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THE GENETICALLY IMPROVED AND FAST-GROWING STRAIN OF SCAMPI 'CIFA-GI SCAMPI®'USHERS ECONOMIC PROSPERITY FOR CARP FARMERS IN SOUTH 24 PARGANAS, WEST BENGAL

PMMSY CS SCHEME ON SCAMPI

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The genetically improved and fast-growing strain of scampi 'CIFA-GI Scampi®'ushers economic prosperity for carp farmers in South 24 Parganas, West Bengal

1. Introduction:

'CIFA-GI Scampi®'is a genetically improved and fast-growing strain of giant freshwater prawn *Macrobrachium rosenbergii* (scampi). It was developed by the ICAR-Central Institute of Freshwater Aquaculture (ICAR-CIFA) through genetic selection in collaboration with Worldfish, Penang, Malaysia.The collaborative project between ICAR-CIFA and Worldfish, Malaysia was started in 2007 to develop a fast-growing strain of scampi. To achieve this, a systematic selective breeding program was implemented, involving the careful selection of scampi populations from three geographically distant regions of India: Gujarat, Kerala, and Odisha, and establishing a base population using a 3 by 3 diallel crossing of the three populations. From the base population, selective breeding was performed by selecting the fastest-growing prawns as parents for the next generation. Through the application of genetic selection protocols, ICAR-CIFA successfully developed a genetically improved and fast-growing strain that was registered as 'CIFA-GI Scampi®' in 2020.

To ensure extensive distribution and adoption of 'CIFA-GI Scampi®', ICAR-CIFA selected five scampi hatcheries as multiplier hatcheries, strategically partnering with them and the National Freshwater Fish Broodbank of NFDB (NFDB-ERC). These multiplier hatcheries have been entrusted with the responsibility of commercial-level production of 'CIFA-GI Scampi®' seeds to meet the growing demand. In 2022, ICAR-CIFA supplied about 2 lakh numbers of G14 brood seeds to these multiplier hatcheries, further facilitating the production of commercial seed stock. From the provided brood seeds, these multiplier hatcheries can produce around 400 million seed which can bring about an additional production of 12,500 t from 25,000 ha. It is expected that the production of GI scampi will increase further with the increased awareness of the economic benefits of GI scampi among the farming community. In 2021-22 itself, the Scampi production in the country has shown a remarkable 2.5-fold increase from 8,303 to 21,317 t. With further concerted efforts from all stakeholders, scampi production can increase many folds.

To evaluate the growth performance of 'CIFA-GI Scampi®' in farmers' fields several multi-location on-farm trials were conducted across Andhra Pradesh, Odisha and West Bengal. The present publication gives details of on-farm trials carried out in 2022-23 in Canning block, South-24-Parganas district of West Bengal in the carp-scampi polyculture system under the Central Sector Scheme of Prime Minister Matsya Sampada Yojana (PMMSY) titled 'Scaling up of Genetic Improvement Programme of Freshwater Prawn *Macrobrachium rosenbergii* (Scampi)' sanctioned to ICAR-CIFA, Bhubaneswar.

South-24-Parganas district in West Bengal offers a promising landscape for scampi production. Canning-1 block of South-24-Parganas is a leading producer of scampi. Totally 04 farms were selected (Fig. 1)at the Canning-1 block for the on-farm trial of 'CIFA-GI Scampi®'. A comprehensive survey was conducted to identify the demonstration sites and farmers with at least three years of scampi farming experience and we selected four progressive farmers,Mr. Alok Mondal, Mr. Krishnapada Haldar, Mr. Gour Sardar and Mr. Sagar Das for the demonstration program.The farmers were provided with major inputs like 'CIFA-GI Scampi®' seed, advanced fingerling of catla and rohu, floating fish feed, ground nut oil cake (GNOC), single super phosphate (SSP) and lime from ICAR-CIFA for the demonstration program. Scientific guidance and regular monitoring

was done by the project team. The demonstration programme was carried out in collaboration with Sasya Shyamala Krishi Vigyan Kendra (SSKVK), Sonarpur, West Bengal.

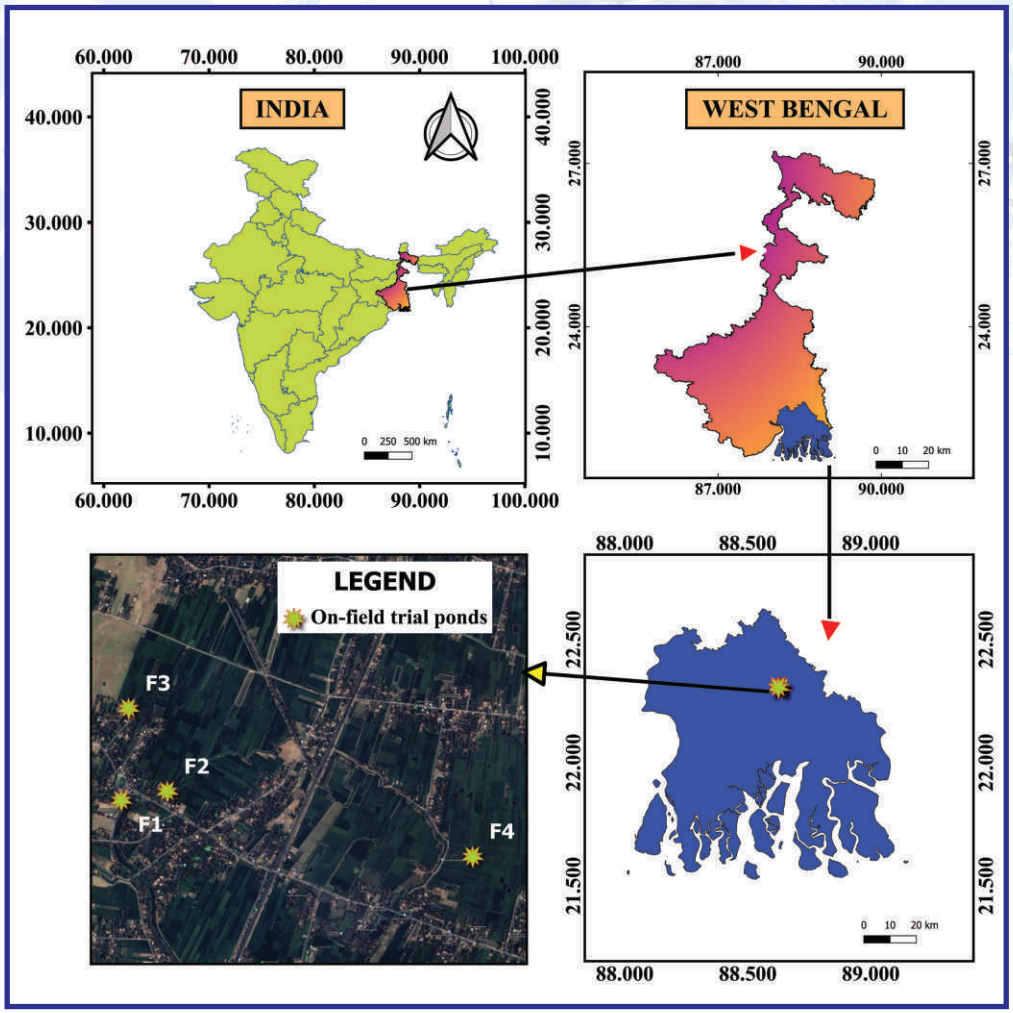

Fig. 1. Map showing ponds of Canning-I block, South-24-Parganas, West Bengal selected for field trial. F1: Mr. Alok Mondal; F2: Mr. Krishnapada Haldar; F3: Gour Sardar & F4: Sagar Das.

2. Success story of CIFA-GI Scampi® in South-24-Parganas, West Bengal

2.1. Mr. Alok Mondal

Name :- Mr. Alok Mondal
District :- South-24-Parganas
State :- West Bengal
Age :- 32 Years
Mobile No. :- 9749490530
Occupation :- Fish farming
No. of ponds :- 03
Years of experience :- 05
Landholding :- 3.50 acre
Family Members :- 04

Fig. 2. Mr. Alok Mondal wih a haul of 'CIFA-GI Scampi®'

Mr. Alok Mondal (32 years), a resident of Canning-I block, has achieved remarkable success with a record production of 'CIFA-GI Scampi®'. The credit for this achievement goes to both the innovative 'CIFA-GI Scampi®' and Mr. Mondal's unwavering dedication. Hailing from Kumarsa Chak village in Canning-I block, South-24-Parganas district, West Bengal, Mr. Mondal is a small-scale farmer with three ponds covering areas of 0.40 ha, 0.18 ha, and 0.12 ha respectively. The demonstration of 'CIFA-GI Scampi®' in the carp-scampi polyculture system, was carried out in his 0.12 ha area pond.

Mr. Mondal received training in conducting on-farm trials in the carp-scampi-polyculture system, with 'CIFA-GI Scampi®' as one of the candidate species. He was provided with necessary inputs including seeds, feeds, and other fertilizers to execute the trial in his 0.12 ha pond. In August 2022, a total of 1800 post larvae of 'CIFA-GI Scampi®' (0.02±0.001g) were stocked in his pond. Additionally, 140 nos. catla (150.00±5.40 g) and 580 nos. rohu (100.00±6.50 g) were also stocked in the same pond. Thus, the stocking densities for prawn and carps were 15,000 post larvae and 6,000 yearlings per hectare respectively. The on-farm trial was conducted under the close supervision of the project team.

The prawns and carp were provided with a daily diet of overnight-soaked GNOC and floating feed (with Crude Protein: 28.0%, Crude Fat: 4.0%). Feed was provided at a rate of 5 % initially slowly reducing it to 2 % of the body weight of the stocked fish towards the end of the culture period. The project staff conducted monthly monitoring of culture practices and stocks through regular visits and sampling. Final harvesting took place in March 2023, after seven months of culture. The harvest details are given in Table 1. Mr. Mondal achieved are markable yield of 144.00 kg of 'CIFA-GI Scampi®' (1200 kg/ha) with an impressive mean body weight of 94.00 g. Additionally, he harvested 301.00 kg of carps from the same 0.12 ha pond (Table 1).

Table 1. Harvest details of carps and CIFA-GI Scampi®

Species	Size at harvest (g)	Nos. harvested	Survival (%)	Production (kg)	Farm gate price (Rs. /kg)	Revenue (Rs.)
CIFA-GI Scampi®	94.00±24.20	1532	85	144	600	86,400
Rohu	500.28±76.04	459	80	230	150	34,500
Catla	650.05±75.07	109	76	71	170	12,070
Total Revenue (Rs.)						**1,32,970**

2.1.1. Cost and returns of scampi-carp-polyculture system

The expenditure for purchasing carp and 'CIFA-GI Scampi®' seeds amounted to Rs. 16,560.00 (Table 2). Additionally, expenses for inputs such as floating feed, lime, GNOC, and manure was Rs. 59,220.00. Mr. Mondal allocated Rs. 7,000.00 for labor costs associated with pond management and miscellaneous expenses. Over the seven-month culture period, the total expenditure reached Rs. 81,328.00. On the other hand, the revenue generated from the sale of fish and prawns amounted to Rs. 1,32,970.00. Consequently, the net profit derived from carp-scampi polyculture in the 0.12 ha pond stood at Rs. 51,642.00 within the seven months. This translates to a noteworthy profit of Rs. 4,30,350.00 per ha/crop in just seven months with a benefit-cost ratio (B:C) of 1.63 (Table 2).

Table 2. Economic analysis of carp-'CIFA GI Scampi®' polyculture in 0.12 ha pond area

Input category	Unit cost (Rs.)	Quantity of input use	Input cost (Rs.)
Seed			
CIFA-GI scampi	Rs. 1.20/pc.	1800	2,160
Carp	Rs. 20/pc.	720	14,400
Subtotal (A)			**16,560**
Feed			
GNOC	Rs. 50/kg	300	15,000
Floating feed	Rs. 45/kg	900	40,500
Subtotal (B)			**55,500**
Other inputs Lime	Rs. 12/kg	24	288
Inorganic Fertilizer (SSP)	Rs. 15/kg	20	300
Manure (Cow dung)	Rs. 2/kg	840	1,680
Subtotal (C)			**2,268**
Manpower			
Labour	-	-	3,000
Netting	-	-	2,000
Subtotal (D)			**5,000**
Other specific cost			
Lease value of the pond	-	-	-
Miscellaneous (Electricity, fuel etc.)	-	-	2,000
Subtotal (E)			**2,000**
Total Expenditure (A+B+C+D+E)			81,328
Total Revenue (Table 1)			**1,32,970**
Net profit	**(Revenue - Expenditure)**		**51,642**
B:C ratio			**1.63**

The field trial of 'CIFA-GI Scampi®' in Canning block, South-24-Parganas, West Bengal, yielded significant success, inspiring nearby farmers to adopt the culture of 'CIFA-GI Scampi®'. Undoubtedly, the spirit, diligence, and dedication of Mr. Mondal was definitely essential in this achievement. Mr. Mondal was able to successfully demonstrate the potential of 'CIFA-GI Scampi®' in enhancing the farm income with little additional inputs. He also expressed keen interest in continuing to culture of 'CIFA-GI Scampi®' in the future.

2.2. Mr. Krishnapada Haldar

Name :- Mr. Krishnapada Haldar
District :- South-24-Parganas
State :-West Bengal
Age :- 32 Years
Mobile No.:-7407294475
Occupation :-Fish farming
No. of ponds :- 08
Years of experience :-10
Landholding :-8.00 acre
Family Members :- 07

Fig. 3. Mr. Haldar showing the harvest of 'CIFA-GI Scampi®'

Mr. Krishnapada Haldar, an experienced fish farmer of 32 years hailing from Canning-I block of South 24 Parganas district of West Bengal, has over ten years of experience in scampi farming. In August 2022, Mr. Haldar was chosen to conduct the 'CIFA-GI Scampi®' on-farm performance trial.We have selected the smaller pond of 0.10 ha for the on-farm demonstration of 'CIFA-GI Scampi®' in the carp-GI scampi polyculture system.

Fig. 4. Fish & Scampi harvested from the pond of Mr. Haldar

Mr. Haldar was provided with seed, feed and other farm inputs to carry out the trial in the 0.10 ha pond. A total of 1500 nos. of post larvae of 'CIFA-GI Scampi®' (0.02±0.001g), 120 numbers of catla (150.00±5.40 g), and 480 numbers of rohu (100.00±6.50 g) were stocked in his pond in August, 2022. The stocking density of 'CIFA-GI Scampi®' was 15,000 nos. and that of carp was 6,000 yearlings /ha. The on-farm trial was carried out under the supervision of the project team. The stocked prawns and carps were fed daily with overnight soaked GNOC and floating feed (Crude Protein: 28.0%, Crude Fat: 4.0%) @ 5 % of biomass of stocked fishes in the beginning and slowly reduced to 2% of the biomass towards the end of the culture period.

The final harvest was done in March 2023 after seven months of culture. Mr. Haldar got a yield of 103 kg 'CIFA-GI scampi®' (1030 kg/ha) with an impressive mean body weight of 78 g in only seven months. He also harvested 226 kg of carps from the same pond of 0.10 ha (Table. 3).

Table 3. Harvest details of carps and CIFA-GI Scampi®

Species	Size at harvest (g)	Nos. harvested	Survival (%)	Production (kg)	Farm gate price (Rs. /kg)	Revenue (Rs.)
CIFA-GI Scampi®	78.02±21.41	1320	88	103	600	61,800
Rohu	450.58±44.74	382	80	172	150	25,800
Catla	550.03±42.64	98	82	54	170	9,180
Total Revenue (Rs.)						**96,780**

2.2.1. Cost and returns of scampi-carp-polyculture system

The expenditure for purchasing carp and 'CIFA-GI Scampi®' seeds amounted to Rs. 13,800.00 (Table 4). Additionally, expenses for inputs such as floating feed, lime, GNOC, and manure was Rs. 49,345.00. Mr. Haldar allocated Rs. 5,000.00 for labour costs associated with pond management and miscellaneous expenses. Over the seven-month culture period, the total expenditure was Rs. 66,945.00. On the other hand, the revenue generated from the sale of fish and prawns amounted to Rs. 96,780.00. Consequently, the net profit derived from carp-scampi polyculture in the 0.10 ha pond stood at Rs. 29,835.00 within the seven-month period. This translates to a noteworthy profit of Rs. 2,98,350.00 /ha/crop in just seven months with a benefit-cost ratio (B:C) of 1.45 (Table 4).

Fig. 5. Harvesting of 'CIFA-GI Scampi®' by Mr. Halder

Table 4. Economic analysis of carp-'CIFA GI Scampi®' polyculture in 0.10 ha pond area

Input category	Unit cost (Rs.)	Quantity of input use	Input cost (Rs.)
Seed			
CIFA-GI scampi	1.20/pc.	1500	1,800
Carp	20/pc.	600	12,000
Subtotal (A)			**13,800**
Feed			
GNOC	50/kg	250	12,500
Floating feed	45/kg	750	33,750
Subtotal (B)			**46,250**
Other inputs			
Lime	12/kg	20	240
Manure (Cow dung)	2/kg	700	1,400
Single super phosphate	15/kg	17	255
Subtotal (C)			**1,895**
Manpower			
Labour	-	-	3,000
Netting (harvesting)	-	-	2,000
Subtotal (D)			**5,000**
Total Expenditure (A+B+C+D+E)			66,945
Total Revenue (Table 3)			**96,780**
Net profit	**(Revenue - Expenditure)**		**29,835**
B:C ratio			**1.45**

2.3. Mr. Gour Sardar

Name :- Mr. Gour Sardar
District :- South-24-Parganas
State :-West Bengal
Age :- 30 Years
Mobile No.:-8370905862
Occupation :-Fish farming
No. of ponds :- 03
Years of experience :-05
Landholding :-02.00 acre
Family Members :- 03

Fig. 6. Mr. Gour Sardar with the harvested carps and 'CIFA-GI Scampi®'

Mr. Gour Sardar, is a young and experienced fish farmer from Canning, South-24-Parganas, West Bengal. He owns three ponds and one of his ponds measuring 0.08 ha area was selected for the demonstration of 'CIFA-GI Scampi®' in carp-scampi polyculture system. To carry out the trial in the 0.08 ha pond, he was provided with 1200 numbers of juveniles of 'CIFA-GI Scampi®' (0.02 g), 96 numbers of catla (150 g), 384 numbers of rohu (100 g), feed and other farm inputs like lime, cow dung, single super phosphate, ground nut oil cake (GNOC) in August, 2022. The stocked scampi and carps were fed daily with overnight soaked GNOC and floating feed (Crude Protein: 28.0%, Crude Fat: 4.0%). The feeding was done @ 5 % of the biomass of stocked fishes in the beginning and slowly reduced to 2 % of the biomass towards the end of the culture period. The culture practice and stock were monitored at monthly intervals by the project staff through regular visits and sampling.

The final harvest was done in March 2023 after seven months of culture. Mr. Sardar got a substantial yield of 81 kg 'CIFA-GI Scampi®' (1012 kg/ha) with an impressive mean body weight of 75 g after only seven months of culture. He also harvested 153 kg of rohu and 47 kg of catla from the same pond of 0.08 ha (Table 5).

Table 5. Harvest details of carps and CIFA-GI Scampi®

Species	Size at harvest (g)	Nos. harvested	Survival (%)	Production (kg)	Farm gate price (Rs. /kg)	Revenue (Rs.)
CIFA-GI Scampi®	75.01±18.54	1080	90	81	600	48,600
Rohu	500.05±64.53	306	80	153	150	22,950
Catla	650.02±68.37	72	75	47	170	7,990
Total Revenue (Rs.)						**79,540**

2.3.1 Cost and returns of scampi-carp-polyculture system

The expenditure for purchasing carp and 'CIFA-GI Scampi®' seeds amounted to Rs. 11,040.00 (Table 6). Additionally, expenses for inputs such as floating feed, lime, GNOC, and manure was Rs. 39,482.00. Mr.

Sardar allocated Rs. 5,000.00 for labor costs associated with pond management and miscellaneous expenses. Over the seven-month culture period, the total expenditure reached Rs. 54,556.00. On the other hand, the revenue generated from the sale of fish and prawns amounted to Rs. 79,540.00. Consequently, the net profit derived from carp-scampi polyculture in the 0.08 ha pond stood at Rs. 24,984.00 within the seven months. This translates to a noteworthy profit of Rs. 3,12,300.00 per ha/crop in just seven months with a benefit-cost ratio (B:C) of 1.46 (Table 6).

Table 6. Economic analysis of carp-'CIFA GI Scampi®' polyculture in 0.08 ha pond area

Input category	Unit cost (Rs.)	Quantity of input use	Input cost (Rs.)
Seed			
CIFA-GI scampi	1.20/pc.	1200	1,440
Carp	20/pc.	480	9,600
Subtotal (A)			**11,040**
Feed			
GNOC	50/kg	200	10,000
Floating feed	45/kg	600	27,000
Subtotal (B)			**37,000**
Other inputs			
Lime	12/kg	16	192
Manure (Cow dung)	2/kg	560	1,120
Single super phosphate	15/kg	13.6	204
Subtotal (C)			**1,516**
Manpower			
Labour	-	-	3,000
Netting (harvesting)	-	-	2,000
Subtotal (D)			**5,000**
Other specific cost			
Lease value of the pond	-	-	-
Miscellaneous (Electricity, fuel etc.)	-	-	-
Subtotal (E)	-	-	-
Total Expenditure (A+B+C+D+E)			**54,556**
Total Revenue (Table 5)			**79,540**
Net profit	**(Revenue - Expenditure)**		**24,984**
B:C ratio			**1.46**

2.4. Mr. Sagar Das

Name :- Mr. Sagar Das
District :- South-24-Parganas
State :-West Bengal
Age :- 33 Years
Mobile No.:-8509117626
Occupation :-Fish farming
No. of ponds :- 03
Years of experience :-10
Landholding :-05.00 acre
Family Members :- 02

Fig. 7. Mr. Sagar Das beside the demonstration pond

Mr. Sagar Das, residing in Canning-I block, has achieved significant success with a record production of 'CIFA-GI Scampi®'. This success is because of the innovative 'CIFA-GI Scampi®' and the hard work of Mr. Das. He has three ponds and we carried out the demonstration program in his 0.10 ha area pond.

Mr. Das was trained to conduct the on-farm trial in the carp-scampi polyculture system, with 'CIFA-GI Scampi®' as a candidate species. He was also provided with necessary inputs including seed, feed and fertilizers to carry out the trial in his 0.10 ha pond. A total of 1500 numbers of post larvae of 'CIFA-GI Scampi®' (0.02±0.001 g), 120 numbers of catla (150.00±5.40 g) and 480 numbers of rohu (100±6.50 g) were stocked in his pond in August 2022. Thus, the stocking densities for prawn and carps were 15,000 post larvae and 6,000 yearlings per hectare respectively. The on-farm trial was conducted under the close supervision of the project team.

Fig. 8. Scampi harvested by Mr. Sagar Das

The stocked prawns and carps were fed daily with overnight soaked GNOC and floating feed (Crude Protein: 28.0%, Crude Fat: 4.0%) @ 5 % of biomass of stocked fish in the beginning and slowly reduced to 2 % of the biomass towards the end of the culture period. The culture practice and stock was monitored once every month by the project staff through regular visit and sampling. Seven months post-culture, the final harvesting was done in March 2023. The details of harvesting are given in Table 7. Mr. Das got a yield of 115 kg 'CIFA-GI scampi®'

(1150 kg/ha) with a remarkable mean body weight of 89 g in seven months. He also harvested 241 kg of carp from the same pond of 0.10 ha (Table 3) with a feed conversion ratio (FCR) of about 2.0.

Table 7. Harvest details of carps and CIFA-GI Scampi®

Species	Size at harvest (g)	Nos. harvested	Survival (%)	Production (kg)	Farm gate price (Rs. /kg)	Revenue (Rs.)
CIFA-GI Scampi®	89.02±26.10	1300	87	115	600	69,000
Rohu	500.70±95.92	358	75	179	150	26,850
Catla	650.07±64.45	95	79	62	170	10,540
Total Revenue (Rs.)						**1,06,390**

2.4.1 Cost and returns of carp-scampi polyculture system

Mr. Das spent Rs. 68,145.00 during the culture period of seven months which includes expenditure towards the cost of seeds of carps and 'CIFA-GI Scampi®', floating feed, lime, GNOC, manure, payment of labour charges for pond management, monthly netting during the culture period and harvesting apart from the charges towards the use of fuel and electricity. The total revenue generated from the sale of fish and prawns was Rs. 1,06,390.00. Hence, the net profit achieved from carp-scampi polyculture from 0.10 ha pond was Rs. 39,776.00 in seven months, which works out to about Rs. 3,97,760.00 /ha/crop for only seven months with a benefit-cost ratio (B:C) of 2.00.

Fig. 9. Scampi and carps harvested by Mr. Das.

Table 8. Economic analysis of carp-'CIFA GI Scampi®' polyculture in 0.10 ha pond area

Input category	Unit cost (Rs.)	Quantity of input use	Input cost (Rs.)
Seed			
CIFA-GI scampi	1.20/pc.	1500	1,800
Carp	20/pc.	600	12,000
Subtotal (A)			**13,800**
Feed			
GNOC	50/kg	250	12,500
Floating feed	45/kg	750	33,750
Subtotal (B)			**46,250**

Input category	Unit cost (Rs.)	Quantity of input use	Input cost (Rs.)
Other inputs			
Lime	12/kg	20	240
Manure (Cow dung)	2/kg	560	1,120
Single super phosphate	15/kg	13.6	204
Subtotal (C)			**1,564**
Manpower			
Labour	-	-	3,000
Netting (harvesting)	-	-	2,000
Subtotal (D)			**5,000**
Other specific cost			
Lease value of the pond	-	-	-
Miscellaneous (Electricity, fuel etc.)	-	-	-
Subtotal (E)	-	-	-
Total Expenditure (A+B+C+D+E)			**66,614**
Total Revenue (Table 7)			**1,06,390**
Net profit	**(Revenue - Expenditure)**		**39,776**
B:C ratio			**1.59**

3. Conclusions

The present on-farm performance evaluation of 'CIFA-GI scampi®' in the Canning block of South-24-Parganas district of West Bengal was a successful venture, inspiring local farmers to adopt the 'CIFA-GI scampi®' in the carp culture. It is important to note that all four farmers could get production of more than one tonne of 'CIFA-GI scampi®' per ha which is significantly higher than that reported in the literature for normal scampi yield in a polyculture system (200-600 kg/ha). Thus,by incorporating 'CIFA-GI scampi®' into the carp culture system the farmers could get a significant increase in income with very little additional expenditure. The short culture period of seven months also helped them to increase the profit. Relatively lower harvest weight of carps may be due to the shorter duration of crop.

Dr. N. C. Sahu, Head Sasya Shyamala Krishi Vigyan Kendra, South-24-Parganas, conveyed his delight, stating, "A significant number of farmers within this district are enthusiastic about embracing the 'CIFA GI-Scampi®' within the carp-scampi polyculture scheme, anticipating greater productivity and enhanced profitability". He also thanked ICAR-CIFA for providing the opportunity to the farmers of Canning block to culture the improved scampi variety.

Fig. 10. Harvest of 'CIFA-GI Scampi®' from farmer field at Canning-I block

4. Acknowledgments

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