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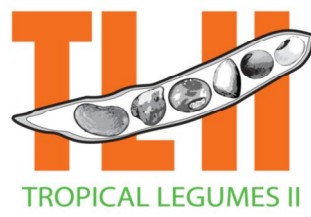
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Targeting and introduction of Chickpea improved cultivars in Barind region of Bangladesh

Tropical Legumes II Phase 2 Project

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Targeting and introduction of chickpea improved cultivars in Barind region of Bangladesh

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1. Introduction

Chickpea is one of the important food legumes of Bangladesh. The area and production of chickpea has declined because of high emphasis on enhancing area and production of staple cereals like rice, wheat, maize and other short duration oilseed crops. There is increasing concern about the sustainability of high input, intensively cropped cereal-dominated cropping systems in Bangladesh. Crop diversification with legumes can help in improving soil fertility and system productivity. Chickpea (*Cicerarietinum L.*) is one of the most important pulse crops in Bangladesh considering consumers' choice and consumption. Chickpea has been traditionally cultivated in Bangladesh under rainfed condition. About 85% Chickpea was grown in Jessore, Faridpur, Rajshahi, Kustia, Pabna, ChapaiNawabgonj and Dinajpur districts. Most of these areas belong to the Agro ecological zone (AEZ) 11 and 12.

The data on area, production and productivity of chickpea for the period from 1980-2012 is presented below (Table 1.1). The average area under chickpea in Bangladesh for the period from 1980-2012 was 49 thousand hectares. The area coefficient of variation (CV) during the same period was 76 percent. Similarly the average chickpea production during the same period was 35 thousand tonnes and CV was estimated at 75 percent. But, the productivity was increased marginally from 723.58 to 742.57 kg/ha during the same period.

Table 1.1 Area, Production and Productivity of chickpea in Bangladesh, 1980 to 2012

Statistic	Area ('000 ha)	Production ('000 tons)	Productivity (kg/ha)
Mean			
1980-1990	72	52	723.58
1990-2000	74	53	725.62
2000-2012	12	9	770.21
1980-2012	49	35	742.57
CV (Raw data)			
1980-1990	37	36	7
1990-2000	41	41	2
2000-2012	26	23	4
1980-2012	76	75	6

Source: BBS

A baseline survey of chickpea has been taken-up under Tropical Legumes II (TL II) project in drought prone districts of Rajshahi and ChapaiNawabgonj of Bangladesh because they were the top producers of chickpea occupying an area of 800 thousand ha during in 2009-10. The baseline survey

aimed at documenting the status of chickpea in terms of production and productivity, ruling varieties, preferences and constraints encountered by the farmers as well as functionaries along the value chain, economics of chickpea, marketing opportunities, marketable surplus and finally to track the supply chain. The analysis of baseline information will serve as a feedback about existing status as prima facie of chickpea. This would redirect the research priorities to enhance breeding programme and also make possible market interventions to enhance the remuneration to the farmers in order to improve livelihoods. However, the specific objectives of this study are:

1. To study the socio economic and environmental factors that influence the adoption of chickpea improved cultivars and also identify the major production constraints for the adoption those.
2. To track the preferred traits along the value chain.
3. To provide preliminary feed back to the crop improvement

2. Methodology

2.1 Sampling framework

The total sample farmers identified from both adopted and control villages of Rajshahi and ChapiNawabgonj districts together constitute about 270. In each district, three treated (adopted) and three control villages have been identified using the FPVS trial locations information. The district wise selection comprised of 90 farmers from adopted area and 45 from control area. The study covers small, medium and large chickpea growers from each location.

2.2 Analytical techniques: Simple tabular analysis was adopted to compile the general characteristics of the sample farmers, the resource structure, cost and returns, profits and opinions of farmers regarding the problems in production and marketing of chickpea. Simple statistics like averages and percentages were used to compare, contrast and interpret results in an appropriate way. To analyse and study the traits preferred in chickpea, weighted average ranking method was used.

3. Results and Discussions

3.1 Socio- economic profile of sample farmers

Socio- economic profile of sample farmers in the study areas were presented in Table 3.1. More than ninety percent of sample farmers were male headed households in the study area. On an average, the household size of the sample farmers were 6 and dependency ratio were 2. The average age of the sample farmers ranges from 43 to 46 years. Majority of the sample farmers were falling into the category of middle ages. Educational status of the sample farmers in terms of number of years of education completed was around 7.

Majority of the sample farmers were not participating in the nominated/elected bodies. Ninety six to ninety seven percent of the sample farmers from both adopted and control villages reported that agriculture as their main occupation followed by business (50-60%). Overall, data showed that

majority percent of the sample farmers had two wheeler/bicycles and television sets indicating that use of these goods had increased in the recent times.

Table 3.1: Socio- economic profile of sample farmers in the study area, 2011-12

Socio-economic Issue	Rajshahi		ChapaiNawabgonj		Pooled	
	A	C	A	C	A	C
Male headed households (%)	97	96	93	91	95	93
Household size (No)	6	6	6	6	6	6
Male workers(no)	2	2	2	2	2	2
Female workers (no)	-	-	-	-	-	-
Dependency ratio*	2	2	2	2	2	2
Age of household head (Years)	43	46	43	45	43	45
Education level of household head (No. of years)	7	6	6	6	7	6
Participation in local bodies (%)	7	7	7	4	7	6
Proportion belonging to forward castes (%)	-	-	-	-	-	-
Proportion belonging to religious minorities (%)	7	2	6	4	7	3
Proportion with agriculture as the main occupation (%)	94	96	97	98	96	97
Proportion with business/service as secondary occupation (%)	67	56	64	49	66	53
Ownership of two wheelers/bicycles (%)	66	69	63	56	64	62
Ownership of television sets (%)	60	64	57	44	59	54
Ownership of radio/tape recorders (%)	4	-	1	2	3	1

* Dependency ratio= (Size of family - Number of workers)/Number of workers

3.2 Land ownership and operational holding pattern

Land ownership pattern and operational farm size in the study area was presented in Table 3.2. Average operational land holding of Rajshahi sample farmers were 1.40 ha irrigated and 0.20 ha in dryland whereas it was 0.95 ha irrigated and 0.07 ha of dryland in ChapaiNawabgonj sample farmers.

3.3 Assets and liabilities

Average value of owned land per household in Rajshahi was Tk. 7370/- thousand in adopted villages while it was Tk. 6054/- thousand in control village. In ChapaiNawabgonj, average value of owned land per household had Tk. 6253/- thousand in adopted village and Tk. 4414/- thousand in control villages (Table 3.3).

Table 3.2: Average land holding size across different farm categories (ha)

Rajshahi	Particulars	Irrig/dry	Marginal	Small	Large	Pooled
	Own land	<i>Irrig</i>		0.30	0.90	3.50
<i>Dry</i>			-	0.10	1.00	0.20
Leased-in land	<i>Irrig</i>		0.40	0.30	-	0.30
	<i>Dry</i>		-	-	-	-
Leased-out land	<i>Irrig</i>		-	-	-	-
	<i>Dry</i>		-	-	-	-
Operated land	<i>Irrig</i>		0.70	1.20	3.50	1.40

ChapaiNawabgonj	Own land	Dry	-	0.10	1.00	0.20
		Irrig	0.20	0.70	2.40	0.75
	Leased-in land	Dry	-	0.10	0.20	0.07
		Irrig	0.20	0.10	0.60	0.20
	Leased-out land	Dry	-	-	-	-
		Irrig	-	-	-	-
	Operated land	Irrig	0.40	0.80	3.0	0.95
		Dry	-	0.10	0.20	0.07

Table 3.3: Value of land owned by sample farmers in the study areas, 2011-12 ('000 Tk/Hh)

Type of Land	Rajshahi				ChapaiNababgonj			
	Adopted		Control		Adopted		Control	
	Area (ha)	Value (Tk 000)	Area (ha)	Value (Tk 000)	Area (ha)	Value (Tk 000)	Area (ha)	Value (Tk 000)
Irrigated land	1.20	6358	1.00	5325	1.13	5861	0.80	4150
Rainfed land	0.30	963	0.20	704	0.13	370	0.07	242
Fallow land	0.02	49	0.01	25	0.01	22	0.01	22
Total land	1.52	7370	1.21	6054	1.27	6253	0.89	4414

In the adopted and control villages of Rajshahi district, total livestock accounted for average value of Tk. 156961/- and Tk. 155501/- per household respectively whereas it was Tk. 138169/- for adopted villages and Tk. 157977/- for control villages in ChapaiNawabgonj district (Table 3.4).

Table 3.4: Value of Livestock owned by sample farmers in the study areas,2011-12 ('000 Tk/Hh)

Type of Livestock	Rajshahi				ChapaiNawabgonj			
	Adopted		Control		Adopted		Control	
	Number	Value	Number	Value	Number	Value	Number	Value
Draft animals	2	37.5	2	46.0	2	36.6	2	51.6
Cows	2	50.3	2	50.5	2	37.4	2	53.6
Buffaloes	1	35.0	1	33.0	1	36.0	1	28.0
Young stock	2	24.4	1	13.7	1	13.4	1	10.7
Sheep/goat	4	4.2	2	6.4	3	8.9	3	8.2
Others (Hen,Duck, Pigeon)	-	5.4	-	5.7	-	5.6	-	5.6
Total livestock	11	157	8	156	9	138	9	158

In Rajshahi district, total farm implements had the average value as Tk. 16660/- per household for adopted village and Tk. 13600/- for control villages followed by Tk. 11277/- per household for adopted village and an average value of Tk. 13026/- for control villages in ChapaiNawabgonj district (Table 3.5).

Table 3.5: Value of Farm Implements owned by sample farmers, 2011-12(Tk per Hh)

Type of Implement	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Tractor and accessories	10777	10000	9844	11289
Electrical/diesel pump sets	3611	1689	1089	1111

Bullock drawn tools	166	244	66	70
Others tools (Harvester, Thresher, power sprayers etc.)	2106	1667	278	556
Total farm implements	16660	13600	11277	13026

In the adopted and control villages of Rajshahi district, total consumers durables assets accounted for average value of Tk. 281571/- per household and Tk. 187005/- per household respectively whereas it was Tk. 280401/- per household for adopted villages and Tk. 157138/- per household for control villages in ChapaiNawabgonj district (Table 3.6).

Table 3.6: Value of Consumer durables owned by sample farmers in the study areas, 2011-12(Tk per Hh)

Type of Consumer durables	Rajshahi				ChapaiNawabgonj			
	Adopted		Control		Adopted		Control	
	No.	Value	No.	Value	No.	Value	No.	Value
Residential house	3.1	226278	2.6	140667	2.1	243189	2.6	121667
Cattle shed	1.1	23222	1.0	15300	0.8	17939	0.8	15260
Cycle/two-wheelers	0.8	19644	0.8	20200	0.7	13043	0.7	13689
Others (Television, Fridge, mobile set etc.)	2.4	12427	1.0	10838	1.3	6230	0.8	6522
Total consumer durables	7.4	281571	5.4	187005	4.9	280401	4.9	157138

Farmers of Rajshahi district were obtaining loans from various nationalized banks, NGO's and private banks to the extent of Tk. 36344/- per household for the adopted villages and Tk. 22800/- for the control villages. In ChapaiNawabgonj sample farmers, loans were sanctioned on an average per house hold of Tk. 16806/- for adopted villages and Tk.11911/- for control villages. Farmers ofRajshahi lend to villagers and friends/relatives by extending an amount of Tk. 9916/- per household per year for adopted villages and Tk. 2420/- for the control villages. But in ChapaiNawabgonj farmers were also lending to villagers and friends/relatives (in an informal way) by extending about Tk. 4958/-for adopted villages and Tk. 1210/- for control. Savings in banks, policies, Samitti, NGO's and post office to the extent of Tk. 34144/- per household in adopted villages and Tk. 12149/- per household for control villages in Rajshahi districtwhereas it was Tk. 7011/- for adopted villages and Tk. 4945/- per household for control villages in ChapaiNawabgonj district (Table 3.7).

Table 3.7: Financial Liabilities and Assets of sample farmers in the study areas, 2011-12(Tk per Hh)

Financial Liabilities and Assets	Rajshahi		ChapaiNababgonj	
	Adopted	Control	Adopted	Control
Borrowings (-)	36344	22800	16806	11911
Lending's (+)	9916	2420	4958	1210
Savings (+)	34144	12149	7011	4945
Net Liabilities	7716	-8231	-4837	-5756

The rate of interest for bank loans remained at 12% but the loans from the private financiers, money lenders and finance companies were costing at 20-35% rate of interest for both the districts in studied areas (Table 3.8).

Table 3.8: Source of finance across sample districts (% HH)

Source of laons	Rajshahi		Interest rate(%)	ChapaiNababgonj		Interest rate(%)
	A	C		A	C	
Loans:						
Nationalized banks	23	20	12	13	13	12
Private banks	4	2	20	8	2	20
NGOs/SHGs	21	22	32	36	24	32
Friends/relatives	4	2	12	4	7	12
Finance companies/samiti	-	9	22	3	2	22
Lending:						
Villagers	3	4	-	3	4	-
Friends/relatives	12	4	-	7	-	-
Savings:						
Banks	27	16	12	3	4	12
LIC/PLI Policies	2	4	12	-	-	-
Samiti	1	2	12	-	-	-
NGOs/SHGs	3	13	12	-	-	-
Post office	3	-	12	4	7	12

Average total assets per household in Rajshahi had Tk. 7826/- thousand in adopted villages and Tk. 6410/- thousand in control village. In ChapaiNawabgonj, average total assets per household had Tk. 6683/- thousand in adopted village and Tk. 4743/- thousand in control villages. Net worth per household in Rajshahi had Tk. 7819/- thousand in adopted villages and Tk. 6402/- thousand in control village. In ChapaiNawabgonj, net worth per household had Tk. 6688/- thousand in adopted village and Tk. 4737/- thousand in control villages (Table 3.9).

Table 3.9: Net worth of sample farmers in the study areas, 2011-12 (Tk '000 per Hh)

Assets and Liabilities	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Value of Land	7370	6054	6254	4414
Value of Livestock	157	156	138	158
Value of Farm Implements	17	13	11	13
Value of Consumer durables	282	187	280	158
Total Assets	7826	6410	6683	4743
Net Liabilities	7	-8	-5	-6
Net worth (Total assets - Net liabilities)	7819	6402	6688	4737

3.4 Cropping pattern and importance of chickpea

The cropping pattern followed by the sample respondents during the year 2011-12 agricultural year is presented in Table 3.10a, 3.10b and 3.10c. The major crops grown during *kharif season* were Paddy (0.21 ha/hh for adopted and control in Rajshahi districts) and mugbean (0.15 ha/hh for adopted and control in both the districts).

Table 3.10a: Average cropping patterns across study districts (ha/hh)-Kharif (Rainy)*

Crops	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Mugbean	0.15	0.15	0.15	0.15
Paddy (T. Aman)	0.21	0.21	0.21	0.20
*(March- June)				

During *rabi season*, since all the respondents were chickpea growers by choice, the area under chickpea was 0.43 ha/hh followed by wheat, potato and mustard (0.12 ha/hh) (Table 3.10b).

Table 3.10b: Average cropping patterns across study districts (ha/hh)-Rabi (Post rainy)*

Crops	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Chickpea	0.43	0.44	0.44	0.41
Wheat	0.12	0.12	0.12	0.12
Potato	0.12	0.12	0.12	0.12
Mustard	0.12	0.12	0.12	0.13
*(Nov-Feb)				

Mainly only one crop grown during summer season (kharif-2) was paddy (0.12 ha/hh) for both adopted and control areas in both the districts (Table 3.10c).

Table 3.10c: Average cropping patterns across study districts (ha/hh)- Summer (kharif-2)

Crops	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Paddy (T. Aus)	0.12	0.12	0.12	0.12
*(July-Oct)				

On an average 56 ha cropped area was under rainy season and 72 ha was under post rainy season and the chickpea area was 35 ha under post rainy season for adopted farmers in the study areas (Table 3.11). Proportion of chickpea area was 49 ha to the total cropped areas for adopted farmers.

Table 3.11: Relative importance of chickpea crop in cropped area of Bangladesh, 2011-12

Cropped area	Rajshahi		ChapaiNawabgonj		Pooled Sample	
	A	C	A	C	A	C
Rainy season cropped area (ha)	54	27	58	28	56	27
Post rainy season cropped area (ha)	62	39	81	46	72	43
Area under rainy season chickpea(ha)	-	-	-	-	-	-
Area under post- rainy season chickpea (ha)	32	18	38	20	35	19
Proportion of chickpea area to total cropped area (%)	52	45	47	44	49	44

Highest productivity level were potato (16-18 t/ha) followed by wheat (3.15 t/ha), mustard (1.3-1.5 t/ha) and chickpea (1.15 t/ha) under *rabi season* in the study areas (Table 3.12).

Table 3.12: Average productivity level across major crops (kg/ha)(source: FGDs)

Crops	Season (K/R/S)	Rajshahi		ChapaiNawabgonj	
		Adopted	Control	Adopted	Control
Chickpea	R	1153	1077	1173	1149
Wheat	R	3105	3157	3158	3135
Potato	R	17800	16600	18377	17191
Mustard	R	1531	1482	1433	1359
Mugbean	K	741	766	766	741
Paddy (T.Aman)	K	4446	4298	4520	4322
Paddy (T.Aus)	S	3835	3779	3927	3853

The chickpea cultivars grown during the last three years from 2009-10 to 2011-12 cropping season in the selected districts was analysed and the results are presented in Table 3.13. Six varieties were grown in the study area, namely BARI Chola-1, BARI Chola-3, BARI Chola-4, BARI Chola-5, BARI Chola-9 and BINA Chola-4. During the year 2011-12 average area of BARI Chola-3, BARI Chola-5 and Chola-9 were 0.27 ha, 0.66 ha and 0.18 ha respectively and BINA-4 was 0.05 ha per household adopted farmers whereas it was 0.28 ha of BARI Chola-3, 0.63 ha of BARI Chola-5, 0.06 ha of BARI chola-9 and 0.11 ha of BINA Chola-4 in control farmers in the studied areas. It is very interesting to note that over the last three years, the area under chickpea seemed to increase, irrespective of the variety.

Table 3.13: Allocation of area under different cultivars/varieties in the last three seasons (hh/ha)

Season	Year	Variety	Rajshahi		ChapiNawabgonj		Pooled	
			A	C	A	C	A	C
Rabi	2009-10	BARI-3	0.11	0.10	0.07	0.11	0.18	0.21
		BARI-5	0.27	0.16	0.32	0.26	0.59	0.42
		BARI-9	0.06	0.02	0.05	0.01	0.11	0.03
		BINA-4	0.02	0.04	0.01	0.04	0.03	0.07
	2010-11	BARI-3	0.11	0.10	0.11	0.12	0.22	0.23
		BARI-5	0.29	0.19	0.42	0.26	0.70	0.45
		BARI-9	0.07	0.03	0.07	0.01	0.14	0.04
		BINA-4	0.02	0.05	0.01	0.04	0.04	0.09
	2011-12	BARI-3	0.11	0.10	0.16	0.17	0.27	0.28
		BARI-5	0.27	0.20	0.39	0.43	0.66	0.63
		BARI-9	0.08	0.03	0.09	0.03	0.18	0.06
		BINA-4	0.03	0.09	0.02	0.02	0.05	0.11

A: Adopted villages; C: Control villages

On an average the area covered under chickpea was highest BARI Chola-5 (59.24 ha in adopted and 28.23 ha in control farmers) followed by BARI Chola-3, BARI Chola-9 and BINA Chola-4 in the study areas (Table 3.14).

Table 3.14: Composition of chickpea varieties in the study areas, 2011-12 (ha)

Variety	Rajshahi		ChapaiNawabgonj		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
BARI Chola-3	10.06	4.66	14.48	7.75	24.54	12.41
BARI Chola-5	24.45	8.80	34.79	19.43	59.24	28.23
BARI Chola-9	7.38	1.34	8.41	1.45	15.79	2.79
BINA Chola-4	2.58	4.01	1.60	1.08	4.19	5.09
Total	44.48	18.81	59.28	29.71	103.76	48.52

The average of the best yields harvested by the sample respondents was 1576.31 kg/ha for adopted farmers as against 1402.96 kg/ha for control farmers in rain fed situation (Table 3.15). In good years, the average yield was to the tune of 1081.06 kg/ha and 1117.68 kg/ha in rain fed conditions for adopted and control farmers respectively whereas in bad years, the corresponding yield levels were 657.77 kg/ha and 644.76 kg/ha for adopted and control farmers respectively.

Table 3.15: Productivity levels of chickpea (kg/ha) perceived by the sample farmers, 2011-12

Perceived Yield	Rajshahi		ChapaiNawabgonj		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Rain fed						
Good	1064.93	1116.44	1096.92	1119.36	1081.06	1117.68
Bad	605.64	607.62	719.83	664.30	657.77	644.76
Best	1630.20	1432.60	1545.51	1373.32	1576.31	1402.96
Irrigated						
Good	-	-	-	-	-	-
Bad	-	-	-	-	-	-
Best	-	-	-	-	-	-

On an average the highest yield was BARI Chola-9 (1380 kg/ha for adopted farmers and 1273 kg/ha for control farmers) followed by BARI Chola-5, BARI Chola-3 and BINA Chola-4 (Table 3.16).

Table 3.16: Productivity of chickpea varieties in the study areas, 2011-12 (Kg/ha)

Variety	Rajshahi		ChapaiNawabgonj		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
BARI Chola-3	996	1003	1100	958	1028	981
BARI Chola-5	1123	1115	1145	1040	1136	1063
BARI Chola-9	1375	1264	1384	1282	1380	1273
BINA Chola-4	988	935	951	926	970	931
Source: FGD's						

3.5 Economics of chickpea and other competing crops

It was observed from the financial analysis that among the studied competitive crops, highest gross return (Tk.163 thousand/ha for adopted farmers and Tk. 152 thousand/ha for control farmers) was found for potato followed by mustard (Tk. 89 thousand/ha for adopted and Tk. 85 thousand/ha for control farmers), chickpea (Tk.73 thousand/ha for adopted and Tk.70 thousand/ha for control farmers) and wheat (Tk. 66 thousand/ha for both adopted and control farmers). But highest benefit

cost ratio was calculated for chickpea (2.1 for adopted and 1.9 for control farmers) followed by mustard (1.9 for adopted and 1.8 for control farmers). On the other hand, lowest benefit cost ratio was obtained from potato (1.3 for adopted and 1.2 for control farmers) due to highest production cost obtained from potato (Table.3.17).

The input-output analysis of ruling chickpea cultivars utilization patterns of inputs in the study areas is depicted in Table 3.18 & 3.19. The average output indicated yield level of 1123 kg/ha among adopted and 1115 kg/ha in case of control area for BARI Chola-5 in Rajshahi district whereas it was 1572 kg/ha for adopted and 1347 kg/ha for control area for BARI Chola-5 in ChapaiNawabgonj districts. In case of BARI Chola-3, average yield was 995 kg/ha for adopted and 1003 kg/ha for control area in Rajshahi district. On the other hand, it was 1100 kg/ha for adopted and 1242 kg/ha for control area in ChapaiNawabgonj district. The productivity was more in case of BARI Chola-5 than BARI Chola-3 for both adopted and control situation. The utilization pattern of inputs also showed almost similar trend between varieties and locations.

Table 3.17: Cost and returns from different competing crops grown by sample farmers in the study areas, 2011-12

Particulars	Rajshahi		ChapaiNawabgonj		Pooled Sample	
	Adopted	Control	Adopted	Control	Adopted	Control
Gross returns (Tk.'000/ha):						
Chickpea	74	68	73	71	73	70
Wheat	68	69	63	63	66	66
Potato	160	149	165	155	163	152
Mustard	92	89	86	82	89	85
Gross cost (Tk.'000/ha):						
Chickpea	38	39	33	35	36	37
Wheat	51	52	44	45	48	49
Potato	122	126	124	127	123	127
Mustard	46	47	48	50	47	49
Net return (Tk.'000/ha):						
Chickpea	36	29	40	36	38	33
Wheat	17	17	19	18	19	18
Potato	38	23	41	28	40	26
Mustard	46	42	38	32	42	37
BCR:						
Chickpea	1.9	1.7	2.2	2.0	2.1	1.9
Wheat	1.3	1.3	1.4	1.4	1.4	1.4
Potato	1.3	1.2	1.3	1.2	1.3	1.2
Mustard	2.0	1.9	1.8	1.6	1.9	1.8
Source: FGD's						

Table 3.18: Economics of chickpea on sample farms in the study areas, 2011-12 (Tk per ha)

Operations	Rajshahi			
	Adopted		Control	
	BARI Chola-5	BARI Chola-3	BARI Chola-5	BARI Chola-3
Land preparation	8585	10681	8084	9423
FYM/Compost	-	-	-	-

Seed costs	4768	5943	4498	3660
Sowing costs	202	225	202	202
Fertilizer costs	3892	4850	3683	4828
Micro-nutrient costs	-	-	-	-
Inter-culture costs	-	-	-	-
Weeding costs	-	-	-	-
Plant protection costs	524	651	494	389
Irrigation costs	-	-	-	-
Watching expenses	-	-	-	-
Harvesting costs	4768	5943	4498	5951
Threshing costs	3361	3967	3001	3982
Marketing costs	397	352	389	352
Total costs/ha	26497	32612	24849	28787
Rental value per season	13121	13121	13121	13121
Grain yield (kgs)	1123	996	1115	1003
Grain price (Tk/kg)	58	57	57	57
Fodder yield (kgs)	636	786	561	449
Fodder price (Tk/kg)	3	3	3	3
Source: FGD's				

Contd.

Operations	ChapaiNawabgonj			
	Adopted		Control	
	BARI Chola-5	BARI Chola-3	BARI Chola-5	BARI Chola-3
Land preparation	7403	9873	6340	9970
FYM/Compost	-	-	-	-
Seed costs	4760	3331	4079	3331
Sowing costs	202	202	202	202
Fertilizer costs	2350	3585	2043	3473
Micro-nutrient costs	-	-	-	-
Inter-culture costs	-	-	-	-
Weeding costs				
Plant protection costs	644	457	524	464
Irrigation costs	-	-	-	-
Watching expenses	-	-	-	-
Harvesting costs	5037	3653	4319	4034
Threshing costs	3361	4034	2882	4004
Marketing costs	554	382	472	434
Total costs/ha	24311	25517	20861	25912
Rental value per season	11698	11699	11698	11699
Grain yield (kgs)	1145	1100	1040	958
Grain price (Tk/kg)	58	54	57	54
Fodder yield (kgs)	636	472	524	501
Fodder price (Tk/kg)	3	3	3	3
Source: FGD's				

Higher gross return was found BARI Chola-5 (ranges Tk. 65 thousand to Tk. 68 thousand) followed by BARI Chola-3 (Tk. 53 thousand to Tk. 60 thousand). And benefit cost ratio was also higher for BARI Chola-5 (ranges from 1.70 to 1.90) than BARI Chola-3 (ranges from 1.30 to 1.60) for adopted and control farmers in both the locations (Table.3.19).

Table 3.19: Economics of BARI Chola-3 and BARI Chola-5 cultivars in rain fed condition

Operations	Adopted		Control	
	BARI Chola-5	BARI Chola-3	BARI Chola-5	BARI Chola-3
Rajshahi				
Yield (kg/ha)	1123	995	1115	1003
COC(Tk/ha)	39618	45733	37970	41908
Gross returns(Tk/ha)	67042	59130	65238	58518
Net returns (Tk/ha)	27424	13397	27268	16610
BCR	1.70	1.30	1.70	1.40
ChapaiNababgonj				
Yield (kg/ha)	1144	1100	1040	958
COC(Tk/ha)	36009	37216	32559	37611
Gross returns(Tk/ha)	68318	60816	60852	53235
Net returns (Tk/ha)	32309	23600	28293	15624
BCR	1.90	1.60	1.90	1.40

Source: FGD's

Table 3.20: Net household income of sample farmers in the study areas,2011-12(Tk/Year/hh)

Source of income	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Income from crops	51322	47856	51344	47578
Farm work (labor earnings)	7138	7956	6022	6800
Non-farm work (labor earnings)	1467	1956	1302	1235
Regular Farm Servant (RFS)	5589	2956	3345	2575
Livestock (milk and milk products selling)	6022	4000	4589	3933
Income from hiring out bullocks	-	-	222	-
Income from selling sheep, goat, chicken, meat, eggs etc.	15822	11078	12522	10044
Selling of water for agriculture purpose	50	11	-	-
Selling CPR (firewood, fruits, stones, and mats etc)	344	467	-	-
Selling handicrafts (specify)	-	-	-	-
Rental income (tractor, auto, sprayer, & truck etc.)	222	160	-	-
Rent from land, building and machinery etc.	6767	4556	5222	3545
Caste occupations (specify)	-	-	-	-
Business (specify)	18278	14600	11233	12444
Regular salaried jobs (Govt./private)	1556	2844	5466	4400
Out migration	7778	1244	3244	1911
Remittances	4444	1156	2345	986
Interest on savings and from money lending	851	111	-	-
Cash and kind gifts including dowry received	1722	378	-	-

Pension from employer	1267	-	-	-
Government welfare/development Programs	-	-	-	-
Grand Total	139459	101329	106967	95451

3.6 Income and expenditure of sample farmers

The analysis of the results on annual net household income by sources is presented Table 3.20. The income from crops was a major source among farmers across districts showed that average income from crops contributed respectively in adopted and control areas (Tk. 51322, Tk. 47856) in Rajshahi district was substantially more or less similar than the corresponding incomes from crops (Tk. 51344, Tk. 47578) in ChapaiNawabgonj district. This was mainly attributed to same environment in both the districts. The other sources which contributed to the total household income were business, selling livestock and poultry, labour earnings and income from rent land & farm machinery. The annual total income of the household in the adopted area was Tk. 139459 and that in control area was Tk. 101329 in Rajshahi district and in the adopted area was Tk. 106967 and in control area was Tk. 95451 in ChapaiNawabgonj district.

Table 3.21: Consumption expenditure of sample farmers,2011-12 (Tk/Year/hh)

Food item	Rajshahi		ChapaiNawabgonj	
	Adopted	Control	Adopted	Control
Cereals	26372	18514	20482	21396
Pulses	10560	10996	7793	4504
Milk and Milk products	847	499	589	465
Edible oils	10979	13440	11648	8640
Non-Veg. foods	18555	19392	15878	13333
Fruits and vegetables	4745	4790	2834	2477
Others (Tea/coffee,sugar,gur,spices etc.)	1178	1270	891	971
Total food expenditure	73236	68901	60115	51786
Health	1574	1291	1318	1377
Education	1969	1796	1992	1878
Entertainment and travel	862	642	692	584
Clothing and shoes	4227	3800	2578	2589
Ceremonies	1097	1011	921	876
Alcohol and Cigarettes	726	400	500	643
Cosmetics	581	556	581	436
Others (maintenance, cooking fuel, mobile etc.)	2238	2022	2235	2663
Total Non-food	13274	11518	10817	11046
Total expenditure	86510	80419	70932	62832

The annual food consumption expenditure for various food items (Table 3.21) across districts was found to be more or less similar among the households. The annual food consumption expenditure indicated that cereals food accounted for largest proportion of expenditure (Tk. 26372 adopted and Tk. 18514 control in Rajshahi district and Tk. 20482 adopted and Tk. 21396 control in ChapaiNawabgonj district) by household followed by non-veg. food (Tk. 18555 adopted, Tk. 19392 control in Rajshahi and Tk. 15878 adopted, Tk. 13333 control in ChapaiNawabgonj), edible oils (Tk. 10979 adopted, Tk. 13440 control in Rajshahi and Tk. 11648 adopted, Tk. 8640 control in

ChapaiNawabgonj) and pulses (Tk. 10560 adopted, Tk. 10996 control in Rajshahi and Tk. 7793 adopted, Tk. 4404 control in ChapaiNawabgonj). The remaining food expenditure incurred was on fruits and vegetables and spices. The annual total food expenditure per household was Tk. 73236 for adopted and Tk 68901 for control in Rajshahi and Tk. 60115 for adopted and Tk. 51786 for control in ChapaiNawabgonj district.

The annual non-food expenditure showed that the proportion of expenditure incurred by households indicated almost similar trend in pattern of expenditure across districts and among adopted and control areas.

The proportion of utilization pattern of output to the total production by households across districts and areas (adopted and control) are presented in Table 3.22. Marketable surplus is grain output available to be sold after meeting the requirement of own consumption, other uses like kind wages gifts and as own seed. The results showed that a large proportion of the total output produced by households in case of adopted 160/161 kg and 120 kg of control was sold in the market in both the district. The adopted and control households retained respectively a considerable quantity of output for consumption.

Table 3.22: Crop utilization (main product) per HH (kgs) (BARI Chola-5)

Particulars	Rajshahi		ChapiNababgonj	
	Adopted	Control	Adopted	Control
Grain output (Kg)	1059.36	1099.15	1081.86	1278.91
Consumed (Kg)	133.11	118.56	111.15	69.16
Other uses*	24.70	18.11	28.82	12.35
Kept as own seed (Kg)	60.24	49.40	54.29	49.40
Sold as seed (Kg)	384.91	290.91	384.99	296.40
Seed sale price (Tk/kg)	92.00	92.00	90.00	90.00
By-product (Kg)	958.91	454.48	261.55	313.69
By-product sale price (Tk/Kg)	3.00	3.00	3.00	3.00
Qty sold in the market (kg)	456.40	622.17	491.04	851.60
Market Price (Tk/Kg)	57	57	57	57
Marketing cost (Tk/q)	86.45	86.45	118.56	111.15

*Includes kind wages, gifts and fed to cattle etc

The study results showed that distance to regulated market and storage centre from the study areas were 2.5 to 3.0 km and 35 to 40 km respectively (Table 3.23).

Table 3.23: Access to market and storage facilities

Dist.	A/C	Village name	Distance to regulated market (km)	Distance to storage facilities (km)
Rajshahi	A	Bijoynagor, Kadomshohor and Kakonhut	2.5	35
	C	Deopara, Saroil and Nazirpur	3.0	35
Chapai Nabab gonj	A	Manikara, Bahoroil and laxmipur	2.5	35
	C	Amnura, Dheenagor and Kanpara	3.5	40

3.7 Sources of information

The results on important sources of information on technology of the produce to the farmers showed that they depended on more than one source of information. Main sources of information about new cultivar, fertilizer management, pest and diseases management with ranked out and presented in Table 3.24. In both the districts the main sources of information about new cultivars, were obtained to the sample farmer from research institute (Rank-1), agricultural extension worker (Rank-2) and input-suppliers (Rank-3) and about fertilizer management were obtained from input-dealers (rank-1), research station (rank-2) and extension staff (rank-3) in the study areas.

Table 3.24: Sources of information to sample farmers in the study areas, 2011-12 (Wt. scale)

Sources of information	New seed/cultivar		Fertilizer management		Pest management		Disease management	
	A	C	A	C	A	C	A	C
Rajshahi								
Input-dealers	6.0(3)	6.0(3)	8.0(1)	8.0(1)	8.0(1)	8.0(1)	6.0(3)	6.0(3)
Research station	8.0(1)	8.0(1)	7.0(2)	7.0(2)	7.0(2)	7.0(2)	8.0(1)	8.0(1)
Extension staff	7.0(2)	7.0(2)	6.0(3)	6.0(3)	6.0(3)	6.0(3)	7.0(2)	7.0(2)
T.V/Radio	-	-	-	-	-	-	-	-
Magazines/News paper	-	-	-	-	-	-	-	-
Fellow farmers	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)
Friends/relatives	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)
NGOs	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)
ChapaiNababgonj								
Input-dealers	6.0(3)	6.0(3)	8.0(1)	8.0(1)	8.0(1)	8.0(1)	6.0(3)	6.0(3)
Research station	8.0(1)	8.0(1)	7.0(2)	7.0(2)	7.0(2)	7.0(2)	8.0(1)	8.0(1)
Extension staff	7.0(2)	7.0(2)	6.0(3)	6.0(3)	6.0(3)	6.0(3)	7.0(2)	7.0(2)
T.V/Radio	-	-	-	-	-	-	-	-
Magazines/News paper	-	-	-	-	-	-	-	-
Fellow farmers	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)	5.0(4)
Friends/relatives	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)	4.0(5)
NGOs	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)	3.0(6)

(Figures in the parentheses indicate rank of importance as source of information)

3.8 Preferred traits of chickpea and price premiums for traits

To analyse the study the traits preferred in chickpea cultivars by the farmers, weighted average Ranking Method was used. Having observed the constraints in all the existing varieties the preferences for in the studied cultivars were presented in Table 3.25a. In both the districts farmers preferred BARI Chola-5 for high yield (Rank-1) followed by fit into existing cropping patterns (Rank-2) and disease resistance (Rank-3) and BARI Chola-9 for also high yield in Rajshahi rank-1 and ChapaiNababgonj rank-3, disease resistance in Rajshahi rank-2 and ChapaiNababgonj rank-1 and pod borer resistance in Rajshahirank-3 whereas it was rank-2 in ChapaiNababgonj. The other preferred traits, in general were attractive grain colour and grain size across varieties and locations.

Table 3.25 a: Preferred traits for chickpea production among cultivars (Wt. scale)

	Rajshahi		ChapaiNababgonj	
	BARI Chola-5	BARI Chola-9	BARI Chola-5	BARI Chola-9
High yield	9.9(1)	10.0(1)	10.0(1)	8.0(3)
Short duration	-	-	-	
Drought tolerance	-	-	-	
Cold tolerance	-	-	-	
Attractive grain colour		7.0(4)	8.0(4)	7.0(4)
Heat tolerance		-	-	
Pod borer resistance		8.0(3)	-	9.0(2)
Disease resistance	8.0(3)	9.0(2)	8.9(3)	10.0(1)
Fit into existing cropping system	7.0(2)	-	9.0(2)	
Higher recovery of dal (%)	6.0(4)	-	7.0(5)	

Figures in parentheses represent ranks in descending order of importance

Consumption preferred traits for both the districts, better taste for BARI Chola-5 and BARI Chola-9 were ranked-1 (Table 3.25b).

Table 3.25 b: Preferred traits for chickpea consumption among cultivars (Wt. scale)

Consumption Preferred Traits	Rajshahi		ChapaiNababgonj	
	BARI Chola-5	BARI Chola-9	BARI Chola-5	BARI Chola-9
Better taste	2.0(1)	2.0(1)	2.0(1)	2.0(1)
Less cooking time	-	-	-	-
High keeping quality	-	-	-	-

Figures in parentheses represent ranks in descending order of importance

Market preferences as observed by farmers both BARI Chola-5 and BARI Chola-9 were high demanded (ranked-1) cultivars by marketing agents and fetching high price (ranked-2) (Table 3.25c).

Table 3.25c: Preferred traits for chickpea marketing among cultivars (Wt. scale)

Marketing Preferred Traits	Rajshahi		ChapaiNababgonj	
	BARI Chola-5	BARI Chola-9	BARI Chola-5	BARI Chola-9
High demand	3.0(1)	3.0(1)	3.0(1)	3.0(1)
Fetches higher price	2.0(2)	2.0(2)	2.0(2)	2.0(2)
Low price fluctuations	1.0(3)	1.0(3)	1.0(3)	1.0(3)

Figures in parentheses represent ranks in descending order of importance

The major constraints in the existing cultivars as expressed by the farmers that high diseases incidence for BARI Chola-5 in Rajshahi district was ranked-1 whereas high pod borer incidence for BARI Chola-5 in ChapaiNababgonj district was ranked-1. In both the district for BARI Chola-9, not fit into cropping system was ranked-2 followed by low germination rate was ranked-3 to the sample farmers (Table 3.26).

Table 3.26: Major constraints among chickpea cultivars (Ranking by wt. Scale)

Constraints	Rajshahi		ChapaiNababgonj	
	BARI Chola-5	BARI Chola-9	BARI Chola-5	BARI Chola-9
Low yield	-	-	-	-
High pod borer incidence	2	-	1	-
High disease incidence	1	4	2	4
Long duration	3	1	4	1
Low germination rate	4	3	3	3
Small grain size	-	-	-	-
Not attractive colour	-	-	-	-
Poor taste	-	-	-	-
Low recovery of dal (%)	-	-	-	-
Low market price	-	-	-	-
Not fit into cropping system	-	2	-	2
Poor fodder quality	-	-	-	-
Susceptible to storage pest	-	-	-	-

3.9 Marketing Channel/Marketing chain

In the study areas chickpea are moved from producer to consumer in the different market through different intermediaries, such as bepari, wholesaler, retailer and processors. According to the transacted volume of the chickpea and participations of the intermediaries in the channel, seven major channels were identified as a dominant in the study areas.

Chan.no.	Major marketing channels	% marketed
As grain directly		
1	Producer→Bepari→Wholesaler→Retailer→Consumer	20
2	Producer → Wholesaler→Retailer →Consumer	10
3	Producer → Retailer →Consumer	5
4	Producer → Consumer	5
As dal/flour		
5	Producer→Bepari→ Processor→Wholesaler→Retailer → Consumer ▶	45
6	Producer → Processor→ Wholesaler →Retailer → Consumer	10
7	Producer → Processor → Consumer	5

Summary and conclusions

On an average the household size of the sample farmers were 6 and dependency ratio were 2. Educational status of the sample farmers in terms of the number of years of education in the adopted villages of Rajshahi district had maximum years of schooling of 8 years followed by adopted farmers of ChapaiNawabgonj district of 6 years. Ninety six to ninety seven percent of the sample farmers of both adopted and control villages in both the district reported that agriculture as their main occupation. Overall data showed that majority percent of the sample farmers had two wheeler/bicycles and television sets indicates that use of this type of goods had increased which increases the cost of living. Average operational land holding of Rajshahi sample farmers were 1.40 ha cultivated in irrigated whereas it was 0.95 ha in ChapaiNawabgonj sample farmers. During *rabi season*, since all the respondents were chickpea growers by choice, the area under chickpea was 0.40 ha/hh followed by wheat, potato and mustard (0.12 ha/hh). On an average the area covered under chickpea was highest BARI Chola-5 (29.70 ha in adopted and 14.10 in control farmers) followed by BARI Chola-3, BARI Chola-9 and BINA Chola-4 in the study areas. Among the studied competitive crops, highest benefit cost ratio was calculated for chickpea (2.1 for adopted and 1.9 for control farmers) followed by mustard (1.9 for adopted and 1.8 for control farmers). The income from crops was a major source among farmers across districts. In both the districts farmers preferred BARI Chola-5 for high yield (Rank-1) followed by fit into existing cropping patterns (Rank-2) and disease resistance (Rank-3). The major constraints in the existing cultivars as expressed by the farmers that high diseases incidence (ranked-1) followed by high pod borer incidence (ranked-2) and long duration (ranked-3) for BARI Chola-5 in Rajshahi district. The gender wise ownership of the resources in the adopted and control areas showed that male members of the family had complete access (100%) to the ownership of different assets. The major activities performed by male (100%) in the adopted and control areas of both the districts.

The study clearly indicates huge potential for chickpea in the targeted sites as they are highly competitive when compared with other post-rainy season crops grown. Chickpea yielded high net benefits per ha and high benefit-cost ratio than the others. So, the targeting of chickpea in rice-fallows increases not only the incomes but also enhances the sustainability of cropping systems. Ultimately, the viability of small and marginal farmers' agriculture will be increased in South Asia.
