# Welcome to my presentation

# ECONOMIC AND ENVIRONMENTAL BENEFITS OF REDUCED FEED AND FERTILIZERS INPUTS OF CLIMBING PERCH –CARP POLYCULTURE SYSTEMS


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# *Introduction*

- Polyculture is an environmental friendly fish culture approach, mainly based on natural utilization of water and nutrients with little dependence on supplemental feed

- To meet the demand for protein source, majority of the people depend largely on fishes which are cheap in comparison to other protein sources

- There is increasing interest in hardy fishes particularly those of air breathing fish farming in Bangladesh. Among various production inputs, the choice of fast growing species with desirable aquaculture traits is a prerequisite for enhancing fish production in culture based fisheries

- Koi (*Anabas testudineus*) is an excellent fish for growing in the shallow and seasonal ponds in Bangladesh

- They can thrive well in low dissolved oxygen (DO), also tolerate extremely unfavorable water conditions and is associated mainly with turbid, stagnant waters

# Objectives

- To evaluate the effectiveness of reduced feeding in Koi–carp polyculture
- To evaluate the effectiveness of fertilization and reduce pollution through reduce amount of feed application
- To maximize cost-benefits for local farmers


# *Materials and Methods*

**Experimental Site**

Fisheries Field Laboratory Complex, Bangladesh Agricultural University, Mymensingh - 2202

**Duration of the Experiment**

120 days (2nd May, 2015 to 30th August, 2015

**Experimental Species**

Koi (*Anabas testudineus*), Rohu *(Labeo rohita)*, Catla *(Gibelion catla)*

**Pond no. :** 12
**Pond depth:** 1.5m

# Experimental Design

| Treatment /Factor | Treatment 1 | Treatment 2 | Treatment 3 |
|---|---|---|---|
| Rohu (*L. rohita*) | 0.8 fish/$m^2$ | 1.0 fish/$m^2$ | None |
| Catla (*G. catla*) | 0.2 fish/$m^2$ | None | 1.0 fish/$m^2$ |
| Koi (*A. testudineus*) | 5.0 fish/$m^2$ | 5.0 fish/$m^2$ | 5.0 fish/$m^2$ |
| Fertilization | 4:1 (N:P) | 4:1 (N:P) | 4:1 (N:P) |
| Replicates (n) | 4 | 4 | 4 |
| Pond Number | 2,5,7,19 | 4,8,9,20 | 1,3,6,21 |

## Pond Preparation

- ✓ Drying and Re-excavation
- ✓ Liming
- ✓ Water Filling
- ✓ Fertilization

## Fingerling Collection and stocking

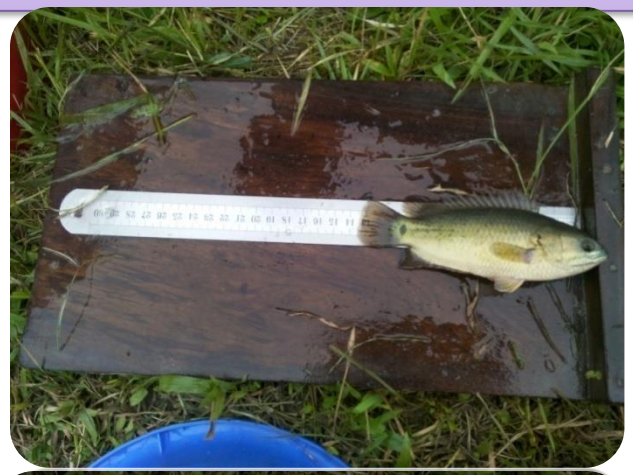
- ✓Koi (~2.94 g),
- ✓Rohu (~22.92 g) and
- ✓Catla (~30.70 g)

# Feeding Strategy

- Commercial fish feed was used twice a day (early morning and evening)
- Feed was applied based on the body weight of Koi


# Sampling and Health Monitoring

- Sampling of fishes was done at 15 day's interval for Koi
- Sampling was done by using a seine net
- Length and weight were measured by using a scale and digital balance



## Sampling and Health Monitoring

- Rohu and Catla were sampled on monthly basis
- They were caught by using seine net
- Length and weight were measured by using a scale and digital balance

# Harvesting of Fish

- After 120 days of rearing, the fish were harvested from all the ponds
- Primarily the harvesting of fish was performed by repeated netting using a seine net
- Final harvesting was done by dewatering the ponds with a submerged low lift pump
- During harvest, all fishes were counted and weighed from each pond to assess the survival rate and production

## Analysis of Growth and Production Parameters

- **Weight gain (g)** = Mean final weight (g) – Mean initial weight (g)

- **Survival rate (%)** = $\frac{\text{No. of fishes harvested}}{\text{No. of fishes stocked}} \times 100$

- $\mathbf{SGR(\%\ per\ day)} = \frac{logeW_2 - logeW_1}{T_2 - T_1} \times 100$

- **FCR (Food Conversion Ratio)** = $\frac{\text{Total feed used (kg)}}{\text{Total weight gain (kg)}}$

- **BCR (Benefit Cost Ratio)** = Gross return (Tk) ÷ Total investment (Tk)

# Results

**Table: Production Performance of Koi (*Anabas testudineus*) in Different Treatments**

| Variable | Treatment 1 | Treatment 2 | Treatment 3 | Significant level |
|---|---|---|---|---|
| Mean Stocking Weight (g) | 2.94±0.87 | 2.94±0.87 | 2.94±0.87 | NS |
| Mean Harvesting Weight(g) | 129.24±36.27 | 148.39±28.39 | 144.13±15.79 | NS |
| Mean Weight Gain (g) | 126.30±36.27 | 145.45±28.39 | 141.19±15.79 | NS |
| Survival Rate (%) | 72.64±23.46 | 64.36±9.92 | 77.36±11.74 | NS |
| Specific Growth Rate, SGR (% $day^{-1}$) | 3.13±0.25 | 3.26±0.17 | 3.24±.09 | NS |
| Gross Production (kg $ha^{-1}$) | $4324.76\pm390.17^{b}$ | $4617.63\pm374.3^{b}$ | $5459.23\pm532.17^{a}$ | ** |
| Net Production (kg $ha^{-1}$) | $4219.25\pm378.42^{b}$ | $4524.16\pm381.24^{b}$ | $5346.88\pm521.64^{a}$ | ** |

**Table: Production Performance of Rohu (*Labeo rohita*) in Different Treatments**

| Variable | Treatment 1 | Treatment 2 | Treatment 3 | Significant level |
|---|---|---|---|---|
| Mean Stocking Weight (g) | 22.92±3.20 | 22.92±3.20 | - | NS |
| Mean Harvesting Weight(g) | 162.6±33.35 | 142.08±22.48 | - | NS |
| Mean Weight Gain (g) | 139.68±33.35 | 119.16±22.48 | - | NS |
| Survival Rate (%) | $99.69\pm0.63^{a}$ | $90.88\pm7^{b}$ | - | ** |
| Specific Growth Rate, SGR (% $day^{-1}$) | 1.62±0.17 | 1.51±0.13 | - | NS |
| Gross Production (kg $ha^{-1}$) | 1282.11±268.31 | 1272.06±188.51 | - | NS |
| Net Production (kg $ha^{-1}$) | 1101.52±267.44 | 1066.28±185.65 | - | NS |

## Table: Production Performance of Catla (*Gibelion catla*) in Different Treatments

| Variable | Treatment 1 | Treatment 2 | Treatment 3 | Significant level |
|---|---|---|---|---|
| Mean Stocking Weight (g) | 30.7±10.29 | - | 30.7±10.29 | NS |
| Mean Harvesting Weight(g) | 243.85±92.72 | - | 198.7±44.10 | NS |
| Mean Weight Gain (g) | 213.15±92.72 | - | 168±44.10 | NS |
| Survival Rate (%) | 84.17±9.86 $^{a}$ | - | 54.13±7.92 $^{b}$ | ** |
| Specific Growth Rate, SGR (% day$^{-1}$) | 1.68±0.34 | - | 1.54±0.2 | NS |
| Gross Production (kg ha$^{-1}$) | 394.57±116.59 $^{b}$ | - | 1086.29±356.48 $^{a}$ | ** |
| Net Production (kg ha$^{-1}$) | 343.51±120.07 $^{b}$ | - | 922.12±333.45 $^{a}$ | ** |

## Table: Combined Production Performance of Koi, Rohu and Catla in Different Treatments

| Variable | Treatment 1 | Treatment 2 | Treatment 3 | Significant level |
|---|---|---|---|---|
| Feed Conversion Ratio, FCR | 0.78±0.12 | 0.85±0.06 | 0.77±0.12 | NS |
| Gross Production (kg $ha^{-1}$) | 6001.44±1776.17 | 5889.69±1809.20 | 6545.52±2374.8 | NS |
| Net Production (kg $ha^{-1}$) | 5664.28±1769.50 $^{ab}$ | 5590.4±1869.05 $^{b}$ | 6269±2399.61$^{a}$ | ** |

Values of the parameter in each row with different superscripts (a and b) differs significantly ($p<0.05$)
NS: Not significant
**: Significantly different

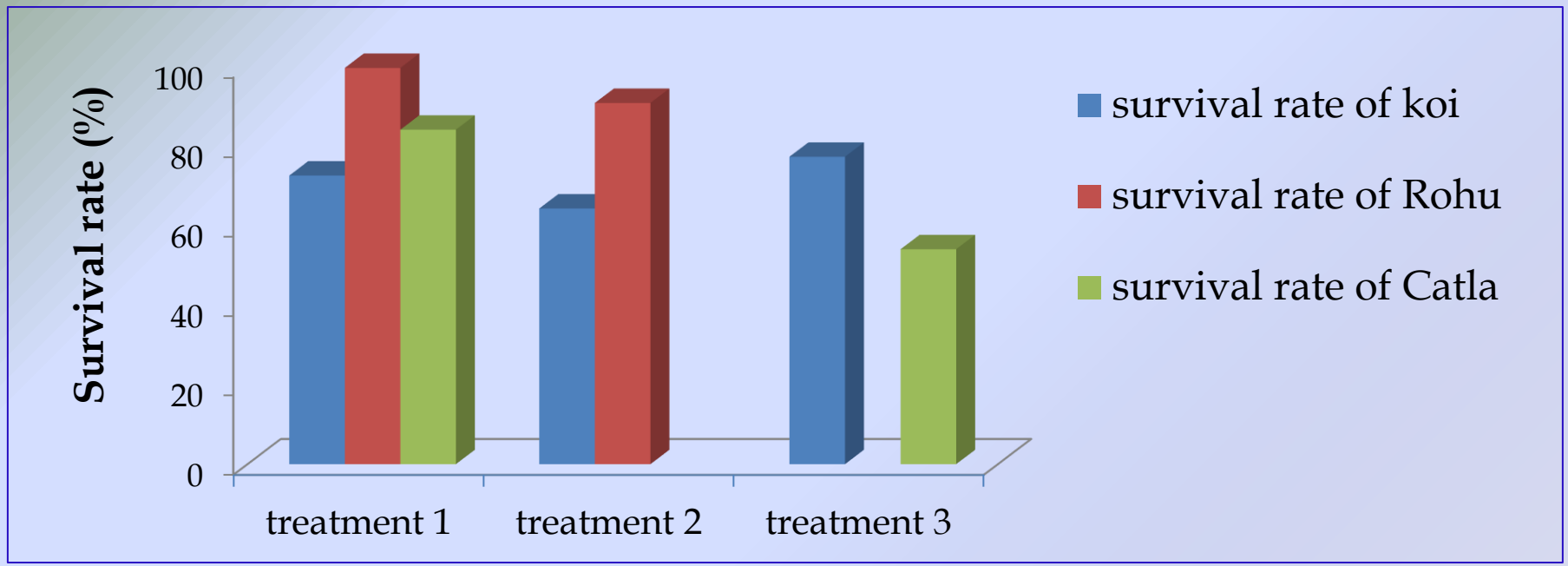



Figure: Mean survival rate of three fish species in three different treatments

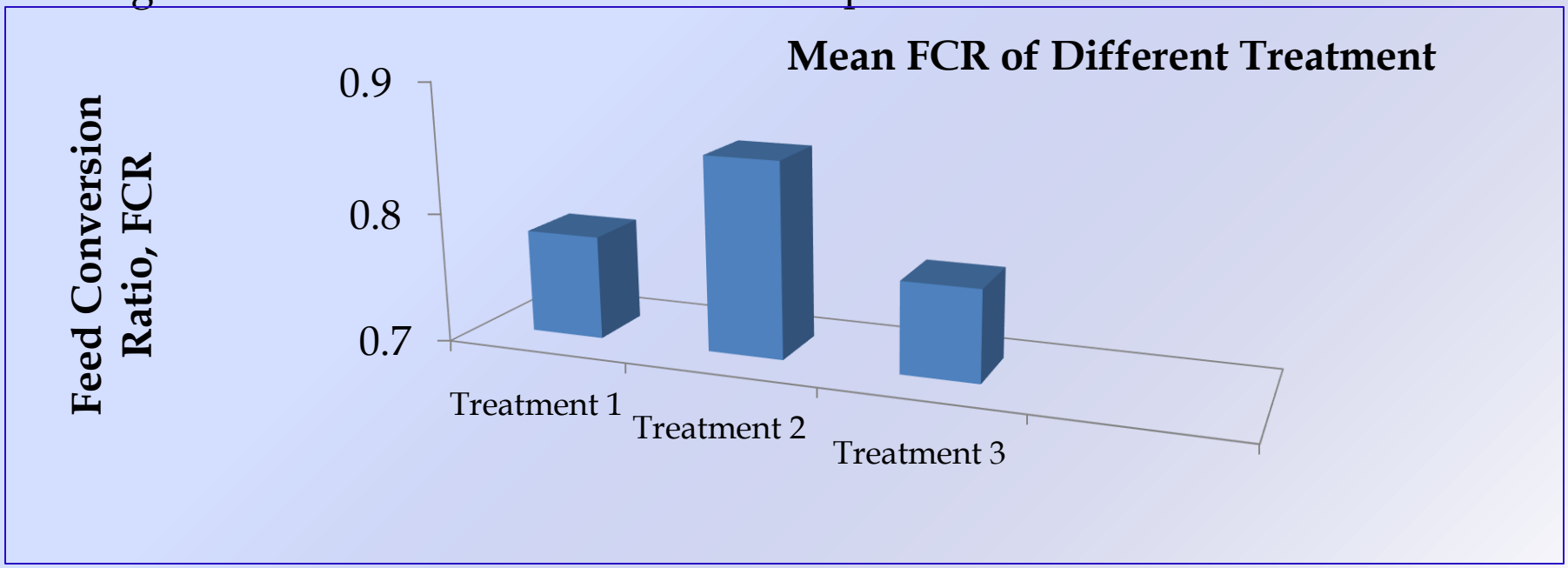



Figure: Mean FCR of different treatment

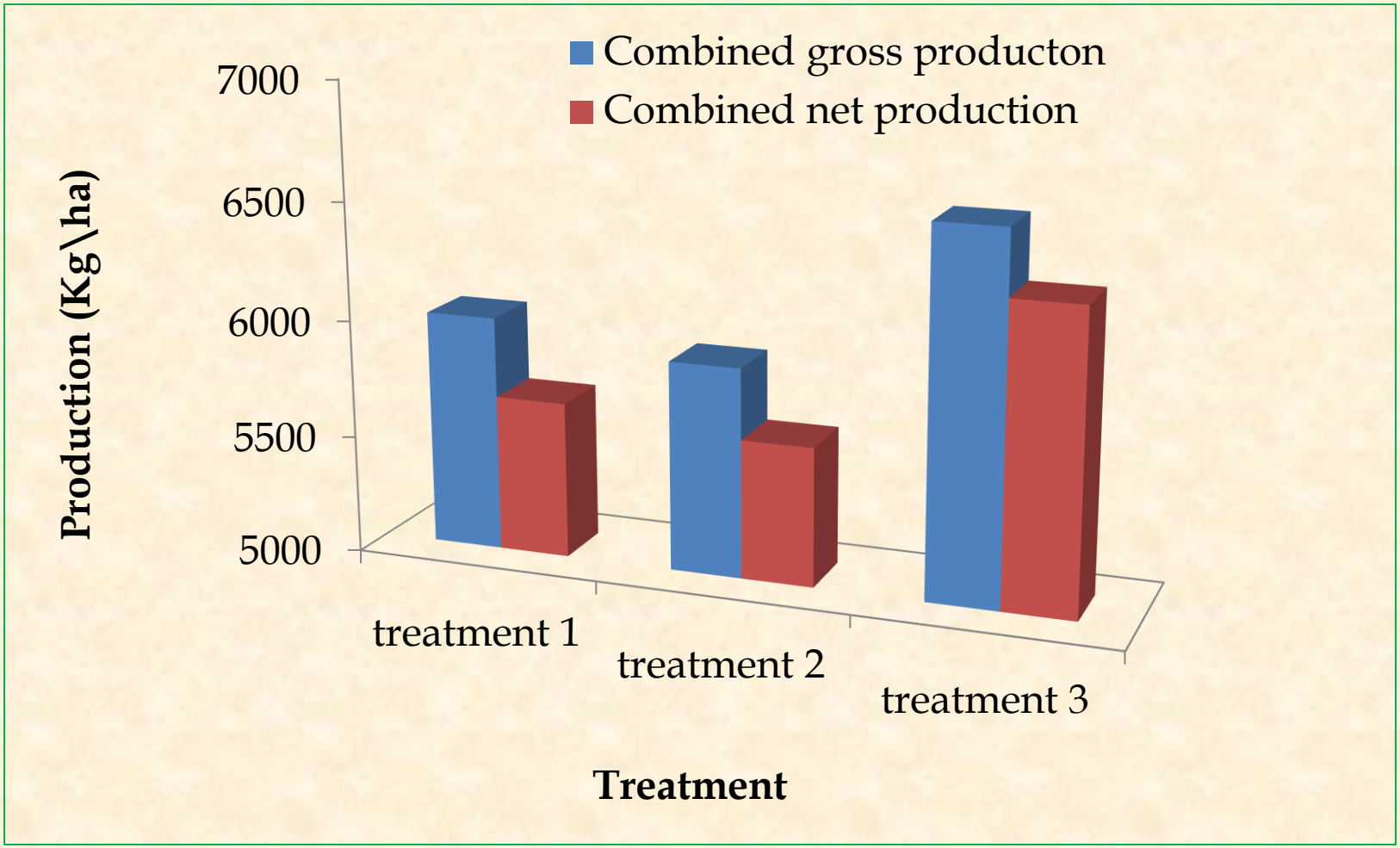



Figure: Combined gross and net production of three fish species in different treatment

## Table: Economic analysis of the production performances of Koi, Rohu and Catla in three different treatments

| Items | Treatment (Taka/ha) | | | Significant level |
|---|---|---|---|---|
| | Treatment 1 | Treatment 2 | Treatment 3 | |
| Financial Input | | | | |
| Salt | 5928 | 5928 | 5928 | NS |
| Lime | 8892 | 8892 | 8892 | NS |
| Urea | 7230.68 | 7230.678 | 7230.678 | NS |
| TSP | 5529.342 | 5529.342 | 5529.342 | NS |
| Koi | 98800 | 98800 | 98800 | NS |
| Rohu | 39520 [b] | 49400 [a] | - | ** |
| Catla | 17784 [b] | - | 88920 [a] | ** |
| Feed | 280900.8 | 302308.2 | 299757 | NS |
| Labor and Others | 10000.00 | 10000 | 10000 | NS |
| Total Cost | 474584.822 | 488088.22 | 525057.02 | NS |
| Financial Return | | | | |
| Koi | 648713.39 [b] | 692644.96 [b] | 818884.97 [a] | ** |
| Rohu | 217959.173 | 216250.3896 | 0 | NS |
| Catla | 59185.64 [b] | 0 | 162943.12 [a] | ** |
| Total Return | 925858.209 | 908895.3539 | 981828.088 | NS |
| Net Return | 451273.387 | 420807.1339 | 456771.068 | NS |
| BCR (Benefit Cost Ratio) | 1.95 | 1.86 | 1.87 | NS |

** Values of the parameter in each row with different superscripts (a and b) differs significantly ($p<0.05$)

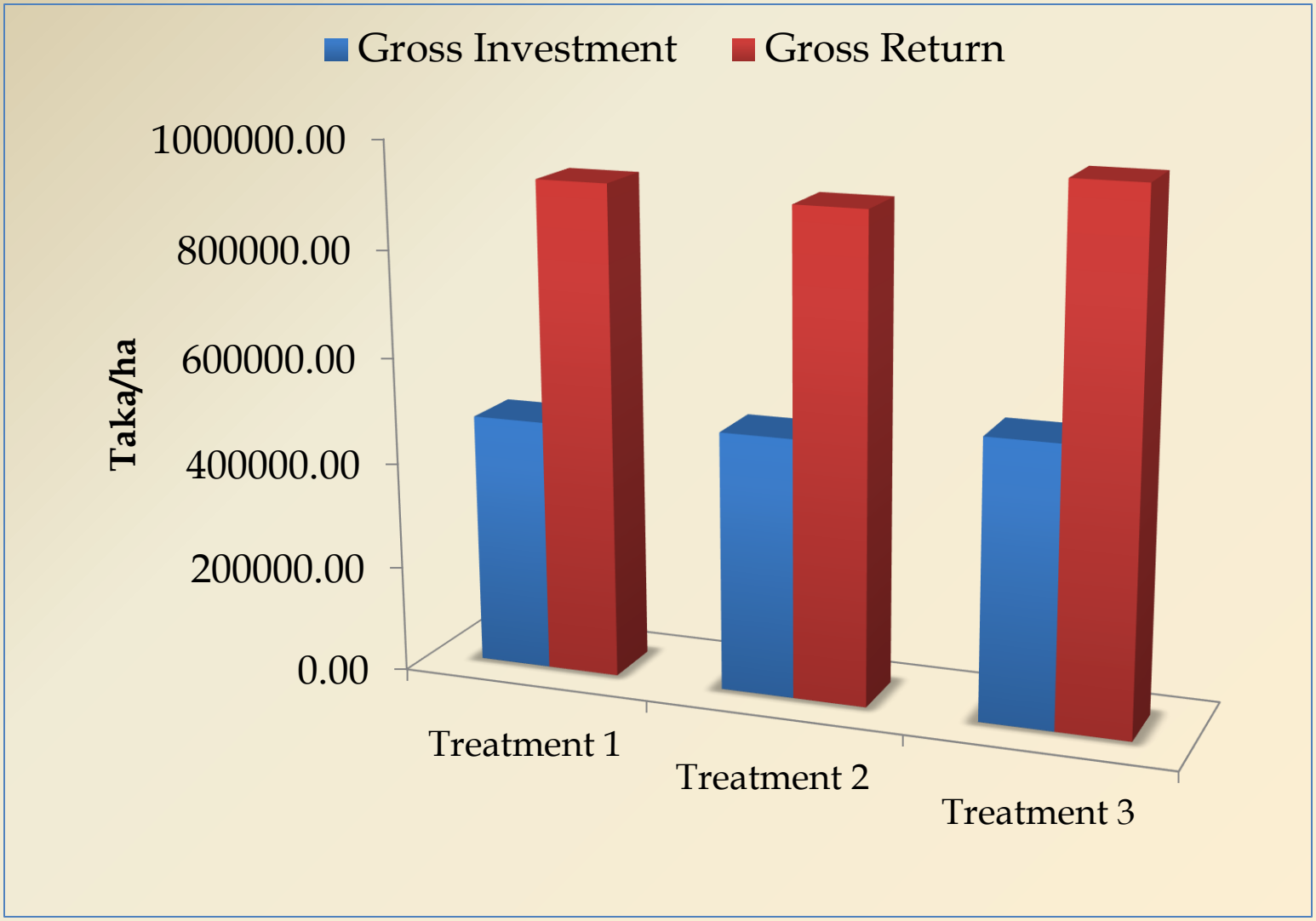



Figure: Gross investment and return from three different treatments

# Conclusion

- Production of Koi, Rohu and Catla were almost varied among the treatments
- Clean environment was observed due to addition of carp species in terms of nutrient loading
- The highest BCR value obtained in $T_1$ might be due to proper amount of feed used i.e. low cost of feed used and relatively higher production of fishes. Finally it could be concluded that ($T_1$) polyculture of Koi and two major carps (Rohu and Catla) were the best combination than the other treatments.
- Further research needed to expand this culture technique of Koi - Carp polyculture

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