CHAPTER – I

1.1 Introduction

Pulses in India have long been considered as the poor man's source of protein. Pulses are grown in 22-23 million hectares of area with an annual production of 13-15 million tones (Mts). India accounts for 33.00 per cent of the World's area and 22.00 per cent of its pulses' production. The major pulse crops grown in India are: chickpea, pigeon pea, lentil, moongbeas, uradbean and fieldpea. About 90.00 per cent of the global pigeon pea, 65.00 per cent of chickpea and 37.00 per cent of the lentil areas fall in India, corresponding to 93.00 per cent, 68.00 per cent and 82.00 per cent of the global production, respectively (FAOSTAT, 2009). India is the largest producer and consumer of pulses in the world. Due to stagnation in the production of pulses between 11 and 14 million tones over the last two decades, the net availability of pulses had come down from 60 gm per person per day in 1950 to 31 gm per day per person in 2008 (Indian Council of Medical Research recommends 65 gram per day per capita).

Pulses are grown in both the seasons rabi and kharif. Yield levels of kharif pulses (417 kg per hectare to 557 kg per hectare) is lower than rabi pulses (684 kg per ha to 751 kg per ha). It indicates that rabi pulse crops like chickpea, lentil, moong and urad and long duration pigeonpea (arhar) have a higher potential in expanding the production of pulse crops. The yield of pulses remained virtually stagnant for the last 40 years (539 kg per ha in 1961 to 544 kg per hectare in 2001 and to 617 kg per hectare in 2009). India's rank in productivity is 24th in chickpea, 9th in pigeonpea, 23rd in lentil, 104th in dry bean, 52nd in field pea and 98th in total pulses (FAOSTAT, 2009). Productivity of pulses has however, slightly increased in recent years, basically due to the expansion of area in rabi pulses, higher growth in yield of pigeonpea and higher growth rate in prices of pulses (20.90 % per annum for chickpea, 32.90 % per annum for urad, 5.8% per annum for pigeonpea during the

period 2004-08) compared to prices of other crops, which encouraged higher input use.

1.2 Pulses in Bihar

Bihar is one of the leading pulse growing states in India contributing about 6.50 per cent to the country's pulses production. The area under pulse crops was recorded to be 14.34 lakh hectares in 1995-96, constituting about 11.00 per cent of the GCA of the state. The coverage of pulses' area under irrigation was only 1.70 per cent (1993-94), which is much below the all India average of 11.20 per cent. The production had increased to 13.50 lakh tones in 1995-96 over 7.08 lakh tones in 1969-70. These phenomena indicated an increase in area, production and productivity in the state during this period. But area, production and productivity of major pulses in the state during the period of 1989-96 had remained nearly stagnant. However, it was found that there was a little decline in area from 15.30 lakh hectares to 14.34 lakh hectares in 1995-96. The production had remained almost stagnant at nearly 13.78 lakh tones in 1988-89 and 13.50 lakh tones in 1995-96. So far as productivity is concerned it had recorded a positive growth during the same period i.e., it increased to 941 kg per hectare in 1995-96 from 809 kg per hectare in 1988-89.

1.3 Objectives

The main objectives of the study are:

i. *To analyze returns from cultivation of pulses vis-à-vis competing crops.*
ii. *To analyze the other major problems and prospects for pulse cultivation.*
iii. *To assess the impact, if any, of NFSM on pulses.*

1.4 Methodology

The universe of the study is fell under two separate administrative districts viz., NFSM district (Patna) and Non-NFSM district (Kishanganj). At the first stage of sampling, one potential block from each district was selected, viz., Dhanaruwa and Kochchadhaman from Patna and Kishanganj districts respectively. Similarly, one village from each block was selected, namely: Pabhera from Patna and Pariharpur from Kishanganj district. At the last leg of sampling, from each village, on the basis

of reconnaissance survey, lists of pulse growing farmers were prepared with their operational holdings. The list prepared was further classified into four size groups, viz., Marginal (< 1ha), Small (up to 2ha), Medium (up to 5 ha) and large (>5 ha). Subsequently, a sample of 50 pulse growers from each of the selected villages was randomly selected by adjusting available size groups. In this way, 50 farmers from each of the two districts were selected for the study. Thus, the sample size was of 100 pulse growers. The details are given in table 1.1.

Table No. 1.1: Category-wise Distribution of Sample Respondents

District	Marginal	Small	Medium	Large	Total
Patna (NFSM)	19 (38.00)	15 (30.00)	12 (24.00)	04 (8.00)	50 (100.00)
Kishanganj (Non-NFSM)	18 (36.00)	14 (28.00)	12 (24.00)	06 (12.00)	50 (100.00)
Total	37 (37.00)	29 (29.00)	24 (24.00)	10 (10.00)	100 (100.00)

NB: In parenthesis, percentage figures are shown.

1.5 Data Collection

This study was based on both primary as well as secondary data. Primary data were collected from sample farmers and secondary data were collected from the respective Block offices, District Agriculture offices and from various agricultural Statistics published by the State Government and the Government of India. Besides, published and unpublished literatures were also consulted.

1.6 Data Analysis

The primary data obtained from the selected farmers were analyzed by using simple arithmetical concept: (i) calculation of the cost of production of some selected pulse crops and other major crops, and; (ii) Finding out input-output ratio.

Costs have been calculated with the help of standard cost concept method. These cost concepts and the items of costs are given below:

Cost A-1:

a. Value of hired human labours
b. Value of hired bullock labours
c. Value of owned bullock labours
d. Value of owned machinery charges

e. Value of hired machinery charges
f. Value of seeds
g. Value of Pesticides
h. Value of land revenue
i. Interest on working capital
j. Miscellaneous expenses

Cost A-2 Cost A-1 + rest paid for leased inland.

Cost B-1 Cost A-1 + interest on value owned fixed capital assets (excluding Land).

Cost B-2 Cost B-1 + rental value of owned land (net of land revenue) and rent paid for leased-inland.

Cost C-1 Cost B-1 + imputed value of family labour.

Cost C-2 Cost B-2 + imputed value of family labour.

Cost C-3 Cost C-2 + 10 per cent of Cost C-2 to account for managerial input of the farmers.

1.7 Statistical Tools used for Secondary Data Analysis

Growth rate

For calculating the growth rate of pulse crops and other major crops, the following trend equation was used:

Exponential trend equation:

$Yt + ABt$

Where,

Yt = value of area, production and productivity in year t (t = 1, 2, …..n)

A = refers to intercept

T = refers to year

$B = 1+\frac{r}{100}$

Where,

'r' refers to the rates of compound annual growth of area, production and productivity.

1.8 Reference Year

The reference year of the study was 2006-07 to 2008-09, viz., pulses cultivation.

CHAPTER – II

PULSES SECTOR IN THE STATE AND THE DISTRICTS

2.1 Overall Scenario

In Bihar, the area under food grains is about 94.57 per cent and out of it, cereals occupy 91.37 per cent and pulses 8.63 per cent. The oilseeds, fibres and sugarcane barely account for 6.00 per cent of the GCA. In terms of area (triennium average of 2005-06 to 2007-08), rice, wheat and maize are three major cereals in the state, which account for 44.72, 26.95 and 8.38 per cent respectively of the GCA. The area under pulses was 7.68 per cent (593.16 thousand ha) of the GCA during the same period. Of the pulses, rabi pulses are grown in 518.92 thousand ha (87.78% of the total pulses area) and, kharif pulses in 74.24 thousand ha (12.52% of the total pulses area *(Economic Survey of Bihar, 2009-10).*

Out of the total geographical area of 93.60 lakh hectares, area under forests in the state has remained unchanged at 7.1 per cent; area under non-agricultural use is at 17.60 per cent. Net sown area shows a share of 60.50 per cent. In absolute terms, it implies an additional cultivated land of 109 thousand hectares. Cropping intensity has increased from 1.33 to 1.36 (2006-07). This implies an additional cultivated area of more than 322 thousand hectares. It is also noted that the proportion of area under both fallow and current fallow had decreased in 2006-07, indicating high pressure on land in Bihar.

Table No. 2.1: Area under Important Crops in the State (Average of Last Five Years)

Crops	Area Under the Crops ('000 ha)	% of area to GCA
Rice	3403	44.64
Wheat	2050	26.89
Maize	630	8.26
Pulses	623	8.17
Oilseed	139	1.82
Others	857	11.22

This table indicates that area under Rice crops occupied the largest share followed by wheat. Pulses accounted for only a small share of 8.17 per cent of State GCA.

2.2 Cropping Pattern of Bihar

As regards the cropping pattern, it is observed that the agricultural economy of Bihar is still oriented towards subsistence. During the period of 2000-01 to 2007-08, the area under food grains had been around 94.00 per cent. Out of it, the share of cereals had however, registered a marginal increase at the cost of pulses. The oilseeds, fibres and sugarcane together accounted for 6.00 per cent of the cropped area, and their individual shares in the total cropped area showed only a marginal change. At the cost of oilseeds and fibre crops, the acreage under sugarcane registered a marginal percentage increase (Economic Survey of Bihar, 2009-10).

Bihar is endowed with rich biodiversity. Consequently, the farmers in Bihar are able to produce a large variety of crops like: cereals, pulses, fibres, fruits and vegetables. It is found that Bihar primarily produces rice (44.20 lakh tones), wheat (40.10 lakh tones), oilseeds (1.70 lakh tones) and sugarcane (44.40 lakh tones). Despite one of the worst droughts during kharif 2009, the total food grain production was estimated at 120.86 lakh tones, for a population of about 96.00 million in 2009-10 (Economic Survey of Bihar, 2009-10).

As regards the productivity, it is observed that the average productivity in Bihar is ---- 1287 kgs/ha (for Rice), 1915 kgs/ha wheat and 2549/ha (maize), while productivity of different pulses in Bihar is --- 860kgs/ha (kharif pulses) and 746kgs/ha (rabi pulses).

It is observed from table 2.2 that annual growth of area of chief crops has declined and annual growth in their production has also decreased, except maize, which registered a marginal annual growth followed by oilseeds.

Table No. 2.2: Compound Annual Growth Rate (CAGR) over 1997-2008 of Area, Production, Yield of the important crops in the State.

Crop	Area	Production	Yield
Rice	(-)2.5506	-5.7770	-3.3236
Wheat	0.2294	-1.4567	-1.2348
Maize	-1.1634	1.2443	2.4325
Pulses	-4.6708	-4.3810	0.3057
Oilseeds	-2.7404	0.7974	3.6869

The consumption of chemical fertilizer in Bihar has been rising steadily in recent year (table 2.3). It had increased by 54.75 per cent during the year 1996-97 and 2007-08, which indicates the eagerness of the farmers to get maximum value from the inputs. It is found from table 2.3 that per hectare consumption of fertilizer was about 156 kgs in (2007-08). The use of fertilizer was higher in rabi season (195.80 kgs/ha) in comparison to kharif season (120.10 kgs/ha). Among the different types of fertilizers, the use of urea was higher, as it alone accounted for about half of the total fertilizer consumption.

Table 2.3 also indicated that annual growth rate of both the net sown area and gross sown area was negative {(-) 2.9366 and (-) 8377 respectively}. An annual growth rate of the net irrigated area was also found negative, whereas that of gross irrigated area was positive (0.7983).

Further, analysis revealed that total gross crop area was 7759 ('000 ha) in recent year (2007-08) and net sown area was 5598 ('000 ha), accounting for 72.15 per cent to the total gross cropped area, whereas total irrigated area was 4904 ('000 ha) and net irrigated area was about 3224 ('000 ha) accounting for 65.74 per cent to the gross irrigated area. Ratio of net irrigated area and net sown area was almost same throughout the period from 1997 to 2002, whereas it increased rapidly throughout the years from 2003 to 2008.

Table No. 2.3: CAGR over 1997-2008 of A. P. Y. of Important Variables in the State (Area in '000 ha)

Year	NSA	GCA	NIA	GIA	NIA/ NSA	GIA/ GCA	Fertilizer Consumption (In '000 tons)	Fertilizer Consumption Per hectare (In kg/ha)
1996-97	7321	9833	3680	4581	50	47	2358	80
1997-98	7321	9833	3680	4581	50	47	2590	86
1998-99	7324	9833	3681	4581	50	47	2685	88
1999-00	7325	9833	3682	4581	50	47	2958	98
2000-01	5663	7993	2821	4457	50	56	2961	99
2001-02	5664	7897	2814	4470	50	57	2345	94
2002-03	5726	7959	2985	4583	52	58	2384	96
2003-04	5712	7882	3166	4886	55	62	2185	87
2004-05	5572	7399	3240	4768	58	64	2250	92
2005-06	5556	7397	3170	4830	57	65	2773	120
2006-07	5665	7719	3242	4926	57	64	3225	142
2007-08	5598	7759	3224	4904	58	63	3649	156
Total	74447	101337	39385	56148	637	677	32363	1238
CAGR	-2.9366	-2.8377	-1.3462	0.7983	1.6912	3.6082	1.6708	4.7778

2.3 Area under Important Pulses in Bihar

Bihar is one of the important pulse growing states in India contributing about 6.50 per cent to the country's pulse production. The area under pulse crops was reported to be 448.7 thousand hectares in 2007-08, accounting for about 5.78 per cent to the GCA of the state. Table 2.4 shows that average area during the last five years under moong was 179 thousand hectares, accounting for 28.69 per cent of the total pulses area followed by lentil (168 thousand hectares), khesari (112 thousand hectares), gram (70 thousand hectares) and arhar (31 thousand hectares) accounting for 26.92 per cent, 17.94 per cent, 11.21 per cent and 4.96 per cent of the total pulses area respectively.

Table No. 2.4: Area under Important Pulses in the State (Average of Last Five Years)

Pulse Crop	Area Under the Crop ('000 ha)	% of Area to Total Pulses Area
Moong	179	28.69
Lentil	168	26.92
Khesari	112	17.94
Gram	70	11.22
Arhar	31	4.97
Others	64	10.26
Total	**624**	**100.00**

2.4 Area, Production, Yield and Irrigated Area under Pulses in Bihar

Total area under pulse crops is about 448.65 thousand hectares with a total production of 365.09 MTs. Production of kharif pulses has increased by 7.54 per cent despite a significant fall in its acreage by 4.36 per cent. This is reflective of significant leap in productivity of kharif pulses (Economic Survey, Government of Bihar, 2007-08).

Production of pulses in the state had shown a more spectacular falling trend over the post bifurcation years, with the exception of 2002-03, when their acreage and production both increased by 0.51per cent and 2.52 per cent respectively, while the year 2004-05 had seen a fall of 15.34 per cent in total pulse production (Bihar was bifurcated as the state of Bihar and Jharkhand in November, 2000).

2.5 Irrigated Area under Pulses in Bihar

Irrigation is the key variable determining the health and prosperity of agriculture. It not only ensures stability of agricultural production in a high volatile climate depending on monsoon, assured irrigation is a necessary pre-requisite of HYV technology. Bihar has 43.24 lakh hectares of irrigated area. Out of it, 10.62 lakh hectares were irrigated by canal, 1.83 lakh hectares by tanks, 28.95 lakh hectares by tube wells and remaining area is irrigated by well. Thus, the tube well irrigation shows nearly 90.00 per cent utilization of total created capacity of minor irrigation while irrigation from canal and tank was only about 44.00 per cent of the total created capacity.

2.6 Area, Production, Yield of Some Important Pulses and Irrigation in Bihar

Analysis of table 2.5A revealed that area under moong had decreased from 189 thousand hectares in 1997 to 172 thousand hectares in 2007-08 accounting for a decline of 8.99 per cent over the year 1996-97. With respect to growth rate of moong it was found negative (-0.72) and production of moong had merely increased from 107 thousand tones in 1996-97 to 117 thousand tones in 2007-08 i.e., an increase of 9.35 per cent and its growth rate was found negative (-0.52), whereas yield of that crop did slightly increased accounting for 19.3 per cent and its growth rate was

found positive (0.19). Irrigated area for moong increased from 18.90 thousand hectares in 1996-97 to 27.52 thousand hectares in 2007-08 accounting for 46.54 per cent signifying a positive growth rate (3.19%).

Table No. 2.5A: Area, Production, Yield and Irrigated Area under Pulses: (Moong) State

Year	Area (In '000 ha)	Production (In '000 tons)	Yield (/ha)	Irrigated Area (In '000 ha)	Area under Improved Varieties
1996-97	189	107	570	18.90	NA
1997-98	187	106	570	20.59	NA
1998-99	186	107	580	20.46	NA
1999-00	186	108	580	22.43	NA
2000-01	187	109	580	22.48	NA
2001-02	181	107	590	19.86	NA
2002-03	196	119	610	24.21	NA
2003-04	190	93	490	24.98	NA
2004-05	183	100	550	25.26	NA
2005-06	172	99	580	25.79	NA
2006-07	176	93	530	26.12	NA
2007-08	172	117	680	27.52	NA
Total	2205	1265	6910	278.60	---
CAGR	-0.7261	-0.5208	0.1918	3.1981	---

Source: Economic Survey, Government of Bihar, 2010

2.7 Area, Production, Yield and Irrigated Area under Pulses: (Lentil) State

It is revealed from the table 2.5 B that area under lentil declined from 173 thousand hectares in 1996-97 to 163 thousand hectares in 2007-08 accounting for 5.78 per cent and its growth rate was found negative (-0.70). Production and productivity of lentil declined from 164 thousand tons to 129 thousand tons and from 950 kg/ha to 790 kg/ha accounting for 21.34 and 16.84 per cent declines respectively leading to their negative growth (-2.47) and (-1.79) respectively. Meanwhile, irrigated area for lentil was found slightly decreased from 13.84 thousand hectares in 1996-97 to 12.52 thousand hectares in 2007-08 accounting for 9.54 per cent decrease and its growth rate was found negative (-1.00), whereas area under improved varieties of lentil was almost negative.

Table No. 2.5 B: Area, Production, Yield and Irrigated Area under Pulses: (Lentil) State

Year	Area (In '000 ha)	Production (In '000 tons)	Yield (/ha)	Irrigated Area (In '000 ha)	Area under Improved Varieties
1996-97	173	164	950	13.84	NA
1997-98	174	129	740	13.96	NA
1998-99	184	184	1001	14.35	3.68
1999-00	182	152	840	14.29	3.64
2000-01	170	168	990	12.02	NA
2001-02	173	138	801	12.54	3.06
2002-03	180	157	871	14.28	3.14
2003-04	171	160	940	12.14	2.95
2004-05	179	127	710	14.72	3.14
2005-06	159	118	740	12.08	2.89
2006-07	168	122	730	12.64	3.48
2007-08	163	129	790	12.52	3.32
Total	2076	1748	10103	159.38	---
CAGR	-0.7034	-2.4753	-1.7943	-1.0068	---

Source: Economic Survey, Government of Bihar, 2010

2.8 Area, Production, Yield, Irrigated Area and Area under Improved Varieties of Pulses: (Gram) State

Table 2.5.C Suggests that area under gram had declined from 119 thousand hectares in 1996-97 to 69 thousand hectares in 2007-08 accounting for 42.02 per cent decline in area and annual growth of gram was recorded as negative(-5.19). Production and productivity of gram were decreased from 139 thousand tones in 1996-97 to 69 thousand tones in 2007-08 and from 1170 kg/ha to 970 kg/ha accounting for 50.36 per cent and 17.09 per cent declines respectively. The annual growth in production and productivity for gram was also found negative (-8.40) and (-3.54) respectively. Irrigated area for gram crops also decreased from 14.28 thousand hectares in 1996-97 to 8.96 thousand hectares in 2007-08 accounting for 37.25 per cent decline in area of gram. Meanwhile, area under improved varieties of gram could not be found throughout these years.

Table No. 2.5 C: Area, Production, Yield and Irrigated Area under Pulses: (Gram) State

Year	Area (In '000 ha)	Production (In '000 tons)	Yield (/ha)	Irrigated Area (In '000 ha)	Area under Improved Varieties
1996-97	119	139	1170	14.28	NA
1997-98	110	135	1230	12.10	2.38
1998-99	101	131	1310	11.50	2.07
1999-00	93	125	1340	8.48	2.42
2000-01	76	79	1040	7.59	2.14
2001-02	68	65	960	7.48	NA
2002-03	71	72	1010	7.72	NA
2003-04	80	79	990	8.45	3.10
2004-05	72	60	830	8.65	3.04
2005-06	63	59	940	7.98	3.14
2006-07	64	54	840	8.14	3.78
2007-08	69	69	970	8.96	4.45
Total	986	1067	12630	111.33	---
CAGR	-5.1945	-8.4027	-3.5408	-3.7057	---

Source: Economic Survey, Government of Bihar, 2010

2.9 Area, Production, Yield and Irrigated Area and Area under Improved Varieties of Pulses: (Khesadi) State

Table 2.5.D reveals that area under khesadi had declined from 161 thousand hectares in 1996-97 to 104 thousand hectares in 2007-08, accounting for 35.40 per cent fall in area resulting is negative growth (-4.87). Production of khesadi was also found to have decreased from 148 thousand tones in 1996-97 to 93 thousand tones in 2007-08 accounting for 37.16 per cent decrease over the year 1996-97 and its annual growth rate was found negative (-6.13), whereas productivity of khesadi during the review period also decreased from 910 to 891 kg per hectare with growth rate being negative (-1.30).

Table No. 2.5 D: Area, Production, Yield and Irrigated Area under Pulses: (Khesadi) State

Year	Area (In '000 ha)	Production (In '000 tons)	Yield (/ha)	Irrigated Area (In '000 ha)	Area under Improved Varieties
1996-97	161	148	910	NA	NA
1997-98	160	146	910	NA	NA
1998-99	158	144	911	NA	NA
1999-00	158	142	890	NA	NA
2000-01	157	144	921	NA	NA
2001-02	157	130	832	NA	NA
2002-03	141	113	802	NA	NA
2003-04	133	123	922	NA	NA
2004-05	118	80	681	NA	NA
2005-06	99	79	802	NA	NA
2006-07	102	81	791	NA	NA
2007-08	104	93	891	NA	NA
Total	1648	1423	10263	---	---
CAGR	-4.8425	-6.1318	-1.3051	---	---

Source: Economic Survey, Government of Bihar, 2010

2.10 Compound Annual Growth Rate (CAGR) of Area, Production, and Yield of Major Pulse Crops in Patna District

In table 2.6, the growth rates of area, production and productivity have been indicated. It may be observed that growth rates of lentil, gram and arhar were negative (-3.01), (-8.38) and (-6.52) respectively. With regard to growth rates of production of lentil, gram and arhar these were also found negative (-0.58), (-7.33) and (-10.91) respectively, whereas annual growth rates of yield of lentil and gram were positive (2.50) and (1.08) respectively, except arhar, which showed negative growth rate (-4.65).

Table No. 2.6: CAGR Over 1997-2008 of A, P, Y of Major Pulse Crops in Patna District.

Pulses Crop	Area	Production	Yield
Lentil	-3.0186	-0.5831	2.5059
Gram	-8.3888	-7.3379	1.0865
Arhar	-6.5299	-10.9153	-4.6531

2.11 Compound Annual Growth Rate (CAGR) of Area, Production, and Yield of Major Pulse Crops in Kishanganj District

In table 2.7, growth rates of area, production and productivity have been presented. It revealed that annual growth rates of area for moong and lentil were negative (-3.96) and (-2.15), except gram, which showed positive growth (0.20). In regard to growth rates of production for moong and lentil these were negative (-3.75) and (-1.84) respectively. Gram had positive growth rate (0.39), whereas growth rates of yield for important pulse crops like moong, lentil and gram were found positive (0.09), (0.29) and (0.16) respectively.

Table No. 2.7: CAGR Over 1997-2008 of A, P, Y of Major Pulse Crops in Kishanganj District.

Pulses Crop	Area	Production	Yield
Moong	-3.9649	-3.7518	0.0901
Lentil	-2.1509	-1.8447	0.2975
Gram	0.2094	0.3996	0.1661

DEMOGRAPHIC PROFILE AND CROPPING PATTERN OF THE STUDY REGION

3.1 Geography and Cropping Pattern

Bihar has a geographical area of 93.60 lakh hectare, which can be categorized in the following three agro-climatic zones:

i. North-West Zone
ii. North-East Zone
iii. South Zone

Out of the total geographical area, gross sown area was 77.10 lakh ha accounting for 82.50 per cent while net sown area was 56.60 lakh hectares accounting for 60.50 per cent, 2006-07 (Economic Survey, Government of Bihar, 2009-10). Area under forest has remained unchanged 6.20 lakh hectare accounting for 6.60 per cent and area under non-agricultural use was 36.90 lakh hectares accounting for 39.50 per cent.

Apart from the fertile soil and abundant water resources, Bihar is also endowed with rich biodiversity. Consequently, the farmers in Bihar are able to produce a large number of crops like cereals, pulses, oilseeds, fibres, fruits and vegetables. Bihar presently produces rice (44.20 lakh tones), wheat (40.10 lakh tones), oilseeds (1.4 lakh tones) and sugarcane (44.40 lakh tones). Despite one of the worst drought during kharif 2009, the total food grain production is estimated at 120.86 lakh tones, for a population of about 96.00 million in 2009-10. It is observed that area under food grains has been around 94.00 per cent while area under oilseeds, fibres and sugarcane together account for barley 6.00 per cent of the total cropped area. The average productivity of three major cereals in Bihar is rice (1284 kg/ha), wheat 1915

kg/ha and maize (2549 kg/ha), while average productivity of pulses in Bihar is 860 kg/ha (kharif pulses) and 746 kg/ha (rabi pulses).

Irrigated area under paddy was found 1977 (000 ha) out of this, high yielding variety and local variety of paddy covered 1378 and 599 (000 ha) respectively whereas irrigated area under wheat was 1878 (000 ha) as regards to high yielding variety and local variety of wheat covers 1434 (000 ha) and 444 (000 ha) respectively while maize covered 305 (000 ha) and 47 (000 ha) of high yielding variety and local variety respectively.

3.2 Area and Location of Sample Districts

Patna is one of the largest districts of Bihar, it has geographical area 317.24 (000 ha) and gross sown area was 225.87, (000 ha) accounting for 71.20 per cent to the total geographical area. Out of total gross sown area, net sown area was 202.19 (000 ha) accounting for 63.70 per cent to the gross sown area and its cropping intensity was found 1.12. Whereas geographical area of Kishanganj district was 189.08 (000/ha), out of total geographical area, gross cropped area and net sown area was 170.55 (000 ha) and 125.61 (000 ha) accounting for 90.20 per cent and 66.40 per cent to the total geographical area respectively (2007-08).

The Patna district virtually lies in the heart of the South Bihar Plains. Besides being the headquarters of the district, Patna is also the divisional headquarters and the state capital since 1911. The district is surrounded by the Ganges on the north beyond which is the districts of saran, Vaishali, Samastipur and Begusarai. In its east there are districts of Lakhisarai and Nalanda and in South the district of Jehanabad. The district has 05 sub-divisions and 23 blocks.

Population

According to 2001 census, the total population of Patna district is 47,09,851 peoples comprising 53.40 per cent males and 46.60 per cent females. The literacy rate is to be found 63.82 per cent.

Agriculture

Soil of Patna is generally clay-loam in nature and single crop is taken in the field however, in some cases, two crops are taken in a year. Generally paddy, potato, onion and vegetables are cultivated.

Rainfall

Annual rainfall of Patna district was found 1065.20 mm whereas that of Kishanganj was 1034.00 mm.

3.2.1 Area and Location of Kishanganj District

Geographical area of Kishanganj district was 189.08 thousand hectare and gross cropped area was 170.55 thousand hectare. Out of total gross cropped area, net sown area was found 125.61 thousand hectare accounting for 66.43 per cent to the total geographical area (Economic Survey, Government of Bihar, 2007-08). Besides, being headquarter of the district Kishanganj is also sub-divisional headquarter. Kishanganj is bounded by Mahananda River and has one sub-division and 07 blocks.

Population

According to census 2001, the total population of Kishanganj district is 9, 84,107 peoples comprising 89.91 per cent rural and 10.09 per cent urban to the total population. The population of SC and ST was found 65,157 and 34,830 accounting for 6.62 per cent and 3.54 per cent to the total population respectively.

Agriculture

Mainly paddy, wheat, maize and jute are cultivated in the Kishanganj district and also jute mills are available in the Kishanganj district.

3.2.2 Education and Literacy

The literacy of Bihar in 2001 was 47.00 per cent to the total population. However, the female literacy rate in Bihar in 2001 was only 33.60 per cent as against a national literacy rate 54.20 per cent whereas literacy of male was found about 60.30 per cent while 10.78 per cent for SCs and 10.82 per cent for ST.

The district having the highest literacy rate is Patna with a literacy rate of 62.90 per cent and lowest level of literacy was found in Kishanganj with 31.10 per cent (Economic Survey, Government of Bihar, 2007-08).

TABLE NO. 3.1: DEMOGRAPHIC PROFILE OF PATNA AND KISHANGANJ DISTRICTS.

SN	Districts	Area (In Sq kms)	Population		SC Population		ST Population	
			Rural	Urban	Rural	Urban	Rural	Urban
1.	Patna	3,202.89	22,41,510	13,76,701	4,23,089	1,37,005	1,286	4,084
2.	Kishanganj	1,884.89	8,84,827	99,280	54,114	11,043	33,441	1,389

3.2.3 Demographic Profile of Sample Households

The total size of sample is 100 households compressing 50 households from NFSM district (Patna) and 50 from Non-NFSM district (Kishanganj) out of 50 households of NFSM district (Patna), 42 (84.00) households are male head and 8 (16.00) household are female head whereas out of 50 households of Non-NFSM district (Kishanganj), 39 households are male head and 11 households are female head accounting for 78.00 per cent and 22.00 per cent to the total 50 households respectively.

TABLE N0.3.2.(A) DEMOGRAPHIC PROFILE OF THE HEAD

	NFS M District (Patna)			Non NFSM District (Kishanganj)		
Size	Male	Female	Total	Male	Female	Total
Marginal	16(32.00)	3 (6.00)	19(38.00)	14 (28.00)	4 (8.00)	18 (36.00)
Small	13(26.00)	2 (4.00)	15 (30.00)	11 (22.00)	3 (6.00)	14 (28.00)
Medium	10 (20.00)	2 (4.00)	12 (24.00)	10 (20.00)	2 (4.00)	12 (24.00)
Large	3 (6.00)	1 (2.00)	4 (8.00)	4 (8.00)	2 (4.00)	6 (12.00)
Total	42 (84.00)	8 (16.00)	50 (100.00)	39 (78.00)	11(22.00)	50 (100.00)

Note: - Parenthesis indicates percentage to the total.

3.2.4 Education of the Head of Sample Household

It was observed from table 3.2.B that out of 50 sample of Kishanganj district, 22 households comprising 44.00 per cent are primary educated, 11 households with 22.00 per cent are secondary and above educated. Thereafter 17 households with 34.00 per cent are illiterates. Whereas education profiles of head of Patna district are 19 households comprising 38.00 per cent are primary educated, 18 households with

36.00 per cent are illiterates and 13 households with 26.00 per cent concerned with secondary and above education.

Table No. 3.2 (B) EDUCATION OF THE HEAD: (No of HHlds)

NFSM DISTRICT

FARM SIZES	ILLITERATES	PRIMARY	SECONDARY AND ABOVE	TOTAL
MARGINAL	8 (42.11)	6 (31.58)	5 (26.31)	19 (100)
SMALL	6 (40.00)	6 (40.00)	3 (20.00)	15 (100)
MEDIUM	4 (33.33)	5 (41.67)	3 (25.00)	12 (100)
LARGE	0 (0.00)	2 (50.00)	2 (50.00)	4 (100)
TOTAL	18 (36.00)	19 (41.67)	13 (26.00)	50 (100)

NON-NFSM DISTRICT

FARM SIZES	ILLITERATES	PRIMARY	SECONDARY AND ABOVE	TOTAL
MARGINAL	7 (38.89)	7 (38.89)	4 (22.22)	18 (100.00)
SMALL	5 (35.71)	6 (42.86)	3 (21.43)	14 (100.00)
MEDIUM	4 (33.33)	6 (50.00)	2 (16.67)	12 (100.00)
LARGE	1 (16.67)	3 (50.00)	2 (33.33)	6 (100.00)
TOTAL	17 (34.00)	22 (44.00)	11 (22.00)	50 (100.00)

Note: Brackets indicate percentage to the total.

3.2.5 Education Profile of the Adult Population of Sample Districts

This table revealed that 216 adult population of Patna district comprising 102 illiterates with 47.2 per cent, 79 primary educated with 36.57 per cent and 35 secondary and above educated with 16.21 per cent whereas in case of Kishanganj district, total number of educated adult population was found 269 comprising 122 illiterates population, 89 primary educated and 58 was secondary and above educated population accounting for 45.35 per cent, 33.09 per cent and 21.56 per cent respectively. However, comparatively analysis showed that percentage of primary education of Patna district was found more than percentage of primary education of Kishanganj district.

Table No. 3.2 (C) EDUCATION PROFILE OF THE ADULT POPULATION

NFSM DISTRICT

(Population)

	ILLITERATES	PRIMARY	SECONDARY AND ABOVE	TOTAL
MARGINAL	42 (52.5)	25 (31.25)	13 (16.25)	80 (100.00)
SMALL	30 (46.88)	24 (37.5)	10 (15.82)	64 (100.00)
MEDIUM	24 (44.44)	22 (40.74)	8 (14.82)	54 (100.00)
LARGE	6 (33.33)	8 (44.44)	4 (22.23)	18 (100.00)
TOTAL	102 (47.22)	79 (36.57)	35 (16.21)	216 (100.00)

NON-NFSM DISTRICT

	ILLITERATES	PRIMARY	SECONDARY AND ABOVE	TOTAL
MARGINAL	44 (48.35)	30 (32.97)	17 (18.68)	91(100.00)
SMALL	32 (43.84)	25 (34.25)	16 (21.92)	73 (100.00)
MEDIUM	30 (44.25)	22 (32.84)	15 (22.38)	67 (100.00)
LARGE	16 (43.11)	12 (31.98)	10 (26.31)	38 (100.00)
TOTAL	122 (45.35)	89 (33.09)	58 (21.56)	269 (100.00)

Note: Bracket indicates percentage to the total.

3.2.6: Demographic Profile of Children of Sample (NFSM & Non-NFSM) District

The total size of children of NFSM district (Patna) is 96 comprising 51 male and 45 female accounting for 53.12 per cent and 46.88 per cent respectively. Farm wise analysis revealed that percentage distribution of children of marginal farmers (35.42%) is highest followed by small (26.04%), medium (22.92%) and large farmers (15.62%). Similarly the total size of children of Non-NFSM district (Kishanganj) is 153 comprising 77 male and 76 female accounting for 50.32 per cent and 49.67 per cent respectively. Farm wise analysis showed that percentage distribution of children of marginal farmer (35.29%) is found highest followed by small (27.45%) medium (22.88%) and large farmers (14.38%). Comparative analysis revealed that the total size of children of Non-NFSM district (Kishanganj) was found more (153) than NFSM district (96).

Table No. 3.2 (D) Demographic Profile of the Children (NFSM District), Patna

Farm wise	Children		
	Male	Female	Total
Marginal	18 (18.75)	16 (16.67)	34 (35.42)
Small	13 (13.54)	12 (12.50)	25 (26.04)
Medium	12 (12.50)	10 (10.42)	22 (22.92)
Large	8 (8.33)	7 (7.29)	15 (15.62)
Total	51 (53.12)	45 (46.88)	96 (100.00)

Note: Bracket indicates percentage to the total

Demographic profile of the children (Non-NFSM, District), Kishanganj

Farm wise	Children		
	Male	Female	Total
Marginal	28 (18.30)	26 (16.99)	54 (35.29)
Small	20 (13.07)	22 (14.38)	42 (27.45)
Medium	17 (11.11)	18 (11.76)	35 (22.88)
Large	12 (7.84)	10 (6.54)	22 (14.38)
Total	77 (50.32)	76 (49.67)	153 (100.00)

Note: Bracket indicates percentage to the total

3.2.7 Caste Composition of the Respondent of Sample Districts

Analysis of this table revealed that total number of sample is 100 households comprising 50 households from NFSM district, (Patna) and 50 households from Non-NFSM district, (Kishanganj). In case of NFSM district, (Patna), 50 households comprising 30 households belong to other backward castes, 14 households general castes and 06 households are Scheduled Castes accounting for 60.00 per cent, 28.00 per cent and 12.00 per cent to the total respondent respectively whereas Non-NFSM district, (Kishanganj), indicated that 50 households comprising 26 other backward castes, 14 general castes and 10 households scheduled castes accounting for 52.00 per cent, 28.00 per cent and 20.00 per cent to the total respondent respectively. After analysis of this table, it was found that number of Scheduled Castes in Kishanganj district is more in comparison to Patna district.

Table No. 3.2. (E) CASTE COMPOSITION: (No of HHlds)

NFSM DISTRICT

FARM SIZE	SC	ST	OBC	OTHERS	TOTAL
MARGINAL	4 (20.00)	…	10 (50.00)	6 (30.00)	20 (100.00)
SMALL	2 (13.33)	…	9 (60.00)	4 (26.67)	15 (100.00)
MEDIUM	0 (0.00)	…	9 (75.00)	3 (25.00)	12 (100.00)
LARGE	0 (0.00)	…	2 (66.67)	1 (33.33)	3 (100.00)
TOTAL	6 (12.00)	…	30 (60.00)	14 (28.00)	50 (100.00)
NON-NFSM DISTRICT					
FARM SIZE	SC	ST	OBC	OTHERS	TOTAL
MARGINAL	5 (26.32)	--	8(42.11)	6 (31.57)	19 (100.00)
SMALL	3 (20.00)	--	8 (53.33)	4 (27.67)	15 (100.00)
MEDIUM	2 (20.00)	--	6 (60.00)	2 (20.00)	10 (100.00)
LARGE	0 (0.00)	--	4 (66.67)	2 (33.33)	6 (100.00)
TOTAL	10 (20.00)	--	26 (52.00)	14 (28.00)	50 (100.00)

3.2.7 Crop Structural Components of the Study Region

The average annual rainfall in Bihar is about 1098 mms, but it shows considerable year to year variation. During 2008 the total rainfall in Bihar was found 1016 mms, which is very close to the average of 1098 mms. However, several districts which had received less than 800 mms of rainfall in 2008. Kishanganj is one of the districts with excess rainfall (more than 1300 mms) whereas Patna district receives about 990-1240 mms. Of annual rainfall with variety of soils--- sandy loam, clay loam, loam and

clay. It may be noted that the devastating floods in Bihar in 2008 was not caused by excess rainfalls, but because of a breach in a barrage in Kosi River, located in Nepal (Economic Survey 2008-09, Government of Bihar).

3.3 Source of Irrigation in Bihar

During the period 2000-01 to 2007-08, the total irrigation area in Bihar has increased from 28.20 lakh hectares to 32.24 lakh hectares implies a growth of 14.30 per cent over a period of 7 years. One of the major constraints in the spread of irrigation is that tube wells are now the major source of irrigation.

As regards the contribution of different sources towards irrigation facilities, it is observed that tube well irrigation is the most important source, accounting for 83.80 per cent of irrigated area in 2007-08. Over the years, this share has increased from 81.90 per cent in 2000-01 to its present level of 83.80 per cent. The share of other sources of irrigations (canal, tanks, other wells and other sources) has either remained unaltered or decreased marginally).

3.3.1 Irrigation of Study Region

Area under irrigation is 124.60 thousand hectare in NFSM district (Patna). Out of total 110.40 thousand hectare is irrigated by tube well and 14.20 thousand hectare is irrigated by other sources of irrigation accounting for 77.46 per cent and 10.00 per cent respectively whereas in Non-NFSM district (Kishanganj), total area under irrigation for 50 sample was found 134 thousand hectare out of it, 101.50 thousand hectare land is irrigated by tube well, 19.50 thousand hectare of land by tank and 13 thousand hectare land is irrigated by other sources of irrigation accounting for 65.27 per cent, 12.54 per cent and 8.36 per cent respectively.

Table No. 3.3. (A): IRRIGATION DETAIL of SAMPLE FARMER (NFSM DISTRICT)

FARM SIZE	IRRIGATED					UNIRRIGATED	TOTAL
	Canal	Tubewell	Tank	Others	Total		
MARGINAL	...	5.25 (70.00))	...	0.75 (10.00)	6 (80.00)	1.5 (20.00)	7.5 (100.00)
SMALL	...	17.15 (70.00)	...	2.45 (10.00)	19.6 (80.00)	1.9 (20.00)	24.5 (100.00)
MEDIUM	...	33.6 (80.00)	...	4.2 (10.00)	37.8 (90.00)	4.2 (10.00)	42 (100.00)
LARGE	...	54.4 (80.00)	...	6.8 (10.00)	61.2 (90.00)	6.8 (10.00)	68 (100.00)
TOTAL	...	110.4 (77.46)	...	14.2 (10.00)	124.6 (87.75)	117.4 (12.25)	142 (100.00)

NON-NFSM DISTRICT

FARM SIZE	IRRIGATED					UNIRRIGATED	TOTAL
	Canal	Tube well	Tank	Others	Total		
MARGINAL	--	5.5 (57.89)	1.5 (15.79)	1 (10.53)	8 (84.21)	1.5 (15.79)	9.5 (100.00)
SMALL	--	16 (61.54)	4 (15.38)	2 (7.69)	22 (84.62)	4 (15.38)	26 (100.00)
MEDIUM	--	28 (62.22)	6 (13.33)	4 (8.89)	38 (84.44)	7 (15.56)	45 (100.00)
LARGE	--	52 (69.33)	8 (10.67)	6 (8.00)	66 (88.00)	9 (12.00)	75 (100.00)
TOTAL	--	101.5 (65.27)	19.5 (12.54)	13 (8.36)	134 (86.17)	21.5 (13.83)	155.5 (100.00)

Note: Parenthesis indicates percentage to the total.

3.3.2 Cropping Pattern over all Seasons of Study Region

This table indicated that total area under cereals and pulses crop in case of Patna district was found 323.86 thousand hectare comprising rice 114 thousand hectare, wheat's 93 thousand hectares, other major crops 65 thousand hectares and pulses 51.86 thousand hectares accounting for 35.20 per cent, 28.72 per cent, 20.07 per cent and 16.01 per cent to the total area under crops respectively. However total area under rice was found 114 thousand hectare out of it large farmers has maximum area 57 thousand hectares followed by mediums, small and marginal. Ultimately we can say that rice has maximum area 114 thousand hectares followed by wheat, other major crops and pulse crops. While in case of Non-NFSM district (Kishanganj), area under cereals and pulse crops have been found 299.17 thousand hectares comprising rice 121.84 thousand hectares, wheat 84.50 thousand hectares, other major crops 55.50 thousand hectares and pulses covered 37.33 thousand hectares accounting for 40.73 per cent, 28.24 per cent, 18.55 per cent and 12.48 per cent respectively.

However, out of total area, rice has maximum area 121.87 thousand hectares followed by wheat, other major crops and pulse crops.

Table No. 3.3.(B): CROPPING PATTERN-OVER ALL SEASONS:

NFSM DISTRICT

(Average of 2006-07, 2007-08, 2008-09)

FARM SIZE	AREA SOWN				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	10 (36.1)	8 (28.88)	5 (18.05)	4.7 (16.97)	27.7 (100.00)
SMALL	16 (32.18)	14 (28.16)	10 (20.11)	9.72 (19.55)	49.72 (100.00)
MEDIUM	34 (35.58)	29 (30.34)	18 (18.83)	14.57 (15.25)	95.57 (100.00)
LARGE	54 (35.79)	42 (27.84)	32 (21.21)	22.87 (15.16)	150.87
TOTAL	114 (35.2)	93 (28.72)	65 (20.07)	51.86 (16.01)	323.86
	NON-NFSM DISTRICT				
FARM SIZE	**RICE**	**WHEAT**	**OTHER MAJOR CROPS**	**PULSES**	**TOTAL**
MARGINAL	8.17 (36.85)	6.5 (29.32)	4.5 (20.30)	3 (13.53)	22.17 (100.00)
SMALL	19.67 (36.65)	16 (29.81)	11 (20.50)	7 (13.04)	53.67 (100.00)
MEDIUM	35 (39.18)	24.33 (27.24)	17.67 (19.78)	12.33 (13.80)	89.33 (100.00)
LARGE	59 (44.04)	37.67 (28.11)	22.33 (16.66)	15 (11.19)	134 (100.00)
TOTAL	121.84 (40.73)	84.5 (28.24)	55.5 (18.55)	37.33 (12.48)	299.17

Note: Bracket indicates percentage to the total.

3.3.3 Cropping Pattern Season wise in Study Region

This table indicated that total area under kharif season in NFSM district (Patna) is found 151 thousand hectares comprising rice with 114 thousand hectares and other major crops with 37 thousand hectares while rabi crop covered 154.86 thousand hectares including wheat with 93 thousand hectares, other major crops i.e., maize with 10 thousand hectares and pulse crops with 51.86 thousands hectares whereas zaid season crop (maize) has 18 thousand hectares out of it larger farmer has maximum area 9.5 thousand hectares followed by medium, small and marginal farmers. Thereafter total area under kharif season in Non-NFSM district (Kishanganj) was found 159.17 thousand hectares comprising rice with 121.84 thousand hectares followed by maize and pulses with 33 thousand hectares and 4.33 thousand hectares respectively. While area under rabi season crops was found 129.50 thousand hectares out of total area under rabi season crops, wheat have maximum area 84.50 thousand hectares followed by pulses with 33 thousand hectares and maize crops with 4.33 thousand hectares whereas in case of zaid season, maize has 11 thousand hectares. However analysis indicated that area under kharif season in Non-NFSM district (Kishanganj) is found more 159.07 thousand hectares in

comparison to NFSM district kharif season crops with 151 thousand hectares. Meanwhile, in case of NFSM district (Patna), area under both rabi with 154.86 thousand hectares and zaid with 18 thousand hectares in comparison to Non-NFSM district (Kishanganj) of both rabi with 129.50 thousand hectares and zaid with 11 thousand hectares.

Table No. 3.3 (C) **Season wise Cropping Pattern** (Average of 2006-07, 2007-08,2008-09)

FARM SIZE	KHARIF (NFSM DISTRICT)				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	10	…	2.5	…	12.5
SMALL	16	…	6	…	22
MEDIUM	34	…	10.5	…	44.5
LARGE	54	…	18	…	72
TOTAL	114	…	37	…	151
	RABI				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	…	8	1	4.7	13.7
SMALL	…	14	1.5	9.72	25.22
MEDIUM	…	29	3	14.57	46.57
LARGE	…	42	4.5	22.87	69.37
TOTAL	…	93	10	51.86	154.86
	ZAID				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	…	…	1.5	…	1.5
SMALL	…	…	2.5	…	2.5
MEDIUM	…	…	4.5	…	4.5
LARGE	…	…	9.5	…	9.5
TOTAL	…	…	18	…	18
	KHARIF (NON-NFSM DISTRICT)				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	8.17	---	2.5	0.5	11.17
SMALL	19.67	---	6	0.7	26.37
MEDIUM	35	---	10.5	1.5	46.9
LARGE	59	---	14	1.73	74.73
TOTAL	121.84	---	33	4.33	159.17
	RABI				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	---	6.5	1.5	2.5	10.5
SMALL	---	16	2.5	6.3	24.8
MEDIUM	---	24.33	4.17	10.93	39.43
LARGE	---	37.67	3.83	13.27	54.77
TOTAL	---	84.5	12	33	129.5
	ZAID				
	RICE	WHEAT	OTHER MAJOR CROPS	PULSES	TOTAL
MARGINAL	---	---	1	---	1
SMALL	---	---	2.5	---	2.5
MEDIUM	---	---	3	---	3
LARGE	---	---	4.5	---	4.5
TOTAL	---	---	11	---	11

3.3.4 Area under Pulses Crops

An analysis of this table revealed that total area under pulse crops in NFSM district (Patna) was found 51.86 thousand hectares comprising lentil, gram and arhar with 27.50, 22.00 and 2.36 thousand hectares accounting for 53.03 per cent, 42.42 per cent and 4.55 per cent respectively while in case of Non-NFSM district (Kishanganj) total area under pulse crops was found 37.33 thousand hectare comprising moong, lentil and gram with 16.50 13.00 and 7.83 thousand hectares accounting for 44.20 per cent, 34.82 per cent and 22.98 per cent respectively.

Table No. 3.3.D Area under Pulses Crops (Average of 2006-07, 2007-08,2008-09)

FARM SIZE	AREA SOWN (NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	2.5 (53.19)	2 (42.55)	0.2 (4.26)	...	4.7 (100.00)
SMALL	5 (51.44)	4 (41.15)	0.72 (7.41)	...	9.72 (100.00)
MEDIUM	8 (54.91)	6 (41.18)	0.57 (3.91)	...	14.57 (100.00)
LARGE	12 (52.47)	10 (43.73)	0.87 (3.8)	...	22.87 (100.00)
TOTAL	27.5 (53.03)	22 (42.42)	2.36 (4.55)	...	51.86 (100.00)
FARM SIZE	AREA SOWN (NON-NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	1.5 (50.00)	1 (33.33)	0.5 (16.67)	...	3 (100.00)
SMALL	3 (42.86)	2.5 (35.71)	1.5 (21.43)	...	7 (100.00)
MEDIUM	5.5 (44.61)	4.5 (36.5)	2.33 (18.9)	...	12.33 (100.00)
LARGE	6.5 (43.33)	5 (33.33)	3.5 (23.34)	...	15 (100.00)
TOTAL	16.5 (44.20)	13 (34.82)	7.83 (22.98)	...	37.33 (100.00)

Note: Parenthesis indicates percentage to the total.

Note: 'TOTAL AREA' in this table should match with that of previous tables

3.4 Area under Pulses Season wise

An analysis revealed that area under kharif pulses in NFSM district (Patna) was found 1.81 thousand hectares for pigeonpea (arhar). However large farmer have maximum area for arhar (1.81) thousand hectares followed by small and medium farmers while in case of Non-NFSM district (Kishanganj), area under kharif pulses was found 4.33 thousand hectares for moong crops.

Table No. 3.4.AArea under Kharif Pulse Crops

(Average of 2006-07, 2007-08,2008-09)

	KHARIF (NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	…	…	0.14	…	0.14
SMALL	…	…	0.58	…	0.58
MEDIUM	…	…	0.42	…	0.42
LARGE	…	…	0.68	…	0.68
TOTAL	…	…	1.81	…	1.81
	KHARIF (NON-NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	0.5	…	…	…	0.5
SMALL	0.7	…	…	…	0.7
MEDIUM	1.4	…	…	…	1.4
LARGE	1.73	…	…	…	1.73
TOTAL	4.33	…	…	…	4.33

3.4.1 Area under Rabi Pulse Crops

An analysis of this table indicated that total area under rabi pulse crops in NFSM district (Patna) was found 50.04 thousand hectares comprising lentil, gram and arhar with an area of 27.50, 22.00 and 0.54 thousand hectares. While in case of Non-NFSM district (Kishanganj), total area under rabi pulse crops was found 33.50 thousand hectares comprising moong, lentil and gram with an area of 13.50, 10.50 and 9.50 thousand hectares. Thereafter area under pulse crops for zaid season in both districts was not found.

Table No. 3.4.B. Area under Rabi Pulse Crops *(Average of 2006-07, 2007-08, 2008-09)*

	RABI (NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	2.5	2	0.06	…	4.56
SMALL	5	4	0.14	…	9.14
MEDIUM	8	6	0.15	…	14.15
LARGE	12	10	0.19	…	22.19
TOTAL	27.5	22	0.54	…	50.04
	RABI (NON-NFSM DISTRICT)				
	PULSE CROP1	PULSE CROP2	PULSE CROP3	PULSE CROP4	TOTAL
MARGINAL	1	1	0.5	…	2.5
SMALL	3	2	1.8	…	6.8
MEDIUM	4	3.5	3.43	…	10.93
LARGE	5.5	4	3.77	…	13.27
TOTAL	13.5	10.5	9.5	…	33.5

3.5 Share of Different Size Groups in Pulse Farming

This table revealed that total area under pulses in NFSM district (Patna) was found 51.86 thousand hectares including large, medium, small and marginal farmers with 22.87, 14.56, 9.72 and 4.70 thousand hectares respectively accounting for 44.10 per cent, 28.09 per cent, 18.14 per cent and 9.06 per cent respectively of the total area under pulses while in case of Non-NFSM district (Kishanganj), total area under pulses was found 37.33 thousand hectare including large, medium, small and marginal farmers with 15.00, 12.33, 7.00 and 3.00 thousand hectares accounting for 40.18, 33.03, 18.75 and 8.04 per cent respectively. However, comparative analysis shows that all the farmers of NFSM district have larger area for pulses than that of Non-NFSM district.

Table No. 3.5 Size Group wise Area in Pulse Farming.

(NFSM DISTRICT)

	TOTAL AREA UNDER PULSES	% SHARE TO TOTAL
MARGINAL	4.7	9.06
SMALL	9.72	18.14
MEDIUM	14.56	28.09
LARGE	22.87	44.1
TOTAL	51.86	100
(NON-NFSM DISTRICT)		
	TOTAL AREA UNDER PULSES	% SHARE TO TOTAL
MARGINAL	3	8.04
SMALL	7	18.75
MEDIUM	12.33	33.03
LARGE	15	40.18
TOTAL	37.33	100.00

3.6 Irrigated Area under Pulse Crops

An analysis of table No. 3.6 A revealed that total irrigated area under pulse crops in NFSM district (Patna) is 6.67 thousand hectare comprising lentil, gram and arhar with 3.50, 2.86 and 0.31 thousand hectares respectively. Out of total irrigated area (6.67 thousand hectares), farmers having 0.58, 1.21, 1.90 and 2.98 thousand hectare with regards to marginal, small, medium and large farm accounting for 8.70 per cent, 18.14 per cent, 28.49 per cent and 44.68 per cent respectively.

Similarly in case of Non-NFSM district (Kishanganj), total irrigated area under pulse crops is 22.50 thousand hectare comprising moong, lentil and gram with 10.0, 6.5 and 6.0 thousand hectares respectively. Out of total irrigated area (22.50 thousand hectare), farmers having 2.0, 3.5, 7.5 and 9.5 thousand hectares with regards to

marginal, small medium and large accounting for 8.89 per cent, 15.56 per cent, 33.33 per cent and 42.22 per cent respectively.

Table No. 3.6.AIrrigated Area under Pulse Crops.

(Average of 2006-07, 2007-08, 2008-09)

	IRRIGATED AREA (NFSM DISTRICT)				
	PULSE CROP1	**PULSE CROP2**	**PULSE CROP3**	**PULSE CROP4**	**TOTAL**
MARGINAL	0.3 (8.57)	0.26 (9.09)	0.02 (6.45)	---	0.58 (8.70)
SMALL	0.6 (17.14)	0.52 (18.18)	0.09 (29.03)	---	1.21 (18.14)
MEDIUM	1.04 (29.71)	0.78(27.27)	0.08 (25.81)	---	1.90 (28.49)
LARGE	1.56 (44.57)	1.3 (45.45)	0.12 (38.71)	---	2.98 (44.68)
TOTAL	3.5 (100.00)	2.86 (100.00)	0.31 (100.00)	---	6.67 (100.00)
	IRRIGATED AREA (NON-NFSM DISTRICT)				
	PULSE CROP1	**PULSE CROP2**	**PULSE CROP3**	**PULSE CROP4**	**TOTAL**
MARGINAL	1.0 (10.00)	0.5 (7.69)	0.5 (8.33)	---	2.0 (8.89)
SMALL	1.5 (15.00)	1.0 (15.38)	1.00 (16.67)	---	3.5 (15.56)
MEDIUM	3.5 (35.00)	2.0 (30.77)	2.0 (33.33)	---	7.5 (33.33)
LARGE	4.0 (70.00)	3.0 (46.15)	2.5 (41.67)	---	9.5 (42.22)
TOTAL	10.0 (100.00)	6.5 (100.00)	6.0 (100.00)	---	22.5 (100.00)

Note: Brackets indicates percentage to the total.

3.6.1 Total Area under Pulse Crops

An analysis revealed that total area under pulse crops in NFSM district (Patna) was found 51.86 thousand hectares comprising lentil 27.50 thousand hectares, gram 22.00 thousand hectare and arhar 2.36 thousand hectare while in case of Non-NFSM district (Kishanganj), total area under pulse crops was found 37.33 thousand hectares comprising moong, lentil and gram with an area of 16.50, 13.00 and 7.83 thousand hectares respectively. After comparatively analysis of both districts, it was found that total area under pulse crop in NFSM district (Patna) was found more 51.86 thousand hectares in comparison to Non-NFSM district (Kishanganj) with 37.33 thousand hectares.

Table No. 3.6.BTotal Area under Pulse Crops

	TOTAL AREA UNDER THE CROP (NFSM DISTRICT)				
	PULSE CROP1	**PULSE CROP2**	**PULSE CROP3**	**PULSE CROP4**	**TOTAL**
MARGINAL	2.5	2	0.2	…	4.7
SMALL	5	4	0.72	…	9.72
MEDIUM	8	6	0.56	…	14.56
LARGE	12	10	0.87	…	22.87
TOTAL	27.5	22	2.36	…	51.86
	TOTAL AREA UNDER THE CROP (NON-NFSM DISTRICT)				
	PULSE CROP1	**PULSE CROP2**	**PULSE CROP3**	**PULSE CROP4**	**TOTAL**
MARGINAL	1.50	1.00	0.50	…	3.00
SMALL	3.00	2.50	1.50	…	7.00
MEDIUM	5.50	4.50	2.33	…	12.33
LARGE	6.50	5.00	3.50	…	15.00
TOTAL	16.50	13.00	7.83	…	37.33

3.7 Crop wise Share in Irrigated Area

An analysis revealed that gross irrigated area under different crops in NFSM district was found 186.17 thousand hectares comprising pulses, rice, wheat and other crops with regards to 6.67, 138 and 41.50 thousand hectares accounting for 3.43 per cent, 74.13 per cent and 22.29 per cent respectively. Out of total irrigated area 186.17 thousand hectares, rice and wheat crops have maximum irrigated area 138.00 thousand hectares followed by other crops 41.50 thousand hectares and pulse crops 6.67 thousand hectares. While in case of Non-NFSM district, gross irrigated area under different crops was found 230 thousand hectares comprising pulses, rice and wheat and other crops with regards to 22.50, 167.50 and 40.00 thousand hectares accounting for 9.78, 72.83 and 17.39 per cent respectively. After comparatively analysis of both districts, it was found that irrigated area under different crops in Non-NFSM district (Kishanganj) was found more than NFSM district (Patna).

Table No. 3.7 Irrigated Area under different Crops.

(Average of 2006-07, 2007-08,2008-09)

FARM SIZE	AREA IRRIGATED(NFSM DISTRICT)			
	PULSES	RICE & WHEAT	ALL OTHER CROPS	TOTAL GIA
MARGINAL	0.58 (7.18)	6 (74.26)	1.5 (18.56)	8.08 (100.00)
SMALL	1.21 (5.21)	20 (86.17)	2 (8.62)	23.21 (100.00)
MEDIUM	1.9 (2.84)	47 (70.25)	18 (26.91)	66.9 (100.00)
LARGE	2.98 (3.39)	65 (73.88)	20 (22.73)	87.98 (100.00)
TOTAL	6.67 (3.43)	138 (74.13)	41.5 (22.29)	186.17 (100.00)
	AREA IRRIGATED (NON-NFSM DISTRICT)			
	PULSES	RICE & WHEAT	ALL OTHER CROPS	TOTAL GIA
MARGINAL	2 (11.76)	11.5 (67.65)	3.5 (20.59)	17 (100.00)
SMALL	3.5 (9.46)	25.5 (68.92)	8 (21.62)	37 (100.00)
MEDIUM	7.5 (11.11)	48 (71.11)	12 (17.78)	67.5 (100.00)
LARGE	9.5 (8.76)	82.5 (76.84)	16.5 (15.21)	108.5 (100.00)
TOTAL	22.5 (9.78)	167.5 (72.83)	40 (17.39)	230 (100.00)

Note: Bracket indicates percentage to the total.

ECONOMICS OF PULSES CULTIVATION

The costs of cultivation have been calculated with the help of standard cost concepts method. These concepts and the items of costs are given below:

Cost A-1:

a. Value of hired human labours
b. Value of hired bullock labours
c. Value of owned bullock labours
d. Value of owned machinery charges
e. Value of hired machinery charges
f. Value of seeds
g. Value of Pesticides
h. Value of land revenue
i. Interest on working capital
j. Miscellaneous expenses

Cost A-2 Cost A-I + rest paid for leased inland.

Cost B-1 Cost A-I + interest on value owned fixed capital assets (excluding land).

Cost B-2 Cost B-1 + rental value of owned land (net of land revenue) and rent paid for leased inland.

Cost C-1 Cost B-1 + imputed value of family labour.

Cost C-2 Cost B-2 + imputed value of family labour.

Cost C-3 Cost C-2 + 10 per cent of Cost C-2 to account for managerial input of the farmers.

4.1 Economics of Lentil (Masur) Cultivation (NFSM District)

The analysis of data regarding economics of lentil (masur) cultivation during three years (2006-07 to 2008-09) suggests that total gross returns per farm during 2006-07, 2007-08 and 2008-09 were estimated at Rs. 19044, Rs. 27912 and Rs. 38399 respectively. It varied farm size group wise i.e., lower the gross returns among smaller farm and higher the gross returns among larger farms. It was also estimated that during the period of 2006-07, 2007-08 and 2008-09, gross returns per hectare for small farmers were Rs. 42000, Rs. 50751 and Rs. 60000 in respective years. Net returns per hectare for the same category of farms during above noted years were found at Rs. 18478, Rs. 21824 and Rs. 30243 respectively. Again, analysis revealed that it varied among the farmers i.e., smaller the farmer, lower the net return per hectare, while higher the net returns per hectare among larger farmers. Thereafter, gross returns per quintal (as total average for all groups of farmers) during 2006-07, 2007-08 and 2008-09 were found Rs. 2864, Rs. 3506 and Rs. 4068 respectively. It didn't vary much among various farmers. This analysis also revealed net returns per quintal at Rs. 1227, Rs. 1504 and Rs. 1716 (as total average) during the years and it varied among farmers, lower the net returns per quintal for smaller farmers, whereas higher the net returns per quintal among larger farmers (table 4.1).

TABLE No. 4.1: PROFITABILITY OF PULSES FARMING (NFSM) DISTRICT: *PULSE CROP1 (Lentil)*

(In Rs.)

	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	4221	2653	1568	40099	14892	2814	1045	1055
2007-08	6677	4073	2604	50745	19787	3514	1370	1736
2008-09	9473	5874	3599	59996	22793	4031	1531	2462
SMALL								
2006-07	11200	6272	4928	42000	18478	2940	1293	3024
2007-08	16917	9643	7274	50751	21824	3502	1505	4736
2008-09	24000	13920	10080	60000	30243	4027	1691	6720
MEDIUM								
2006-07	24500	12740	11760	44025	20160	2948	1415	7105
2007-08	33833	17932	15901	52600	23853	3499	1645	10149
2008-09	45000	24300	20700	61450	27600	4029	1853	13950
LARGE								
2006-07	105000	52500	52500	46200	18261	2563	1282	33600
2007-08	152250	77647	74603	54260	24868	3500	1715	53287
2008-09	210005	109200	100800	62300	32256	4510	2165	94502
TOTAL								
2006-07	19044	10147	8897	42099	17502	2864	1227	5701
2007-08	27912	14956	12956	51473	21780	3506	1504	8779
2008-09	38399	20922	17477	60530	26939	4068	1716	13859

Note: Gross Returns = Value of Main Product (Production*Price)+Value of by-product
Net Returns = Gross Returns-Paid out Costs
Value of Marketed Surplus=Quantity sold*price
Gross Returns/ha=Gross Returns/area sown under the crop
Gross Returns/qtl=Gross Returns/production of the crop

4.2 Profitability of Gram Farming in NFSM District (Patna)

It was estimated that gross returns per farm as total average of all classes of farmers during 2006-07, 2007-08 and 2008-09 were Rs. 8799, Rs. 13200 and Rs. 17472 respectively. It varied accordingly, lower the gross returns among smaller farmers and higher the gross returns among larger farmers during the years. However, net returns per farm as total average of all groups of farmers were found Rs. 4170, Rs. 6132 and Rs. 7950 during 2006-07, 2007-08 and 2008-09 respectively. It varied during the same period of time among farmers, i.e., lower the net returns among smaller farmers, whereas higher the net returns among larger farmers. This analysis indicated that gross returns per hectare as total average were Rs. 21998, Rs. 30262 and Rs. 36396, whereas net returns per hectare were Rs. 7383, Rs. 13007 and Rs.

15256 during 2006-07, 2007-08 and 2008-09 respectively. Analysis of returns per quintal revealed that gross returns per quintal as total average were Rs. 2007, Rs. 2504 and Rs. 2811, whereas net returns per quintal were found Rs. 882, Rs. 1075 and Rs. 1178 during 2006-07, 2007-08 and 2008-09 respectively. It was also found that net returns per quintal varied among the farmers, i.e., lower the net returns per quintal among smaller farmers, and higher the net returns per quintal among larger farmers (table No. 4.2).

TABLE No. 4.2: PROFITABILITY OF PULSES FARMING (NFSM) DISTRICT: *PULSE CROP1 (Gram)*

(In Rs.)

	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	2316	1389	927	21994	8803	2009	804	463
2007-08	3158	1926	1232	29990	11700	2504	977	663
2008-09	3832	2376	1456	36351	13827	2811	1068	843
SMALL								
2006-07	5133	2875	2258	22002	9680	2007	883	1231
2007-08	8000	4560	3440	29996	12900	2504	1077	2080
2008-09	10920	6334	4586	36400	52288	2810	1180	2730
MEDIUM								
2006-07	10083	5243	4840	22001	10560	2007	964	3024
2007-08	15000	7950	7050	30000	14100	2504	1176	4800
2008-09	19717	10647	9070	36398	16744	2811	1293	6901
LARGE								
2006-07	49500	24750	24750	22000	11000	2007	1004	19800
2007-08	75000	38250	36750	33333	16333	2504	1227	31500
2008-09	100100	52052	48048	36400	17472	2811	1349	45045
TOTAL								
2006-07	8799	4629	4170	21998	7383	2007	882	2855
2007-08	13200	7068	6132	30262	13007	2504	1075	4547
2008-09	17472	9522	7950	36396	15256	2811	1178	6399

4.3 Profitability of Pulse Crops (Lentil + Gram) in NFSM District

Analysis revealed that gross returns per farm during 2006-07, 2007-08 and 2008-09 were Rs. 28119, Rs. 41112 and Rs. 55872, whereas net returns per farm as total average were Rs. 6533, Rs. 9544 and Rs. 12713 in respective years. It varied from marginal to larger farmers, i.e., lower the gross returns per farm among smaller farmers and higher the gross returns per farm among larger farmers. It was also estimated that gross returns per hectare as total average during 2006-07, 2007-08 and

2008-09 were Rs. 32048, Rs. 40867 and Rs. 48463, while net returns per hectare as total average were Rs. 12442, Rs. 17393 and Rs. 21097 respectively. It varied from marginal to larger farms. Though, net returns were lower among smaller farmers and higher among the larger farmers, however, gross returns per quintal did not vary much across the farm size. Further, net returns per quintal as total average during 2006-07, 2007-08 and 2008-09 were found at Rs. 1054, Rs. 1289 and Rs. 1447 respectively. It also varied from smaller to larger farmers (table 4.3).

TABLE No. 4.3: TOTAL PROFITABILITY OF PULSES (NFSM DISTRICT):

Lentil + Gram

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	3268	2021	1247	31046	11847	2411	924	759
2007-08	4917	2999	1918	40367	15743	3009	1173	1199
2008-09	6652	4125	2527	48193	18310	3421	1299	1652
SMALL								
2006-07	8166	4573	3593	32001	14079	2473	1088	2127
2007-08	12458	7101	5357	40373	17363	3003	1291	3408
2008-09	17460	10127	7333	48200	22765	3418	1435	4725
MEDIUM								
2006-07	17291	8991	8300	33013	15360	2477	1189	5064
2007-08	24416	12941	11475	41300	18976	3001	1410	7474
2008-09	32358	17473	14885	48924	22172	3420	1573	10425
LARGE								
2006-07	77250	38625	38625	34100	14630	2285	1143	26700
2007-08	113625	57948	55677	43796	20600	3002	1471	42393
2008-09	155052	80626	74426	49350	24864	3660	1757	69773
TOTAL								
2006-07	13921	7388	6533	32048	12442	2445	1054	4278
2007-08	20556	11012	9544	40867	17393	3005	1289	6663
2008-09	27935	15222	12713	48463	21097	3439	1447	10129

4.4 Profitability of Pulses Crops (Moong) in Non-NFSM District (Kishanganj)

Analysis revealed that gross returns per farm as total average were Rs. 9420, Rs. 12012 and Rs. 13494, whereas net returns per farm were Rs. 3996, Rs. 5094 and Rs. 5691 during 2006-07, 2007-08 and 2008-09 respectively. It varied from marginal to larger farmers, i.e., lower the returns among smaller farmers and higher the returns among larger farmers. Gross returns per hectare were, on overall level, were Rs. 29954, Rs. 36405 and Rs. 39078, while net returns per hectare were Rs. 11741, Rs. 14388 and Rs. 15325 during 2006-07, 2007-08 and 2008-09 respectively. Thereafter,

gross returns per quintal as total average were estimated at Rs. 4984, Rs. 5608 and Rs. 6011, whereas net returns per quintal were found Rs. 1953, Rs. 2213 and Rs. 2357 respectively during the years (table 4.4).

TABLE No. 4.4: **PROFITABILITY OF PULSES FARMING** (NON-NFSM DISTRICT): PULSE CROP1 **(Moong)**

(In Rs.)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	2168	1387	781	30027	10817	5003	1802	694
2007-08	3033	1914	1119	36410	13433	5600	2066	1518
2008-09	3683	2357	1326	39014	14047	6000	2160	1840
SMALL								
2006-07	6000	3720	2280	30000	11400	5000	1900	3121
2007-08	7540	4675	2865	36407	13834	5627	2128	4144
2008-09	9193	5699	3494	39002	14824	6000	2280	5516
MEDIUM								
2006-07	13000	7540	5460	30002	12601	5000	2100	7150
2007-08	16987	9852	7135	36998	15288	5600	2752	9343
2008-09	18525	10744	7781	39000	16381	6000	2520	11115
LARGE								
2006-07	32000	17280	14720	29539	13588	4861	2236	18100
2007-08	39433	21294	18139	36400	16744	5600	2576	23660
2008-09	42900	23166	19734	39601	18217	6092	2802	26190
TOTAL								
2006-07	9420	5424	3996	29954	11741	4984	1953	5012
2007-08	12012	6918	5094	36405	14388	5608	2213	6788
2008-09	13494	7803	5691	39078	15325	611	2357	8017

Note: Gross Returns = Value of Main Product (Production*Price) +Value of by-product
Net Returns = Gross Returns-Paid out Costs
Value of Marketed Surplus=Quantity sold*price
Gross Returns/ha=Gross Returns/area sown under the crop
Gross Returns/qtl=Gross Returns/production of the crop

4.5 Profitability of Pulses Crops (Lentil) in Non-NFSM District (Kishanganj)

It was estimated that gross returns per farm on overall level (total of all farm size groups) were Rs. 9984, Rs. 12012 and Rs. 14150 during the years 2006-07, 2007-08 and 2008-09, while that varied among farmers from marginal to larger farmers. Therefore, net returns per farm as total average were found Rs. 4737, Rs. 5475 and Rs. 6238 during the same years. It also varied among different farmers, that is, lower the net returns among smaller farmers and higher the net returns among larger

farmer. Gross returns per hectare as total average were found Rs. 38990, Rs. 46187 and Rs. 53583, while net returns per hectare were calculated as Rs. 17251, Rs. 19644 and Rs. 21990 during above noted years respectively. The analysis further revealed that gross returns per quintal as total average were Rs. 2985, Rs. 3500 and Rs. 3939, whereas net returns per quintal were Rs. 1320, Rs. 1489 and Rs. 1641 during 2006-07, 2007-08 and 2008-09 respectively (table 4.5).

TABLE No. 4.5: PROFITABILITY OF PULSES FARMING (NON-NFSM DISTRICT): PULSE CROP2 (Lentil)

(In Rs.)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	2167	1300	867	38975	15594	3000	1200	1082
2007-08	2567	1591	976	46169	17554	3501	1331	1221
2008-09	2978	1906	1072	53561	19281	4001	1440	1407
SMALL								
2006-07	6407	3588	2819	38996	17158	2977	1310	3550
2007-08	8250	4702	2548	46193	19866	3499	1505	4535
2008-09	10337	5996	4341	53587	22504	3995	1678	5964
MEDIUM								
2006-07	14625	7605	7020	39000	18720	2977	1429	8429
2007-08	17325	9355	7970	46200	21253	3500	1610	10073
2008-09	20100	11055	9045	53600	24120	4000	1800	12239
LARGE								
2006-07	32500	16250	16250	39002	19501	2977	1489	18733
2007-08	38500	20020	18480	46202	22177	3499	1680	22385
2008-09	44667	24120	20547	53603	24657	3499	1840	27202
TOTAL								
2006-07	9984	5247	4737	38990	17251	2985	1320	5654
2007-08	12012	6537	5475	46187	19644	3500	1489	6813
2008-09	14150	7912	6238	53583	21990	3939	1641	8378

4.6 Profitability of Pulses Crops (Moong + Lentil) in Non-NFSM District (Kishanganj)

Analysis reveals that gross returns per farm meant for both these crops on overall level (total of all farm size groups) were Rs. 9702, Rs. 12012 and Rs. 13822, whereas net returns per farm as total average for both the crops were estimated at Rs. 4366, Rs. 5285 and Rs. 5965 during 2006-07, 2007-08 and 2008-09 respectively. These varied across the farm size; that is, lower the returns among smaller farmers and higher the returns among larger farmers. However, gross returns per hectare as total average were found Rs. 34472, Rs. 41296 and Rs. 46330, whereas net returns per hectare were

noted as Rs. 14496, Rs. 17016 and Rs. 18657 during the same years. Further, gross returns per quintal as total average and net returns per quintal were estimated at Rs. 3984, Rs. 4554, Rs. 4975 and Rs. 1636, Rs. 1851, Rs. 1999 respectively. It was ultimately found that trend of increasing returns was similar for all size of surveyed farmers (table 4.6).

TABLE No. 4.6: TOTAL PROFITABILITY OF PULSES (NON-NFSM DISTRICT) (Moong & Lentil)

(In Rs.)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	2167	1343	824	34501	13205	4001	1501	888
2007-08	2800	1752	1047	41289	15493	4550	1698	1369
2008-09	3330	2131	1199	46287	16664	5000	1800	1623
SMALL								
2006-07	6203	3654	2549	34498	14279	3988	1605	3335
2007-08	7895	4688	3206	41300	16850	4563	1816	4339
2008-09	9765	5847	3917	46294	18664	4997	1979	5740
MEDIUM								
2006-07	13812	7572	6240	34501	15660	3988	1764	7789
2007-08	17156	9603	7552	41299	18270	4550	1981	9708
2008-09	19312	10899	8413	46300	20250	5000	2160	11677
LARGE								
2006-07	32250	16765	15485	34270	16544	3919	18625	18416
2007-08	38966	20657	18309	41301	19460	4549	2128	2302
2008-09	43785	23643	20140	46602	21437	4795	2321	26696
TOTAL								
2006-07	9702	5335	4366	34472	14496	3984	1636	5333
2007-08	12012	6727	5285	41296	17016	4554	1851	6800
2008-09	13822	7857	5965	46330	18657	4975	1999	8197

4.7 Profitability of Rice in NFSM and Non-NFSM Districts

Analysis revealed that gross returns of respondents per farm on overall level (total) in NFSM district (Patna) were Rs. 116380, Rs. 127490 and 135045, whereas the same in Non-NFSM district (Kishanganj) were estimated at Rs. 115762, Rs. 132257 and Rs. 143225 during the years 2006-07, 2007-08 and 2008-09 respectively. It varied across the farm size, i.e., lower the returns among smaller farmers and higher the returns among larger farmers. However, net returns per farm in NFSM district were noted as Rs. 54881, Rs. 57612 and Rs. 58380, whereas those in Non-NFSM district were estimated at Rs. 52997, Rs. 60559 and Rs. 65581 during the above noted years respectively. Table No. 4.7 also shows that gross returns per hectare in NFSM

district were Rs. 49582, Rs. 54377 and Rs. 57107 and that in Non-NFSM district were Rs. 46559, Rs. 54436 and Rs. 59832. Net returns per hectare in NFSM district as total average were Rs. 21828, Rs. 22768 and Rs. 22853, and that in Non-NFSM district were estimated as Rs. 19652, Rs. 22927 and Rs. 25277 respectively. Further, gross returns per quintal as total average in NFSM and Non-NFSM districts were found same at Rs. 1689, Rs. 1748 and Rs. 1869 and Rs. 1754, Rs. 2002 and Rs. 2195 in respective years. Net returns per quintal in both NFSM and Non-NFSM districts were estimated to be Rs. 775, Rs. 822, 861 and Rs. 740, Rs. 846, Rs. 926 respectively. Almost similarly increasing trends could be seen in all the cases (table 4.7).

TABLE No. 4.7: TOTAL PROFITABILITY OF OTHER MAJOR CROPS LIKE RICE (In Rs.)

NFSM DISTRICT								
FARM SIZE	**GROSS RETURNS /FARM**	**TOTAL PAID-OUT COSTS /FARM**	**NET RETURNS /FARM**	**GROSS RETURNS PER HA**	**NET RETURNS PER HA**	**GROSS RETURNS PER QTL**	**NET RETURNS PER QTL**	**VALUE OF MARKETED SURPLUS /FARM**
MARGINAL								
2006-07	24864	14672	10192	47243	19365	1680	738	4972
2007-08	28432	17343	11082	54022	21056	1715	780	5686
2008-09	31309	19725	11584	59488	22010	1850	814	7827
SMALL								
2006-07	57369	32701	24668	53781	23125	1710	774	17210
2007-08	58304	34399	23905	56658	22410	1795	820	17491
2008-09	56282	34332	21950	52762	20577	1898	858	18010
MEDIUM								
2006-07	148296	77114	71182	52340	25123	1755	864	51903
2007-08	164640	88907	75733	58108	26729	1820	920	62563
2008-09	177164	99212	77952	62529	27513	1925	968	74409
LARGE								
2006-07	676620	345076	331544	50120	24559	1890	882	318011
2007-08	776010	395385	350625	57482	25972	1965	940	388005
2008-09	796796	438238	358558	59022	26559	2160	990	414339
TOTAL								
2006-07	116380	61499	54881	49582	21828	1689	775	44606
2007-08	127490	69878	57612	54377	22768	1748	822	53113
2008-09	135045	76665	58380	57107	22853	1869	861	59022
NON-NFSM DISTRICT								
FARM SIZE	**GROSS RETURNS /FARM**	**TOTAL PAID-OUT COSTS /FARM**	**NET RETURNS /FARM**	**GROSS RETURNS PER HA**	**NET RETURNS PER HA**	**GROSS RETURNS PER QTL**	**NET RETURNS PER QTL**	**VALUE OF MARKETED SURPLUS /FARM**
MARGINAL								
2006-07	21525	13345	8180	46967	17848	1781	679	4735
2007-08	24750	15345	9405	53933	20057	1997	759	5692
2008-09	26598	16491	10107	59851	22743	2216	842	6649
SMALL								
2006-07	66825	38758	28067	46753	19637	1764	741	17374
2007-08	76024	44094	31930	54579	22923	2006	843	21286
2008-09	82736	47987	34749	59398	24947	2171	912	23166
MEDIUM								
2006-07	139781	75482	64299	45954	21139	1718	790	41934
2007-08	157500	85050	72450	54783	25520	2003	921	50400
2008-09	170775	92218	78557	60274	27726	2199	1011	59771
LARGE								
2006-07	464625	241605	223020	46093	22125	1719	825	185850
2007-08	535500	278460	257040	54923	26363	2004	962	240975
2008-09	575150	305198	277992	59911	28758	2182	1048	260617
TOTAL								
2006-07	115762	62765	52997	46559	19652	1754	740	38935
2007-08	132257	71998	60559	54436	22927	2002	846	49022
2008-09	143225	77644	65581	59832	25277	2195	926	54514

4.8 Profitability of Wheat in NFSM and Non-NFSM Districts

It could be seen from table 4.8 that gross returns per farm in case of wheat in NFSM and Non-NFSM districts were Rs. 71984, Rs. 86816, Rs. 77029 and Rs. 78474, Rs. 85082, Rs. 101137 in the years 2006-07, 2007-08 and 2008-09 respectively. These varied among the farmers, i.e., lower the returns among smaller farmers and higher the returns among the larger farmers. Net returns per farm also varied from marginal to larger farmers, i.e., higher the returns among larger farmers and lower the returns among marginal farmers. Analysis also indicated that gross returns per hectare in both the districts were Rs. 39950, Rs. 45418, Rs. 55309 and Rs. 47898, Rs. 49945 and Rs. 59199 respectively during the years. Net returns per hectare during the years were Rs. 17903, Rs. 18610, Rs. 22748 in NFSM district (Patna) and Rs. 20824, Rs. 21758, Rs. 25764 in Non-NFSM district (Kishanganj) during 2006-07, 2007-08 and 2008-09 respectively. Further, gross returns per quintal and net returns per quintal in both the sample districts showed increasing trend during the years 2006-07, 2007-08 and 2008-09 (table 4.8).

TABLE NO. 4.8: PROFITABILITY OF OTHER MAJOR CROP LIKE WHEAT NFSM DISTRICT

(In Rs.)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	17789	10318	7471	39760	16698	1341	546	3557
2007-08	19747	11650	8097	46893	19228	1398	574	4344
2008-09	22905	14201	8704	58031	22052	1406	608	5497
SMALL								
2006-07	37943	21622	16321	37943	16321	1396	572	9485
2007-08	37107	24951	12156	39960	13091	1408	602	9647
2008-09	53360	31482	21878	49803	20420	1456	656	14940
MEDIUM								
2006-07	101617	51824	49793	42047	20603	1460	637	35565
2007-08	115033	60968	54065	49300	23171	1470	658	43712
2008-09	140000	77000	63000	56000	25000	1490	720	56000
LARGE								
2006-07	442000	216580	225400	42095	21466	1500	663	198900
2007-08	507850	263718	243932	47241	42691	1560	672	243768
2008-09	624800	337392	287408	60956	28039	1580	736	324896
TOTAL								
2006-07	71984	40172	31812	39950	17903	1398	574	28644
2007-08	86816	47642	39174	45418	18610	1431	612	34537
2008-09	77029	60312	16717	55309	22748	1455	660	46002

NON-NFSM DISTRICT

(In Rs)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	16901	10140	6761	48677	19472	1786	714	2535
2007-08	17743	10646	7097	49135	19654	1803	721	2838
2008-09	22201	13320	8881	59202	23682	2145	858	3996
SMALL								
2006-07	53486	29952	23534	48311	21257	1769	778	10697
2007-08	56575	31682	24893	49501	21780	1810	796	14143
2008-09	69771	39072	30699	59198	26047	2137	940	19535
MEDIUM								
2006-07	93601	50544	43057	46800	21528	1711	787	28080
2007-08	10071	54038	46033	51101	23506	1865	858	32022
2008-09	120867	65268	55599	59199	27231	2133	981	42303
LARGE								
2006-07	291252	151451	139801	46800	22464	1711	821	101938
2007-08	323633	168289	155344	51100	24528	1865	895	126216
2008-09	371677	193272	178405	59200	28416	2133	1024	167254
TOTAL								
2006-07	78474	42342	36132	47898	20824	1754	762	22879
2007-08	85082	45867	39215	49945	21758	1827	796	27812
2008-09	101137	54592	46545	59199	25764	2138	930	37131

4.9 Profitability of (Rice + Wheat) in NFSM and Non-NFSM Districts

Analysis reveals that gross returns per farm in case of rice and wheat in NFSM and Non-NFSM districts were Rs. 94182, Rs. 107153, Rs. 106037, and Rs. 97118, Rs. 108669, Rs. 122181 during the years 2006-07, 2007-08 and 2008-09 respectively. Net returns per farm in both the districts were found to be Rs. 43347, Rs. 48393, Rs. 37549 and Rs. 44565, Rs. 49887, Rs. 56063 during above noted years respectively. Gross returns per hectare in NFSM and Non-NFSM districts were found to be Rs. 44766, Rs. 49897, Rs. 56208 and Rs. 47228, Rs. 52190 and Rs. 59515 in the years 2006-07, 2007-08 and 2008-09 respectively. Net returns per hectare in both the noted districts were calculated as Rs. 19865, Rs. 20689, Rs. 22800 and Rs. 20238, Rs. 22342, Rs. 25520 respectively.

Further, gross returns per quintal in NFSM and Non-NFSM districts didn't vary much across the farm size and were found as Rs. 1543, Rs. 1589, Rs. 1662 and Rs. 1754, Rs. 1914, Rs. 2166 respectively. Net returns per quintal in NFSM district were estimated at Rs. 674, Rs. 717 and Rs. 760, whereas the same in Non-NFSM district were Rs. 751, Rs. 821 and Rs. 928 in the years 2006-07, 2007-08 and 2008-09 respectively. Similar trend could be viewed in these cases, i.e., returns varied from marginal to larger, indicating lower the returns in case of smaller farmers and higher the returns in case of larger farmers (table 4.9).

TABLE NO.4.9: TOTAL PROFITABILITY OF OTHER MAJOR CROPS LIKE RICE+ WHEAT (NFSM DISTRICT)

(In Rs.)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	21326	12495	8831	43501	18031	1510	642	4264
2007-08	24089	14496	9593	50457	20142	1556	677	5015
2008-09	27107	16963	10144	58759	22031	1628	711	6662
SMALL								
2006-07	47656	27161	20495	45862	19723	1553	673	13347
2007-08	47705	29675	18030	47309	17750	1601	711	13569
2008-09	54821	32907	21914	51282	20498	1677	757	16475
MEDIUM								
2006-07	124956	64469	60487	47193	22863	1607	750	43734
2007-08	139836	74937	64899	53704	24950	1645	789	53137
2008-09	158582	73106	85476	59264	26256	1707	844	65204
LARGE								
2006-07	559310	280828	278482	46107	23012	1695	772	258455
2007-08	641930	329551	312379	52361	24331	1762	806	315886
2008-09	710798	387815	322983	59989	27299	1870	863	369617
TOTAL								
2006-07	94182	50835	43347	44766	19865	1543	674	36625
2007-08	107153	58760	48393	49897	20689	1589	717	43825
2008-09	106037	68488	37549	56208	22800	1662	760	52512

NON-NFSM DISTRICT

(In Rs)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	19213	11742	7471	47822	18660	1783	696	3635
2007-08	21246	12995	8251	51534	19855	1900	740	4265
2008-09	24399	14905	9494	59526	23212	2180	850	5322
SMALL								
2006-07	60155	34355	25800	47532	20447	1766	757	14035
2007-08	66299	37888	28411	52040	22351	1908	819	17714
2008-09	76253	43529	72724	59298	25497	2154	926	21350
MEDIUM								
2006-07	116691	57421	59270	46377	21333	1714	788	35007
2007-08	128785	69544	59241	52942	24513	1934	889	41211
2008-09	145821	78743	67078	59736	27478	2166	996	51037
LARGE								
2006-07	377938	196528	181410	46446	22294	1715	823	143894
2007-08	429566	223374	206192	53011	25445	1934	928	183595
2008-09	475413	247215	228198	59555	28587	2157	1036	213935
TOTAL								
2006-07	97118	52553	44565	47228	20238	1754	751	30907
2007-08	108669	58782	49887	52190	22342	1914	821	38417
2008-09	122181	66118	56063	59515	25520	2166	928	45822

4.10 Profitability of Maize in NFSM and Non-NFSM Districts

Analysis of table 4.10 reveals that gross returns per farm as total average in case of NFSM district were Rs. 41067, Rs. 54607 and Rs. 74056, whereas in case of Non-NFSM district, these were calculated as Rs. 34781, Rs. 46262 and Rs. 62153 during the years 2006-07, 2007-08 and 2008-09 respectively. It was also observed that net returns per farm in NFSM district were Rs. 23536, Rs. 30196 and Rs. 39833, whereas in case of Non-NFSM district, these were Rs. 19830, Rs. 25444 and Rs. 33201 in the years 2006-07, 2007-08 and 2008-09 respectively. Gross returns per hectare as total average in NFSM and Non-NFSM districts were estimated at Rs. 32606, Rs. 41866, Rs. 54603, and Rs. 32746, Rs. 41653, Rs. 53304 respectively, while net returns per hectare as total average in the above noted districts were calculated as Rs. 11832, Rs. 14615, Rs. 18354, and Rs. 17946, Rs. 22015, Rs. 27230 respectively. Ultimately, it could be observed in regard to gross returns per quintal that these were Rs. 470, Rs. 535 and Rs. 570 in NFSM and Rs. 612, Rs. 712 and Rs. 757 in Non-NFSM district respectively. Net returns per quintal were Rs. 300, Rs. 368, Rs. 456 and Rs. 355, Rs. 434 and Rs. 537 in NFSM and Non-NFSM districts during the years 2006-07, 2007-08 and 2008-09 respectively (table 4.10).

TABLE 4.10 TOTAL PROFITABILITY OF OTHER MAJOR CROPS LIKE MAIZE NFSM DISTRICT

(In Rs)

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	8532	4095	4437	32416	10536	450	286	1706
2007-08	10986	5493	5493	41740	13044	500	350	2197
2008-09	14334	7454	6880	54460	16338	550	432	3153
SMALL								
2006-07	20548	9247	11301	32446	13039	450	302	5137
2007-08	27935	13129	14806	41900	15864	550	371	7263
2008-09	38323	18778	19546	54747	19546	550	459	9197
MEDIUM								
2006-07	46088	19818	26270	32532	11258	500	313	11522
2007-08	62916	28312	34604	41944	14318	550	385	16358
2008-09	87281	41020	46261	55126	18504	600	477	24438
LARGE								
2006-07	257493	105572	151921	34332	15192	550	324	90122
2007-08	336896	144870	192026	42112	18288	600	398	128020
2008-09	452059	198906	253153	53183	23013	650	504	189864
TOTAL								
2006-07	41067	17532	23536	32606	11832	470	300	12164
2007-08	54607	24411	30196	41866	14615	535	368	17181
2008-09	74056	34223	39833	54603	18354	570	456	25011

FARM SIZE	GROSS RETURNS /FARM	TOTAL PAID-OUT COSTS /FARM	NET RETURNS /FARM	GROSS RETURNS PER HA	NET RETURNS PER HA	GROSS RETURNS PER QTL	NET RETURNS PER QTL	VALUE OF MARKETED SURPLUS /FARM
MARGINAL								
2006-07	8091	3883	4208	34269	17822	579	353	1699
2007-08	10334	5179	5155	41336	20620	665	408	2170
2008-09	13464	7001	6463	51019	24490	698	484	2962
SMALL								
2006-07	24325	10946	13379	32433	17338	643	354	5351
2007-08	32571	15308	17263	41454	21971	720	434	7165
2008-09	44024	21572	22452	53596	27333	785	540	10125
MEDIUM								
2006-07	44664	19206	25458	30909	17618	611	348	10272
2007-08	62591	28166	34425	42506	23378	750	461	15021
2008-09	83421	39212	44218	55620	29478	796	580	20023
LARGE								
2006-07	119487	48989	70498	32587	19226	644	379	29871
2007-08	153332	65933	87399	41366	23578	765	464	39866
2008-09	207966	91505	116461	54847	30714	798	604	58230
TOTAL								
2006-07	34781	14951	19830	32746	17946	612	355	8159
2007-08	46262	20818	25444	41653	22015	712	434	1176
2008-09	62153	28952	33201	53304	27230	757	537	15694

Note: Gross Returns = Value of Main Product (Production*Price)+Value of by-product
Net Returns = Gross Returns-Paid out Costs
Value of Marketed Surplus=Quantity sold*price
Gross Returns/ha=Gross Returns/area sown under the crop
Gross Returns/qtl=Gross Returns/production of the crop

TECHNOLOGY ADOPTION

5.1 Households Reporting Area under Improved Varieties of Pulses for NFSM District and Non-NFSM District

Getting or not getting associated with the operation of technology adoption in the villages of sample farmers depends upon their perception. Various perceptions as reported by sample farmers of NFSM and Non-NFSM districts along with the ranks assigned to each of them by respondents have been shown in table 5.1

TABLE NO. 5.1: HOUSEHOLDS REPORTING AREA UNDER IMPROVED VARIETIES OF PULSES:

NFSM DISTRICT

PULSE CROP	No OF HHLDS REPORTING AREA UNDER IMPROVED VARIETIES	TOTAL NO OF HHLDS IN THE SIZEGROUP	% OF HHLDS REPORTING
1. Lentil	5	19	26.32
2. Gram	4	15	26.67
3. Arhar	4	12	33.33
4. Khesadi	3	4	75.00
TOTAL	15	50	30.00
NON-NFSM DISTRICT			
PULSE CROP	**No OF HHLDS REPORTING AREA UNDER IMPROVED VARIETIES**	**TOTAL NO OF HHLDS IN THE SIZEGROUP**	**% OF HHLDS REPORTING**
1.Moong	4.00	18.00	22.22
2. Lentil	4.00	14.00	18.57
3. Gram	5.00	12.00	41.67
4. Arhar	4.00	6.00	66.67
TOTAL	17.00	50.00	34.00

Analysis of the responses of sample farmers reveals that larger proportion of respondents (3 out of 4 i.e., 75%) considered/pointed out about knowledge of area under improved varieties of pulses by large farmers followed by medium (4 out of 12 i.e, 33.33) and small farmers 4 out of 15 accounting for 26.67 per cent while in case of Non-NFSM district (Kishanganj), it was found that larger proportion of

respondents (4 out of 6 i.e, 66.67 %) pointed out about knowledge of area under improved varieties of pulses by large farmers followed by medium (5 out of 12 i.e., 41.67%) and marginal farmers (4 out of 18) respondents accounting for 22.22 per cent.

5.2 Area under Improved Varieties of Pulses in NFSM and Non-NFSM Districts

Table 5.2 shows that total areas under traditional and improved varieties of pulses in NFSM district (Patna) were 42.36 hectare and 9.5 hectare respectively. In case of Non-NFSM district (Kishanganj) that was estimated at 27.33 hectares and 10 hectares respectively. On the other, analysis reveals that areas under improved varieties of lentil and gram were 5.5 hectare and 4 hectare accounting for 20.00 per cent and 18.18 per cent in NFSM district. Similarly in case of Non-NFSM district, areas under improved varieties of moong, lentil and gram were found 4 hectare, 3.5 hectare and 2.5 hectare accounting for 24.24 per cent, 26.92 per cent and 31.93 per cent respectively.

TABLE NO. 5.2: AREA UNDER IMPROVED VARIETIES OF PULSES:

NFSM DISTRICT

PULSE CROP	TOTAL AREA UNDER THE CROP	AREA UNDER TRADITIONAL VARIETIES	AREA UNDER IMPROVED VARIETIES	% OF AREA UNDER IMPROVED VARIETIES
1 (Lentil)	27.5	22	5.5	20.00
2 (Gram)	22	18	4.0	18.18
3 (Arhar)	2.36	2.36	…	…
TOTAL	51.86	42.36	9.5	18.32
NON-NFSM DISTRICT				
PULSE CROP	TOTAL AREA UNDER THE CROP	AREA UNDER TRADITIONAL VARIETIES	AREA UNDER IMPROVED VARIETIES	% OF AREA UNDER IMPROVED VARIETIES
Moong	16.50	12.50	4.00	24.24
Lentil	13.00	9.50	3.50	26.92
Gram	7.83	5.33	2.50	31.93
TOTAL	37.33	27.33	10.00	26.79

5.3 Knowledge of Improved Varieties in NFSM and Non-NFSM Districts

Knowledge of improved varieties as expressed by the sample respondent has been put in table 5.3. As it is evident from the table that out of the total 50 respondents, 25 farmers were aware about improved varieties of pulses, which accounted for 50.00 per cent. In NFSM district, larger farmers have cent per cent knowledge about improved varieties of pulses followed by medium (66.67%), small (46.67%) and marginal (31.58%), while in case of Non-NFSM district, 19 farmers out of 50 farmers were aware about improved varieties of pulses, accounting for 38.00 per cent. However, analysis revealed that larger farmers had 50.00 per cent knowledge of improved varieties of pulses followed by medium (5 out of 12) accounting for 41.67 per cent and small farmers (5 out of 14) accounting for 35.11 per cent. Therefore it may be concluded that farmers of NFSM district (Patna) were more aware about improved varieties of pulses in comparison to Non-NFSM district (Kishanganj).

TABLE NO. 5.3: KNOWLEDGE OF IMPROVED VARIETIES: NFSM DISTRICT

FARM SIZE	NFSM DISTRICT			NON-NFSM DISTRICT		
	NO OF FARMERS AWARE OF IMPROVED VARIETIES	TOTAL NO OF FARMERS IN THE SIZEGROUP	% OF FARMERS AWARE OF IV	NO OF FARMERS AWARE OF IMPROVED VARIETIES	TOTAL NO OF FARMERS IN THE SIZEGROUP	% OF FARMERS AWARE OF IV
MARGINAL	6	19	31.58	6	18	33.33
SMALL	7	15	46.67	5	14	35.71
MEDIUM	8	12	66.67	5	12	41.67
LARGE	4	4	100.00	3	6	50.00
TOTAL	25	50	50.00	19	50	38.00

5.4 Source of Knowledge of Improved Varieties in NFSM and Non-NFSM Districts

There are different sources of knowledge of improved varieties i.e., Extension Agent, Neighbours and Newspapers/Media. It may be observed from the table that 25 out of 50 farmers were aware about improved varieties. However, 12 farmers (48%), 09 farmers (36%) and 4 farmers (16%) knew about improved varieties and awareness were provided by Extension Agent, Neighbours and Newspaper/Media respectively in NFSM district (Patna). Analysis of sample district also revealed that

Extension agents were the most important sources for knowledge of improved varieties of pulses in NFSM district, while in case of Non-NFSM district (Kishanganj), 30 farmers out of 50 were aware about improved varieties of pulses. However, Extension Agent may also be considered most effective source at average 36.67 per cent followed by Neighbours (30%), Newspapers (26.67%) and others (6.68%).

TABLE NO. 5.4: SOURCE OF KNOWLEDGE OF IMPROVED VARIETIES

FARM SIZE	NFSM DISTRICT				
	EXTENSION AGENT	NEIGHBOURS	NEWSPAPER/ MEDIA	OTHERS	TOTAL
MARGINAL	2 (33.33)	4 (66.67)	…	…	6 (100.00)
SMALL	3 (42.86)	3 (42.86)	1 (14.28)	…	7 (100.00)
MEDIUM	4 (50.00)	2 (25.00)	2 (25.00)	…	8 (100.00)
LARGE	3 (75.00)	…	1 (25.00)	…	4 (100.00)
TOTAL	12 (48.00)	9 (36.00)	4 (16.00)	…	25 (100.00)
	NON-NFSM DISTRICT				
FARM SIZE	EXTENSION AGENT	NEIGHBOURS	NEWSPAPER/ MEDIA	OTHERS	TOTAL
MARGINAL	4 (44.44)	3 (33.33)	2 (22.23)	…	9 (100.00)
SMALL	3 (37.5)	2 (25.00)	2 (25.00)	1 (12.50)	8 (100.00)
MEDIUM	2 (25.00)	3 (37.5)	2 (25.00)	1 (12.50)	8 (100.00)
LARGE	2 (40.00)	1 (20.00)	2 (40.00)	…	5 (100.00)
TOTAL	11 (36.67)	9 (30.00)	8 (26.67)	2 (6.68)	30 (100.00)

Note: Bracket indicates percentage to the total.

5.5 Recommended Practices for Improved Varieties of Pulse Crops (NFSM and Non-NFSM District)

There are many recommended practices i.e., sowing and seed practices. Among these recommended practices, seed practices were more prevalent than sowing practices in the both NFSM (Patna) and Non-NFSM (Kishanganj) districts it may be concluded that seed and sowing practices were adopted by 44.00 per cent, 28.00 per cent of the respondents and 28.00 per cent did not follow any practice in NFSM district. In Non-NFSM district these accounted for 52.63 per cent, 42.11 per cent and 5.26 per cent for seed practice, sowing practice and not followed any practices respectively. However, it was found that seed practices were most important in both the districts (NFSM and Non-NFSM district).

TABLE NO. 5.5: RECOMMENDED PRACTICES

NFSM DISTRICT				
FARM SIZE	FOLLOWED SOME PRACTICE			NOT FOLLOWED ANY PRACTICE
	SOWING PRACTICES	SEED PRACTICES	OTHERS	
MARGINAL	…	4 (66.67)	…	2 (33.33)
SMALL	2 (28.57)	3 (42.86)	…	2 (28.57)
MEDIUM	3 (37.5)	2 (25.00)	…	3 (37.5)
LARGE	2 (50.00)	2 (50.00)	…	…
TOTAL	7 (28.00)	11 (44.00)	…	7 (28.00)
NON-NFSM DISTRICT				
FARM SIZE	FOLLOWED SOME PRACTICE			NOT FOLLOWED ANY PRACTICE
	SOWING PRACTICES	SEED PRACTICES	OTHERS	
MARGINAL	2 (10.53)	3 (15.75)	…	1 (5.26)
SMALL	2 (10.53)	3 (15.75)	…	…
MEDIUM	3 (15.75)	2 (10.53)	…	…
LARGE	1 (5.26)	2 (10.53)	…	…
TOTAL	8 (42.11)	10 (52.63)	…	1 (5.26)

Note: Bracket indicates percentage to the total.

5.6 Households Reporting Problems with Improved Varieties of Pulses (NFSM and Non-NFSM Districts)

Analysis of the responses of sample farmers in NFSM district reveals that larger proportion of respondents (12 out of 25 i.e., 48%) considered 'availability but not on time' as the most important problem with improved varieties of pulses. Problems of availability but not on time emerged as the next most important problem for improved varieties of pulses as larger proportion of respondents (9 out of 25 i.e, 36%) ranked it as the second among the various problems with improved varieties of pulses. Again, comparatively large percentage of households reporting problems with improve varieties of pulses (9 out of 25 i.e., 35%), perceived very expensive as the third most important problem of improve varieties of pulses. Larger proportion of respondents (32% i.e., 8 out of 25) reported that much lower yield than expected was the next most important problem with improved varieties of pulses in their opinion. Need large doses of other inputs was ranked fifth in order of importance by larger proportion (32%) of respondents. Pest resistance not adequate was assigned 6th rank by households reporting problems with improved varieties of pulses by larger percentage (68% i.e., 17 out of 25) of respondents. Analysis of

responses of sample farmers in Non-NFSM district (Kishanganj) reveals that larger proportion of respondents (19 out of 90 i.e., 21.11%) considered as the most important problems as non-availability of improved varieties of pulses followed by next important problem as non-availability of improved varieties of pulses (17 out of 90 i.e., 18.89%) as second ranked and third rank (12 out of 90 i.e., 13.33%). However, it may be concluded that availability but not on time emerged as most important problem which was ranked first (8 out of 18 i.e., 44.44%) followed by problems of not available at all (6 out 15 i.e., 40%).

TABLE NO. 5.6: HOUSEHOLDS REPORTING PROBLEMS WITH IMPROVED VARIETIES OF PULSES:

NFSM DISTRICT							
PROBLEM	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Not available at all	10 (40.00)	8 (32.00)	5 (20.00)	2 (8.00)	…	…	25 (100.00)
Available but not on time	12 (48.00)	9 (36.00)	2 (8.00)	2 (8.00)	…	…	25 (100.00)
Very expensive	3 (12.00)	8 (32.00)	9 (36.00)	5 (20.00)	…	…	25 (100.00)
Need large doses of other inputs	…	…	4 (16.00)	5 (20.00)	8 (32.00)	8 (32.00)	25 (100.00)
Much lower yield than expected	…		5 (20.00)	8 (32.00)	12 (48.00	…	25 (100.00)
Pest resistance not adequate	…	…	…	3 (12.00)	5 (20.00)	17 (68.00)	25 (100.00)
TOTAL	25 (16.67)	25 (16.67)	25 (16.67)	25 (16.67)	25 (16.67)	25 (16.67)	150 (100.00)
NON-NFSM DISTRICT							
PROBLEM	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Not available at all	6 (40.00)	4 (26.67)	2 (13.33)	3 (20.00)	…	…	15 (100.00)
Available but not on time	8 (44.44)	5(27.78)	3 (16.67)	2(11.11)	…	…	18 (100.00)
Very expensive	3 (17.65)	2 (11.76)	3 (17.65)	…	4 (23.53)	5 (29.41)	17 (100.00)
Need large doses of other inputs	…	3 (25.00)	2 (26.67)	3 (25.00)	…	4 (33.33)	12 (100.00)
Much lower yield than expected	2 (14.29)	2 (14.29)	…	4 (28.57)	3 (21.43)	3 (21.42)	14 (100.00)
Pest resistance not adequate	…	1 (7.14)	2 (14.29)	5 (35.71)	2 (14.29)	4 (28.57)	14 (100.00)
TOTAL	19 (21.11)	17 (18.89)	12 (13.33)	17 (18.89)	9 (10.00)	16 (17.78)	90 (100.00)

Note: Parenthesis indicates percentage to the total.

5.7 Suggested Solutions for Improved Varieties of Pulses in NFSM and Non-NFSM Districts

Analysis of the responses of sample farmers in NFSM district revealed that larger proportion of respondents (11 out of 25 i.e., 44%) considered cheaper availability of seed as the most important suggestion for improved varieties of pulses which was ranked as first followed by timely availability of seeds (9 out of 25 i.e., 36%). However, important suggestions as cheaper availability of seed were predominant throughout the rank among various suggestions for improved varieties of pulses. It was followed by suggestions related to timely availability of seeds and subsidy, while in case of Non-NFSM district, analysis of the responses of sample farmers reveals that larger proportion of respondents (47.11%) considered timely availability of seeds as the most important suggestion for improved varieties of pulses followed by cheaper availability of seeds (42.11%) and subsidy (35.78%).

TABLE NO. 5.7 SUGGESTED SOLUTIONS FOR IMPORVED VARIETIES:

NFSM DISTRICT					
PROBLEM	RANK1	RANK2	RANK3	RANK4	TOTAL
Cheaper availability of seeds	11 (44.00)	8 (32.00)	6 (24.00)	…	25 (100.00)
Timely availability of seeds	9 (36.00)	7 (28.00)	5 (20.00)	4 (16.00)	25 (100.00)
Subsidy	5 (20.00)	6 (24.00)	9 (36.00)	5 (20.00)	25 (100.00)
Any Other (Specify)	…	4 (16.00)	5 (20.00)	16 (64.00)	25 (100.00)
TOTAL	25 (25.00)	25 (25.00)	25 (25.00)	25 (25.00)	100 (100.00)
PROBLEM	RANK1	RANK2	RANK3	RANK4	TOTAL
NON-NFSM DISTRICT					
Cheaper availability of seeds	8 (42.11)	6 (31.58)	5 (26.31)	…	19 (100.00)
Timely availability of seeds	9 (47.37)	7 (36.84)	3 (15.79)	…	19 (100.00)
Subsidy	2(14.29)	5 (35.71)	4 (28.57)	3 (21.43)	14 (100.00)
Any Other (Specify)	…	…	2 (28.57)	5 (71.43)	7 (100.00)
TOTAL	19 (32.2)	18 (30.51)	14 (23.73)	8 (13.56)	59 (100.00)

5.8 Marketing Channels for Pulse Crops in NFSM and Non-NFSM Districts

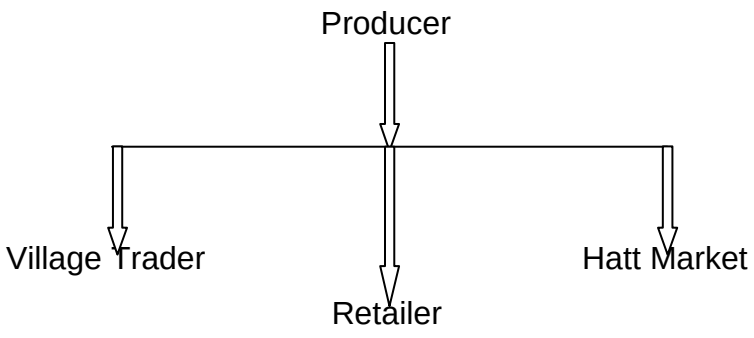
Marketing channels for pulses varied from commodity to commodity and from producer to producer. In rural areas and small towns; many producers perform the

functions of village traders. Most of the studies on the identification of marketing channels for agricultural commodities have concentrated on a concept of marketing channel, which defines the flow of the produce from the producer (farmer) to the consumer. But, as the commercialization (market orientation) of agriculture is increasing and as the farmers and consumers are located in different states or different countries, the marketing channels that are emerging go across the states or even national boundary. This apart, unless quantities flowing into various channels are estimated, the relative importance of alternative channels cannot be assessed. Such as analysis was done and found that Markets for pulses are thin and fragmented due to scattered production and consumption across states. Farmers/village traders sell their marketed surplus immediately after harvest while some large traders/wholesaler trader with major markets and hoard pulses to take advantage of speculative gains in the off season. Due to this, farmers do not benefit from the higher market prices of pulses. Also, for certain pulses like khesari, demand is localized and market is underdeveloped. In recent years, there have been improvements in market information and infrastructure, and the price spread between consumer price and producer price is reducing, especially in the harvest season. However, it may be observed that two or three marketing channels have been functioning as per the responses of sample farmers of selected districts.

Marketing Channels

There were two or three marketing channels in the study area:

1. *Producer* ⟹ *Local Market (Hatt Market)* ⟹ *VillageTraders* ⟹ *Consumers*
2. *Producer* ⟹ *Village Traders* ⟹ *Consumers*
3. *Producer* ⟹ *Consumers*



5.8 Number of Households Marketing through Various Channels

Analysis based on table No. 5.9 revealed that total number of households of NFSM district marketing through village trader and common agent was 13 farmers and 37 farmers. Marginal and small farmers generally sold their produces to the village trader and in the common agent, whereas medium and large farmers mostly sold their produces to village traders. These two channels are found predominant in the sample farm i.e., NFSM district (Patna), while farmers perception was found same in the Non-NFSM district (Kishanganj). Total number of households marketing through hatt market and village traders was found 15 and 35 farmers. However, it may be concluded that in both the NFSM and Non-NFSM districts, hatt market, village trader and common agent for marketing of pulses were common.

TABLE NO. 5.8: MARKET CHANNELS FOR PULSE CROPS

NFSM DISTRICT						
NO OF HOUSEHOLDS MARKETING THROUGH VARIOUS CHANNELS						
FARM SIZE	VILLAGE TRADER	COMMN AGENT	REGULATED MARKET	GOVT AGENCIES (NAFED)	OTHERS	TOTAL
MARGINAL	6 (46.15)	13 (35.14)	…	…		19 (38.00)
SMALL	4 (30.77)	11 (29.73)	…	…	…	15 (30.00)
MEDIUM	3 (23.08)	9 (24.32)	…	…	…	12 (24.00)
LARGE	…	4 (10.81)	…	…	…	4 (8.00)
TOTAL	13 (100.00)	37 (100.00)	…	…	…	50 (100.00)

NON-NFSM DISTRICT

FARM SIZE	HATT MARKET	VILLEGE TRADER	REGULATED MARKET	GOVT AGENCIES (NAFED)	OTHERS	TOTAL
MARGINAL	7 (46.67)	11 (31.43)	…		…	18 (36.00)
SMALL	5 (33.33)	9 (25.71)	…	…		14 (28.00)
MEDIUM	3 (20.00)	9 (25.71)	…	…	…	12 (24.00)
LARGE	…	6 (17.15)	…	…	…	6 (12.00)
TOTAL	15 (100.00)	35 (100.00)	…	…	…	50 (100.00)

Note: Bracket indicates percentage to the total.

5.9 Quantity Sold through Various Channels (NFSM and Non-NFSM)

Analysis based on table No. 5.10 reveals that total quantity of pulses (lentil) sold in NFSM district Patna was 35851 kg and price received Rs. 1249420. Quantity sold, out of the total quantity through village traders and common agent were found to be 5166 kg and 30685 kg, with regard to price received Rs. 103931 and Rs. 1145489 respectively. Sold quantity of lentil varied according to the farm size. However,

quantity sold was found lower among the smaller farmer and higher among the larger farmer. Similarly in case of Non-NFSM district (Kishanganj), analysis (table No. 5.11) reveals that total quantity of lentil sold was 9242 kg and price received was found Rs. 332712. Quantities sold through hatt market and village traders were found 1670 kg and 7572 kg, and prices received for those quantities were Rs. 60120 and Rs. 272592 respectively. However, it may be concluded that village trader was the most suitable marketing channel for selling pulses in both the NFSM and Non-NFSM districts. Analysis of the sample district showed that most of the small and marginal farmers grew pulses for home consumption, but they sold their produces according to their situation of livelihood, while larger farmers grew pulses for both home consumption and commercial purposes.

TABLE NO. 5.9: QUANTITY SOLD THROUGH VARIOUS MARKETING CHANNELS (*PULSE CROP 1 : Lentil)*

NFSM DISTRICT												
FARM SIZE	**VILLAGE MARKET**		**COMM. AGENT**		**REGULATED MARKET**		**GOVT AGENCIES (NAFED)**		**OTHERS (-------)**		**TOTAL**	
	QTY SOLD (In kg)	**PRICE (Rs)**	**QTY SOLD (In Kg)**	**PRICE (In Rs.)**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD (In Kg)**	**PRICE In Rs.)**
MARGINAL	824.5	30779	1786	66671	…	…	…	…	…	…	2610.5	97450
SMALL	1751.4	65380	4817	179819	…	…	…	…	…	…	6568.4	245199
MEDIUM	2590.5	7772	7771.5	290110	…	…	…	…	…	…	10362.0	297882
LARGE	…	…	16311	608889	…	…	…	…	…	…	16311.0	608889
TOTAL	5166	103931	30685	1145489	…	…	…	…	…	…	35851.9	1249420

TABLE NO. 5.10: QUANTITY SOLD THROUGH VARIOUS MARKETING CHANNELS (*PULSE CROP 2 : Lentil)*

Non-NFSM												
FARM SIZE	**HATT MARKET**		**VILLEGE TRADER**		**REGULATED MARKET**		**GOVT AGENCIES (NAFED)**		**OTHERS (-------)**		**TOTAL**	
	QTY SOLD	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**	**QTY SOLD**	**PRICE**
MARGINAL	231	8316	363	13068	…	…	…	…	…	…	594	21384
SMALL	620	22320	1116	40176	…	…	…	…	…	…	1736	62496
MEDIUM	819	29484	2457	88452	…	…	…	…	…	…	3276	117936
LARGE	…	…	3636	130896	…	…	…	…	…	…	3636	130896
TOTAL	1670	60120	7572	272592	…	…	…	…	…	…	9242	332712

5.11 Quantities of Moong Sold through Various Marketing Channels (Non-NFSM) District

It may be concluded from the analysis of table No. 5.12 that total quantity of moong sold and price received in Non-NFSM district (Kishanganj) by sample farmers was 5918 kg and Rs. 325490 respectively. Out of the total, quantities sold and prices received through hatt market and village market was 1043 kg with Rs. 57365 and 4875 kg in regard to Rs. 268125 respectively. However, it may be seen that quantities sold varied from marginal to large farmer. Higher quantum meant for larger farmer and lower quantum was sold by lower farmer. Also it may be found that village trader market was most prevalent as reported by all the responses of the sample farmers.

TABLE NO. 5.11: QUANTITY OF MOONG SOLD THROUGH VARIOUS MARKETING CHANNELS

NON-NFSM DISTRICT

PULSE CROP1 (Moong)

FARM SIZE	HATT MARKET		VILLEGE TRADER		REGULATED MARKET		GOVT AGENCIES (NAFED)		OTHERS (--------)		TOTAL	
	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD	PRICE
MARGINAL	168	9240	264	14520	...	...	...	...	...	...	432	23760
SMALL	380	20900	684	37620	...	...	...	...	...	...	1064	58520
MEDIUM	495	27225	1485	81675	...	...	...	...	...	...	1980	108900
LARGE	...	...	2442	134310	...	...	...	...	...	...	2442	134310
TOTAL	1043	57365	4875	268125	...	...	...	...	...	...	5918	325490

5.12 Quantities of Gram sold through Various Marketing Channel (NFSM District)

Analysis based on table No. 5.12 reveals that total quantity of gram sold and price received in NFSM district (Patna) was 21474 kg and Rs. 520315 respectively. Out of this, quantity sold and price received through village market was 2995 kg and Rs. 72569, whereas remaining quantity sold and price received through common agent was 18479 kg and Rs. 447746. However, it may be concluded that quantities sold increased from marginal to larger farmers and village trader marketing channel was found predominant among all the farmers of the sample district.

TABLE NO. 5.12: QUANTITY SOLD THROUGH VARIOUS CHANNELS

NFSM DISTRICT

PULSE CROP 2 (Gram)

FARM SIZE	VILLAGE MARKET		COMM. AGENT		REGULATED MARKET		GOVT AGENCIES (NAFED)		OTHERS (--------)		TOTAL	
	QTY SOLD (In kg)	PRICE (In Rs.)	QTY SOLD (In Kg)	PRICE In Rs.)	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD	PRICE	QTY SOLD (In Kg)	PRICE (In Rs.)
MARGINAL	523	12672	1133	27453	…	…	…	…	…	…	1656	40125
SMALL	1008	24424	2772	67166	…	…	…	…	…	…	3780	91590
MEDIUM	1464	35473	4392	106418	…	…	…	…	…	…	5856	141891
LARGE	…	…	10182	246709	…	…	…	…	…	…	10182	246709
TOTAL	2995	72569	18479	447746	…	…	…	…	…	…	21474	520315

MAJOR PEST PROBLEMS

There has been a high degree of risk in pulse production; more than 250 insect species are reported to affect pulses in India. Among these, nearly one dozen cause heavy crop losses. On an average, 2 to 2.4 million tones of pulses with a monetary value of nearly Rs. 6,000 crore are lost annually due to ravages of insect pest complex. Among them, pod borer (helicoverpa armigera) causes the most harm, followed by pod fly, wilt and root rot. Another important pest affecting pulses are nematodes, among which root-knot nematodes are important in terms of spread and damage to crop yield, which have been effectively controlled by bio-agents. Trials at the Indian Institute of Pulses Research (IIPR) in infested fields have shown avoidable yield losses ranging from 10.40 per cent in irrigated to 15 to 30 per cent in rainfed areas from control of nematodes by utilizing bio-agents and chemicals. Recent developments of these bio-pesticides can also reduce harmful chemical residue in grains, which ultimately improve the quality of food grains. Research in insect pests has been concentrated only on helicoverpa armigera, multiple resistance varieties need to be developed in future to simultaneously control many pests.

Among important diseases, wilt in chickpea, sterility mosaic virus (SMV) in pigeonpea, yellow mosaic virus (YMV) and powdery mildow (PM) are common and more damaging.

6.1 Opinion Survey for Major Pest Problems (NFSM and Non-NFSM) Districts

It may be observed from the table 6.1 that there were various types of insect pest and diseases i.e., pod borer, pod fly, wilt, root rot, nematodes for pulses, which were found in NFSM district. These pests i.e., pod borer, wilt and nematodes cause damage to gram pulse and estimated yield loss per acre was recorded 19 kg, 14 kg and 10 kg with respective insect-pests, whereas yield losses per acre for Arhar and Lentil were found 29 kg and 26 kg with respective insect-pests. In Non-NFSM

district, pod borer and nematodes cause damage gram crops and estimated yield loss per acre was recorded 24 kg and 21 kg with respective insect-pests. Also, it was observed that estimated losses per acre from pod fly and wilt for moong were 20 kg and 13 kg and root rot for lentil was recorded 37 kg. with respective insect-pests. However, it may be concluded that pod fly in NFSM district was found serious pest while in Non-NFSM district, root rot was found serious pest for damaging pulse crops.

TABLE NO. 6.1 MAJOR PEST PROBLEMS:

NFSM DISTRICT

TYPE OF PEST	NO OF HHLDS REPORTING PROBLEM	% TO TOTAL HHLDS	CROPS AFFECTED	ESTIMATED YIELD LOSS PER ACRE(kg)
Pod borer	14	28.00	Gram	19
Pod fly	9	18.00	Arhar	29
Wilt	8	16.00	Gram	14
Roor rot	12	24.00	Lentil	26
Nematodes	7	14.00	Gram	10
NON-NFSM DISTRICT				
TYPE OF PEST	**NO OF HHLDS REPORTING PROBLEM**	**% TO TOTAL HHLDS**	**CROPS AFFECTED**	**ESTIMATED YIELD LOSS PER ACRE (kg)**
Pod borer	14	28	Gram	24
Pod fly	12	24	Moong	20
Wilt	9	18	Moong	13
Roor rot	8	16	Lentil	37
Nematodes	7	14	Gram	21

6.2 Reasons for Growing Pulses (NFSM and Non-NFSM)

Reasons for growing pulses have been shown in table 6.2. A perusal of the table indicated that larger proportion of respondents (32 out of 50 i.e., 64%) of NFSM district considered home consumption as the most important reason for growing pulses. Inferior quality of land and lack of irrigation emerged as the next most important reasons for growing pulses as reported by larger proportion of respondents (7 out of 50 i.e., 14%), while the responses of sample farmers of Non-NFSM district revealed that larger proportion of respondents (14 out of 50 i.e., 28%)

considered home consumption to be the most important reason for growing pulses followed by inferior quality of land and profitability as the reasons accounting for 24.00 per cent and 20.00 per cent respectively. However, it may be observed that home consumption emerged as the most important reason for growing pulses among the respondents of the both the districts i.e., NFSM and Non-NFSM.

TABLE NO. 6.2: REASONS FOR GROWING PULSES: (*NO OF HHLDS)*

REASONS	NFSM DISTRICT		NON-NFSM DISTRICT	
	TOTAL NO OF HHLDS	% OF TOTAL HHLDS	TOTAL NO OF HHLDS	% OF TOTAL HHLDS
Home Consumption	32	64.00	14	28
Animal feed	..	..	8	16
Inferior quality of land	7	14.00	12	24
Lack of irrigation	7	14.00	6	12
Profitability	4	8.00	10	20
Others	…	…	…	…
Total	50	100.00	50	100

6.3 Size group wise Reasons for Growing Pulses: (NFSM and Non-NFSM) Districts

Various reasons for growing pulses as reported by the sample farmers of NFSM and Non-NFSM districts have been presented in table 6.3. Analysis of the responses of sample farmers of NFSM district revealed that large proportion of respondents i.e., 74.00 per cent considered home consumption of marginal farmers as the most important reason for growing pulses followed by small farmers, i.e., 67.00 per cent and medium farmers, i.e., 66.67 per cent. As it is evident from the table, viewed inferior quality of land by small farmers 20.00 per cent that emerged as next most important reason for growing pulses. Again, larger farmer perceived lack of irrigation as the third most important reason for growing pulses, while analysis of the responses of sample farmers of Non-NFSM district revealed that larger proportion of respondents (12.7%) considered home consumption by the marginal farmers as the most important reasons for growing pulse. Small farmers considered inferior quality of land (7.94%) as the next most important reason for growing pulses. Medium and larger farmers ranked animal feed (6.35%) and profitability (6.35%) as the third and fourth important reasons for growing pulses respectively.

TABLE NO. 6.3: REASONS FOR GROWING PULSES: SIZE GROUPWISE

NFSM DISTRICT

FARM SIZE	REASON						
	Home Consumption	Animal feed	Inferior quality of land	Lack of irrigation	Profitability	Others	Total
MARGINAL	14 (74.00)	…	2 (10.00)	3 (16.00)	…	…	19 (100.00)
SMALL	10 (67.00)	…	3 (20.00)	2 (13.00)	…	…	15 (100.00)
MEDIUM	6 (50.00)	…	2 (17.00)	2 (17.00)	2 (16.00)	…	12 (100.00)
LARGE	…	…	…	2 (50.00)	2 (50.00)	…	4 (100.00)
TOTAL	32 (64.00)	…	7 (14.00)	9 (14.00)	4 (8.00)	…	50 (100.00)

NON- NFSM DISTRICT

FARM SIZE	REASON						
	Home Consumption	Animal feed	Inferior quality of land	Lack of irrigation	Profitability	Others	Total
MARGINAL	8 (12.7)	6 (9.52)	6 (9.52)	…	…	…	20 (31.75)
SMALL	5 (7.94)	4 (6.35)	5 (7.94)	3 (4.76)	…	…	17 (26.98)
MEDIUM	3 (4.76)	4 (6.35)	3 (4.76)	3 (4.76)	3 (4.76)	…	16 (25.4)
LARGE	2 (3.17)	…	2 (3.17)	2 (3.17)	4 (6.35)	…	10 (15.87)
TOTAL	18 (28.57)	14 (22.22)	16 (25.4)	8 (12.7)	7 (11.11)	…	63(100.00)

Note: Bracket indicates percentage to total.

6.4 Criteria used for Growing Pulses (NFSM and Non-NFSM) Districts

Various criteria used for growing pulses as reported by the sample farmers of NFSM and Non-NFSM districts, have been shown in table 6.4. Analysis of the responses of sample farmers of NFSM district revealed that larger proportion of respondents (27 out of 50 i.e., 54%) considered home requirement as the most important criteria for growing pulses followed by extent of irrigation (9 out of 50 i.e., 18%) and maintenance of soil fertility (6 out of 50 i.e., 12%). Similarly an analysis of sample farmers of Non-NFSM district revealed that larger proportion of respondents (22 out of 50 i.e., 44%) considered home requirement as the most important criteria for growing pulses. Inferior quality of land and extent of irrigation by sample farmers were considered as the next most important criteria for growing pulses (9 out of 50 i.e., 18%). However, it may be concluded that most of the farmers of both the

districts (NFSM and Non-NFSM district) have been growing pulses for home consumption.

TABLE NO. 6.4: CRITERIA USED WHILE OPTING TO GROW PULSES

	NFSM DISTRICT		NON-NFSM DISTRICT	
REASONS	TOTAL NO OF FARMERS	% OF FARMERS	TOTAL NO OF FARMERS	% OF FARMERS
Rainfall	4	8.00	6	12.00
Soil Fertility	6	12.00	4	8.00
Home requirement	27	54.00	22	44.00
Inferior quality of	4	8.00	9	18.00
Extent of Irrigation	9	18.00	9	18.00
Others	...	...	...	...
Total	50	100.00	50	100

6.5 Reasons for Low Area under Pulses (NFSM and Non-NFSM) Districts

Various reasons for low area under pulses in NFSM and Non-NFSM districts, as reported by sample farmers, have been shown in table 6.5. Analysis based on table 6.5 revealed that larger proportion of respondents (15 out of 50 i.e., 30%) of NFSM district considered pest problems as the most important reason for low area under pulses followed by low profitability and low yield reasons accounting for 24.00 per cent and 20.00 per cent respectively. Similarly respondents of Non-NFSM district reported pest problem (14 out of 50 i.e., 28%) as the most important reason for low area under pulses followed by low yield (12 out of 50 i.e., 24%) and instability of both yield and price (10 out of 50 i.e., 20%) accounting for second and third reasons for low area under pulses respectively.

TABLE NO. 6.5 REASONS FOR LOW AREA UNDER PULSES:

	NFSM DISTRICT		NON-NFSMDISTRICT	
REASONS	TOTAL NO OF FARMERS	% OF FARMERS	TOTAL NO OF FARMERS	% OF
Low profitability	12	24.00	6	12
Low yield	10	20.00	12	24
Instability (yield or price or	6	12.00	10	20
Marketing problem	7	14.00	8	16
Pest problems	15	30.00	14	28
Others	...	...	...	...
Total	50	100.00	50	100

6.6 Crops Grown on Inferior Quality of Land (NFSM and Non-NFSM Districts)

Various reasons for crops grown on inferior quality of land, as expressed by the sample respondents, have been put in table 6.6. As it is evident from the table that coarse cereals were viewed by sample farmers of the NFSM district as the most important reason for crops grown on inferior quality of land accounting for 44.00 per cent, whereas oilseeds and pulses were reported the second and third important reasons for crops grown on inferior quality of land accounting for 24.00 per cent and 14.00 per cent respectively. The sample respondents of Non-NFSM district revealed that coarse cereals were also viewed as the most important reason for crops grown on inferior quality of land accounting for 32.00 per cent followed by superior cereals (13 out of 50 i.e., 26%) and pulse crops (9 out of 50 i.e., 18%). However, it may be concluded that coarse cereals was reported as the most important reason for crops grown on inferior quality of land as reported by the sample farmers of both the (NFSM and Non-NFSM districts).

TABLE NO. 6.6: CROPS GROWN ON INFERIOR QUALITY OF LANDS

REASONS	NFSM DISTRICT		NON-NFSM DISTRICT	
	TOTAL NO OF FARMERS	% OF FARMERS	TOTAL NO OF FARMERS	% OF FARMERS
Superior cereals	3	6.00	13	26
Coarse cereals	22	44.00	16	32
Pulses	7	14.00	9	18
Oilseeds	12	24.00	6	12
Vegetables	6	12.00	4	8
Any other (specify)	...	...	2	4
Total	50	100.00	50	100

6.7 Problems in Growing Pulses on Inferior Quality of Land (NFSM and Non-NFSM Districts)

Various problems for growing pulses on inferior quality of land have been presented in table 6.7. The analysis of the responses of the sample farmers of NFSM district revealed that larger proportion of respondents (24 out of 50 i.e., 48%) considered poor grains quality as the most important reason for growing pulses on inferior quality of land followed by low yield (14 out of 50 i.e., 28%), whereas sample farmers

of Non-NFSM district reported that both yield and grain quality far low and, so these were poor considered as the most important reasons for growing pulses on inferior quality of land as reported by the farmer of Non-NFSM district.

Table No. 6.7: PROBLEMS OF GROWING PULSES ON INFERIOR QUALITY LANDS

REASONS	NFSM DISTRICT		NON-NFSM DISTRICT	
	TOTAL NO OF FARMERS	% OF FARMERS	TOTAL NO OF FARMERS	% OF FARMERS
Yield is low	14	28.00	12	24
Grain quality is poor	24	48.00	14	28
both 1 and 2	12	24.00	24	48
Total	50	100.00	50	100

6.8 Reasons for Shifting from Pulses to other Crops (NFSM and Non-NFSM) Districts

Various reasons for shifting from pulses to other crops have been presented in table 6.8. The analysis of the responses of the sample farmers of NFSM district showed that larger proportion of respondents (22 out of 50 i.e., 44%) considered low yield as the most important reason for shifting from pulses to other crops. Yield of improved varieties being uncertain was considered as the next most important reason accounting for 26.00 per cent. Again, low price realization was viewed as third most important reason for shifting from pulses to other crops followed by large doses of other inputs required and 'no assured market' accounting for 12.00 per cent and 10.00 per cent respectively. Respondents of Non-NFSM district considered low price realization as the most important reason for shifting from pulses to other crops accounting for 24.00 per cent. Uncertainties in yield of improved varieties as reported by sample respondents (10 out of 50 i.e., 20%) emerged as the next most important reason for shifting from pulses to other crops. Further, comparatively large percentage of sample farmers (18% i.e., 9 out of 50) perceived low yield as the third most important reason for shifting from pulses to other crops followed by reasons related to absence of assured market and large doses of other inputs required.

TABLE NO. 6.8: REASONS FOR SHIFTING FROM PULSES TO OTHER CROPS

REASONS	NFSM DISTRICT		NON-NFSM DISTRICT	
	TOTAL NO OF FARMERS	% OF FARMERS	TOTAL NO OF FARMERS	% OF FARMERS
Yield is low	22	44.00	9	18
Price realization is low	6	12.00	12	24
No assured market	4	8.00	8	16
Yield of improved varieties is uncertain	13	26.00	10	20
Large doses of other inputs required	5	10.00	7	14
Others	…	…	4	8
Total	50	100.00	50	100

6.9 Farmers Willing to Grow Pulses if Assured Market are provided (NFSM and Non-NFSM Districts)

Analysis of the responses of sample farmers of NFSM district revealed that number of farmers willing to grow pulses (if assured market is available) was recorded as (30 out of 50 i.e., 60%). Size group wise analysis suggests that larger proportion of large farmers (60%) was willing to grow pulses, if assured market was provided followed by marginal farmers (63.16%), small farmers (60%) and medium farmers (58.33%). Sample farmers of Non-NFSM district viewed that larger proportion of large farmers (66.67%) was willing to grow pulses, if assured market was available followed by medium farmers (58.33%), small farmers (57.14) and marginal farmers (38.89%). However, it may be concluded that larger proportion of large farmers of both the districts (NFSM and Non-NFSM) was willing to grow pulses, if assured market was provided to sample farmers.

TABLE NO. 6.9: FARMERS WILLING TO GROW PULSES IF ASSURED MARKET IS PROVIDED

NFSM DISTRICT				NON-NFSM DISTRICT		
FARM SIZES	NO OF FARMERS WILLING	TOTAL NO OF FARMERS IN THE SIZEGROUP	% OF FARMERS WILLING	NO OF FARMERS WILLING	TOTAL NO OF FARMERS IN THE SIZEGROUP	% OF FARMERS WILLING
MARGINAL	12	19	63.16	7	18	38.89
SMALL	9	15	60.00	8	14	57.14
MEDIUM	7	12	58.33	7	12	58.33
LARGE	3	4	75.00	4	6	66.67
TOTAL	30	50	60.00	26	50	52.00

6.10 Major Problems for Cultivating Pulses (NFSM and Non-NFSM Districts)

Getting or not getting associated with responses of sample farmers depends upon their perception of the major problems. The sample farmers of both the district (NFSM and Non-NFSM) were asked to express their perception for problems in cultivating pulses and also to rank them. Various problems for cultivating pulses, as reported by the sample farmers of both the districts along with the rank assigned to each of them by the respondents, have been presented in table 6.10.

Analysis based on the responses of sample farmers of NFSM district revealed that larger proportion of respondents (20 out of 50 i.e., 40%) considered lack of improved varieties of pulses as the most important problem for cultivating pulses and ranked it as first. Large doses of other inputs required emerged as the next most important problems by sample farmers (16 out of 50 i.e., 32%). Further, comparatively larger percentage of sample farmers (18 out of 50 i.e., 36%) perceived lack of irrigation facilities as the third most important problem for cultivating pulses, while data related to sample farmers of Non-NFSM district showed that larger proportion of respondents 37.04 per cent considered large doses of other inputs required as the most important problem for cultivating pulses followed by lower yield (34.29%), lack of improved varieties (30.43%) and lack of irrigation facilities (29.03%).

TABLE NO. 6.10: Major Problems in Cultivating Pulses (NFSM & Non-NFSM) *(No of Farmers)*

NFSM DISTRICT

REASONS	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Lack of Irrigation Facility	---	---	18 (36.00)	16 (32.00)	9 (18.00)	7 (14.00)	50 (100.00)
Lack of Improved Variety	20 (40.00)	12 (24.00)	10 (20.00)	8 (16.00)	---	---	50 (100.00)
Lower Yield	12 (24.00)	14 (28.00)	16 (32.00)	8 (16.00)	---	---	50 (100.00)
Large Doses of other Input Required	18 (36.00)	16 (32.00)	6 (12.00)	6 (12.00)	4 (8.00)	---	50 (100.00)
Any other (Specify)	---	8 (16.00)	---	12 (24.00)	14 (28.00)	16 (32.00)	50 (100.00)
Total	50 (20.00)	50 (20.00)	50 (20.00)	50 (20.00)	27 (10.80)	23 (9.20)	250 (100.00)

Non-NFSM DISTRICT

REASON	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Lack of Irrigation Facility	9 (29.03)	8 (25.81)	6 (19.35)	5 (16.13)	3 (9.68)	---	31 (100.00
Lack of Improved Variety	14 (30.43)	12 (26.09)	9 (19.57)	7 (15.22)	4 (8.70)	---	46 (100.00)
Lower Yield	12 (34.29)	10 (28.57)	7 (20.00)	4 (11.43)	2 (5.71)	---	35 (100.00)
Large Doses of other Input Required	10 (37.04)	7 (25.93)	5 (18.52)	3 (11.11)	2 (7.41)	---	27 (100.00)
Any other (Specify)	3 (21.43)	2 (14.28)	4 (28.57)	5 (35.72)	---	---	14 (100.00)
Total	48 (31.37)	39 (25.49)	31 (20.26)	24 (15.69)	11 (7.19)	---	153 (100.00)

Note: Parenthesis indicates percentage to the total.

6.11 Important Suggestions from the Farmers for Cultivating Pulses (NFSM and Non-NFSM Districts)

Analysis based on data in table 6.10 revealed that larger proportion of respondents (36%) of the NFSM district considered availability of high yielding varieties as the most important suggestion for cultivating pulses. This suggestion occupied as pre dominant position throughout the rank also. Further, comparatively improving

irrigation facilities (32%) was ranked fourth whereas availability of pest resistant varieties (28%) was ranked third in regard to important suggestions for cultivating pulses followed by assured procurement with MSP and high market price. Analysis based on the responses of sample farmers of Non-NFSM district revealed that larger proportion of respondents (32.65%) considered assured procurement with MSP as the most important suggestion rank and it was ranked as the first and second by the farmers of sample district followed by improving irrigation facilities (27.03%), availability pest resistant varieties (25%) and availability of high yielding varieties of pulses (24.39%).

TABLE NO. 6.11: IMPORTANT SUGGESTIONS FROM THE FARMERS FOR CULTIVATING PULSES: *(No of Farmers)*

NFSM DISTRICT

REASONS	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Improving Irrigation facilities	4 (8.00)	6 (12.00)	10 (20.00)	16 (32.00)	8 (16.00)	6 (12.00)	50 (100.00)
Availability of high-yielding varieties	18 (36.00)	14 (28.00)	12(24.00)	6 (12.00)	…	…	50 (100.00)
Availability of pest-resistant varieties	10 (20.00)	12 (24.00)	14 (28.00)	8 (16.00)	6 (12.00)	…	50 (100.00)
Assured procurement with MSP	12 (24.00)	10 (20.00)	7 (14.00)	9 (18.00)	6 (12.00)	6 (12.00)	50 (100.00)
Higher market price	6 (12.00)	8 (16.00)	7 (14.00)	6 (12.00)	10 (20.00)	13 (26.00	50 (100.00)
Any other	…	…	…	5 (12.50)	15 (37.50)	20 (50.00)	40 (100.00)
Total	50 (17.24)	50 (17.24)	50 (17.24)	50 (17.24)	45 (15.52)	45 (15.52)	290 (100.00)

NON-NFSM DISTRICT

REASON	RANK1	RANK2	RANK3	RANK4	RANK5	RANK6	TOTAL
Improving irrigation facilities	6 (16.22)	8 (21.62)	10 (27.03)	7 (18.92)	6 (16.22)	…	37 (100.00)
Availability of high-yielding varieties	10 (24.39)	9 (21.95)	8 (19.51)	8 (19.51)	4 (9.76)	2 (4.88)	41 (100.00)
Availability of pest-resistant varieties	12 (25.00)	11 (22.92)	9 (18.75)	7 (14.58)	5 (10.42)	4 (8.33)	48 (100.00)
Assured procurement with MSP	16 (32.65)	14 (28.57)	8 (16.33)	6 (12.24)	5 (10.21)	23	49 (100.00)
Higher market price	6 (31.58)	4 (20.05)	2 (10.53)	3 (15.79)	2 (10.53)	2(10.52)	19 (100.00)
Any other	…	…	3 (30.00)	3 (30.00)	2 (20.00)	2 (20.00)	10 (100.00)
Total	50 (24.5)	46 (22.55)	40 (19.61)	34 (16.67)	24 (4.91)	10 (4.91)	204 (100.00)

Note: Bracket indicates percentage to total.

IMPACT OF NFSM PULSE ON PULSE PRODUCTION IN BIHAR

7.1 Farmers' Awareness of NFSM Pulses

The analysis based on size group wise responses of farmers of NFSM district has been presented in table 7.1 Analysis of sample farmers reveals the total number of households aware about NFSM for pulses production at (24 out of 50 i.e., 48%). Size group wise analysis reveals that out of the total number of large households, (3 i.e., 75%) were aware with NFSM followed by medium, small and marginal farmers accounting for 58.33 per cent, 53.33 per cent and 31.58 per cent respectively.

TABLE NO. 7.1: FARMERS' AWARENESS OF NFSM-PULSES

FARM SIZES	NO OFHHLDS AWARE	TOTAL NO OF HHLDS IN THE SIZEGROUP	% OF HHLDS AWARE
MARGINAL	6	19	31.58
SMALL	8	15	53.33
MEDIUM	7	12	58.33
LARGE	3	4	75.00
TOTAL	24	50	48.00

7.2 Received Some Important Assistance under NFSM Pulses

It was observed from analysis based on data in table 7.2, that total number of households who received assistance under NFSM for pulses production was (17 i.e., 34%). On the other hand, size group wise analysis shows that large households who received assistance under NFSM for pulses' production constituted 50.00 per cent followed by medium farmers (41.67%), small (40%) and marginal farmers (21.05%). However, it may be observed from the analysis of table 7.2 that larger farmers were more conscious about NFSM for pulses' production than smaller ones.

TABLE NO. 7.2: RECEIVED ANY ASSISTANCE UNDER NFSM-PULSES

FARM SIZES	NO OF HHLDS WHO RECEIVED ASSISTANCE	TOTAL NO OF HHLDS IN THE SIZEGROUP	% OF HHLDS ASSISTED
MARGINAL	4	19	21.05
SMALL	6	15	40.00
MEDIUM	5	12	41.67
LARGE	2	4	50.00
TOTAL	17	50	34.00

7.3 Distribution of Various types of Assistance

The distribution of various types of assistance has been presented in table 7.3. Analysis based on data in table 7.3 reveals that total number of households assisted was 19. Out of this, 12 farmers got assistance of training and 07 farmers received assistance of seed practices and treatment accounting for 63.16 per cent and 36.84 per cent respectively. On the another hand, size group wise analysis reveals that on aggregate level larger percentages of medium and small farmers were assisted under training for pulses production 21.05 per cent followed by marginal and large farmers (10.53%), whereas under seed practices, larger percentage of marginal and small farmers were seen to have been assisted was observed 10.53 per cent. It was followed by larger and medium farmers accounting for 10.26 per cent and 5.26 per cent respectively.

TABLE NO. 7.3: DISTRIBUTION BY TYPE OF ASSISTANCE

FARM SIZES	NO OF HHLDS ASSISTED							
	SEEDS	INM	IPM	EQUIPMENT LIKE SEED DRILLS ETC	DEMONSTRATION	TRAINING	OTHER	TOTAL
MARGINAL	2(10.53)	…	…	…	…	2 (10.53)	…	4 (21.05)
SMALL	2 (10.53)	…	…	…	…	4 (21.05)	…	6 (31.58)
MEDIUM	1 (5.26)	…	…	…	…	4 (21.05)	…	5 (26.32)
LARGE	2 (10.26)	…	…	…	…	2 (10.53)	…	4 (21.05)
TOTAL	7 (36.84)	…	…	…	…	12 (63.16)	…	19 (100.00)

7.4 Usefulness of NFSM for Pulses Production

A perusal of the table 7.4 indicates that total number of households, who received usefulness of NFSM for pulses production, was (24 i.e., out of 50). Size group wise analysis reveals that larger proportion of marginal farmer accounting for 33.33 per cent have taken usefulness of NFSM for pulses production followed by small, medium and large farmers accounting for 29.17 per cent, 25.00 per cent and 12.50 per cent respectively.

TABLE NO. 7.4: USEFULNESS OF NFSM-PULSES

FARM SIZES	NO OF HHLDS WHO FOUND USEFUL	TOTAL NO OF HHLDS IN THE SIZEGROUP
MARGINAL	8 (33.33)	19 (38.00)
SMALL	7 (29.17)	15 (30.00)
MEDIUM	6 (25.00)	12 (24.00)
LARGE	3 (12.50)	4 (8.00)
TOTAL	24 (100.00)	50 (100.00)

NB: In brackets percentages to the respective total are shown.

7.5 Distribution of Different type of uses

The distribution of various types of use, as reported by the sample farmers of study area, along with the ranks assigned to each of them by the respondents have been presented in table 7.5. Analysis based on the responses of the sample farmers reveals that larger proportion of respondents (21 i.e., out of 50) considered higher yield as the most important distribution by type of use followed by reduced pest attacks. Both reduced drudgery of marginal farmers and increased knowledge of small farmers have same thing.

Farm size wise analysis revealed that higher percentage of marginal farmers fell under reduced drudgery (42.86) and increase knowledge (42.86) distribution by type of uses followed by marginal farmers under reduced pest attacks (40.00).

TABLE NO. 7.5: DISTRIBUTION BY TYPE OF USE

NO OF HHLDS BY TYPE OF USE						
FARM SIZES	HIGHER YIELD	REDUCED PEST ATTACKS	REDUCED DRUDGERY	INCREASED KNOWLEDGE	OTHERS	TOTAL
MARGINAL	8 (38.10)	6 (40.00)	3 (42.86)	2 (28.57)	---	19 (38.00)
SMALL	6 (28.57)	4 (26.67)	2 (28.57)	3 (42.86)	---	15 (30.00)
MEDIUM	5 (23.81)	3 (20.00)	2 (28.57)	2 (28.57)	---	12 (24.00)
LARGE	2 (9.52)	2 (13.33)	---	---	---	4 (8.00)
TOTAL	21 (100.00)	15 (100.00)	7 (100.00)	7 (100.00)	---	50 (100.00)

Note: Brackets indicates percentage to the total.

7.6 Area under Pulse Crops before and after NFSM

The analysis based on the data related to area under pulses crops before and after NFSM of the sample farmers has been presented in table No. 7.6. It reveals that total areas under lentil crops before and after NFSM were 25.25 hectares and 32.00 hectares respectively. It has increased to 26.73 per cent after NFSM. Total area under gram crop before and after NFSM had been recorded as 21 hectares and 24 hectares respectively. Its area had increased to 14.29 per cent in gram. It means there was higher percentage change/increase in the area of lentil than gram.

Size group wise analysis reveals that area of the marginal and small farmers for lentil crops increased to 33.33 per cent after NFSM followed by large farmers (27.27%), medium farmers (20%), whereas area of the marginal farmers for gram crops remained same after NFSM. Small farmers showed 20.00 per cent increase in area after NFSM followed by larger farmers (15.79%) and medium farmer (13.04%).

TABLE NO. 7.6: AREA UNDER PULSE CROPS BEFORE AND AFTER NFSM

(Area In ha)

	PULSE CROP1		PULSE CROP2	
FARM SIZES	AVERAGE OF 2006-07 AND 2007-08	2008-09	AVERAGE OF 2006-07 AND 2007-08	2008-09
MARGINAL	2.25	3.00	2.00	2.00
SMALL	4.50	6.00	3.75	4.50
MEDIUM	7.50	9.00	5.75	6.50
LARGE	11.00	14.00	9.50	11.00
TOTAL	25.25	32.00 (26.73%)	21.00	24.00 (14.29%)

7.7 Production of Pulse Crops before and after NFSM

The analysis based on table 7.7 reveals that total production of lentil crops before NFSM was 36037 kg and after NFSM; it increased by 33.20 per cent, whereas total production of gram crops before NFSM was 24200 kg and after NFSM, it increased to 28.93 per cent.

Size group wise analysis reports that marginal and small farmers showed higher percentage (40.1%) increase in production of lentil followed by large farmers (33.76%) and medium farmers (26.07%) after NFSM, while medium farmers showed higher percentage (36.6%) increase in production of gram followed by small farmers (35.26%), large farmers (30.59%) and marginal farmers (13.04%). However, it may be concluded that there were comparatively large percentage increase farm size group wise in the area and production of lentil crop than increase in the area and production of gram crops after NFSM.

TABLE NO. 7.7: PRODUCTION OF PULSE CROPS BEFORE AND AFTER NFSM (In kg)

	PULSE CROP1		PULSE CROP 2	
FARM SIZES	AVERAGE OF 2006-07 AND 2007-08	2008-09	AVERAGE OF 2006-07 AND 2007-08	2008-09
MARGINAL	3212	4500	2300	2600
SMALL	6425	9002	4325	5850
MEDIUM	10700	13500	6625	4850
LARGE	15700	21000	10950	14300
TOTAL	36037	48002 (33.20%)	24200	31200 (28.93%)

7.8 Increases in Area under Pulses after NFSM: Farmers' Perception

The analysis of the responses of sample farmers as evident from table 7.8 reveals that total number of farmers who reported increase in area under pulses after NFSM was (24) accounting for 48.00 per cent.

Size group wise analysis shows that larger proportion of large farmers accounting for 75.00 per cent viewed agreed an increase in area under pulses after NFSM followed by medium farmers (58.33%), small farmers (53.33%) and marginal farmers (31.58%).

TABLE NO. 7.8: INCREASE IN AREA UNDER PULSES AFTER NFSM: FARMERS' PERCEPTION

FARM SIZES	NO OF FARMERS WHO REPORTING INCREASE	TOTAL NO OF FARMERS IN THE SIZEGROUP	% OF FARMERS
MARGINAL	6	19	31.58
SMALL	8	15	53.33
MEDIUM	7	12	58.33
LARGE	3	4	75.00
TOTAL	24	50	48.00

7.9 Distribution by Extent of Increase: Farmers' Perception

It may be observed from table 7.9 that farmers' perceived about distribution by extent of increased area under pulses after NFSM. It was recorded (24 farmers out of 50 i.e., 48%). Size group wise analysis showed that marginal farmer caste his/her perception with 2.1 to 5.00 per cent and 5.1 to 10.00 per cent distribution by extent of increased area under pulses after NFSM. These were recorded as 50.00 per cent for both the limits respectively. Further, small farmer's shared perception was maximum 50.00 per cent in favour of 5.00 to 10.00 per cent distribution by extent of increase in area under pulses after NFSM, whereas medium farmers shared their perception in favour of 1.00 to 2.00 per cent increase in area under pulses after NFSM. It was recorded as 58.57 per cent, which was maximum among other distributions by extent of increase. Larger farmers had a maximum of 66.67 per cent perception in favour of 5.00 to 10.00 per cent increase in area under pulses after NFSM.

TABLE NO. 7.9: DISTRIBUTION BY EXTENT OF INCREASE: FARMER'S PERCEPTION

	NO OF HHLDS BY TYPE OF USE				
FARM SIZES	**1%-2%**	**2%-5%**	**5%-10%**	**>10**	**TOTAL**
MARGINAL	…	3 (50.00)	3 (50.00)	…	6 (100.00)
SMALL	…	2 (25.00)	4 (50.00)	2 (25.00)	8 (100.00)
MEDIUM	2 (58.57)	3 (42.86)	2 (28.57)	…	7 (100.00)
LARGE	…	1 (33.33)	2 (66.67)	…	3 (100.00)
TOTAL	2 (8.33)	9 (37.5)	11 (45.83)	2 (8.34)	24 (100.00)

Note: Brackets indicates percentage to the total.

7.10 Problems for Improvement of the NFSM Pulses' Programme

Various problems for improvement of the NFSM pulses' programme has been presented in table 7.10. The analysis of the responses of the sample farmers of NFSM

district showed that larger proportion of overall percentage of respondents considered lack of high yielding varieties of seed (60%) as the most important problem for improvement of the NFSM pulses' programme.

Lack of original pesticides to control insect-pest and diseases was considered as the next most important problems for improvement of the NFSM pulses' programme accounting for 52.00 per cent. Again, pulse seeds are not available at all the time and everywhere was viewed as third most important problems for improvement of the NFSM pulses' programme accounting for 48.00 per cent followed by pulses have much lower yield compared to cereal crops (44%) and low price support for gram compare to lentil whereas production of both the pulses are the same (40%).

7.10 Problems for Improvement of the NFSM Pulses' Programme

SN	Constraints	Responses in per cent				
		Marginal	Small	Medium	Large	All
1.	Lack of HYV seeds	63.15	60.00	58.33	50.00	60.00
2.	Lack of original medicines/pesticides to control insect-pest and diseases	57.89	53.33	50.00	25.00	52.00
3.	Low price support for gram compared to lentil, whereas the cost of production of both the pulses are the same	47.36	40.00	33.33	25.00	40.00
4.	Pulses seeds are not available at all the time and everywhere	52.63	46.66	41.66	50.00	48.00
5.	Pulses have much lower yield compared to cereal crops.	42.10	33.33	50.00	75.00	44.00

7.11 Important Suggestions for Cultivating Pulses in NFSM District

Analysis of the responses of sample farmers of NFSM district regarding important suggestions for cultivating pulses have been presented in table 7.11 which revealed that larger proportion of overall percentage of respondents considered markets and marketing infrastructure should be made available for pulses cultivation (62%) as the most important suggestions for pulses cultivation. High yielding varieties should be made available to the farmers was considered as the next most important suggestions for cultivation of pulses accounting for 60.00 per cent.

Again, procurement should be ensured with minimum support prices was viewed as third most important suggestions for pulses cultivation accounting for 50.00 per cent

followed by pest resistant varieties should be made available to the farmers (46%) and irrigation facilities should be provided properly (26%).

7.11 Important Suggestions for Cultivating Pulses in NFSM District

SN	Constraints	Responses in per cent				
		Marginal	Small	Medium	Large	All
1.	Irrigation facility should be provided properly	31.57	26.66	25.00	---	26.00
2.	High-yielding varieties should be made available to the farmers	68.42	53.33	58.33	50.00	60.00
3.	Pest resistant varieties should be made available to the farmers	52.63	46.66	41.66	25.00	46.00
4.	Procurement should be ensured with minimum support prices	57.89	40.00	50.00	25.00	50.00
5.	Markets and marketing infrastructure should be made available for pulses	63.15	60.00	58.33	75.00	62.00

CHAPTER – VIII

SUMMARY, CONCLUSIONS AND POLICY IMPLICATIONS

8.1 Background of Pulses Production in Bihar

Bihar is one of the important pulse growing states in India contributing about 6.5 per cent to the country's pulse production. The area under pulse crops was reported to be 448.7 thousand hectares in 2007-08, accounting for 5.78 per cent of the GCA of the state.

Total area under pulse crops is about 448.7 thousand hectares with a total production of 365.09 MT. Production of kharif pulses has increased by 7.54 per cent despite a significant fall in its acreage by 4.36 per cent. This is reflective of significant leap in productivity of kharif pulses (Economic Survey, Government of Bihar, 2007-08). Production of pulses in the state has shown a more spectacular declining trend over the post bifurcation years with the exception of 2002-03, when their acreage and production both increased by 0.51 per cent and 2.52 per cent respectively. The year 2004-05 had seen a fall of 15.34 per cent in total pulse production (Bihar was bifurcated in the states of Bihar and Jharkhand in November, 2000).

8.2 Background of Pulses Production in Sample Districts

It is found that growth rate of lentil, gram and arhar in NFSM district (Patna) was (-) negative with (-3.01), (-8.38) and (-6.52) respectively. With regards to growth rate of production of lentil, gram and arhar these were found negative i.e., (0.58), (-7.33) and (-10.91) whereas, annual growth rates of yield of lentil and gram were positive (2.50) and (1.08) respectively, except arhar that witness negative growth rate (-4.65).

Meanwhile, annual growth rates of area for moong and lentil in Non-NFSM district (Kishanganj) were found negative with (-3.96) and (-2.15) except gram which showed positive growth (0.25). With regard to growth rates of production for moong and lentil these were negative (-3.75) and (-1.84) respectively except gram that showed positive growth rate (0.39). Growth rates of yield for important pulse crops like moong, lentil and gram were positive with (0.09), (0.29) and (0.16) respectively.

8.3 Objectives

The main objectives of the study are:

i. To analyze returns from cultivation of pulses vis-à-vis competing crops.

ii. To analyze the other major problems and prospects for pulse cultivation.

iii. To assess the impact, if any, of NFSM on pulses.

8.4 Methodology

The universe of the study is fell under two separate administrative districts viz., NFSM district (Patna) and Non-NFSM district (Kishanganj). At the first stage of sampling, one potential block from each district was selected, viz., Dhanaruwa and Kochchadhaman from Patna and Kishanganj districts respectively. Similarly, one village from each block was selected, namely: Pabhera from Patna and Pariharpur from Kishanganj district. At the last leg of sampling, from each village, on the basis of reconnaissance survey, lists of pulse growing farmers were prepared with their operational holdings. The list prepared was further classified into four size groups, viz., Marginal (< 1ha), Small (up to 2ha), Medium (up to 5 ha) and large (>5 ha). Subsequently, a sample of 50 pulse growers from each of the selected villages was randomly selected by adjusting available size groups. In this way, 50 farmers from each of the two districts were selected for the study. Thus, the sample size was of 100 pulse growers.

8.5 Profitability of pulse crops in NFSM districts (Patna)

i. Overall gross return per hectare for lentil (masur) in NFSM district was found Rs. 42,099, Rs. 51,473 and Rs. 60,530 during 2006-07, 2007-08 and 2008-09

respectively, whereas net returns per hectare during above noted year were found Rs. 17,502, Rs. 21,780 and Rs. 26,939. Therefore, gross returns per quintal were Rs. 2864; Rs. 3506 and Rs. 4068 whereas; net returns per quintal were Rs. 1227, Rs. 1504 and Rs. 1716 during the years 2006-07, 2007-08, and 2008-09 respectively. Consequently, it was concluded that these returns varied among the farmers, i.e., lower the return among the marginal and small farmers and higher the returns among the medium and larger farmers.

ii. Gram

Overall gross returns per hectare were found Rs. 21998, Rs. 30262 and Rs. 36396, whereas net returns per hectare were Rs. 7383, Rs. 13007 and Rs. 15256 during the years 2006-07, 2007-08 and 2008-09 respectively.

Overall gross returns per quintal were found Rs. 2007, Rs. 2504 and Rs. 2811, whereas net returns per quintal were Rs. 882, Rs. 1075 and Rs. 1178 during 2006-07, 2007-08 and 2008-09 respectively. However, these returns varied among the farmers, i.e., lower the net returns among the marginal and small farmers and higher the returns among the medium and large farmers.

iii Lentil and Gram

Gross returns per hectare were calculated as Rs. 3248, Rs. 40867 and Rs. 48463, whereas net returns per hectare were Rs. 12442, Rs. 17393 and Rs. 21097 during reference years. Further, net returns per quintal were found Rs. 1054, Rs. 1289 and 1447 during 2006-07, 2007-08 and 2008-09 respectively. However, it may be concluded that returns were lower among marginal and small farmers and higher among medium and large farmers.

8.6 Profitability of Major Pulse Crops in Non-NFSM District (Kishanganj)

i. Moong

Overall gross returns per hectare were found Rs. 29954, Rs. 36405 and Rs. 39078, whereas net returns per hectare were Rs. 11741, Rs. 14388 and Rs. 15325 during the years 2006-07, 2007-08 and 2008-09 respectively. Gross returns per quintal were found Rs. 4984, Rs. 5608 and Rs. 6011 during same period.

ii. Lentil

Overall gross returns per hectare of lentil were found Rs. 38990 Rs. 46187 and Rs. 53583, whereas net returns per hectare were found Rs. 17251, Rs. 19644 and Rs. 21990 during referred years. However, gross returns per quintal were found Rs. 2985, Rs. 3500 and Rs. 3939 and net returns per quintal were Rs. 1320, Rs. 1489 and Rs. 1641 during above noted years.

iv. Lentil + Moong

Overall gross returns per hectares were found Rs. 34472, Rs. 41296 and Rs. 46330, whereas net returns per hectare were noted as Rs. 14496, Rs. 17016 and Rs. 18657 during the same years. Further, gross returns per quintal and net returns per quintal were estimated at Rs. 3984, Rs. 4554, Rs. 4975 and Rs. 1636, Rs. 1851, Rs. 1999 respectively. It was ultimately found that trend of increasing returns was similar for all size of surveyed farmers.

8.7 Profitability of Rice in NFSM and Non-NFSM Districts

Overall gross returns per hectare in NFSM district were Rs. 49582, Rs. 54377 and Rs. 57107 and that is in Non-NFSM district were Rs. 46559, Rs. 54436 and Rs. 49832 respectively. Net returns per hectare in NFSM district were Rs. 21828, Rs. 22768 and Rs. 22853, and that in Non-NFSM district were estimated as Rs. 19652, Rs. 22927 and Rs. 25277 respectively. Further, the gross returns per quintal in NFSM and Non-NFSM districts were found same as Rs. 1689, Rs. 1748, Rs. 1869 and Rs. 1754, Rs. 2002, Rs. 2195 in respective years. Net returns per quintal in both NFSM and Non-NFSM districts were estimated to be Rs. 775, Rs. 822, 861 and Rs. 740, Rs. 846, Rs. 926 respectively. Almost increasing trend could be seen in all the cases.

8.8 Profitability of Wheat in NFSM and Non-NFSM Districts

Overall gross returns per hectare in both the districts were Rs. 39950, Rs. 45418, Rs. 55309 and Rs. 47898, Rs. 49945, Rs. 49199 respectively. Net returns per hectare were Rs. 17903, Rs. 18610, Rs. 22748 in NFSM district (Patna) and Rs. 20824, Rs. 21758, Rs. 25764 in Non-NFSM district (Kishanganj) during 2006-07, 2007-08 and 2008-09 respectively. Further, gross returns per quintal

and net returns per quintal in both the sample districts increased in the years 2006-07, 2007-08 and 2008-09.

8.9 Profitability of Rice and Wheat in NFSM and Non-NFSM Districts

Overall gross returns per hectare in NFSM and Non-NFSM districts were found to be Rs. 44766, Rs. 49897, Rs. 56208 and Rs. 47228, Rs. 52190, Rs. 59515 in the years 2006-07, 2007-08 and 2008-09 respectively. Net returns per hectare in both the noted districts were calculated as Rs. 19865, Rs. 20689, Rs. 22800 and Rs. 20238, Rs. 22342, Rs. 25520 respectively.

8.10 Profitability of Maize in NFSM and Non-NFSM Districts

Overall gross returns per hectare in NFSM and Non-NFSM districts were estimated at Rs. 32606, Rs. 41866, Rs. 54603, and Rs. 32746, Rs. 41653, Rs. 53304 respectively, while overall net returns per hectare in the above noted districts were calculated as Rs. 11832, Rs. 14615, Rs. 18354, and Rs. 17946, Rs. 22015 Rs. 27230 respectively. Ultimately, it may be observed in regard to gross returns per quintal that these were Rs. 470, Rs. 535 and Rs. 570 in NFSM and in Non-NFSM districts, these were Rs. 612, Rs. 712 and Rs. 757 whereas net returns per quintal were Rs. 300, Rs. 368, Rs. 456 and Rs. 355, Rs. 434 Rs. 537 in NFSM and Non-NFSM districts during 2006-07, 2007-08 and 2008-09 respectively.

8.11 Technology Adoption of the Respondent of the Sample Districts

Larger proportion of respondents (3 out of 4 i.e., 75%) considered/pointed out about knowledge of area under improved varieties of pulses (Khesadi) by large farmers followed by medium (4 out of 12 i.e, 33.33) for arhar and small farmers 4 out of 15 for gram accounting for 26.67 per cent, while in case of Non-NFSM district (Kishanganj), it was found that larger proportion of respondents (4 out of 6 i.e, 66.67 %) pointed out about knowledge of area under improved varieties of pulses (arhar) by large farmers followed by medium (5 out of 12 i.e., 41.67%) for gram, small (4 out of 14) with 18.57 per cent for lentil and marginal farmers (4 out of 18) respondents accounting for 22.22 per cent for moong.

8.12 Area under Improved Varieties of Pulses

- Areas under improved varieties of lentil and gram were 5.5 hectares and 4.0 hectares accounting for 20.00 per cent and 18.18 per cent respectively in NFSM district, whereas in case of Non-NFSM district, areas under improved varieties of moong, lentil and gram were found 4.0 hectare, 3.5 hectare and 2.5 hectare accounting for 24.24 per cent, 26.92 per cent and 31.93 per cent respectively.

8.13 Knowledge of Improved Varieties in NFSM and Non-NFSM Districts

- In NFSM district, larger farmers have cent per cent knowledge about improved varieties of pulses followed by medium (66.67%), small (46.67%) and marginal (31.58%), while in case of Non-NFSM district, 19 farmers out of 50 farmers were aware about improved varieties of pulses, accounting for 38.00 per cent. 50.00 per cent of the larger farmers had knowledge of improved varieties of pulses followed by medium (5 out of 12) accounting for 41.67 per cent and small farmers (5 out of 14) accounting for 35.11 per cent. Therefore, it may be concluded that farmers of NFSM district (Patna) were more aware about improved varieties of pulses in comparison to Non-NFSM district (Kishanganj).

8.14 Source of Knowledge of Improved Varieties

- Extension agents were the most important source, for knowledge of improved varieties of pulses in NFSM district. In case of Non-NFSM district (Kishanganj), 30 farmers out of 50 were aware about improved varieties of pulses. However, Extension Agents were considered most effective source at the average 36.67 per cent followed by Neighbours (30%), Newspapers (26.67%) and others (6.68%).

8.15 Recommended Practices for Improved Varieties of Pulses

- Seed and sowing practices were adopted by 44.00 per cent, 28.00 per cent of the respondents and 28.00 per cent did not follow any practice in NFSM district. In Non-NFSM district, these accounted for 52.63 per cent, 42.11 per

cent and 5.26 per cent for seed practice, sowing practice and not followed any practices respectively. However, it was found that seed practices were most important in both the districts (NFSM and Non-NFSM).

8.16 Households Reporting Problems with Improved Varieties of Pulses

- Analysis of the responses of sample farmers in NFSM district reveals that larger proportion of respondents (12 out of 25 i.e., 48%) considered 'availability but not on time' as the most important problem with improved varieties of pulses. In Non-NFSM district (Kishanganj), it reveals that larger proportion of respondents (19 out of 90 i.e., 21.11%) considered non-availability of improved varieties of pulses as the most important problem followed by next important problem as non-availability of improved varieties of pulses (17 out of 90 i.e., 18.89%) as second rank and third rank (12 out of 90 i.e., 13.33%). However, it may be concluded that **availability but not on time** emerged as the most important problem, which was ranked first (8 out of 18 i.e., 44.44%) followed by problems of not available at all (6 out 15 i.e., 40%).

8.17 Suggested Solutions for Improved Varieties of Pulses (NFSM & Non-NFSM)

- Analysis of the responses of sample farmers in NFSM district revealed that larger proportion of respondents (11 out of 25 i.e., 44%) considered cheaper availability of seed as the most important suggestion for improved varieties of pulses which was ranked as first followed by timely availability of seeds (9 out of 25 i.e., 36%), while in case of Non-NFSM district, analysis of the responses of sample farmers reveals that larger proportion of respondents (47.11%) considered timely availability of seeds as the most important suggestion for improved varieties of pulses followed by cheaper availability of seeds (42.11%) and subsidy (35.78%).

8.18 Marketing Channels for Pulse Crops in NFSM & Non-NFSM Districts

- It may be concluded that in both the NFSM and Non-NFSM districts, hatt and village trader for marketing of pulses were common.

- Total quantity of pulses (lentil) sold in NFSM district Patna was 35851 kg and price received Rs. 1249420. Quantity sold, out of the total quantity through hatt market and village traders were found to be 5166 kg and 30685 kg. In regard to prices received, these were Rs. 103931 and Rs. 1145489 respectively.
- It may be concluded that village trader was the most suitable marketing channel for selling pulses in both the NFSM and Non-NFSM districts. Analysis of the sample district showed that most of the small and marginal farmers grew pulses for home consumption, but they sold their produces according to their situation of livelihood, while larger farmers grew pulses for both home consumption and commercial purposes.
- Total quantity of gram sold and price received in NFSM district (Patna) were 21474 kg and Rs. 520315 respectively. Out of this, quantity sold and price received through village market were 2995 kg and Rs. 27569, whereas remaining quantity sold and price received through common agent were 18479 kg and Rs. 447746.
- Total quantity of moong sold and price received in Non-NFSM district (Kishanganj) by sample farmers were 5918 kg and Rs. 325490 respectively. Out of the total, quantities sold and prices received through hatt market and village market were 1043 kg with Rs. 57365 and 4875 kg with Rs. 268125 respectively.

8.19 Opinion Survey for Major Pest Problems (NFSM & Non-NFSM) Districts

There were various types of insect pests and diseases i.e., pod borer, pod fly, wilt, root rot, nematodes for pulses, which were found in NFSM district. These pests i.e., pod borer, wilt and nematodes cause damage to gram pulse and estimated yield losses per acre were recorded at 19 kg, 14 kg and 10 kg with respective insect-pests, whereas yield losses per acre for Arhar and Lentil were found 29 kg and 26 kg with respective insect-pests. In Non-NFSM district, pod borer and nematodes cause damage to gram crops and estimated yield losses per acre were recorded 24 kg and 21 kg with respective insect-pests. Also, it was observed that estimated losses per acre from pod fly and wilt for moong were 20 kg and 13 kg and root rot for lentil was recorded 37

kg. with respective insect-pests. However, it may be concluded that pod fly in NFSM district was found serious pest, while in Non-NFSM district, root rot was found serious pest for damaging pulse crops.

8.20 Major Problems for Cultivating Pulses (NFSM and Non-NFSM Districts)

Analysis based on the responses of sample farmers of NFSM district revealed that larger proportion of respondents (20 out of 50 i.e., 40%) considered lack of improved varieties of pulses as the most important problem for cultivating pulses and ranked it as first. **Large doses of other inputs required** emerged as the next most important problem by sample farmers (16 out of 50 i.e., 32%). Further, comparatively larger percentage of sample farmers (18 out of 50 i.e., 36%) perceived lack of irrigation facilities as the third most important problem for cultivating pulses, while data related to sample farmers of Non-NFSM district showed that larger proportion of respondents 37.40 per cent considered large doses of other inputs required as the most important problem for cultivating pulses followed by lower yield (34.29%), lack of improved varieties (30.43%) and lack of irrigation facilities (29.03%).

8.21 Important Suggestions from the Farmers for Cultivating Pulses

Larger proportion of respondents (36%) of the NFSM district considered availability of high yielding varieties as the most important suggestion for cultivating pulses. This suggestion occupied a predominant position throughout the rank also. Further, **comparatively improved irrigation facilities** (32%) was ranked fourth, whereas availability of pest resistant varieties (28%) was ranked third in regard to important suggestions for cultivating pulses followed by **assured procurement with MSP** and high market price. Analysis based on the responses of sample farmers of Non-NFSM district revealed that larger proportion of respondents (32.65%) considered assured procurement with MSP as the most important suggestion and it was ranked as the first and second by the farmers of sample district followed by improving irrigation facilities (27.03%), availability of pest

resistant varieties (25%) and availability of high yielding varieties of pulses (24.39%).

8.22 The effect of NFSM on Area and Production of Pulses

Total areas under lentil crop before and after NFSM were 25.25 hectares and 32.00 hectares respectively. It has increased to 26.73 per cent after NFSM. Total area under gram crop before and after NFSM had been recorded as 21 hectares and 24 hectares respectively. Its area had increased to 14.29 per cent in gram. It means there was higher percentage change/increase in the area of lentil than gram.

Size group wise analysis reveals that area of the marginal and small farmers for lentil crops increased to 33.33 per cent after NFSM followed by large farmers (27.27%), medium farmers (20%), whereas area of the marginal farmers for gram crop remained the same after NFSM. Small farmers showed 20.00 per cent increase in area after NFSM followed by larger farmers (15.79%) and medium farmer (13.04%).

- Total production of lentil crop before NFSM was 36037 kg and after NFSM; it increased by 33.20 per cent, whereas total production of gram crop before NFSM was 24200 kg and after NFSM, it increased to 28.93 per cent.

- Size group wise analysis reports that marginal and small farmers showed higher percentage (40.10%) increase in production of lentil followed by large farmers (33.76%) and medium farmers (26.07%) after NFSM, while medium farmers showed higher percentage (36.60%) increase in production of gram followed by small farmers (35.26%), large farmers (30.59%) and marginal farmers (13.04%). However, it may be concluded that there were comparatively large percentage increase (farm size group wise) in the area and production of lentil crop than increase in the area and production of gram crop after NFSM.

8.23 Problems for Improvement of the NFSM Pulses' Programme

Various problems for improvement of the NFSM pulses' programme has been presented in table 7.10. The analysis of the responses of the sample farmers of NFSM district showed that larger proportion of overall percentage of respondents considered lack of high yielding varieties of seed (60%) as the most important problem for improvement of the NFSM pulses' programme.

Lack of original pesticides to control insect-pest and diseases was considered as the next most important problems for improvement of the NFSM pulses' programme accounting for 52.00 per cent. Again, pulse seeds are not available at all the time and everywhere was viewed as third most important problems for improvement of the NFSM pulses' programme accounting for 48.00 per cent followed by pulses have much lower yield compared to cereal crops (44%) and low price support for gram compare to lentil whereas production of both the pulses are the same (40%).

8.24 Important Suggestions for Cultivating Pulses in NFSM District

Analysis of the responses of sample farmers of NFSM district regarding important suggestions for cultivating pulses have been presented in table 7.11 which revealed that larger proportion of overall percentage of respondents considered markets and marketing infrastructure should be made available for pulses cultivation (62%) as the most important suggestions for pulses cultivation. High yielding varieties should be made available to the farmers was considered as the next most important suggestions for cultivation of pulses accounting for 60.00 per cent.

Again, procurement should be ensured with minimum support prices was viewed as third most important suggestions for pulses cultivation accounting for 50.00 per cent followed by pest resistant varieties should be made available to the farmers (46%) and irrigation facilities should be provided properly (26%).

8.25 Policy Implication

On the basis of field data, there are some suggestions to increase area and production of pulse crops, which are as given below:

1. Insect-pest and disease free pulses' seed should be made available for better yield. *(Attn: Dept. of Agri., Govt. of Bihar).*

2. Original medicines/pesticides should be provided to control insect-pest and diseases. *(Attn: Dept. of Agri., Govt. of Bihar).*

3. With a view to increase area under gram, its price may be increased to compete with lentil. *(Attn: Ministry of Agri, Govt. of India).*

4. Pulses' seed should be made available to all in time. *(Attn: Dept. of Agri., Govt. of Bihar).*

5. Farmers should be encouraged to undertake cultivation of high yielding variety of pulses in rice, wheat and other cereals' growing areas also. *(Attn: Dept. of Agri., Govt. of Bihar, Ministry of Agri, Govt. of India)*

6. Measures should be taken to reduce storage losses through infrastructural development. *(Attn: Dept. of Agri., Govt. of Bihar, Ministry of Agri, Govt. of India)*

7. Emphasis on strengthening market information systems should be given. *(Attn: Dept of Agri., Govt. of Bihar, Ministry of Agri, Govt. of India)*

8. Linking MSP to market prices can bridge the gap between demand and supply of pulses. *(Attn: Ministry of Agri, Govt. of India)*

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Annexure-I

Comments on Draft Report of the Study entitled

POSSIBILITIES AND CONSTRAINTS FOR INCREASING THE PRODUCTION OF PULSES IN BIHAR AND IMPACT OF NFSM ON PULSES IN BIHAR

Tables to be completed by AER Centre, Bhagalpur, Bihar
Please refer to the tabulation scheme sent by IEG. Kindly adhere to that scheme to ensure uniformity with other reports.

Chapter	Table Name	Comments
Chapter 3	Demographic Profile	No details of Children
Chapter 3	Education Profile of Adult Population	Page No. 22, Table 3.2 (C). Total and % in Non-NFSM incorrect.
Chapter 3	Share of Size Group in Pulses Farming	Table 3.3 D & 3.6 B incorrect. The figures for area under pulses for Non-NFSM district do not match.
Chapter 3	Percentage of Irrigated Area under Pulses	Table 3.6 (a). The correct calculation is irrigated area under pulses w.r.t. area under the pulses. Not % share of irrigated area of different pulses. Correct this.
Chapter 4	Profitability of Pulses Farming-pulses-other-total	Page No. 36-52. Chapter 4. The gross returns, paid-out-costs and net returns of 'Total' category should be the sum of the marginal, small, medium and large categories. The calculations appear incorrect. Kindly correct the tables and the write-up.
Chapter 5	Area under Improved Varieties of Pulses	Page No. 54. Should be Table 5.2 and not 5.1 % calculation is incorrect in both NFSM and Non-NFSM. Correct calculation is "(Area under Improved Varieties/total area under the crop)* 100." Please correct.
Chapter 5	No. of Households Marketing through various channels % in	Page No. 62. Tables 5.9, (Table No. 5.8 missing). Incorrect % calculation for 'Total" category.
Chapter 5	Quantity sold through various channels-crop 2+	Page No. 64. Table 5.11. Addition incorrect. Please recheck all other tables in this section.
Chapter 6	Criteria used while opting to grow pulses	Page No. 71. Table 6.4 is incorrect and is a repetition of table 6.5. Correct this.
Chapter 6	Reasons for Low area under pulses	Page No. 72. Table 6.5: 'Total No. of Farmers' for Non-NFSM sum is NOT Correct.
Chapter 6	Crops grown on Inferior quality land	Page No. 73. Table 6.5. Title incorrect.
Chapter 7	Usefulness of NFSM	Page No. 82. Table 7.4, % incorrect
Chapter 7	Distribution by type of use	Page No. 83. Table 7.5, % incorrect
Chapter 7	Suggestions for Improvement of NFSM	Kindly provide a table (or a list based on your survey) on this.

Sd/-
Dated: 23/09/2011 (Dr. CSC Sekhar)
(Through e-mail) Associate Professor
Institute of Economic Growth
University of Delhi Enclave
Delhi 110 007

Annexure-II

Action Taken Report (ATR)

Title of the Study: **Possibilities and Constraints for Increasing the Production of Pulses in Bihar and Impact of NFSM in Bihar**

Date of Dispatch of the Draft Report : 30/04/2011

Date of Receipt of the Comments : 24/09/2011

Chapter wise Actions Taken as below :

III. Details of Children incorporated at appropriate place.
III. Table corrected.
III. Tables corrected.
III. Table corrected.
IV. Tables corrected and write-up revised.
V. Table corrected.
V. Table No. 5.8 incorporated and calculation revised.
V. Tables Re-checked.
VI. Table corrected.
VI. Table corrected.
VI. Title of the table corrected.
VII. Percentage corrected.
VII. Percentage corrected.
VII. Table provided at due place.

Rambalak Choudhary
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