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A Comparative cost and return analysis of different cropping systems and integrated farming systems adopted in climate smart agricultural situation in upper Brahmaputra Valley Zone of Assam

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Abstract
Rice is the staple crop in the state of Assam. The study was conducted in locations which are climate resilient in nature. Two Agriculture Development Officer's circles and from each circle three villages were selected. From each village, 20 farm families were selected randomly. Here, different cropping sequences were studied to analyze economically viable one. It was revealed from the study that out of six different combinations of cropping sequences/patterns both Flood tolerant rice - Cauliflower and Fishery cum Duckery sequence in adopter's combination were found the most viable one and the pooled benefit-cost ratio for both the combinations was calculated as 2.14. In case of non-adopter's combination, the most viable cropping sequence was recorded as normal winter rice - cauliflower and its pooled benefit cost ratio was calculated as 2.02 followed by normal winter rice - cabbage sequence. Other cropping sequences were not found profitable. The flood tolerant rice - toria and normal winter rice - toria sequences in both adopter's combination and non-adopter's combination were found non-viable.

Keywords: Flood tolerant, Adopter's combinations, Cropping sequence, Benefit-cost ratio, Gross return, Net return

Introduction
Rice is found to be the major food crop in Assam as well as India. This crop is considered as the base crop in different farming practices. In general rice-based cropping system is very popular in which rice is considered as the major crop followed by cultivation of other crops like field crops, oilseeds, pulses, vegetables, green manuring crops. In many regions of India, intercropping of rice with other compatible crops is very popular. Various rice-based cropping systems have been reported from different parts of India ranging from rice-rice-rice to rice followed by other cereals, pulses, oilseeds, vegetables and fiber crops. The major advantage of rice-based cropping systems is that the cropping systems may cover both lowland and upland crops. Till date, many of the farmers of India focusing on monocropping. In rice growing areas, several crop combinations (cropping systems) are in practice based on agro-ecological conditions, market and domestic needs and facilities available with farmers.
Now a days, fishery-based integrated farming systems become very popular where fish culture combines with other farming activities, like livestock, poultry, duck, horticultural crops or field crops, so that the waste or by-products of one system becomes valuable inputs for another. It maximizes resource utilization, reduces costs, increased income through diversification, and the recycling of farm waste to create a more sustainable and profitable farm. The study was conducted with the objectives to analyze the costs and returns from the different combinations of rice-based cropping sequences and fishery based integrated farming systems.

Methodology
The study was conducted in the Dibrugarh district of Upper Brahmaputra Valley Zone of Assam. Two Agricultural Development Officer (ADO) circles were selected for the study and from each ADO circle, three villages were selected based on the intensity of occurrence of flood.

From each selected village, 20 farm families were selected randomly, comprising two distinct groups: the adopter's group, consisting of farm families that implemented more than 50% of identified climate-smart livelihood practices, and the non-adopter's group, which included farm families that adopted less than 50% or did not implement such practices at all. Consequently, 60 farm families were selected from each ADO circle, leading to a total of 120 farm families being taken into consideration for the study.

The sample farm families were categorized based on landholding size: marginal farm families (land holding 0 to <1 ha), small farm families (land holding 1 to <2 ha), semi-medium farm families (land holding 2 to <4 ha), and medium farm families (land holding 4 to <10 ha). The distribution among these categories was followed in a 4:3:2:1 ratio.

Calculation of Cost of Cultivation

The cost of production for various technologies was estimated using standard cost concepts:

Cost A: Includes all actual expenses incurred by farm operators, the imputed value of own bullocks and machinery, depreciation on implements and machinery, interest on working capital and fixed capital, and land revenue.

Cost B: Consists of Cost A plus the imputed rental value of own land and interest on fixed capital.

Cost C: Includes Cost B plus the imputed value of family labor.

Returns Calculation

The returns from various technologies were determined in terms of:

Gross Income: Computed by multiplying enterprise output by its respective price.

Farm Business Income: Derived by deducting Cost A from gross income.

Family Labour Income: Obtained by subtracting Cost B from gross income.

Net Income: Determined by deducting Cost C from gross income.

Results and Discussion

Classification of farmers based on operational holding

Out of 60 farmers under adopter's group, the highest 46.67 percent were marginal farmers (Table 1); followed by small farmers (31.67 per cent), semi-medium farmers (18.33 per cent) and the lowest was recorded for medium farmers (3.33 per cent). In case of non-adopter's group, similar trend was observed with the highest 43.33 per cent which was calculated for marginal farmers followed by small farmers (30.00 per cent), semi-medium farmers (21.67 per cent) and medium farmers (5.00 per cent).

Operational holding (in ha) of farmers

The operational holding of farmers is presented in Table 2. It was observed that the total operational holding of non-adopter's group was found more (108.54 ha) than the adopter's group (94.60 ha). The farmer's own land holding for non-adopter's group was also recorded more (92.32 ha) than the adopter's group (84.40 ha). For the adopter's group, the highest operational holding was calculated in case of small farmers (34.36 per cent) followed by semi-medium farmers (28.69 per cent), small farmers (25.86 per cent) and medium farmers (11.10 per cent). In case of non-adopter's group, the highest operational holding was recorded for semi-medium farmers (33.44 per cent) followed by small farmers (28.23 per cent), small farmers (24.67 per cent) and medium farmers (11.10 per cent).

Cost and Return analysis of different cropping systems and Integrated Farming Systems

The costs and returns of different combinations of farming (Climate resilient and normal) were found out and their benefit-cost ratio (BCR) was compared to determine the profitability of climate resilient practices over the normal practices.

Combination 1: Rice - cauliflower cropping sequence

Winter rice is the major crop in the state of Assam. In climate resilient areas, growing winter rice becomes a challenging job due to the reiterated occurrence of floods during the season. Therefore, in such situations, farmers grow high yielding rice varieties which are resistant/ tolerant to flood. The details of economics of rice followed by rabi crops/ vegetables cropping sequence is discussed below.

The costs and returns from the combinations of flood tolerant rice and cauliflower by the adopter's group and the combinations of normal winter rice and cauliflower by the non-adopter's group in the Upper Brahmaputra Valley Zone is presented in Table 3. The table revealed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination and the non-adopter's combination. The pooled cost C for adopter's combination was computed as Rs. 118324.00 per hectare against Rs. 55994.38 per hectare for non-adopter's combination. This implied that the purchasing power of farmers group was increased with the increase in farm size. It is very clear from the table that the per hectare gross return received was increased with an increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 253124.75 and Rs. 113152.00 for adopter's combination and the non-adopter's combination, respectively against the net return of Rs. 134800.75 and Rs. 57157.63 for adopter's combination and the non-adopter's combination, respectively. It was clear from the discussion that the farmers under climate resilient groups (adopter's combination) adopted better farming practices than the normal situation (non-adopter's combination). The farmers under non-adopter's combination could earn a better return provided good agricultural practices were followed. The BCR values in adopter's were found to be 1.97, 2.09, 2.21 and 2.27 in marginal, small, semi medium and medium farm sizes of the farmers, respectively. In case of non-adopter's combination, the values found were 1.89, 2.00, 2.09 and 2.10 in marginal, small, semi medium and medium farm sizes of the farmers, respectively. This meant that comparatively more BCR was calculated in the adopter's group than the non-adopter's group. But both the adopter's and non-adopter's groups could get a good profit and it was a viable cropping sequence. Chabok *et. al* (2013) [1] reported that cauliflower cultivation is possible in paddy fields after rice harvesting and can provide a good income to farmers. Similar result was reported by Kumar *et al* (2021) [4] for their study conducted in Eastern Uttar Pradesh.

Combination 2: Rice-potato cropping sequence

The costs and returns from the combinations of flood tolerant rice and potato by the adopter's group and the combinations of normal winter rice and potato by the non-adopter's group in the Upper Brahmaputra Valley Zone is presented in Table 4. The table revealed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination and the non-adopter's combinations. The pooled

cost C for adopter's combination was computed as Rs. 1,77,852.00 per hectare against Rs. 87,749.00 per hectare for non-adopter's combination. This implied that the purchasing power of farmers group was increased with the increase in farm size. It was very clear from the table that the per hectare gross return received was increased with the increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 2,69,721.00 for adopter's combination and Rs. 1,25,809.25 for the non-adopter's combination. The net return (Rs./ha) was calculated as Rs. 91,869.00 for adopter's combination and Rs. 38,060.13 for the non-adopter's combination. It is clear from the discussion that the farmers under climate resilient groups (adopter's combination) adopted better farming practices than the normal situation (non-adopter's combination). The farmers under non-adopter's combination could earn a better return provided good agricultural practices are followed. The BCR values for adopters were computed as 1.47, 1.50, 1.50 and 1.58 in marginal, small, semi medium and medium farm sizes of the farmers, respectively with the pooled data of 1.51. In case of non-adopter's the values found out were 1.41, 1.43, 1.43 and 1.46 for the marginal, small, semi medium and medium farm size groups of the farmers, respectively with the pooled data of 1.43. This meant that comparatively higher BCR was calculated in the adopter's group than the non-adopter's group; but the BCR for both the adopter's and non-adopter's combination was not satisfactory. It may be due to the potato varieties used by the farmers not being suitable for late cultivation and the soil might not be suitable for cultivation of potato. Sharmah *et. al* (2023) [5] reported that the maximum gross return (298.27 ha^{-1}) and net return (172.51 ha^{-1}) was received by the farmers of Dibrugarh district. in case of winter Rice- potato sequence. Deka *et. al* (2023) [2] reported that among the tested cropping sequences in the study area, the Rice-Potato sequence emerged as the most viable option, capable of enhancing farm profitability and food production, particularly in rainfed medium land areas of Udalguri district of Assam, India.

Combination 3: Rice-toria cropping sequence

Rice - toria is a very important cropping sequence for development of the agriculture sector. It will be fruitful provided both the crops can give a good return. The costs and returns from the combinations of flood tolerant rice and toria by the adopter's group and the combinations of normal winter rice and toria by the non-adopter's group in the Upper Brahmaputra Valley Zone is presented in Table 5. The table revealed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination and the non-adopter's combination. The pooled cost C for adopter's combination was computed as Rs. 53,413.75 per hectare against Rs. 24026.50 per hectare for non-adopter's combination. This implied that the purchasing power of farmers group was increased with the increase in farm size. It is very clear from the table that the per hectare gross return received was increased with an increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 75,282.50 for adopter's combination and Rs. 31,135.88 for the non-adopter's combination. The net return (Rs./ha) was calculated as Rs. 21,868.75 for adopter's combination and Rs. 7109.38 for the non-adopter's combination. The BCR values for adopter's were computed as 1.36, 1.38, 1.43 and 1.46 in marginal, small, semi medium and medium farm sizes of the farmers, respectively with the pooled data of 1.41. In case of non-adopter's, the values found were 1.27, 1.27, 1.31 and 1.33 in the said four groups of farmers with the pooled data of 1.30. Though the BCR was calculated higher in the adopter's group than the non-adopter's group; yet, the performance of the combination of crops was not satisfactory at all. The farmers could earn a better return provided good agricultural practices are followed by them. The farmers need to provide some training and demonstration, awareness to know about the good agricultural practices. Farmers should use the late varieties of toria to get a good performance of the crop. A similar study was reported by Sarmah *et. al* (2024) [6] which was conducted at Darrang district of Assam.

Combination 4: Rice-cabbage cropping sequence

The rice - cabbage cropping sequence plays a very important role in the development of the agriculture sector. It will be fruitful provided both the crops can give a good return. In this cropping sequence, the mid-season varieties second crop are grown. The costs and returns from the combinations of flood tolerant rice and cabbage by the adopter's group and the combinations of normal winter rice and cabbage by the non-adopter's group in the Upper Brahmaputra Valley Zone is presented in Table 6. The table revealed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination and the non-adopter's combination. The pooled cost C for adopter's combination was computed as Rs. 53,413.75 per hectare against Rs. 24026.50 per hectare for non-adopter's combination. This implied that the purchasing power of farmers group was increased with the increase in farm size. It is very clear from the table that the per hectare gross return received was increased with an increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 2,85,942.30 for adopter's combination and Rs. 1,29,539.25 for the non-adopter's combination. The net return (Rs./ha) was calculated as Rs. 1,12,195.50 for adopter's combination and Rs. 47,636.00 for the non-adopter's combination. The BCR values for adopters were computed as 1.63, 1.64, 1.65 and 1.65 in marginal, small, semi medium and medium farm sizes of the farmers, respectively with the pooled data of 1.65. In the case of non-adopter's, the value was found as 1.58 for all the groups of farmers. The calculated value of BCR was higher in the adopter's group than the non-adopter's group indicates the adopters' group gained more profit in the cropping sequence. To receive a better income, they need to facilitate some training, demonstration, and awareness to know more about good agricultural practices.

Combination 5: Integrated Farming System (Fishery cum poultry) and Fishery alone

Integrated Farming System (IFS) is one of the profitable ventures in agricultural system where the feeding cost of the fish is reduced and additional return from the other component can be obtained. In the study it was tried to evaluate and compare the economics of fishery-based IFS (adopter's combination) with fishery alone (non-adopter's combination). The costs and returns from the combinations of IFS and fishery alone in the Upper Brahmaputra Valley Zone are presented in Table 7. The table revealed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination and the non-adopter combination. The pooled cost C for adopter's combination was computed as Rs. 4,26,542.50 per hectare against Rs. 2,51,512.25 per hectare for non-adopter's combination. This implied that the purchasing power of farmers

group was increased with the increase in farm size. It was very clear from the table that the per hectare gross return received was increased with the increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 6,98,210.25 for adopter's combination and Rs. 2,92,659.38 for the non-adopter's combination. The net return (Rs./ha) was calculated as Rs. 2,71,667.75 for adopter's combination and Rs. 41,147.13 for the non-adopter's combination. It was clear from the discussion that the farmers under climate resilient groups (adopter's combination) adopted better farming practices than the normal situation (non-adopter's combination). The farmers under non-adopter combination can earn a better return provided scientific fish farming practices are followed. The BCR values for adopters were computed as 1.57, 1.61, 1.66 and 1.71 in marginal, small, semi medium and medium farm sizes of the farmers, respectively with the pooled data of 1.64. In case of non-adopters, the values found out were 1.15, 1.16, 1.17 and 1.17 in the said four groups of farmers with the pooled data of 1.16. This means that more BCR was calculated in the adopter's group than the non-adopter's group. The BCR for non-adopter's combination was not satisfactory. It may be due to that the problem of flood, insufficient feed supply to fishes and other management practices followed by the farmers. Kaur and Tanwar (2023) [3] reported a net profit of approximately 6.78 lakh rupees annually from 1 ha of integrated fish and poultry farming.

Combination 6: Integrated Farming System (Fishery cum Duckery) and Duckery alone

In the study it was observed that each of the Cost A, Cost B and Cost C was increased with the increase in farm size both in adopter's combination (Fishery cum duckery) and the non-adopter's combination (duckery alone) (Table 8). The pooled cost C for adopter's combination was computed as Rs. 5,65,144.00 per hectare against Rs. 3,25,178.25 per hectare for non-adopter's combination. This implied that the purchasing power of farmers group was increased with the increase in farm size. It is very clear from the table that the per hectare gross return received was increased with an increase in farm size both in the adopter's combination as well as the non-adopter's combination. The pooled gross return (Rs./ha) was computed as Rs. 12,12,000.25 for adopter's combination and Rs. 4,55,775.00 for the non-adopter's combination. The net return (Rs./ha) was calculated as Rs. 6,46,856.25 for adopter's combination and Rs. 1,30,596.75 for the non-adopter's combination. It was clear from the discussion that the farmers under climate resilient groups (adopter's combination) adopted better farming practices than the normal situation (non-adopter's combination). The farmers under non-adopter's combination could earn a better return provided scientific fish farming practices were followed. The BCR values for adopter's combination were computed as 2.09, 2.12, 2.17 and 2.19 in marginal, small, semi medium and medium farm sizes of the farmers, respectively with the pooled data of 2.14. In case of non-adopter's combination, the values found were 1.39, 1.39, 1.41 and 1.41 in the said four groups of farmers with the pooled data of 1.40. This means that more BCR was calculated in the adopter's group than the non-adopter's group. The BCR for non-adopter's combination was not satisfactory. It might be due to that the problem of flood, insufficient supply of feed to fishes and other management practices followed by the farmers. A similar study was reported by Sasmal *et al* (2025) [7].

Table 1: Classification of farmers based on operational holding

Type of farmers	Farm size	No. of farm families	Percentage of farm families
Adopter's combination	Marginal (land holding 0 to <1 ha)	28	46.67
	Small (land holding 1 to <2 ha)	19	31.67
	Semi-Medium (land holding 2 to <4 ha)	11	18.33
	Medium (land holding 4 to <10 ha)	2	3.33
	Total	60	100.00
Non-adopter's combination	Marginal (land holding 0 to <1 ha)	26	43.33
	Small (land holding 1 to < 2 ha)	18	30.00
	Semi-Medium (land holding 2 to <4 ha)	13	21.67
	Medium (land holding 4 to < 10 ha)	3	5.00
	Total	60	100

Table 2: Operational holding (in ha) of farmers

Type of farmers	Farm size	Operational holding (in ha)			
		Own	Leased in	Leased out	Total operational holding
Adopter's combination	Marginal	20.16 (23.87)	4.30 (67.19)	0.00 (0.00)	24.46 (25.86)
	Small	30.40 (36.02)	2.10 (32.81)	0.00 (0.00)	32.50 (34.36)
	Semi-Medium	24.64 (29.19)	0.00 (0.00)	2.50 (65.79)	27.14 (28.69)
	Medium	9.20 (10.90)	0.00 (0.00)	1.30 (34.21)	10.50 (11.10)
	Total	84.40 (100.00)	6.40 (100.00)	3.80 (100.00)	94.60 (100.00)
Non adopter's combination	Marginal	21.58 (21.95)	5.20 (62.65)	0.00 (0.00)	26.78 (24.67)
	Small	27.54 (28.01)	3.10 (37.35)	0.00 (0.00)	30.64 (28.23)
	Semi-Medium	35.10 (35.70)	0.00 (0.00)	1.20 (62.50)	36.30 (33.44)
	Medium	14.10 (14.34)	0.00 (0.00)	0.72 (37.50)	14.82 (13.65)
	Total	9832 (100.00)	8.30 (100.00)	1.92 (100.00)	108.54 (100.00)

Figures in the brackets indicate percentage to the total

Table 3: Costs and Returns from the combination of Flood tolerant rice + Cauliflower and Normal Winter rice + Cauliflower in Upper Brahmaputra Valley Zone

Items	Adopter's Combination					Non-Adopter's Combination				
	Flood tolerant rice + Cauliflower					Normal Winter rice + Cauliflower				
	Marginal	Small	Semi-medium	Medium	Pooled	Marginal	Small	Semi-medium	Medium	Pooled
Cost A (Rs./ha)	65488.00	66161.00	68723.00	72026.00	68099.50	30823.00	31710.50	32944.00	34325.50	32450.75
Cost B (Rs./ha)	86537.00	87277.00	90095.00	91192.00	88775.25	41155.00	42132.00	43488.00	44040.50	42703.88
Cost C (Rs./ha)	117440.00	117933.00	118891.00	119032.00	118324.00	54154.50	55987.00	56197.50	57638.50	55994.38
Gross Return (Rs./ha)	231636.00	247054.00	263173.00	270636.00	253124.75	102358.00	112125.00	117216.00	120909.00	113152.00
Farm Business Income (Rs./ha)	166148.00	180893.00	194450.00	198610.00	185025.25	71535.00	80414.50	84272.00	86583.50	80701.25
Family Labour Income (Rs./ha)	145099.00	159777.00	173078.00	179444.00	164349.50	61203.00	69993.00	73728.00	76868.50	70448.13
Net Income (Rs./ha)	114196.00	129121.00	144282.00	151604.00	134800.75	48203.50	56138.00	61018.50	63270.50	57157.63
BCR	1.97	2.09	2.21	2.27	2.14	1.89	2.00	2.09	2.10	2.02

Figures in the parentheses indicate percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Table 4: Costs and Returns from the combination of Flood tolerant rice + Potato and Normal Winter rice + Potato in Upper Brahmaputra Valley Zone

Items (Rs./ha)	Adopter's Combination					Non-Adopter's Combination				
	Flood tolerant rice + Potato					Normal Winter rice + Potato				
	Marginal	Small	Semi Medium	Medium	Pooled	Marginal	Small	Semi Medium	Medium	Pooled
Cost A	121508.00	124115.00	126597.00	130713.00	125733.25	60252.00	62057.00	63687.00	64476.00	62618.00
Cost B	148159.00	151027.00	153757.00	158285.00	152807.00	73527.00	75512.50	77647.00	78959.00	76411.38
Cost C	175900.00	177135.00	177558.00	180815.00	177852.00	86006.50	87205.00	88778.00	89007.00	87749.13
Gross Return	259278.00	266173.00	267093.00	286340.00	269721.00	121620.00	125021.50	126619.00	129976.50	125809.25
Farm Business Income	133777.00	142058.00	140496.00	155627.00	14398.75	61368.00	62964.50	62932.00	65500.50	63191.25
Family Labour Income	111119.00	115146.00	113336.00	128055.00	116914.00	48093.00	49509.00	48972.00	51017.50	49397.88
Net Income	83378.00	89038.00	89535.00	105525.00	91869.00	35613.50	37816.50	37841.00	40969.50	38060.13
BCR	1.47	1.50	1.50	1.58	1.51	1.41	1.43	1.43	1.46	1.43

Figures in the parentheses indicate percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Table 5: Costs and Returns from the combination of Flood tolerant rice + Toria and Normal Winter rice + Toria in Upper Brahmaputra Valley Zone

Items (Rs./ha)	Adopter' Combination					Non-Adopter's Combination				
	Flood tolerant rice + Toria					Normal Winter rice + Toria				
	Marginal	Small	Semi Medium	Medium	Pooled	Marginal	Small	Semi Medium	Medium	Pooled
Cost A	28101.00	29532.00	32013.00	33415.00	30765.25	13314.00	13860.00	14508.00	14610.50	14073.13
Cost B	36911.00	38485.00	41213.00	42757.00	39841.50	17645.50	18246.00	19336.00	19466.00	18673.38
Cost C	51419.00	52244.00	54524.00	55468.00	53413.75	23908.00	24002.00	24223.50	23972.50	24026.50
Gross Return	70070.00	71900.00	78200.00	80960.00	75282.50	30340.00	30425.00	31785.00	31993.50	31135.88
Farm Business Income	41969.00	42368.00	46187.00	47545.00	44517.25	17026.00	16565.00	17277.00	17383.00	17062.75
Family Labour Income	33159.00	33415.00	36987.00	38203.00	35441.00	12694.50	12179.00	12449.00	12527.50	12462.50
Net Income	18651.00	19656.00	23676.00	25492.00	21868.75	6432.00	6423.00	7561.50	8021.00	7109.38
BCR	1.36	1.38	1.43	1.46	1.41	1.27	1.27	1.31	1.33	1.30

Figures in the parentheses indicate percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Table 6: Costs and Returns from the combination of Flood Tolerant rice + Cabbage and Normal Winter rice + Cabbage in Upper Brahmaputra Valley Zone

Items (Rs./ha)	Adopter' Combination					Non-Adopter's Combination				
	Flood Tolerant rice + Cabbage					Normal Winter rice + Cabbage				
	Marginal	Small	Semi Medium	Medium	Pooled	Marginal	Small	Semi Medium	Medium	Pooled
Cost A	96815.00	101882.00	106416.00	110593.00	103926.50	47994.50	50976.00	52792.00	54661.50	51606.00
Cost B	120997.00	126570.00	131558.00	135833.00	128739.50	60044.00	63324.00	64507.00	65274.00	63287.25
Cost C	169609.00	172773.00	174485.00	178120.00	173746.80	80227.00	81059.50	83055.00	83271.50	81903.25
Gross Return	277268.00	283636.00	288400.00	294465.00	285942.30	127124.00	128313.00	131260.00	131460.00	129539.25
Farm Business Income	180453.00	181754.00	181984.00	183872.00	182015.80	79129.50	77337.00	78468.00	76798.50	77933.25
Family Labour Income	156271.00	157066.00	156842.00	158632.00	157202.80	67080.00	64989.00	66753.00	66186.00	66252.00
Net Income	107659.00	110863.00	113915.00	116345.00	112195.50	46897.00	47253.50	48205.00	48188.50	47636.00
BCR	1.63	1.64	1.65	1.65	1.65	1.58	1.58	1.58	1.58	1.58

Figures in the parentheses indicate percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Table 7: Costs and Returns from the combination of IFS (Fishery cum poultry) and Fishery alone in Upper Brahmaputra Valley Zone

Items (Rs./ha)	Adopter' Combination					Non-Adopter's Combination				
	IFS (Fishery cum poultry)					Fishery Alone				
	Marginal	Small	Semi Medium	Medium	Pooled	Marginal	Small	Semi Medium	Medium	Pooled
Cost A	301896.00	317762.00	329321.00	330894.00	319968.25	161624.00	167804.00	169581.00	172688.00	167924.25
Cost B	358028.00	375005.00	387373.00	389057.00	377365.75	207937.00	214550.00	222871.00	233286.00	219661.00
Cost C	410194.00	424880.00	434824.00	436272.00	426542.50	248094.00	249761.00	252996.00	255198.00	251512.25
Gross Return	642122.00	682852.00	720319.00	747548.00	698210.25	284400.00	290030.00	296350.00	299857.50	292659.38
Farm Business Income	340226.00	365090.00	390998.00	416654.00	378242.00	122776.00	122226.00	126769.00	127169.50	124735.13
Family Labour Income	284094.00	307847.00	332946.00	358491.00	320844.50	76463.00	75480.00	73479.00	66571.50	72998.38
Net Income	231928.00	257972.00	285495.00	311276.00	271667.75	36306.00	40269.00	43354.00	44659.50	41147.13
BCR	1.57	1.61	1.66	1.71	1.64	1.15	1.16	1.17	1.17	1.16

Figures in the parentheses indicate percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Table 8: Costs and Returns from the combination of IFS (Fishery cum Duckery) and Duckery in Upper Brahmaputra Valley Zone

Items (Rs./ha)	Adopter's Combination					Non-Adopter's Combination				
	IFS (Fishery cum Duckery)					Duckery alone				
	Marginal	Small	Semi Medium	Medium	Pooled	Marginal	Small	Semi Medium	Medium	Pooled
Cost A	419465.00	423041.00	427460.00	431451.00	425354.25	252149.00	269631.00	278119.00	288401.00	272075.00
Cost B	513827.00	517654.00	522383.00	526653.00	520129.25	284800.00	303505.00	312588.00	323589.00	306120.50
Cost C	547042.00	559799.00	571957.00	581778.00	565144.00	319346.00	320957.00	328365.00	332045.00	325178.25
Gross Return	1144682.00	1189355.00	1241854.00	1272110.00	1212000.25	442720.00	447248.00	464636.00	468496.00	455775.00
Farm Business Income	725217.00	766314.00	814394.00	840659.00	786646.00	190571.00	177617.00	186517.00	180095.00	183700.00
Family Labour Income	630855.00	671701.00	719471.00	745457.00	691871.00	157920.00	143743.00	152048.00	144907.00	149654.50
Net Income	597640.00	629556.00	669897.00	690332.00	646856.25	123374.00	126291.00	136271.00	136451.00	130596.75
BCR	2.09 (50.36)	2.12 (52.52)	2.17 (53.90)	2.19 (55.32)	2.14 (52.86)	1.39	1.39	1.41	1.41	1.40

Figures in the parentheses indicates percentage change in BCR of Adopters combinations over Non-Adopters Combinations

Conclusion

In climate resilient locations farmers usually face great challenges to perform their farm activities. There is always a probability of getting loss if they do not follow proper scientific agricultural practices. To cope up with the situation, farmer's self-study and experience of farming is essential. The Government should also pay some attention to such situation. The Government should popularize some best technologies for climate resilient agriculture so that the farmers can benefit from their farm practices.

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