0.51	2150	1.63	450	160	0.069	9289	3.31	59	3.65
D.bakri	3600	400	5220	5320	6600	980	1.83	0.27	1380	2.61	300	120	0.041	4318	1.43	35	2.19
R.megna	3600	120	7620	7740	8100	360	2.25	0.1	480	7.5	385	180	0.059	-1252.54	0.7	4	0.65
Sagar	3600	400	5225	5625	6000	375	1.67	0.1	775	4.64	300	120	0.055	574	1.13	15	1.16
Gophar	3400	338.88	8825	9163.88	9450	286.12	2.78	0.08	625	5.44	525	210	0.069	53	1.01	12	1.02
Angang	3600	383.33	6825	7208.33	7776	567.67	2.16	0.15	951	3.78	432	160	0.075	1663	1.39	21	1.46
Sone	3450	362.5	11250	11612.5	12150	537.5	3.52	0.16	900	3.83	675	270	0.055	1653	1.42	22	1.48
Rata	3500	350	5450	5800	5040	-760	1.44	-0.2	-410		210	120	0.048	-6291.2	0.68	-11	-0.79
Saitali	3900	380.54	4350	4730.54	4488.75	-241.79	1.15	-0.1	138.75	28.11	213.75	95	0.062	-3455.35	0.91	3	0.11
Pungani	3600	366.66	6820	7186.66	11200	4013.34	3.11	1.11	4380	0.82	560	160	0.097	23096	6.75	117	7.42
G.D.duba	3600	350	7420	7770	7000	-770	1.94	-0.2	-420		350	175	0.055	-269.22	-0.93	11	0.92
G.B.Jop.	3800	416.66	6900	7316.66	11200	3883.34	2.95	1.02	4300	0.88	560	160	0.097	22193	6.01	107	6.84
M.beria	3600	383.33	6025	6408.33	8400	1991.67	2.33	0.56	2375	1.52	420	140	0.083	10478	3.48	62	3.91
T.borbil	3750	404.16	4870	5274.16	7700	2425.84	2.05	0.65	2830	1.33	385	110	0.097	13196	4.05	72	4.52
M.disoi	4450	433.33	3650	4083.33	5040	956.67	1.13	0.21	1390	3.2	280	80	0.097	3686	1.74	28	1.82
B.khosa	3400	338.88	4350	4688.88	4987.5	298.62	1.47	0.09	637.5	5.3	237.5	95	0.069	127	1.03	13	1.04
Bihdia	3300	316.66	3310	3626.66	3850	223.34	1.17	0.07	540	6.11	175	70	0.069	-269.22	0.92	10	0.92
T.danga	3650	412.5	6820	7232.5	8000	767.5	2.19	0.21	1180	3.09	400	160	0.069	2979	1.69	28	1.82
M.dikhow	3550	387.5	6020	6407.5	7000	592.5	1.97	0.17	980	3.62	350	140	0.069	1944	1.47	23	1.55
Batha	3450	350	5220	5570	3240	-2330	0.94	-0.7	-1980		147.2	120	0.034	-15934.17	-3.33	-56	-3.62
M.dipling	3450	362.5	5580	6382.5	5600	-782.5	1.62	-0.2	-420		254.5	125	0.055	-6517.53	-0.66	-12	-0.89
Raumari	3650	379.16	5220	5599.16	4560	-1039.16	1.25	-0.3	-660		200	120	0.046	-8064.69	-1.03	-18	-1.21
Average	**3577.6**	**362.4229**	**5964.49**	**6329.1504**	**6293.7**	**-55.0504**	**1.76**	**-0**	**319.617**	**-0.916**	**315.774**	**136.8**	**0.0621633**	**-1985.2078**	**0.442**	**0.7551**	**0.417**

Table-4.8 Economic Indicators of Dhenkijal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Sagamara	5200	676.18	7350	8026.18	9680	1653.82	1.86	0.32	2330	2.23	440	80	0.014	7975	2.24	42	2.53
Borbilla	5800	847.61	7800	8647.61	8882.5	234.89	1.53	0.04	1082.5	5.36	403.75	85	0.012	-973.34	0.87	8	0.83
B.kamak	5200	716.18	8250	8966	10260	1294	1.97	0.25	2010	2.59	427.5	90	0.012	5995	1.92	34	2.16
Deepar	5800	847.61	7800	8647.61	13260	4612.39	2.3	0.79	5460	1.06	552.5	85	0.065	19936	3.59	70	4.44
Mori	6000	803.57	5025	5828	9240	3240	1.54	0.54	4215	1.42	440	55	0.02	17473	3.31	62	3.91
Bormon	6000	803.57	4330	4410.57	6142.5	1731.93	1.02	0.29	1812.5	2.37	292.5	45	0.016	8132	2.08	39	2.36
Udori	6300	975	8250	9225	19950	10725	3.16	1.7	11700	0.54	950	95	0.025	64252	8.86	170	11.19
N.karmari	5300	691.66	6250	6941.66	15435	8493.34	2.91	1.6	9185	0.58	735	70	0.026	49684	7.93	156	10.37
Satiyan	7500	1208	11880	13088.33	19110	6021.67	2.55	0.8	7230	1.04	910	140	0.016	33616	4.02	84	5.48
Siyale	8000	1222.21	15050	16272.21	32130	15857.79	14	1.98	17080	0.47	1530	180	0.021	93567	8.69	183	12.69
D.patali	8000	1222.21	7070	8292.21	12600	4307.79	1.57	0.54	5530	1.45	600	80	0.018	22073	2.82	59	3.76
B.maijan	5300	741.66	7280	8021.66	5760	-2261.66	1.08	-0.4	-1520	[illegible]	240	80	0.007	-16579.72	-1.31	-26	-2.13
D.bakri	6300	825	10400	11225	16200	4975	2.57	0.78	5800	1.08	900	120	0.018	27731	4.39	84	5.4
R.megna	4700	691.66	10340	11031.66	9240	-1791.66	1.97	-0.4	-1100	[illegible]	420	120	0.008	-12837.28	-1.14	-22	-1.71
Sagar	5500	625	11975	12600	10780	-1820	1.96	-0.3	-1195	[illegible]	490	140	0.008	-13936.45	-1.13	-21	-1.53
Gophar	5000	720.23	7630	8350.23	7854	-496.23	1.57	-0.1	224	22.32	327.25	85	0.009	-5172.54	0.21	4	-0.03
Angang	4700	591.66	8020	8611.66	7020	-1591.66	1.49	-0.3	-1000	4.7	292.5	90	0.008	-12137.28	-1.04	-122	-1.58
Sone	4900	641.66	8480	9121.66	9405	283.34	1.92	0.05	925	5.29	427.5	95	0.011	-629.41	0.9	9	0.87
Saitali	5300	741.66	8020	8761.66	8640	-121.66	1.63	-0	620	8.55	360	90	0.01	-3333.12	0.54	11	0.37
Pungani	5700	675	8695	9370	7920	-1450	1.39	-0.3	-775	[illegible]	360	90	0.01	-11744.53	-0.69	-13	-1.06
G.D.duba	5000	666.66	8020	8686.66	9180	493.34	1.84	0.09	1160	4.31	382.5	90	0.011	621	1.09	16	1.12
G.B.Jop.	6300	889.28	10400	11289.28	15960	4670.72	2.53	0.74	5560	1.13	760	80	0.024	26245	4.21	81	5.17
M.disoi	4750	547.61	11750	12297.61	24540	12242.39	5.17	2.58	12790	0.37	1170	140	0.016	73641	14.32	256	16.5
B.khosa	5300	741.66	8000	8741.66	8100	-641.66	1.53	-0.1	100	18	337.5	90	0.009	-6552	0.09	1.69	-0.24
Bihdia	5300	741.66	7200	7941.66	8280	338.34	1.56	0.06	1080	4.91	360	80	0.011	-485.72	0.93	10	0.91
T.danga	5500	660.71	6615	7275.71	9450	2174.29	1.71	0.39	2835	1.94	450	75	0.015	11009	2.68	49	3
m.dikhow	6200	860.71	7000	7860.71	9240	1379.29	1.49	0.22	2240	2.27	440	80	0.027	5899	1.74	31	1.95
Batha	5800	847.11	7800	8647.61	8882.5	234.89	1.53	0.04	1082.5	5.36	552.5	85	0.065	-973.34	0.87	8	0.83
M.dipling	6000	803.57	5025	5828	9240	3412.43	1.54	0.57	4215	1.42	440	55	0.02	18538	3.45	65	4.09

Raumari	5200	676.18	7350	8026.18	9680	1653.82	1.86	0.32	2330	2.23	440	80	0.014	7975	2.24	42	2.53
Gathia	5200	716.18	8250	8966	10260	1294.82	1.97	0.25	2010	2.59	427.5	90	0.012	6001	1.93	34	2.15
Average	**5711.3**	**787.6987**	**8300.16**	**9064.5158**	**11687.8**	**2617.766**	**2.35**	**0.42**	**3387.63**	**2.77**	**543.823**	**92.26**	**0.018**	**13387.364**	**2.6**	**45.313**	**3.107**

Table-4.9 Economic Indicators of Horhorijal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Siliguri	4800	511.11	23120	23631.11	31920	8288.89	6.65	1.73	8800	0.55	1330	140	0.015	48840	9.67	174	11.17
Mori	5100	508.33	26285	26793.33	32640	5846.67	6.4	1.15	6355	0.8	1360	160	0.013	33614	6.87	120	7.59
Bormon	5100	508.33	45050	45558.33	48840	3281.67	9.57	0.64	3790	1.35	2220	185	0.012	17736	4.04	72	4.48
Jaluguti	4900	533.33	34350	34883.33	42000	7116.67	8.57	1.45	7650	0.64	1750	140	0.013	41032	7.49	142	9.37
Kaso	4350	480.55	26300	26780.55	29760	2979.45	6.84	0.69	3460	1.26	1240	160	0.012	16184	4.09	75	4.72
Kuji	5100	495	26295	26790	40320	13530	7.91	2.65	14025	0.36	1680	160	0.016	80767	14.36	259	16.84
Deora	4850	503.33	23035	23538.33	31920	8381.67	6.58	1.73	8885	0.55	1330	140	0.014	48806	8.88	167	11.06
Udori	5300	535	22990	23525	31920	8395	6.02	1.58	8930	0.59	1330	140	0.014	48713	8.42	156	10.19
N karmari	4100	425	23095	23520	28560	5040	6.97	1.23	5465	0.75	1190	140	0.013	29105	7.16	127	8.09
Average	**4844.4**	**499.9978**	**27835.6**	**28335.553**	**35320**	**6984.447**	**7.28**	**1.43**	**7484.44**	**0.761**	**1492.22**	**151.7**	**0.0135556**	**40533**	**7.887**	**143.56**	**9.279**

found to be 45%, which indicates the over all economic viability of the gear in the beel fisheries of Assam.

(vii) Net benefit-Cost Ratio (N-K ratio): The N-K Ratio, which should be equal to or more than unity to become economically viable, is found to be viable in 19 cases out of 31 total surveyed beels. In 12 beels the ratio is found below the viable range of which in 7 cases, such as Brahmamaijan (-2.13); Rani-megna (-1.71); Sagar (-1.53); Gopharchang (0.03); Angang (-1.58); Pungani (-1.06); and Botalikhosa (-0.24), it is found to be negative. The average of the ratio is recorded at 3.107, which of course indicates the viability if the gear in over all cases.

Thus, above analyses indicate that *ghatjal* is not viable in all the beels (12 out of 31 total surveyed beels) under present study. Moreover, the efficiency of the gear varies from beel to beel. On the basis of B-C ratio and N-K ratio, it is clear that the gear is able to provide maximum benefits at least cost in certain conditions only, which must be evaluated prior to it's application.

4.4.9 ECONOMIC ANALYSIS HORHORIJAL

It is conical in shape, bag-like, 8–10m in length and 6 – 8m in circumference at the mouth. The net is used during October to January. It is found to be operated in pit free river-like beels. During the survey period data and information regarding economic analysis were available in only 9 beels out of 56 total surveyed beels. In another 47 beels data were not sufficient for the purpose of economic evaluation. Hence, the economic evaluation of the gear has been worked out in 9 beels to find out its viability in the beel fisheries of Assam. The economic parameters of *horhorijal* (table-4.9) has been described below:

4.4.9.1 Catch and Effort

Horhorijal is found to be operated between 145–185 days for commercial purposes in the beel fisheries of Assam. The use of the gear is recorded in only 9 beels i.e. 16% of the total beel surveyed. The catch per day, as recorded, is maximum in Jaluguti beel (12.5 Kg) whereas it is found minimum in Kasodhora beel (7.75 Kg). But the annual catch is found to be maximum in Bormonoha beel (2220 Kg) where as minimum in Nandini karmari beel (1190 Kg) with an average of 1492.22 Kg in 152 days of operation. The CPGH is recorded in between 0.012 to 0.016 with an average of 0.0136 Kg in a year.

4.4.9.2 Capital Investment and Depreciation

The total acquisition cost of *horhorijal* is found in the range between Rs.4100/- (Nandini-karmari) to Rs.5300/- (Udori) with an average of Rs.4844/-. Accordingly, the fixed cost or the depreciation is found between Rs.425/- to Rs.534/-, which is recorded in Nandini karmari and Udori beel respectively. The average depreciation is found to be Rs.499/- in a year.

4.4.9.3 Total Cost

The total cost for the operation of horhorijal has been segregated in terms of fixed cost and variable cost.

Fixed cost: Fixed cost, which is the depreciation of the boats and gear, has been described under 4.4.9.2.

Variable cost: The variable cost or the operating cost, which includes labor costs and repair and maintenance of gear and boats, is found between Rs.22990/-(Udori beel) to Rs.45050/- (Bormonoha beel) with an average of Rs.27835/-. The variations of the

operating costs in different beels are mainly attributed by the number of labor employed in fishing and number of days of operation per year.

Accordingly, the total cost is calculated to be the maximum in Bormonoha beel (Rs.45558/-) and the minimum in Nandini karmari beel (Rs.23520/-) with an average of Rs.28335/-.

4.4.9.4 Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and calculated for per annum like other gears. The average weighted value of fish is found between Rs.22/- to Rs.24/-. The gear shows to earn a maximum of Rs.48840/- (Bormonoha beel) and a minimum of Rs.28560/- (Nandini-Karmmari beel) with an average of Rs.35320/- in a year.

4.4.9.5 Economic Viability

The relevant data for cost and return analysis was recorded at beel site to evaluate the economic viability of *horhorijal*. All the data and information was recorded at beel site on per day basis and then converted as per annum to find out the economic viability of the gear. The different economic indicators (table-4.9) has been described below:

(i) Capital Turn Over Ratio (CTOR): The capital turn over ratio is found maximum in Bormonoha (9.57 times) and minimum in Udori (6.02 times). The average CTOR is found to be 7.28 times, which is around 7 times of the economic viable range. Moreover, in all beels under study it is recorded within the feasible range.

(ii) Rate of Return (ROR): The rate of return, which should be 12% or more to become economically viable, is found within the viable range in all the cases under

the present study. The maximum ROR is recorded in Kujibalipatti beel (265%) whereas the minimum is found in Kasodhora beel (65%) with an average of 143% in a year.

(iii) Pay Back Period (PBP): The pay back period is recorded in between 0.55 year (Siligurijan beel) to 1.26 year (Kasodhora beel) with an average of 0.76 year, which indicates the economic viability of the gear in the cases under study. (vide page no.80)

(iv) Benefit-Cost Ratio (B-C Ratio): The B-C Ratio is found within the range of 4.09 (Kasodhora) to14.4 (Kujibalipatti) with an average of 7.89. Thus, in all beels the ratio is recorded within the economic viable range in the beel fisheries of Assam.

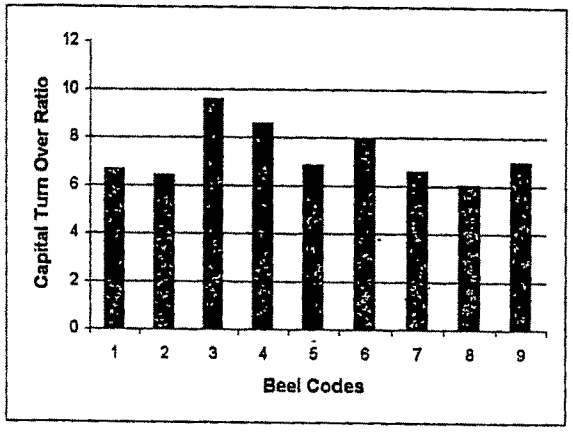
(v) Net Present Value (NPV): The NPV, which should be positive, is recorded from Rs.16184/- (Kasodhora) to Rs.80767/- (Kujibalipatti). The annual average is found to be Rs.40533/-, which indicates the economic feasibility of the gear as far as the present survey is concern.

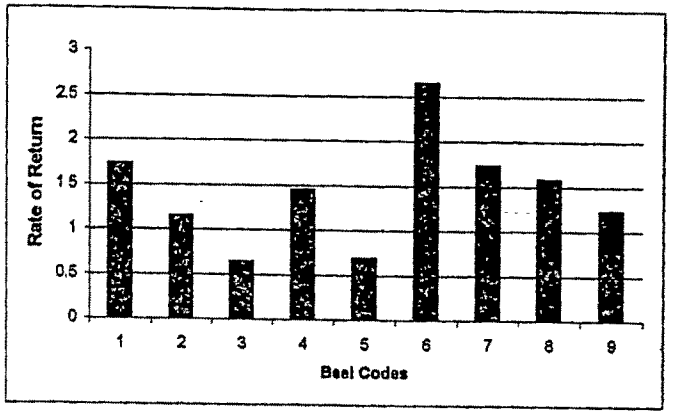
(vi) Internal Rate of Return (IRR): The internal rate of return, which should be above 12% to become viable is also found between 72% (Bormonoha) to 259% (Kujibalipatti beel) with an average of 144%.

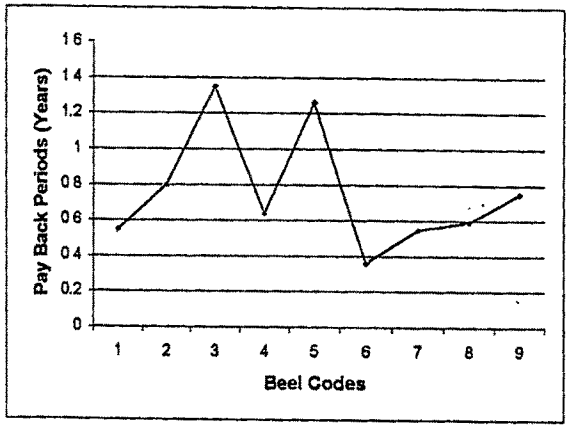
(vii) Net benefit-Cost Ratio (N-K Ratio): The net benefit investment ratio (N-K ratio), which should be equal to or more than one is found within the economically feasible range and recorded between 4.72 (Kasodhora beel) and 16.84 (Kujibalipatti beel). The average of the ratio is found to be 9.279, which suggests that the gear is highly beneficial for the beel fisheries of Assam as far as the present study is concern.

Thus, the economic and financial analysis of *horhorijal* indicates that the gear is economically feasible in the beel fisheries of Assam. Moreover, on the basis of B-C ratio and N-K ratio, it is clear that the gear is able to provide maximum benefits at least cost.

Fig.- 4. 9 Economic Indicators of Horhori jal.







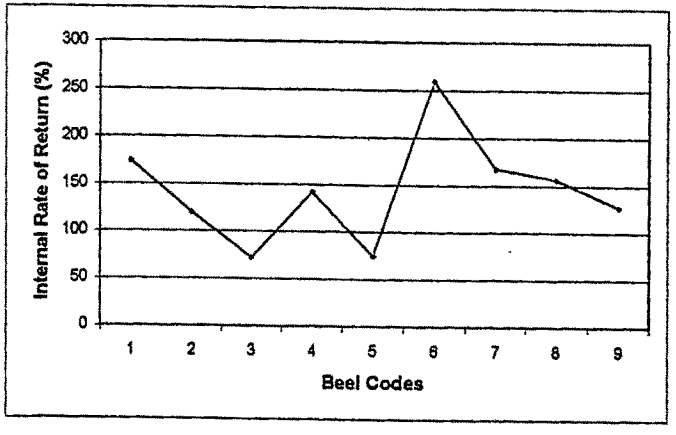


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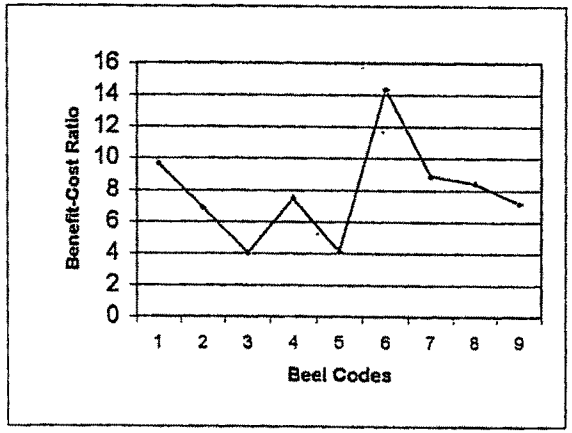
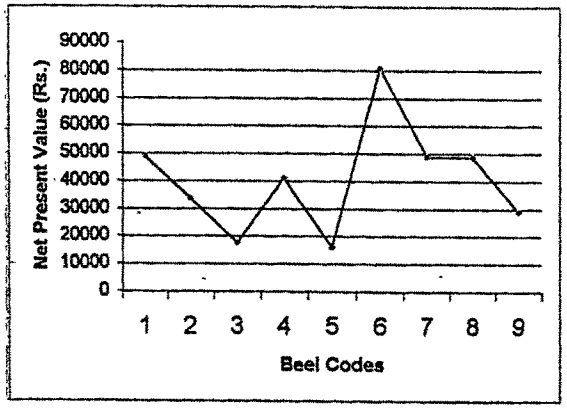
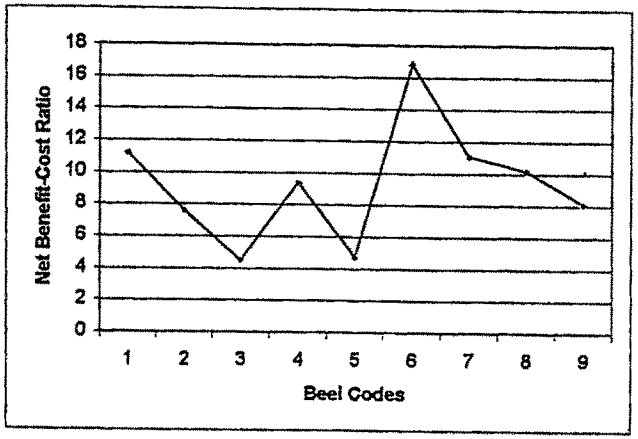
Fig.- 4. 9 Economic Indicators of Horhori jal.







BEEL CODES	NAME OF THE BEELS
1	Siliguriian
2	Mori
3	Bormonoha
4	Jaluguti
5	Kasodhora
6	Kujibalipatti
7	Deora
8	Udori
9	Nandini-kamari

4.4.10 ECONOMIC ANALYSIS PARANGIJAL

Parangijal is also known as *dharmajal* or *sipjal* and is used in almost all beels but the data for financial analysis were available in only 14 beels out of 56 numbers of total surveyed beels for the present work. The net is used mostly during high flood when other gears fail to do the fishing purpose.

The economic analysis of the gear has been worked out with the same objectives as described earlier in this chapter and the results of the analysis (table-4.10) has been described below:

4.4.10.1 Catch and Effort

The gear is found to be operated from 80 days (Deora beel) to 180 days (Solmari and Baskandi beel) with an average of 126 days in a year. The catch per annum is recorded maximum in Chandakhal beel with 1425 Kg whereas it was minimum in Bhoispuri beel with just 266 Kg with an annual average of 504.25 Kg. As far as the study of CPGH is concern, it is found in between 0.0038 (Baskandi) to 0.0198 Kg (Chandakhal) with an average of 0.0082 Kg in a year.

4.4.10.2 Capital Investment and Depreciation

The total acquisition cost or the capital investment for *parangijal* is found between Rs.4100/- (Merkolaberia) to Rs.8500/- (Sagar beel) with an average of Rs.5796/-. But in Tinsuliborbil where no boats are used for the operation the capital investment is recorded only Rs.500/-. Accordingly, the fixed cost or the depreciation is found between Rs.420.23 (Kasodhora beel) to Rs.1333.33 (Jogra beel) with an average of Rs.807/-. But in case of Tinsuliborbil it is just Rs.125/- due to lack of depreciation of boat.

4.4.10.3 Total Cost

The total cost in the operation of the gear is segregated into fixed cost and variable cost, which are described below:

Fixed cost: The fixed cost in this case is the depreciation, which has been described under the subhead 4.4.10.2.

Variable cost: Variable costs or the operating costs for the operation of *parangijal* is recorded between Rs.4050/-(Deora beel) to Rs.14890/- (Solamari beel) with an average of Rs.9664/- in a year.

Accordingly, the total cost for the operation of the gear is found between Rs.4494.44 (Deora beel) to Rs.15323.34 (Solmari beel). The average total cost in case of *parangijal* is found to be Rs.7043/- in a year.

4.4.10.4 Revenue

The data on catch in terms of quantity and value realized were observed on daily basis and calculated for per annum like other gears. The average weighted value of fish is found between Rs.22/- to Rs.24/-. The total revenue earned from the operation of the gear ranged from Rs.5852/- (Bhoispuri beel) to Rs.31500/-(Chandakhal beel) with an average of Rs.10960/- in a year (table-4.10).

4.4.10.5 Economic viability

All the relevant data were collected to find out the economic viability of the gear. The different economic indicators as represented in table-4.10 have been described below:

(i) Capital Turn Over Ratio (CTOR): The capital turn over ratio, which should be equal to unity to become viable, is found within the feasible range in 11 cases (78.57% cases). In another 3 cases the ratio is below the viable range. The ratio is found between 0.07 times (Tinsuliborbil) and 3.94 times (Chandakhal) with an average of 1.75 times, which indicates the over all viability of the gear in the beel fisheries of Assam.

(ii) Rate of Return (ROR): The ROR, which should be 12% or more to become economically viable, is found between 2% (Bhoispuri) and 297% (Chandakhal) with an annual average of 73%. Out of 14 total surveyed beels in 11 beels the ratio is found above the economic viable range. In another 3 cases, such as Barundanga (3%), Bhoispuri (2%), and Kasodhora (7%) the ratio is recorded below the viable limit.

(iii) Pay Back Period (PBP): The PBP in this case should be below 2 years to become economically viable. Table-4.10 shows that in maximum cases (8 beels out of 14 beels) the PBP is found above 2 years. It is recorded between 0.32 (Chandakhal) to 7.73 years (Barundanga beel). The average PBP is found to be 2.79, which indicates the economic non-viability of the gear in over all cases. (vide page no.80)

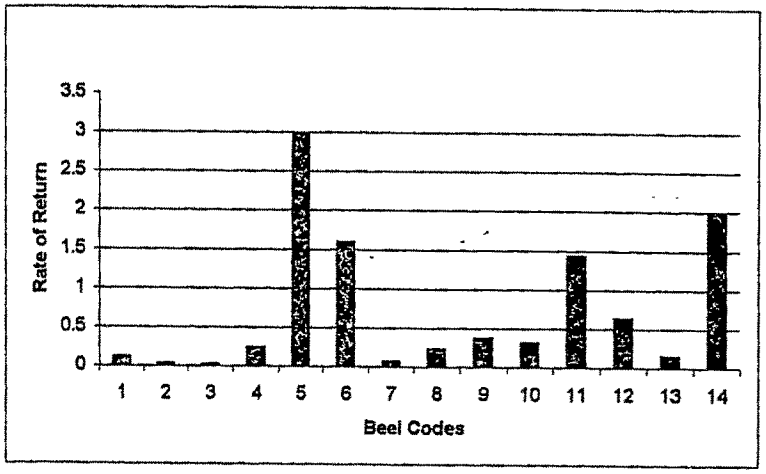
(iv) Benefit-Cost Ratio (B-C Ratio): The benefit cost ratio study reveals that the gear is not viable in Barundanga (0.49) and Bhoispuri beel (0.77). In another 12 cases it is recorded between 1.0 (Solmari) to 12.8 (Chandakhal). Out of 12 in 8 beels the B-C ratio is found up to 4 times whereas in another 4 beels the ratio exceeds above 6 times. The annual average of the ratio is found to be 3.68, which suggests the economic viability of the gear in all the surveyed beels.

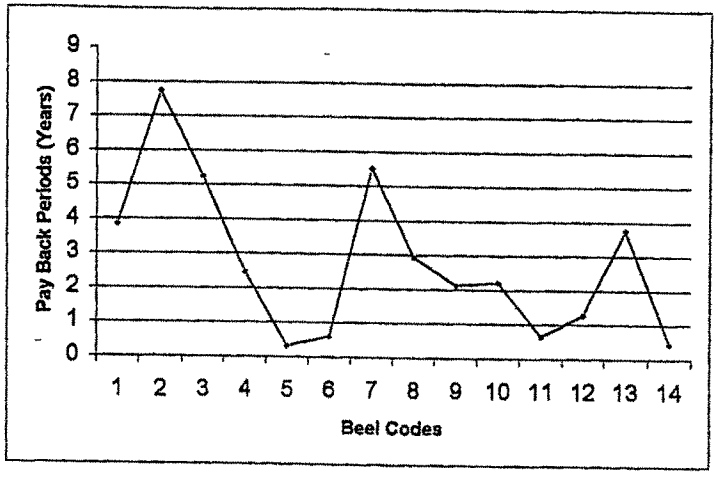
(v) Net Present Value (NPV): The NPV, which should be always positive to become economically viable, is found negative in Barundanga (Rs.-5876/-) and Bhoispuri (Rs.-2633/-) beel. In another 12 cases it is recorded within the feasible range and found between Rs.27/- (Kasodhora) and Rs.142901/- (Chandakhal). The average of NPV is found to be Rs.21217/-.

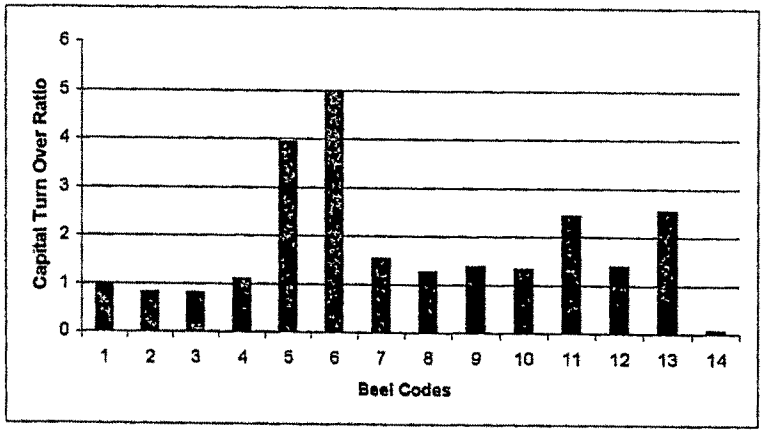
Table-4.10 Economic Indicators of Parangijal

Beel	C I (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	ROR	NOI (Rs)	PBP	T C/Year	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR (%)	NKR
Harin	7500	1069.43	5600	6669.43	7560	890.57	1	0.12	1960	3.83	360	120	0.0062	994.5	1.08	15	1.13
B.danga	7500	1180.54	5080	6260.54	6050	-210.57	0.81	0.03	970	7.73	275	110	0.0052	-5876.14	0.49	6	0.22
Bhois	7300	1241.66	4460	5701.66	5852	150.34	0.8	0.02	1392	5.24	266	95	0.0058	-2633.24	0.77	3	0.64
Jogra	8000	1333.33	5580	6913.33	8820	1906.67	1.1	0.24	3240	2.47	420	120	0.0073	7898	1.65	35	1.99
Chanda	8000	1222.21	6450	7672.21	31500	23827.79	3.94	2.97	25050	0.32	1425	150	0.0198	142901.9	12.75	268	18.86
Solmari	4500	433.34	14890	15323.34	22500	7176.66	5	1.6	7610	0.59	900	180	0.0104	42086.2	9.38	163	10.35
Kaso	3950	420.23	53330	5750.23	6048	297.77	1.53	0.07	718	5.5	336	120	0.0058	26.69	1	12	1
Kuji	5000	541 66	4600	5141.66	6300	1158.34	1.26	0.23	1700	2.94	350	100	0.0073	5003.3	1.91	31	2
Deora	4500	444.44	4050	4494.44	6160	1665.56	1.37	0.37	2110	2.13	280	80	0.0073	8040.3	2.6	45	2.79
Baska	5300	691.56	4580	5271.66	6982.5	1710.84	1.32	0.32	2402.5	2.21	332.5	180	0.0038	1507.46	1.21	18	1.28
Tapang	6500	875	5700	6575	15840	9265	2.43	1.43	10140	0.64	720	120	0.0125	60687.8	7.31	142	9.33
Sagar	8500	1263.88	5225	6493.88	11880	5386.12	1.39	0.63	6655	1.28	540	120	0.0094	28505.9	3.25	68	4.35
M.beria	4100	463.08	9300	9763.08	10395	631.92	2.54	0.15	1095	3.74	495	110	0.0094	2054.41	1.43	22	1.5
T.borbill	500	125	6450	6575	7560	985	0.07	1.97	1110	0.45	360	160	0.0047	5851.07	6.74	167	12.7
Average	**5796.4**	**807.5257**	**9663.93**	**7043.2471**	**10960.5**	**3917.286**	**1.75**	**0.73**	**4725.18**	**2.791**	**504.25**	**126.1**	**0.0082071**	**21217.725**	**3.684**	**71.071**	**4.867**

Fig. - 4.10 Economic Indicators of Parangi Jal







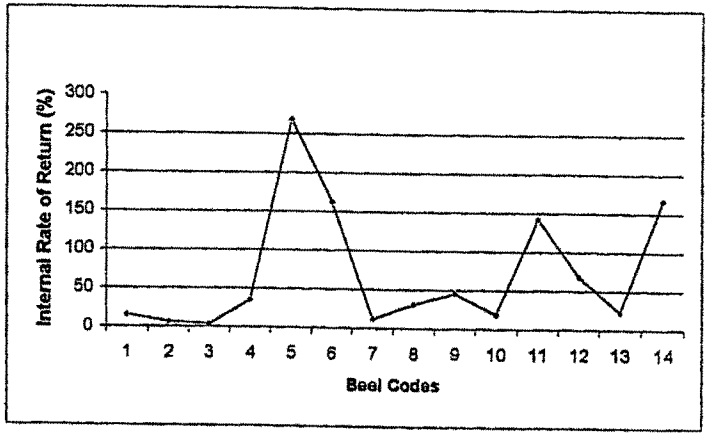


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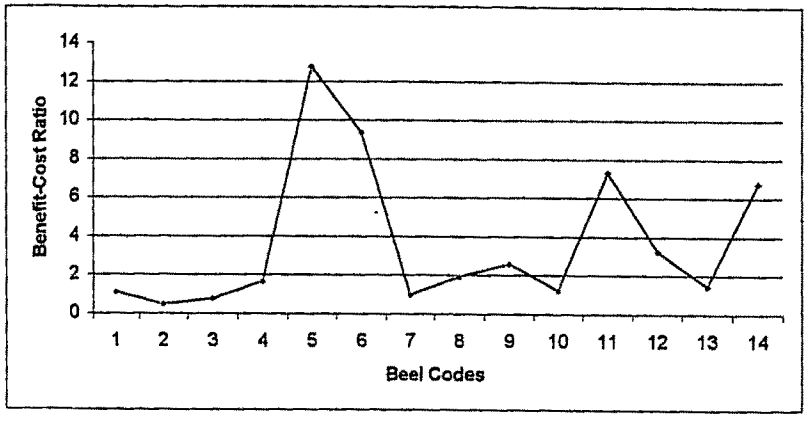
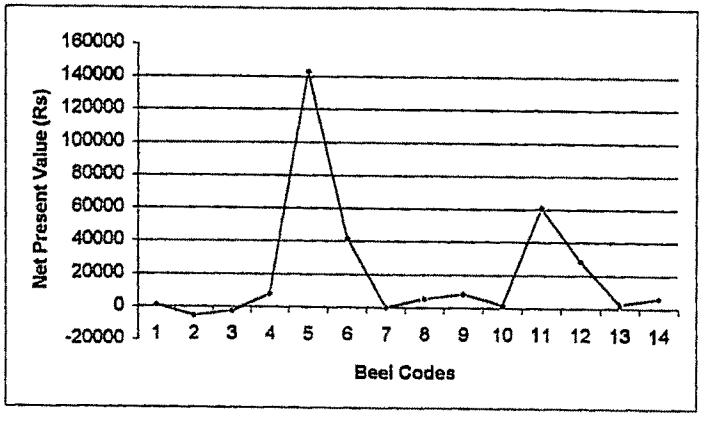
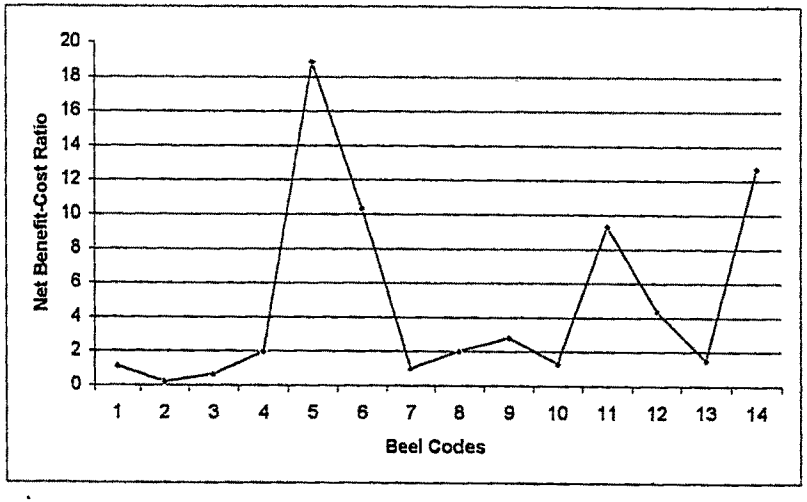
Fig. - 4.10 Economic Indicators of Parangi jal







BEEL CODES	NAME OF THE BEELS
1	Hannchora
2	amount
3	Bholspuri
4	Jogra
5	Chandakhal
6	Solmari
7	Kasodhora
8	Kuljbalipatti
9	Deora
10	Baskandi
11	Tapang
12	Sagar
13	Merkola berla
14	Tinsukl borbill

(vi) Internal Rate of Return (IRR): It is found 12% and above in 12 cases and is recorded from 12 (Kasodhora) to 268% (Chandakhal). In two beels, such as Barundanga (6%) and Bhoispuri (3%) the IRR is found below the economic viable range (i.e. 12%). The annual average IRR is found to be 71%, which of course shows the economic feasibility of the gear in the surveyed beels.

(vii) Net benefit Investment Ratio (N-K Ratio): The N-K Ratio is also found below the economic viable range in two beels, such as Barundanga (0.22) and Bhoispuri (0.64) beel. In another 12 beels, it is recorded between 1.0 (Kasodhora) and 18.86 (Chandakhal). The average of the ratio is found to be 4.867, which indicates the viability of the gear in the over all surveyed beels.

Thus, above analyses show that the gear is economically feasible in most of the cases as far as the present study is concerned. It is found below the feasible range in two beels, such as Barundanga and Bhoispuri beel.

4.4.11 ECONOMIC ANALYSIS OF KATAL FISHING

Katal fishing or *katalmara* is a method, which is extensively used in the beel fisheries of Assam and account for a major catch. It is also known as *jeng* in lower Assam and was probably brought to this region by the migrating fishermen from the erstwhile East Pakistan (Yadav, 1981). Now-a- days it is an inseparable device of the beels of Assam.

Present study deals in details about the economic viability of *katal* fishing on the following objectives.

(a) To examine the costs and return from *katal* fishing in different beels of Assam.

(b) To work out economic feasibility of investment on *katals,* and

(c) To work out its efficiency on the basis of some economic indicators.

4.4.11.1 Catch and Effort

The total catches from the *katals* in 33 beels of Assam has been shown in table-4.11. Each *katal* is found to be operated 2 to 5 times in a year. A single operation of *katal* fishing needs at least two days and requires 12–45 labors, depending upon the size of the *katal* installed. The catch record is found to vary in different beels mainly due to difference in *katal* size. It is found between 580 Kg (Botuakamakhya) to 1300 Kg (Bormonoha) with an average of 950.76 Kg in a year.

4.4.11.2 Capital Investment and Depreciation

The average acquisition cost or the installation cost of a *katal* is recorded between Rs.16000/- (Jogra and Ganak-dubai-duba beel) to Rs.28000/- (Thekera and Tinsuliborbil), which includes only boats and gears. The average capital invetment for the installation of katal is found to be Rs.21697/-. Accordingly, the fixed cost, which includes the depreciation of boat and gear, is found between Rs.3333.34 (Jogra and Ganak-dubai-duba beel) and Rs.5666.67 (Thekera and Tinsuliborbil).

4.4.11.3 Total Cost

The total cost of the operation in *katal* fishing is segregated into fixed cost or the depreciation (Table-4.11) of boat and gears and variable costs. The difference between fixed and variable costs basically lies in the fact that while the fixed cost needed to be incurred even if the *katal* is not operated the variable costs are incurred

only when operations are conducted. The fixed cost and variable costs has been described below:

Fixed cost: The fixed cost for the *katal* fishing has been described under the subheading 4.5.2.

Variable cost: Variable costs or the operating costs in case of *katal* fishing includes repair and maintenance of gear and boat, cost of bamboo and tree stumps and wages of labors. As far as the present study is concern the maximum variable costs is recorded with Rs.9430/- in Ganak-dubai-duba beel whereas the minimum with Rs.4060/- in Botuakamakhya beel in Nalbari district with an average of Rs.6359/-.

Accordingly, the total cost for installation of a *katal,* is found to be a minimum of Rs.8046.67 (Solmari beel) and a maximum of Rs.14396.67 (Moridisoi beel) with an average of Rs.11251/- in a year. The variations in the total costs are due to the size of the *katal,* number of days of operation and the number of labor engaged during operation.

4.4.11.4 Revenue

The data on catch in terms of quantity and value realized were observed during landing in different beels. The mode of disposal of catches was by middlemen who brought the fishes at wholesale price and carried them to the market. The quality fishes were found to be sold @Rs.25/- per Kg while the intermediate group fishes @Rs.15/- per Kg. The study reveals that Tinsuliborbil beel earns the maximum revenue (Rs.38720/-) from the *katal fishing* in comparison to other beels while Botuakamakhya beel exhibits the lowest earning (Rs.10730/-). The average revenue in a year is found to be Rs.21232/-. The fluctuations in the total revenue generation is

mainly because of the productivity of the beels, size of *katal* installed, as well as habitat for quality fishes and condition of inlet channel from the river.

4.4.11.5 Economic Viability

Using the information in earlier part of the analysis regarding various components of cost, life expectancy of crafts and gears, gross revenue based on total catches and its price realized per Kg, the viability of investment for K*atal* fishing has been worked out. The economic parameters (table-4.11) regarding the viability of *Katal* fishing in different beels have been described below:

(i) Capital Turn Over Ratio (CTOR): The capital turn over ratio, which should be equal to or more than one is found within the viable range in 16 numbers of beels (i.e. 48.5% of the total surveyed beels under present study). Of the viable case in most of the beels (15 out of 16 beels) the ratio is found below 1.5 times. In only one beel (Ganak-dubai-duba), it is found to be above 1.5 times. On the other hand in 17 beels (51.5% of the total surveyed beels) the ratio is found below the economic viable range. The CTOR is recorded in between 0.54 times (Botuakamakhya) and 1.54 times (Ganak-dbai-duba) with an average of 0.99 times, which is just below the economic viable range (fig-4.11).

(ii) Rate of Return (ROR): The ROR should be 12% as suggested by planning commission to become economically feasible. The ratio is found within the viable range in 32 (96.97%) beels and is recorded between 12% (Kalidanga) to 98% (Tinsuliborbil) with an average of 48% in a year. In one beel (Botua kamakhya beel) it is found below the economic viable level and is recorded at 10%.

(iii) Pay Back Period (PBP): It should be below two years to become economically feasible, which is found within the feasible range in 28 beels (fig-11). In another 5 cases, such as Kalidanga (3.16 year), Harinchora (2.17 years), Borundanga (2.07

years), Botuakamakhya (2.99 years), and Angang (2.07 years); it is found just below the feasible range. (vide page no.80)

(iv) Benefit - Cost Ratio (B-C Ratio): For economic viability the benefit–cost ratio (B – C ratio) should be more than or equal to one. In the case of *katal* fishing the ratio exceeded unity in all of the beels under present study. Fig-4.11 shows that in 9 beels the ratio is found from 1 to below 2, in 13 beels it is found from 2 to below 3, in 9 cases the ratio is recorded from 3 to below 4, and finally, in 2 cases it is found above 4. The annual average of the ratio is found to be 2.61, which indicates the economic viability of *katal* fishing in the beel fisheries of Assam.

(v) Net Present Value (NPV): It should be more or equal to zero. In the case of *katal* fishing it shows the positive result in all 33 beels. In maximum cases (16 beels) the NPV is found below Rs.50000/- whereas in 14 beels it is found from Rs.50000/- to below Rs.100000/-. In another two beels (Bormonoha and Tinsuliborbil) it is found above Rs.100000/-. The average NPV is found to be Rs.54714/-, which indicates the economic feasibility of the *katal* fishing.

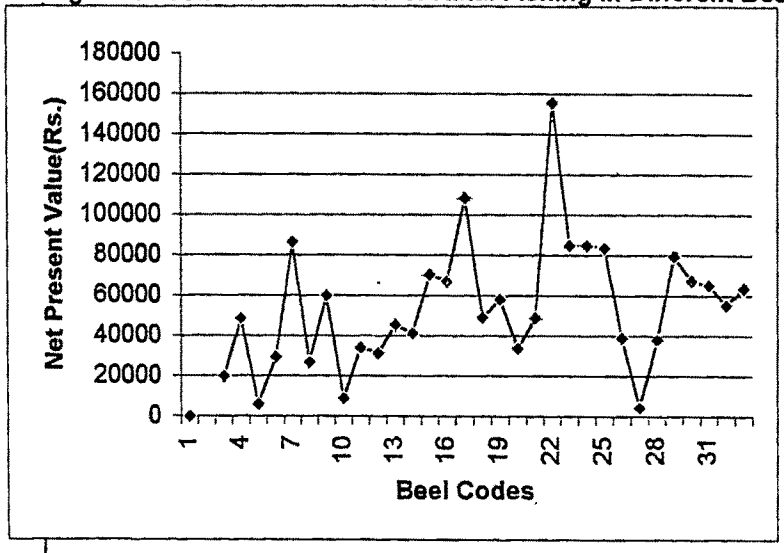
(vi) Internal Rate of Return (IRR): It should be more than 12% to become economically feasible. In cases of *katal* fishing it is recorded within the feasible range in all the cases. The IRR of *katal* fishing is recorded in between 26% (Kalidanga beel) and 96% (Tinsuliborbil) with an average of 57.52%, which indicates the economic viability of this fishing method in the surveyed beels.

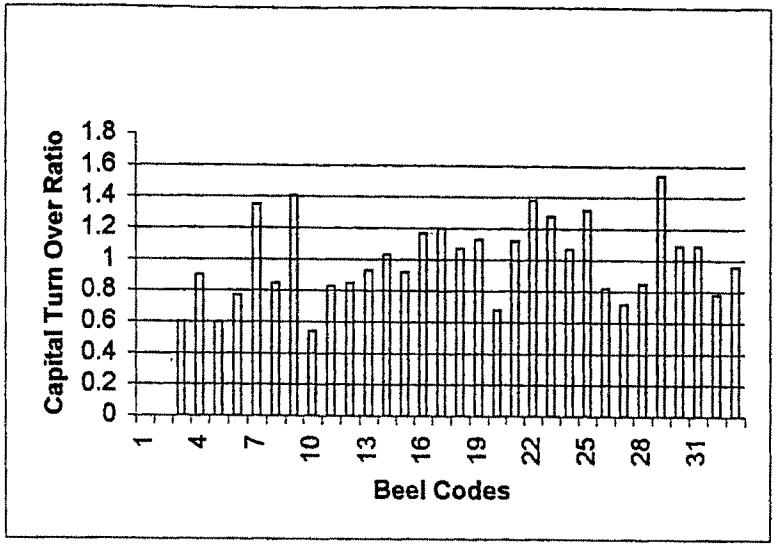
(vii) Net benefit Investment Ratio (N- K ratio): The N-K Ratio should be more than or equal to unity. In the present study it is found between 1.24 (Kalidanga) to 6.5 (Tinsuliborbil) with an average of 3.63. In maximum cases (19 beels) the ratio is found between 2 and 4 (fig-4.11). In 11 beels it is recorded above 4 but in 3 beels the ratio is found below 2.

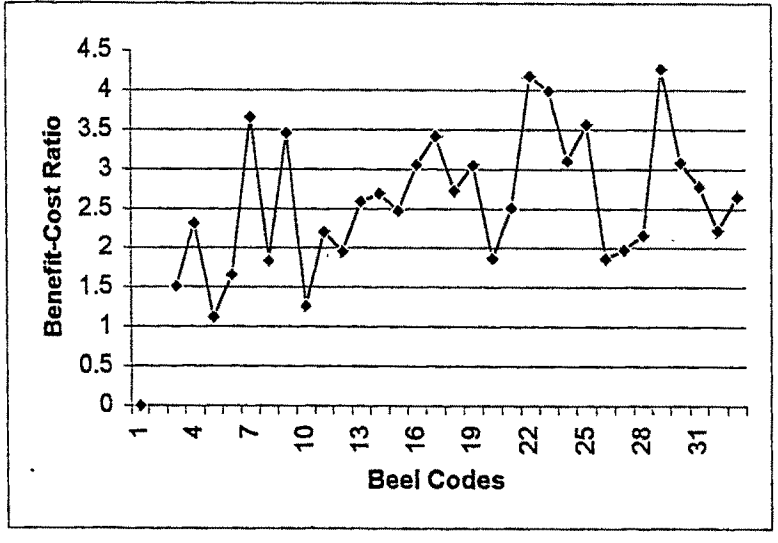
Table-4.11 Economic Indicators of Katal Fishing

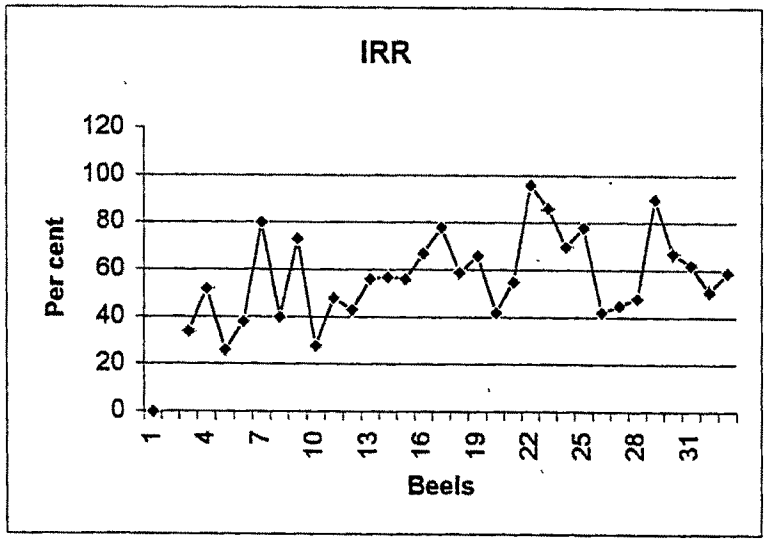
Beel	CI (Rs)	Depr. (Rs)	TOC (Rs)	T C (Rs)	T R (Rs)	PAT (Rs)	CTOR	RORI	NOI (Rs)	PBP(Y	NPV(Rs.)	BCR	IRR(%	NKR	T.Cat.(Kg)/Y
Hakama	23,000	5,666.67	4,520	10,186.67	13,975	3,788.33	0.6	0 16	9,455	2	19935.45	1.5	34	1.9	750
Nandini	22,000	4,166.67	6,200	10,366.67	19,950	9,583.33	0.9	0.43	13,750	1.6	48560.9	2.3	52	3.2	650
Kalidanga	26,000	5,166.67	7,910	12,696.67	15,750	3 053.33	0.6	0.12	7,840	3.16	6172.6	1.1	26	1.2	750
Hannchora	26,000	5,166 67	7,970	13,136.67	19,950	6,813.33	0.77	0.26	11,980	2.17	29558.42	1.7	38	2.1	1050
Bhoispun	20,000	4,666.67	7,780	12,446.67	27,000	14,553.33	1.35	0.73	19,220	1.04	86499	3.7	80	5.3	950
Barundanga	20,000	4,666.67	7,370	12,036 67	17,000	4,963.33	0.85	0.25	9,630	2.07	27136.9	1.8	40	2.4	825
Jogra	16,000	3,333.34	9,040	12,373.34	22,650	10,276	1.41	0.64	13,610	1.17	59924.51	3.5	73	4.7	750
B.Kamakhya	20,000	4,666.67	4,060	8,726.67	10,730	2,003.33	0.54	0.1	6,670	2.99	8814.5	1.3	28	1 4	1300
Sagamara	18,000	5,666.67	4,880	10,546.67	15,000	4,453.33	0.83	0.51	10,120	1.78	34248.8	2.2	48	2.9	760
Siliguriian	20,000	6,666.67	6,700	13,366.67	17,000	3,633.33	0.85	0.39	10,300	1.94	31284.2	2	43	2.6	950
Solmari	18,000	3,166.67	4,880	8,046.67	16,800	8,753.33	0.93	0.75	11,920	1.51	45390.8	2.6	56	3.5	720
Moribeel	16,000	3,333.34	5,970	9,303.34	16,560	7,256.66	1.03	0.45	10,590	1.51	41236.9	2.7	57	3.6	1125
Thekera	28,000	5,666.67	6,625	12,291.67	25,875	13,583.33	0.92	0.48	19,250	1.45	70369.5	2.5	56	3.5	925
N.Karman	20,000	4,666.67	7,300	11,986 67	23,400	11,413.33	1.17	0.57	16,100	1 24	67062.4	3.1	67	4 4	1200
Bormonoha	26,000	5,166.67	6,470	11,636.67	31,200	19,563.33	1.2	0.75	24,730	1.05	108369.5	3 4	78	5.2	950
Satiyan	18,000	3,166.67	6,850	10,016.67	19,388	9,370.83	1.07	0.52	12,538	1.44	49210.03	2.7	59	3.7	1200
D.Patali	18,000	4,000	6,440	10,440	20,425	9,985	1.13	0.55	13,985	1.29	58173.15	3.1	66	4.2	850
Pungani	23,000	5,666.67	4,070	9,736.67	15,750	6,013.33	0.68	0.26	11,680	1.96	33708.2	1.9	42	2.5	800
Ganak-Dubai-Dub	20,000	3,666.67	9,430	13,096.67	22,575	9,478.33	1.12	0.47	13,145	1.52	48894.75	2.5	55	3.4	1000
T.Borbill	28,000	5,666.67	5,710	11,376.67	38,720	27,343.33	1.38	0.98	33,010	0.84	155543.9	4.2	96	6.5	900
Bihdia	18,000	4,000	4,720	8,720	23,030	14,310	1.28	0.79	18,310	0.98	84944.9	4	86	5.7	580
Botalikhosa	26,000	6,666.67	5,360	12,026.67	27,840	15,813.33	1.07	0.61	22,480	1.15	84944.9	3.1	70	4.6	850
G.B.Jopora	20,000	4,666 67	7,650	12,316.67	26,400	14,083.33	1.32	0.7	18,750	1.06	83589.7	3.6	78	5.2	980
Moridisoi	26,000	6,666.67	7,730	14,396.67	21,275	6,878.33	0.82	0.26	13,545	1.92	39134.35	1.9	42	2.5	1160
Merkolaberia	26,000	5,167	4,350.00	9,166.67	18,700	9,183.33	0.72	0.35	14,350	1.81	4417.3	2	45	2.7	900
Teliadanga	20,000	3,666.67	5,500	9,166.67	16,920	7,753.33	0.85	0.39	11,420	1.75	38217	2.2	48	2.9	1150
D.B.Baiya	16,000	3,333.34	7,810	11,143.34	24,600	13,456.66	1.54	0.84	16,790	0.95	79614.9	4.3	90	6	1200
Baskandi	20,000	4,666.67	5,700	10,366.67	21,850	11,483.33	1.09	0.57	16,150	1.23	67495.7	3 1	67	4 4	1200
Sibnarayanpur	22,000	5,333.34	7,770	13,103.34	24,187	11,089.66	1.09	0.5	16,417	1.34	65106.77	2.8	62	4	1150
Salchapra	26,000	6,666.67	4,350	11,016.67	20,500	9,483.33	0.78	0.36	16,150	1.61	55259.3	2.2	51	3.1	750
Autibauti	23,000	5,666.67	5,520	11,186.67	22,050	10,863.33	0.96	0.47	16,530	1.39	63729.7	2.7	59	3.8	1150
Rata	23,000	5,666.67	6,100	11,767	18,900	7,133.33	0.82	0.31	12,800	1.79	40640.9	2.1	46	2.8	1050
Angang	24,000	6,000	7,115	13,115	24,725	11,610	1.03	0.48	17,610	2.07	68375.5	2.7	60	3.9	850
Average	**21,697**	**4,914.14**	**6,359.09**	**11,251.72**	**21,232.58**	**9,970.40**	**0.99**	**0.48**	**14,873.48**	**1.61**	**54,714.10**	**2.61**	**57.52**	**3.63**	**950.76**

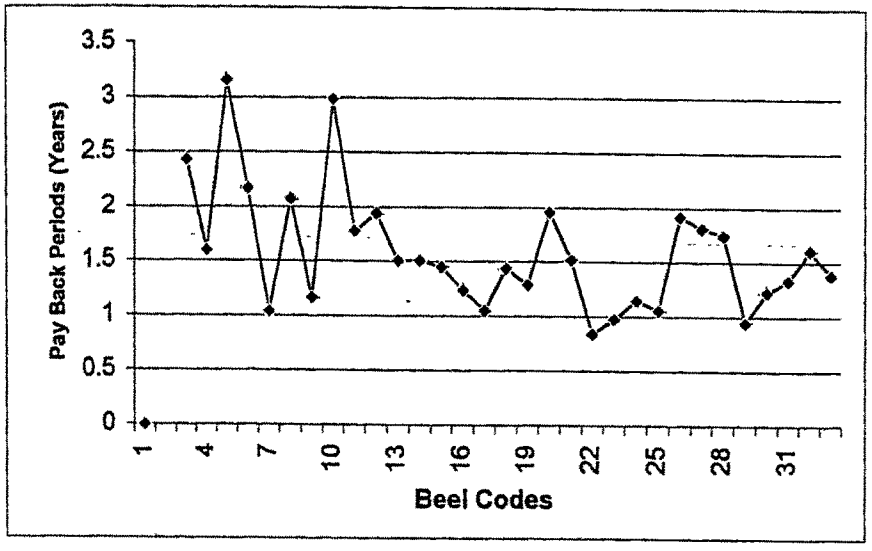
Fig. 4.11 Economic Indicators of Katal Fishing in Different Beels

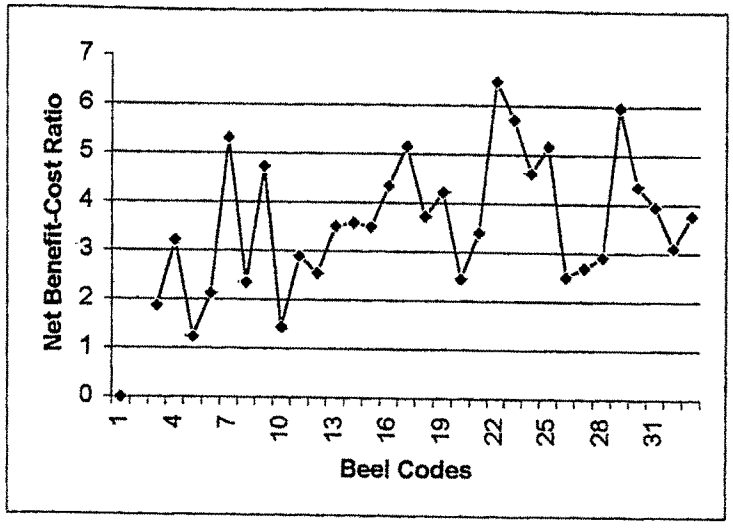


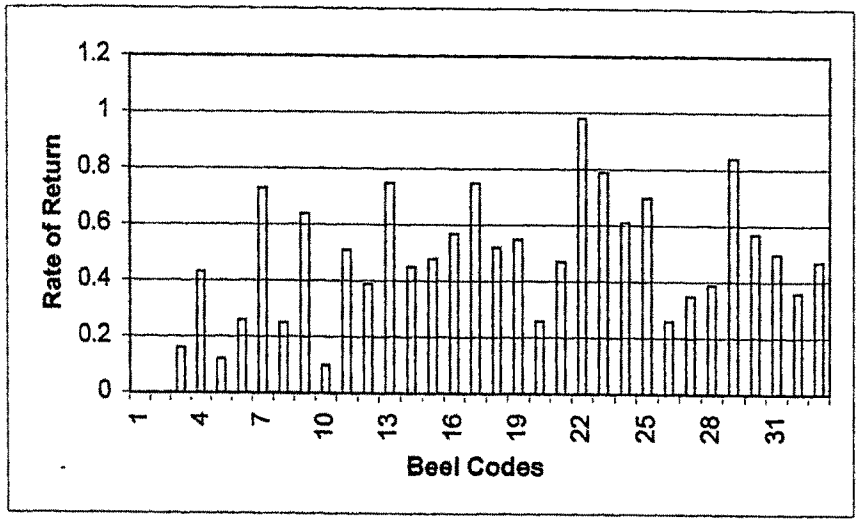












Beel Codes	Name of the Beels
1	Hakama
2	Nandini
3	Kalidanga
4	Harinchora
5	Bhoispuri
6	Barundanga
7	Jogra
8	B.Kamakhya
9	Sagamara
10	Siligurijan
11	Solmari
12	Monbeel
13	Thekera
14	N.Karman
15	Bormonoha
16	Satiyan
17	D.Patali
18	Pungani

Beel Codes	Name of the Beels
19	Ganak-Dubai-Duba
20	T.Borbill
21	Bihdia
22	Botalikhosa
23	G.B.Jopora
24	Moridisoi
25	Merkolaberia
26	Teliadanga
27	D.B.Baiya
28	Baskandi
29	Sibnarayanpur
30	Salchapra
31	Autibauti
32	Rata
33	Angang

Thus, above analyses indicate that the method of *katal* fishing is economically feasible as far as the present samples study is concerned. On the basis of B-C ratio and N- K ratio, it is clear that the method of *katal* fishing is able to provide maximum benefits at least cost.

DISCUSSION

Ten gears such as *musarijal, dolijal, berjal, phansijal, langijal, khewalijal, hook and line fishing, dhenkijal, horhorijal,* and *parangijal* have been considered for economic evaluation due to their extensive use in the beel fisheries of Assam and accordingly all relevant data and information have been collected during the survey. But for the purpose of economic analysis data on catch and return have not been found sufficient. Out of 56 total surveyed beels data and information for economic evaluation for *langijal* and *khewalijal* is found in 52 beels (94.55%), for *musarijal* and *phansijal* in 51 beels (92.73%), for hook and line fishing in 49 beels (89.09%), for *dhenkijal* in 31 beels (56.36%) for *berjal* in 25 beels (45.45%), for *parangijal* in 14 beels (25.45%) for *horhorijal* in 9 beels (16.36%), and for *dolijal* in only 8 beels (14.54%). A discussion has been made here on different economic parameters for all gears on the basis of results obtained from the analysis of data and information collected from the beel fisheries of Assam.

Catch and Effort

The average annual total catch is found maximum in case of *dolijal* (8573.75 kg) in an average of 141 days of operation with CPGH at 0.1354 kg. *Dolijal* is followed by *musarijal, berjal, horhorijal, langijal, dhenkijal, khewalijal, parngijal, phansijal* and *hook and line fishing* respectively (Table-4.12). Fig-4.12.F indicates that *phansijal, langijal, khewali, hook and line fishing* and *dhenkijal* exhibits almost equal total catch, whereas the maximum catches are obtained by *dolijal, musarijal* and *berjal.*

Total number of days of operation is found above 100 days for all the cases except *dhenkijal* (92 days). This is due to the fact that *dhenkijal* is used mostly in the monsoon season. In other seasons its use is negligible and fishermen depend on other gears.

Capital Investment (CI)

Capital investment (Fig.12.A) for acquisition of boats and gears is found to be higher in the case of *dolijal* with an average amount of Rs.48812/-, which is followed by *berjal* (Rs.43400/-) and *musarijal* (Rs39558/-). It is found below Rs.6000/- in case of *phansijal, langijal, khewalijal, dhenkijal, horhorijal* and *parangijal* but the minimum is recorded for hooks and line fishing at Rs.3577/-. The fluctuation in CI is mainly due to size of gear and number of boat required for the operation of gear. *Phansijal, langijal, khewalijal, hook and line fishing, dhenkijal* and *parangijal* required only one boat for the operation, therefore, their CI become very low in comparison to *dolijal, musarijal* and *berjal.*

Depending upon the CI the depreciation is found in the range between Rs.362/- (hook and line) and Rs.7569/- (*dolijal*).

Total Cost (TC)

Total cost in the present case includes operating costs and depreciation. Table-4.12 depicts that the operation cost is higher for *dolijal* (Rs.75325/-) followed by *musarijal* (Rs.60137/-) and *berjal* (Rs.52738/-). The operating costs for *phansijal, langijal, khewalijal, hook and line, dhenkijal* and *parangijal* does not exceed Rs.10000/-. The operating costs in this case includes wages of labor, number of labour engaged at the time of fishing, and repair and maintenance of boats and gears. In case of *dolijal, musarijal* and *berjal* due to their large sizes require more fishermen (8-14 person) in

comparison to other gears such as *horhorijal* (3-4 person), and *dhenkijal, phansijal, langijal* (1-2 person). But *khewalijal,* hook and line and *parangijal* require only one person, hence their operation costs are found very low in comparison to *dolijal, musarijal* and *berjal.*

Accordingly, TC (Fig-4.12.C) is found high for *dolijal, musarijal* and *berjal* in comparison to other gears.

Revenue

Revenue depends solely on catch and prices of fish species. As shown in table-4.12.G, it is found maximum in the case of *dolijal* (Rs.214343/-) followed by *musarijal* (Rs.138332/-) and *berjal* (Rs.96760/-). In case of *phansijal, langijal, khewalijal, hook and line* and *parangijal* it is recorded between Rs.6293/- (hook and line) and Rs.12080/- (*langijal*). On the other hand, is able to earn Rs.35320/-. The revenue earn by *berjal* depends on the major and some of the intermediate fish groups. But *musarijal and dolijal* due to their smaller mesh size are able to catch all groups of fishes, hence, their catches as well as revenue is found higher than *berjal. Phansijal* and *langijal* are the entangling gears, which are very much species specific, thus their catches depends largely on availability of that particular species. Hook and line in not found dependable fishing method for commercial purpose because the catch is a matter of by chance. Thus, the revenue in case of *dhenkijal* and *parangijal* depends on the number of operations in addition to the availability of fish species in a particular beel.

ECONOMIC VIABILITY

The economic viability for ten gears such as mentioned earlier have been analyzed on the basis of seven criteria such as ***Capital Turn Over Ratio, Rate of Return, Pay Back Period, Benefit-Cost Ratio, Net Present Value, Internal Rate of Return and***

Net benefit-Investment Ratio. All the criteria regarding the economic viability of fishing gears have been discussed below:

Capital Turn Over Ratio

The ratio is found within the viable range in all the cases (Fig.4.12.H). It is found to be higher *horhorijal* (7.28 times) due to its higher revenue against the capital investment. In other cases such as *musarijal, dolijal, berjal, phansijal, langijal, khewalijal* and *dhenkijal* it is found above 2 times whereas in case of hook and *parangijal* the ratio is found below 2 times but within economically viable range.

Thus, the ratio depicts that all the gears under generate revenue within the economic feasible limit against their capital investment.

Rate of Return

Rate of return, which depends on profit after tax (net cash flow), is better in case of *dolijal*, which is followed by *musarijal* (198%), *horhorijal* (143%), *berjal* (102%) respectively. In case of *phansijal* and *langijal* also it is found 85% and 86% respectively, which is better than *dhenkijal* (42%) and *parangijal* (73%). The ratio is recorded below the economic viable range in case of hook and line (-1%). It means except hook and line fishing, all the other gears under study are able to generate good profit against their respective capital investments.

Pay Back Period

Pay back period (Fig.4.12.J) is found better in case of *horhorijal* (0.76 year), *dolijal* (0.84 year), *musarijal* (1.12 year), *langijal* (1.68 year) and *phansijal* (1.8 year). It means these gears are able to recover good benefit within minimum time. But on the other hand, *dhenkijal* (2.77 years), *parangijal* (2.79 years), *berjal* (4.6 years),

Khewalijal (12.1 years), and hook and line fishing (41 years) fail to provide benefit within the viable period.

Benefit-Cost Ratio

The ratio is found better in case of *dolijal* (11.03), which is followed by *muarijal* (9.16), *horhorijal* (7.89), *berjal* (4.81), *langijal* (4.57), *khewlijal* (4.37), *phansijal* (4.29), *parangijal* (3.68) and *dhenkijal* (2.6). But in case of hook and line the ratio is found below the economic viable limit (0.44). Thus from the study it is evident that except hook and line all other gears are able to earn sufficient profit margins against their total costs in their operation (Fig.-4.12.K).

Net Present Value

The study reveals that NPV (Fig.-4.12.L), in case of *musarijal, dolijal, berjal, phansijal, langijal, khewalijal, dhenkijal, horhorijal* and *parangijal*, is positive and found between Rs.13387/- (*dhenkijal*) and Rs.711700/- (*dolijal*). But in case of hook and line it is found o be negative indicating higher operational costs against the profit earn by the gear.

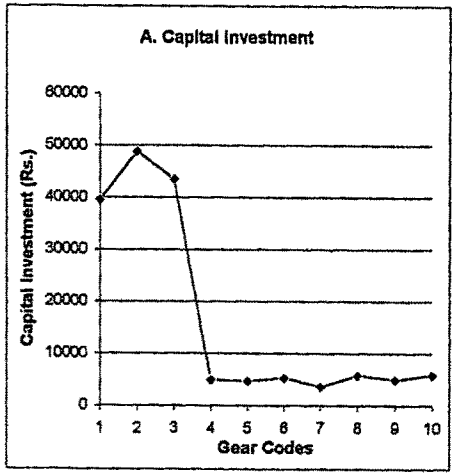
Internal Rate of Return

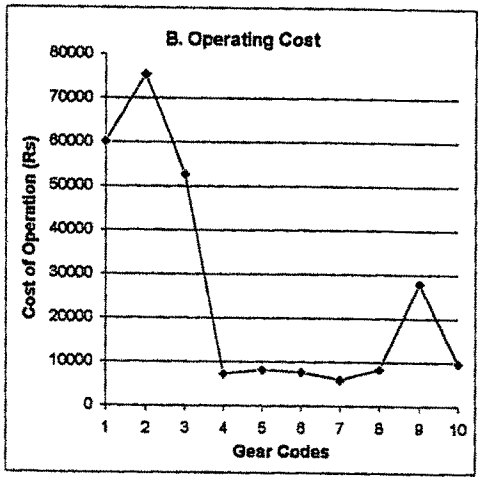
The IRR (Fig.-4.12.M) is found in the economic viable range in all the cases except hook and line, where it is found to be only 08%. Among the viable cases dolijal exhibits the higher IRR at 220% followed by *musarijal* (174%), *horhorijal* (144%), *berjal* (95.3%), *langijal* (86%), *Khewalijal* (84%), *parangijal* (71%) and *dhenkijal* (45%).

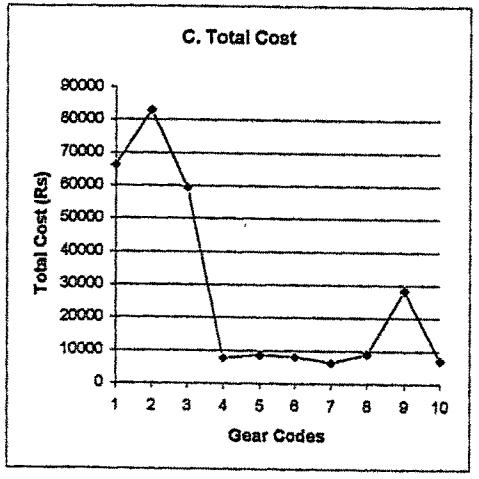
Net benefit-Investment Ratio

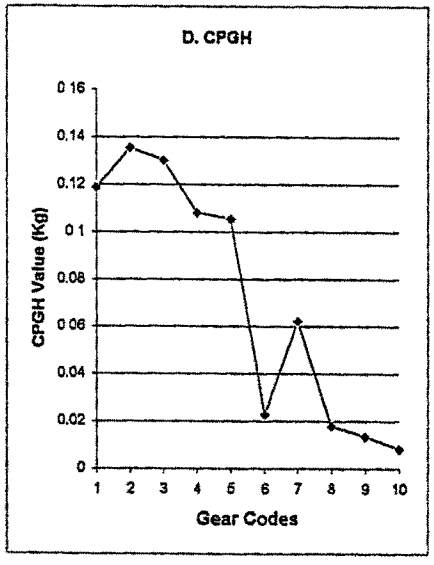
The ratio (Fig.-4.12.N) is found better in case of *dolijal* (14.68) in comparison to other gears. As far as the study is concern, *musarijal* (12.14), *berjal* (6.3), *phansijal*

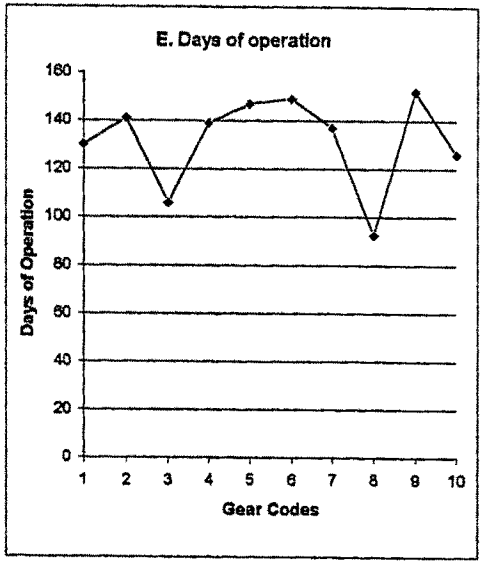
Fig.12 Economical Parametrs of Different Gears.

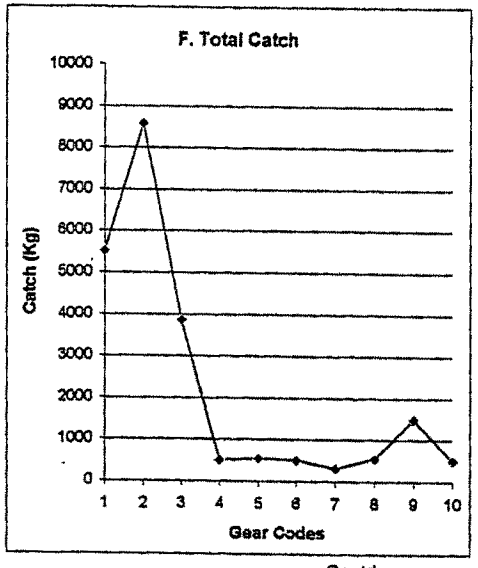












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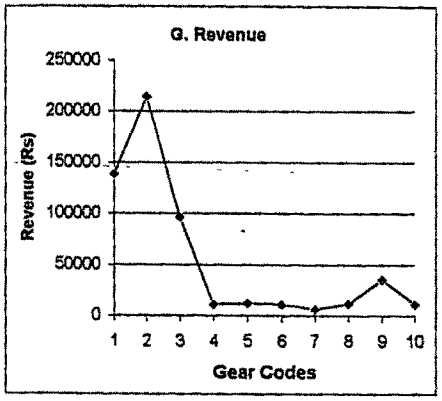
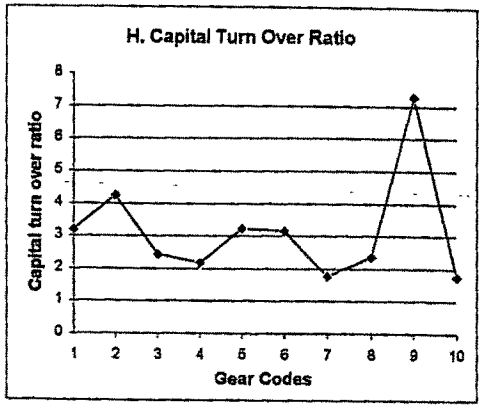
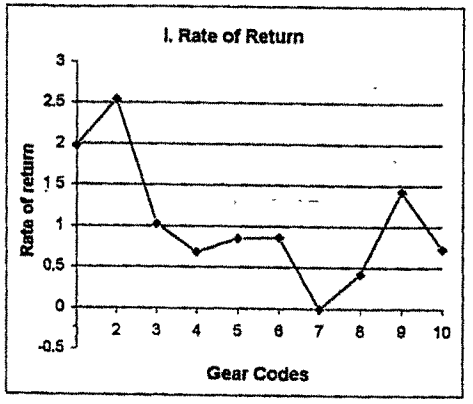
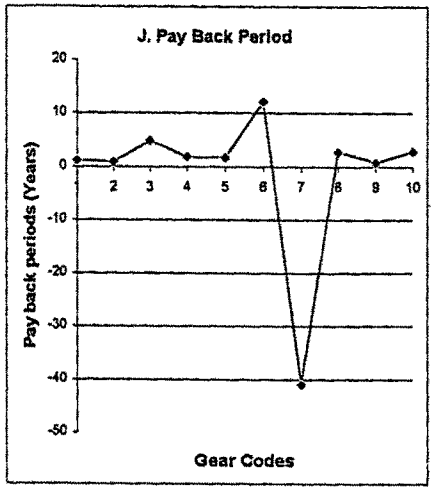
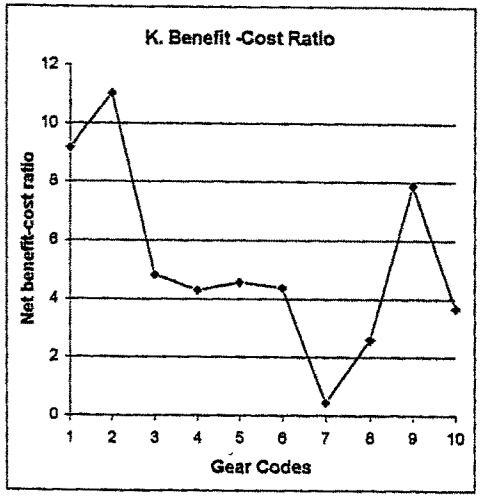
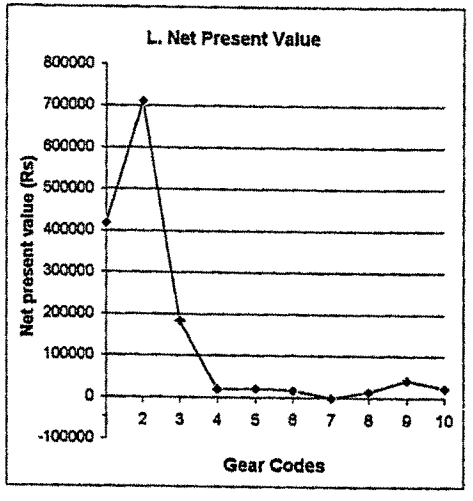

G. Revenue
Revenue (Rs)
250000
200000
150000
100000
50000
0
1 2 3 4 5 6 7 8 9 10
Gear Codes


H. Capital Turn Over Ratio
Capital turn over ratio
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10
Gear Codes

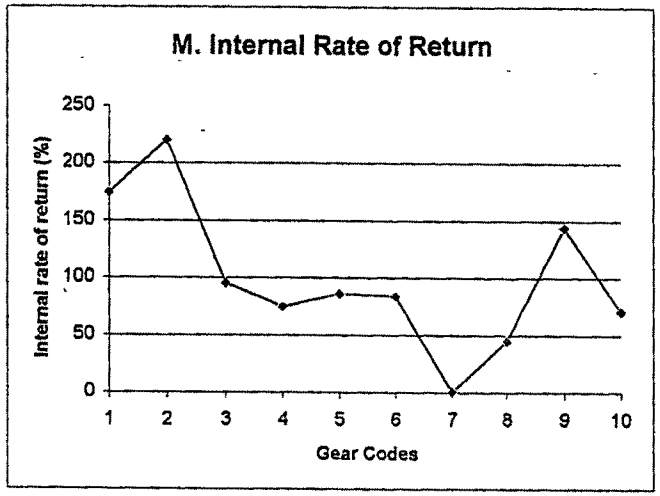

I. Rate of Return
Rate of return
3
2.5
2
1.5
1
0.5
0
-0.5
2 3 4 5 6 7 8 9 10
Gear Codes

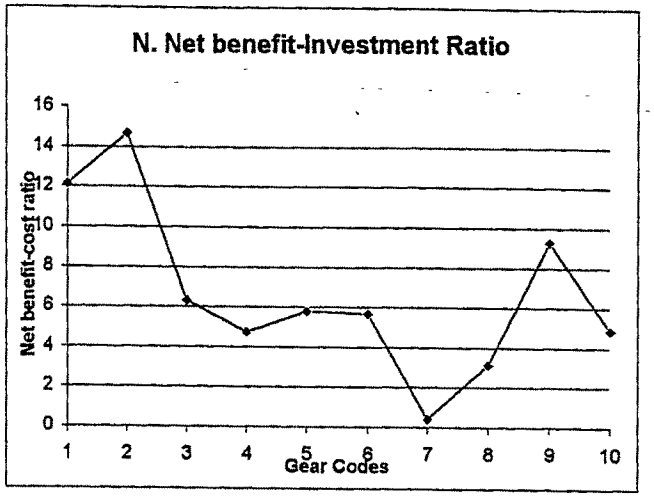

J. Pay Back Period
Pay back periods (Years)
20
10
0
-10
-20
-30
-40
-50
2 3 4 5 6 7 8 9 10
Gear Codes


K. Benefit -Cost Ratio
Net benefit-cost ratio
12
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10
Gear Codes


L. Net Present Value
Net present value (Rs)
800000
700000
600000
500000
400000
300000
200000
100000
0
-100000
2 3 4 5 6 7 8 9 10
Gear Codes

Contd.....





GEAR CODES	NAME OF GEARS
1	Musarijal
2	Dolijal
3	Berjal
4	Phansijal
5	Langijal
6	Khewalijal
7	Hook & line
8	Dhenkijal
9	Horhonjal
10	Parangijal

Table-4.12 Economic Indicators of Different Gears

Gear	C I (Rs)	Depr (Rs)	TOC (Rs)	TC (Rs)	T R (Rs)	PAT(Rs)	CTOR	RORI	NOI(Rs)	PBP	T.Cat./Y	Days	CPGH (Kg)	NPV (Rs)	BCR	IRR(%)	NKR
Musanjal	39559	6455.93	60137.3	66136.33	138332	72195.29	3.2	1.98	78349	1.12	5514.37	130	0.1187	416734.9	9.163	174	12.14
Dolijal	48813	7569.18	75325	82894.18	214344	131449.6	4.23	2.54	139019	0.84	8573.75	141	0.1354	711699.9	11.03	220	14.68
Berjal	43400	6711.04	52738	59449.04	96760.8	37311.76	2.44	1.02	44023	4.86	3859.1	106	0.13	182525.4	4.81	95.3	6.3
Phansijal	4910.8	568.68	7197.25	7611.62	11013	3305.91	2.16	0.68	3819.29	1.8	497.55	139	0.10786	18720.69	4.29	74.8	4.72
Langijal	4636.5	518.93	8142.5	8660.83	12079.6	3422.24	3.23	0.85	3941.1	1.68	547.18	147	0.1054	19417.33	4.57	86	5.79
Khewalijal	5250	520.77	7548.37	8069.14	11208	3138.84	3.15	0.86	3646.5	12.1	505.12	149	0.0228	15606.26	4.37	84	5.66
Hook & line	3577.9	362.42	5964.49	6329.15	6293.69	-55.05	1.76	-0	319.62	-41	315.77	137	0.0622	-1985.21	0.44	0.8	0.417
Dhenkijal	5711.3	787.69	8300.16	9064 52	11687.8	2617.77	2.35	0.42	3387.6	2.77	543.82	92.3	0.018	13387.36	2.6	45	3.12
Horhonjal	4844	500	27835.6	28335.55	35320	6984.45	7.28	1.43	7484.4	0.76	1492.22	152	0.0136	40533	7.89	144	9.28
Parangijal	5796.4	807.53	9663.93	7043.25	10960.6	3917.29	1.75	0.73	4725.2	2.79	504.25	126	0.0082	21217.73	3.68	71	4.867

(4.72), *langijal* (5.76), *khewalijal* (5.66), *dhenkijal* (3.12), *horhorijal* (9.28), and *parangijal* (4.87), also show the economic viability in the beel fisheries of Assam. But on the other hand hook and line shows the ratio below the viable range (0.42) indicating less net benefit against the cost incurred in the operation of the gear.

Thus, the study of economic parameters shows that *musarijal, dolijal, berjal, phansijal, langijal, khewalijal, dhenkijal, horhorijal,* and *parangijal* are beneficial in the beel fisheries of Assam. But, hook and line fishing exhibits negative trends. As shown in Table-4.12, it is clear that in case of hook and line the total cost exceeds the amount of revenue, hence, the important economic parameters such as rate of return, pay back period, benefit-cost ratio, net present value, internal rate of return, and net benefit-investment ratio, are found below the viable limit. Only capital turn over ratio is found just above the viable limit (1.76 times). Therefore, it is clear that . . the gear is able to generate sufficient revenue against the investment, but fails to meet the total cost requirement in fishing practices.

The economic efficiencies of different fishing gears in different beels of Assam have been discussed below:

Musari jal

The cost effectiveness study on *musari jal* (encircling gear) reveals that the operation of the gear is economically feasible and yields reasonably good profit margin in most of the beels (98.04%) under the present studied. But in Dighali-patali beel all the economic parameters are found below the viable range (Table-4.1). Out of 51 total surveyed beels CTOR in 4 beels, ROR in 1 beel, PBP in 6 beels, NPV in 1 beels, BCR in 1 beel, IRR in 1 beel and NKR in 1 beel is found below the viable limit.

Dolijal

In case of *dolijal* the data and information for feasibility study were available in only 8 beels, i.e. in 14.54% of the total surveyed beels. From the economic valuation it is clear that the gear can provide a good profit margin in all the cases against its

investment and operational costs. The gear needs higher capital investment, operating costs and total cost. Of the economic parameters ROR, B-C Ratio, NPV, N-K Ratio, and IRR (Fig-4.12) are found to be higher than the other gears. The study indicates that the gear is able to return better profit margins against its cost of installation and total cost.

Berjal

Berjal is found to be economically viable in most of the beels (80%) under study. It requires less capital investment and total cost than *dolijal* and *musarijal* but higher than *phansijal, langijal, khewlijal, hook and line, horhorijal* and *parangijal.* Of the economic parameters CTOR, ROR, and B-C Ratio, IRR, N-K Ratio is found less than *dolijal, musarijal* and *horhorijal* but better than *phansijal, langijal, khewalijal, hook and line, parangijal,* and *dhenkijal.* The NPV is also found higher than all the other gears except *dolijal* and *musarijal* (Fig.4.12).

Phansijal

The study of economic parameters show that the gear is economically viable in all the beels under study, but level of effectiveness is found to be higher in Baskandi, Rani-megna, Pungani, Gorimari-Bihdia-Jopora, Moridisoi and Teliadanga beel in comparison to other beels (Table-4.4).

As shown in fig.4.12, the capital investment, operating costs and total cost are found much lower in comparison to *musarijal, dolijal, berjal* and *horhorijal.* The economic indicators such as CTOR, ROR, PBP, and B-C Ratio, NPV, IRR, and N-K Ratio are found less than *musarijal* and *dolijal* and *berjal* but almost at the same level with *langijal, khewalijal,* and *parangijal.* On the other hand these ratios are found far better than *hook and line*, and *dhenkijal.*

Langijal

Langijal, which is also an entangling gear, is found in operation in 52 beels out of 55 total surveyed beels. As far as the study of economic viability indicators, such as

CTOR, ROR, NPV, BCR, IRR, and NKR, are concern the gear is found economically feasible in all the beels under present study, which indicate that the gear can provide sufficient benefit margin against the capital investment and total cost requirement for the operation of the gear. But, on the other hand, study of PBP (Fig-4.5) exhibits that in 12 beels (21.81% of the total surveyed beels) the gear can't provide the required profit margin within economically viable period (i.e. less than 2 years). In comparison to other gears *langijal* also shows similar results (Fig.4.12) as found in the case of *phansijal.*

Khewalijal

The cost effectiveness study on *khewalijal* reveals that the operation of the gear is economically feasible and yields reasonably good profit margins in most of the (98.04%) surveyed beel (Fig. 4.6). The level of effectiveness in terms of the average of economic parameters like CTOR (3.15 times), ROR (86%), PBP (12.1 years), NPV (Rs.15606/-), BCR (4.37), IRR (84%), and NKR (5.66) is found at same level with *langijal.* But beel-wise study shows that the gear is not economically viable in all the beels. Though CTOR is found below the viable range in only four beels, but ROR is found in below the viable limit on 11 nos. of beels of which 5 beels show negative results. Moreover, NPV, BCR, IRR, and NKR also recorded below the viable limit in 9 cases. It means, though the gear is able to earn sufficient revenue against its investment but fail to show required benefits against the total cost incurred for the operation of the gear.

Hook and Line Fishing

As far as the economic viability study is concerned in 49 beel fisheries of Assam, the averages of economic parameters for hook and line is found below the viable range. Though, CTOR is found above the viable range in 85.71% of the total surveyed beel, but other important parameters such as ROR, PBP, BCR, NPV, IRR, and NKR are found either negative or below the economic viable range in most of the beel (Fig-7). In comparison to other gear hook and line fishing is found to be least beneficial. From the study it is clear that though, in maximum cases the gear is able to earn good

revenue but it fails to meet the costs required during the operation including the opportunity cost of the fishermen.

Dhenkijal

The average CTOR for *dhenkijal* is found 2.35 times. It means the gear is able to earn sufficient revenue against the total capital investment as far as the study in 31 beels is concern. The average of ROR (42%), NPV (RS.13387/-), BCR (2.6), IRR (45%) and NKR (3.12) are found above the economic viable range, which means the gear is able to provide a feasible profit margin against the required operating cost. But, as far as the study of PBP is concern *dhenkijal* is found not to be economically viable and shows 2.77 years instead of 2 years or below to become viable. In comparison to *musarijal, dolijal, berjal, horhorijal* and *parangijal,* the gear needs less capital investment, operating cost and total cost. On the other hand, it requires higher capital investment and operating cost, but earns less profit than *phansijal, langijal,* and *khewlijal.*

Horhorijal

The data and information for economic evaluation of *horhorijal* were available in 9 numbers of beels only out of 55 beels. In other beels either the gear is not found in operation or data and information were not sufficient to work out economic evaluation. As far as the study in only 9 beels is concern the gear is found economically viable in all beels. Moreover, the gear is found more profitable in comparison to *phansijal, langijal, khewalijal, hook and line,* and *parangijal* (Fig-13 and 14). The average of economic parameters such as CTOR (7.28), ROR (143%), PBP (0.76 year), NPV (Rs.40533/-), BCR (7.89), IRR (144%), and NKR (9.28), are found above the viability limit (Table-4.12).

Parangijal

In case of *parangijal* also data and information are found in 14 numbers of beels out of 55 total surveyed beels. Of these beels the economic parameters such as CTOR and ROR is found below the viability level in 3 beels, but BCR, IRR, and NKR are found

below the profitable limit in 2 beels only. NPV is also recorded as negative in 2 beels whereas PBP is found above 2 years in 8 numbers of beels. The average of economic parameters such as CTOR (1.75), ROR (73%), NPV (Rs.21217/-), BCR (3.68), IRR (71%), and NKR (4.87) are found above the economic viable limit but PBP (2.79 years) shows that the gear needs more than two years to recover the capital investment. Moreover, Fig-4.12 shows that the gear is more profitable than some other gears like *dhenkijal* and *hook and line* fishing.

From the economic viability study it is evident that only a few types of fishing gears, such as *musarijal, berjal, phansijal, langijal, khewalijal, hooks and line* and *dhenkijal* are being in use for commercial purpose in most of the beel fisheries of Assam. Some other gears, such as *dolijal*, and *horhorijal* are also used in the beels but their use is restricted in 8 and 9 beels out of the total 56 numbers of surveyed beels. Again, *parangijal*, which is also known as *dharmajal or sipjal*, though found in almost all beels but it is not use for large-scale fishing due to its poor catch.

It has been further observed that *musarijal, dolijal,* and *berjal* need higher capital investment and operating costs and are able to yield sufficient profit in most of the bels. On the other hand, *phansijal, langijal,* and *khewalijal* need comparatively less capital investment and operating costs but are able to provide a good profit margin. Therefore, these gears are most popular in the beels of Assam.

As far as the study is concerned, hooks and line fishing is found as the only fishing gear which is unable to provide benefit in the commercial fishing practices.

KATAL FISHING

Fishing methods in beel fisheries were diverse and some of them were unique. Common gear such as cast net, gill nets; dip nets and traps were in vogue though certain beels offer ample scope to practise *Katal* fishing (Yadav, et al., 1981). *Katal*

fishing was recorded as the most viable indigenous fishing device in the beel fisheries of Assam. This method was found in 33 beels (60%) out of 55 beels under consideration for the study. The economic feasibility analysis revealed that *Katal* fishing was cost effective in all the samples under consideration of study. The economic indicators such as capital turn over ratio, rate of return, net present value, benefit-cost ratio, internal rate of return, pay back period and net benefit-investment ratio were recorded above the feasible range and indicated maximum benefits at least cost. Yadav, et al., 1981 also reported *katal* fishing as beneficial fishing device in the beel fisheries of Assam.

CONCLUSION

The above analyses on cost effectiveness showed that encircling gears (*musari jal* and *berjal*), gill nets (*langi jal* and *phansi jal*), trawling gears (*doli jal* and *horhori jal*) and scooping gears (*dhenki jal* and *parangi jal*) were the economically feasible gears and were in vogue in most of the beel fisheries of Assam. On the other hand economic indicators for hooks and line fishing were in negative in most of the cases. Thus fishermen should avoid the use of this gear for commercial purposes.