

Pulse Production for Livelihood and Nutritional Security under Cluster Frontline Demonstration (CFLD) Programme (2019-20)

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PREFACE

Cluster Frontline Demonstration (CFLD) on Pulses under National Food Security Mission – Pulses (NFSM-Pulses) is a nation-wide programme initiated by the Ministry of Agriculture and Farmers' Welfare, Govt. of India having a unique approach to provide a direct interface between researcher and farmers as the former are directly involved in planning, execution and monitoring of the demonstrations for the technologies and get direct feedback from the farmers' field about pulses production in general and technology being demonstrated in particular. The growth rate of pulse production in the country has increased but at a slower rate compared to other food grains like rice, wheat and nutri-cereals. The average productivity of pulse in the year 2016-17 in India was 786 kg/ha. However, the average productivity in northeast India during the same year was 1072.63 kg/ha which is more than the national's average productivity of pulses. It can be seen that Northeast India has a huge potential in pulse production.

ICAR through its KVKs across the country has been conducting Cluster Frontline Demonstration (CFLD) on Pulses since 2015-16. During 2019-20, a total of 19 KVKs under ICAR-ATARI, Zone VII, Umiam conducted demonstrations in five northeastern states of India viz., Manipur, Meghalaya, Mizoram, Nagaland and Tripura with proven technology packages contributing to pulse production and for ensuring nutritional security.

Compilation of Pulse Production through Cluster Frontline Demonstration on Pulses in Manipur, Meghalaya, Mizoram, Nagaland and Tripura for 2019-20 depicts a close assessment on latest notified/released varieties along with full package of practices on selected farmers' fields with a view to demonstrate the potentiality of the technologies to participating farmers and to analyze the production performance of the technologies.

We would like to extend our appreciation to the DAC & FW, Ministry of Agriculture and Farmers' Welfare, Govt. of India and heartfelt gratitude to Dr. V.P. Chahal, ADG (Agricultural Extension), ICAR, New Delhi, for his generous support in implementing the CFLD (Pulses) programme in NE Region of India and all the colleagues of Agricultural Extension Division in the Council HQ for financial support and their constant encouragement, guidance and support in executing the programme. We sincerely acknowledge the services rendered by the scientist of the KVKs and ICAR-ATARI, Umiam including the SRFs/DEOs for successfully bringing out this bulletin.

Place: Umiam, Meghalaya


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Chapter 1

INTRODUCTION

Indian population is predominantly vegetarian and the source of dietary protein requirement for the growth and development of human beings is mostly met with pulse. Apart from the human diet, pulses, being leguminous, have an important and unique property of maintaining and restoring soil fertility through biological nitrogen fixation as well as conserving, and improving physical properties of soil by virtue of their deep root system and leaf fall leaving behind reasonable quantity of nitrogen in the soil and add up to 40 kg N/ha to it. Being deep rooted, pulses are highly adaptive to dry land areas of the country which constitute a major cropped area and contribute enormously in total pulse production. Pulse also forms an important fraction of cattle feed and fodder as hay, green fodder and concentrates, etc.

In the year 2017-18, India grew pulse crops on 29.99 million ha area and produced nearly 25.23 million tonnes of pulse grain. The commonly grown pulse crops are: blackgram or urd bean (*Vigna mungo*), lentil or masur (*Lens culinaris*), fieldpea or matar (*Pisum sativum*), cowpea or black-eyed pea (*Vigna unguiculata*), frenchbean or common bean or rajmash (*Phaseolus vulgaris*), greengram or mungbean (*Vigna radiata*), Bengalgram or chickpea or gram or Bengal gram (*Cicer arietinum*), arhar or pigeonpea or tur (*Cajanus cajan*), khesari or lathyrus (*Lathyrus sativus*).

The growth rate of pulses production in the country has increased but at a slower rate compared to other food grains like rice, wheat and nutri-cereals. In Fig.1.1, there is a growing trend in area, production and productivity of pulses in India from 2010-11 to 2019-20.

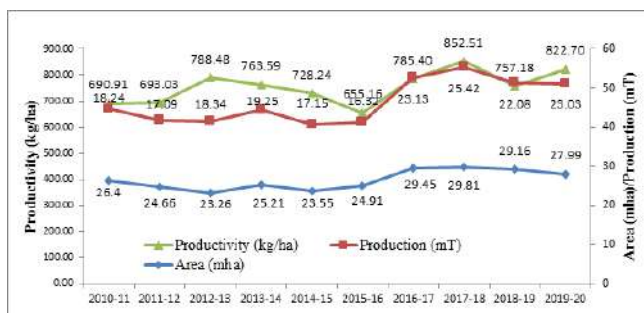


Fig 1.1: All India Area, Production and Productivity of pulses from 2010-11 to 2019-20

Source: Directorate of Economics & Statistics

In 2019-20, the area under pulses is 27.99 Lakh ha of which 2.673 lakh hectares is contributed by Northeast India. The average productivity of pulse in the year 2019-20 in India is 822.7 kg/ha and that of Northeast India is 1049.157 kg/ha (Table 1.1) which is more than the National's average productivity. It can be seen that Northeast India has a huge potential in pulse production. Table 1.1 highlights the area, production and productivity of pulses contributed by the North-eastern states of India in the year 2019-20.

Table 1.1. Area, production and productivity of total pulses in NEH region during 2019-20

State	Area (Lakh ha)	Production (Lakh tonnes)	Productivity (kg/ha)
All India	27.99	23.03	822.70
Arunachal Pradesh	0.13	0.14	1059.95
Assam	1.44	1.06	736.59
Manipur	0.27	0.25	917.55
Meghalaya	0.08	0.12	1444.18
Mizoram	0.04	0.05	1353.19
Nagaland	0.40	0.47	1160.56
Sikkim	0.05	0.05	961.54
Tripura	0.25	0.19	759.70
Total/Avg NEH	2.673	2.334	1049.157

Source: Directorate of Economics & Statistics, M/A, Govt of India
NEDFi DataBank

Chapter 2

PULSES CONTRIBUTION TO NUTRITIONAL SECURITY IN NORTHEAST INDIA

The per capita availability of pulses has increased considerably in last few years. In conformity to Food Security Act (FSA), 2013 to ensure nutritional security to vegetarian population, the per capita per day availability of pulses which dwindled down to a provisional level of 41-42 g (15-16 kg/annum) in 2011-2013, has now attended the level of 53 g per head/day *i.e.*, > 19 kg/annum/person (GoI, Directorate of Pulses Development. Annual Report: 2017-18). The same trend has also been followed in the north-eastern states. Considering per capita consumption at 19 kg per annum, the requirement and deficit of pulses for NE region, has been worked out and has been presented in Table 2.1 The requirement of pulses per annum has a deficit of 74.93% in the northeast region as a whole. In order to increase production of pulses in the country, Government of India has been implementing the National Food Security Mission (NFSM) on Pulses through State Governments.

Table 2.1. Requirement, deficient/ surplus of pulses in NE region (computed considering requirement of 19 kg/annum/person). P*

States	Population (2018)	Production 2016-17 ('000 tonnes)	Requirement as per 2018 population ('000 tonnes)	Deficit/ Surplus (000 tonnes)	Deficit/ Surplus (%)
Arunachal Pradesh	15,28,296	13.1	29.04	-15.94	-54.89
Assam	3,45,86,234	107.5	657.14	-549.64	-83.64
Manipur	30,08,546	30.3	57.16	-26.86	-46.99
Meghalaya	32,76,323	11.8	62.25	-50.45	-81.04
Mizoram	12,05,974	4.8	22.91	-18.11	-79.05
Nagaland	21,89,297	44.5	41.60	2.90	6.98
Sikkim	6,71,720	5.5	12.76	-7.26	-56.91
Tripura	40,57,847	23.2	77.10	-53.90	-69.91
Total NE	5,05,24,237	240.7	959.96	-719.26	-74.93

P* - Provisional figures are based on IIIrd Advance Estimates of production for 2017-18,
Source: Press Information Bureau, Ministry of Agriculture & Farmers Welfare.
Compiled by Author

Enhancing nutrition with pulses into human diets has the potential in contributing to nutritional adequacy. Pulses which have high-protein, micronutrient-rich caloric values offer a great opportunity for eradicating malnutrition. Pulses are smart food as they are critical for food basket (dal-roti, dal-chawal), rich source of protein *i.e.*, 20-25% which is double the protein content of wheat and thrice that of rice and help address obesity, diabetes malnutrition etc (GoI, Directorate of Pulses Development. Annual Report: 2017-18). Table 2.2 shows the Nutritional contents of various pulses.

Table 2.2. Nutritional labels of various Pulses (Unit mg/100g)

Nutrients/Minerals	Tur	Gram	Lentil	Peas	Moong	Urd
Protein (%)	22	20	25	22	25	24
Vit. A (I.U.)	220	316	450	31	83	64
Vit. C	-	3	-	-	-	-
Vit.K	-	0.29	0.25	-	-	0.19
Thiamine	0.45	0.3	0.45	0.47	0.72	0.41
Riboflavin	0.51	0.51	0.49	0.21	0.15	0.37
Nicotinic acid	2.6	2.1	1.5	3.5	2.4	2
Biotin (g/100g)	7.6	10	13.2	-	-	7.5
Choline	183	194	299	-	-	206
Folic-acid (g/100g)	83	125	107	-	-	144
Inositol	100	240	130	-	-	90
Pantothenic acid	1.5	1.3	1.6	-	-	3.5
Total No. of Vit. /Minerals	10	12	11	5	5	11

Source: Indian Council of Medical Research (ICMR), Hyderabad, 2012.

Pulses are gluten-free, promote bone health and have a low glycemic index, low fat and high fiber content which is suitable for people with diabetes. In fact, the protein obtained from pulses is significantly less expensive compared to animal foods. Additionally, the iron absorption of pulses and the protein quality of the diet are enhanced when pulses were eaten with cereals and vitamin C rich foods (Fidler *et al.* 2004)

Pulses are also rich in complex carbohydrates, micronutrients, protein and B-vitamins, which are vital component of a healthy diet. Low in fat and rich in fibre, pulses were excellent for managing cholesterol, digestive health and regulating energy levels. Pulses are also particularly rich in folate, iron, calcium, magnesium, zinc and potassium. (FAO, 2016).

Chapter 3

CLUSTER FRONT LINE DEMONSTRATIONS ON PULSES

Government of India has been implementing through the National Food Security Mission (NFSM)-Pulse state governments, since 2007-08. The funds under the umbrella scheme of NFSM are allocated for promoting cultivation of pulses. Since 2014-15, NFSM-Pulse is being implemented in 622 districts of 27 states including all districts of North-Eastern hill States by KVKs (Ministry of State for Agriculture & Farmers Welfare, 2016). The basic strategies of NFSM-Pulses programmes were implementation of interventions in a mission mode through active engagement of all the stakeholders at various levels including KVKs. These interventions include promotion and extension of improved technologies i.e., seed, Integrated Nutrient Management (micro-nutrient, soil amendments), Integrated Pest Management and Resource Conservation Technologies (RCTs) along with capacity building of farmers. (GoI, Directorate of Pulses Development, Annual Report: 2015-16).

Cluster Frontline Demonstrations (CFLDs) is a form of applied research to demonstrate the latest notified/released varieties along with full package of practices on cluster basis in farmers' fields with a view to show the potentiality of the technologies to participating farmers, neighbouring farmers and to analyze the production performance of the technologies for scientific feedback. This is a unique approach to provide a direct interface between researchers and farmers. Cluster Frontline Demonstrations has been conducted through Krishi Vigyan Kendras (KVKs under ICAR system) and State Agriculture Universities, reputed and registered NGOs.

Under ICAR-ATARI Zone VII, Umiam during the year 2019-20, a total 19 KVKs from NE India i.e., 6 KVKs from Manipur, 2 KVKs from Meghalaya, 3 KVK from Mizoram, 5 KVKs from Nagaland and 3 KVKs from Tripura have been actively involved in conducting CFLDs in *kharif* and *rabi* pulses during 2019-20.

A total of 1290 CFLDs on pulses during *kharif*-2019 & *rabi*-2020 in participatory mode were allocated for demonstration to harness production potentialities of the newly released varieties along with full package of practices in the 531 ha (Table-3.1).

Table 3.1. Targets and achievements of CFLDs on pulses under NFSM during 2019-20

State	Area (ha) allocated	Demo allocated (No.)	Area (ha) covered	Demo conducted (No.)
Manipur	180	450	187	457
Meghalaya	40	100	40	75
Mizoram	90	225	94	160
Nagaland	120	300	120	363
Tripura	90	225	90	235
Total	520	1300	531	1290

Table 3.2. Frontline Demonstration on pulses during 2019-20

Crops	Achievements of FLDs		Average yield (q/ha)		Difference of yield between demo and local (q/ha)	% Increase in yield over check	Avg. cost of cultivation (Rs. /ha)		Avg. Benefit Cost ratio
	No. of Demo	Area (ha)	Demo	Local			Demo	Local	
Blackgram	223	80	8.53	6.3	2.23	35.40	34556	32675	2.56
Greengram	30	10	6.35	-	-	-	23400	-	2.17
Field pea	797	317	12.38	8.75	3.63	41.49	39436	34818	2.7
Lentil	160	89	8.11	5.47	2.64	48.26	25647	23227	2.38
Rajma	80	35	13.85	11	2.85	25.91	22554	22500	2.43
Total	1290	531							

Chapter 4

TECHNOLOGIES DEMONSTRATED THROUGH CFLD

4.1. Technologies demonstrated for enhancing productivity of pulse through CFLD

Table 4.1. Major technologies demonstrated through CFLD in Manipur during 2019-20

Improved technologies	Blackgram (<i>Vigna mungo</i>)	Greengram (<i>Vigna radiata</i>)	Lentil (<i>Lens esculanta</i>)	Field pea (<i>Pisum sativum</i>)
Improved varieties	PU-31	IPM-2-3	HUL-57	Aman
Sowing method	Raised bed, line sowing, broadcasting	Line sowing 45cm × 15cm	Line sowing	Line sowing and broadcasting
Planting season	<i>Kharif</i> (August-September)	<i>Kharif</i> (July-September)	<i>Rabi</i> (November) under rainfed conditions	<i>Rabi</i> (November-December) under rainfed conditions
Avg. yield (q/ha)	15	12-15	14	22
Seed rate (kg/ha)	15-20	20	40	60-70
Days to maturity	75-85	70-72	117-130	124-137
Seed treatment	Seed Treatment with <i>Trichoderma</i> @10 g/kg seed; <i>Rhizobium</i> culture @10 ml/kg seed and Phosphate Solubilizing Bacteria @ 50 g/kg seed	Seed Treatment with <i>Trichoderma</i> @10 g/kg seed; <i>Rhizobium</i> culture @10 ml/kg seed	Carbendazim 2 g/kg seeds	Seed treatment with carbendazim @ 2 g/kg, <i>Rhizobium</i> @ 10 g + 10 g sugar per kg of seed, <i>Trichoderma</i> @10 g/kg seed

Cropping system	Rice-pulse based cropping system	Rice-pulse based cropping system	Rice-pulse cropping system	Rice-pulse cropping system
Nutrient management	Soil quality was enhanced by application of vermicompost @ 1.5 t/ha and 65.5 kg/ha of lime as soil amendment. Integrated Nutrient Management with 25 kg N, 50 kg P ₂ O ₅ and 25 kg K ₂ O	Application of 20 kg N, 40 kg P ₂ O ₅ and 30 kg K ₂ O and vermicompost @ 1.0 t/ha and 13.1 q of lime as soil amendment	Application of NPK @ 20:40:20 kg/ha	Application of basal fertilizer application viz. 25 kg N, 50 kg P ₂ O ₅ and 25 kg K ₂ O
Pest and disease management	The variety is resistant to Yellow Mosaic Virus. Seed treatment with Mancozeb and Carbendazim @ 2 g/kg. Spraying with Chloropyrifos 20 EC against infestation of leaf eating caterpillar.	Chloropyrifos @ 2.5 ml/l of water for controlling caterpillar attack at vegetative stage, use of Neembicidine @ 3 ml/l against sucking pests.	No major disease attack	Spraying of 0.25 % of organic sulphure hectare and Dimethoate 30 EC @ 1-1.5 ml/l against aphids; For powdery mildew it was advised to spray the crop with carbendazim 0.05%

Table 4.2. Major technologies demonstrated through CFLD in Meghalaya during 2019-20

Crops	Improved varieties	sowing method	Planting season	Avg. yield (q/ha)	Seed rate (kg/ha)	Days to maturity	Seed treatment	Nutrient management
Lentil	WBL-77 (Resistant to wilt and grey mold)	Broad casting	<i>Rabi</i> (First week of November)	15	30	117	Carbendazim @ 2 g/kg seed	FYM @ 2.0-2.5 t/ha + seed inoculation with biofertilizer <i>Rhizobium</i> @ 50 g/kg of seed
Field pea	Aman (Resistant to powdery mildew)	Line sowing	<i>Rabi</i>	22	80	124-137	-	-

Table 4.3. Major technologies demonstrated through CFLD in Mizoram during 2019-20

Improved technologies	Field pea (<i>Pisum sativum</i>)	Lentil (<i>Lens esculanta</i>)	Rajma (<i>Phaseolus vulgaris</i>)
Improved varieties	Aman (Resistant to powdery mildew)	HUL-57 (Small seeded, resistant to rust and Wilt)	WBL-77 (Resistant to wilt and grey mold) Arun
Sowing method	Line sowing	Line sowing	Line sowing
Planting season	<i>Rabi</i> (November)	<i>Rabi</i> (November)	<i>Rabi</i> (November) <i>Rabi</i> (October-November)
Avg. yield (q/ha)	22	14	15 15-16
Seed Rate (kg/ha)	60	40-45	35 80-100
Days to maturity	122	130	117 125-135



Seed treatment	<i>Rhizobium</i> culture @10 ml/kg seed	Seed treatment with mancozeb and carbendazim @2 g/kg	<i>Rhizobium</i> @ 30 g /Kg seed and PSB @ 40 g/Kg seed	Phosphate Solubilizing Bacteria @ 40 g/kg seed
Nutrient management	No application of NPK	No application of NPK	Nutrient management with 20 kg N, 40 kg P2O5 and 15 kg K2O	Nutrient management with 40 kg N, 20 kg P2O5 and 20 kg K2O
Disease management	No major disease attack	Seed treatment with mancozeb and carbendazim @2 g/kg against wilt and rust	Chlorpyrifos 20% EC @ 200 ml in 200 - 400 L of water per Acre against beetle, aphid	Chlorpyrifos 20% EC @ 200 ml in 200 - 400 L of water per Acre against beetle, aphid

Table 4.4 Major technologies demonstrated through CFLD in Nagaland during 2019-20

Improved technologies	Field pea (<i>Pisum sativum</i>)	
Improved varieties	Aman (Resistant to powdery mildew)	Prakash (Resistant to powdery mildew and tolerant to rust)
Sowing method	Dibbling method in line	Line sowing
Planting season	<i>Rabi</i> (November)	<i>Rabi</i> (November)
Avg. yield (q/ha)	22	21
Seed rate (kg/ha)	60	80
Days to maturity	122	120
Seed treatment	<i>Rhizobium</i> culture @10 ml/kg seed	No seed treatment
Nutrient management	Application of 200 g of biofertilizer in 10-15 kg of seeds as seed treatment	Application of 200 g of biofertilizer in 10-15 kg of seeds as seed treatment
Disease management	No major disease attack	Nem oil 5 ml/l water for aphids and powdery mildew

4.5. Technologies demonstrated for enhancing productivity of pulse through CFLD in Tripura

Table 4.5. Major technologies demonstrated through CFLD in Tripura during 2019-20

Improved technologies	Blackgram (<i>Vigna mungo</i>)	Lentil (<i>Lens esculanta</i>)	Field pea (<i>Pisum sativum</i>)	
Improved varieties	Tripura Maskolai	HUL-57	Prakash	TRCP-8 (Powdery mildew resistant)
Sowing method	Line sowing	Line sowing	Line sowing and broadcasting	Line sowing 30 × 30 cm
Planting season	Rabi (September-October)	Rabi (November) under rainfed conditions	Rabi (November-December) under rainfed conditions	Rabi (November) under rainfed conditions
Avg. yield (q/ha)	9.5	14	22	16
Seed rate (kg/ha)	25	40	60-70	100
Days to maturity	90	117-130	124-137	130
Seed treatment	<i>Trichoderma</i> @10 g/kg seed, <i>Rhizobium</i> culture @10 ml/kg seed and Phosphate Solubilising Bacteria @ 50 g/kg seed, <i>Trichoderma viride</i> @ 5 g/kg seed	Carbendazim 2 g/kg seeds	<i>Trichoderma viridae</i> @ 4 g/kg seed, <i>Rhizobium</i> culture @ 200 g/kg and Phosphobacteria @ 2 kg/ha, Soil application of ZnSO ₄ @ 25 kg/ha	2 g bavistin per kg seed
Cropping system	Rice-pulse based cropping system	Rice-pulse cropping system	Rice-pulse cropping system	Rice-pulse cropping system
Nutrient management	Fertilizer dose: 15:40:20 kg NPK per ha along with 5 mt FYM/ha.	Application of NPK @ 20:40:20 kg/ha	Soil application of ZnSO ₄ @ 25kg/ha	Fertilizer dose: 20:40:20 kg NPK per ha
Pest and disease management	No incidence of disease and pest	No incidence of disease and pest	Spraying of azadirachtin 0.03% (300 ppm) @ 3 ml/l from pre-flowering stage to maturity stage at 15 days interval	No incidence of disease and pest

Chapter 5

PERFORMANCE OF PULSE CROPS DURING *KHARIF* AND *RABI* SEASON IN ZONE VII (2019-20)

5.1. Performance of pulse crops during *kharif* and *rabi* seasons in Manipur

During *kharif* season, CFLDs on blackgram variety PU-31 was demonstrated in an area of 60 ha through Krishi Vigyan Kendras in 5 districts of Manipur. All the KVK conducted FLDs with full package of practices. Results showed that the average demonstration yield of PU-31 was 8.24 q/ha and farmers practices of 5.96 q/ha resulting in 38.7% higher demonstration yield as compared to local check (Table 5.1). CFLD on green gram was conducted in an area of 10 ha by 1 KVK i.e., KVK Imphal East, Manipur. The average demonstration yield of 6.35 q/ha. During *rabi* season, lentil was conducted in the district of Chandel covering an area of 10 ha. The variety HUL-57 yielded 9.5 q/ha with a B:C ratio of 2.68. CFLDs on field pea variety Aman was conducted in an area of 107 ha through in 6 districts. Results showed an average demonstration yield of 11.85 q/ha which was 31.45% higher than local check (8.89 q/ha).

Table 5.1. Performance pulse crops during *kharif* and *rabi* season

KVK	Area (ha)	No. of Demo	Yield (q/ha)		% Increase in yield over check	Economics of local check (Rs./ha)		Economics of demonstration (Rs./ha)	
			Check	Demo		Net return	B:C ratio	Net return	B:C ratio
Blackgram (PU-31) <i>kharif</i>									
Bishnupur	20	40	5.75	8.35	45.22	19800	1.76	36600	2.21
Chandel	10	30	5.54	8.4	51.62	17750	1.67	37160	2.49
Imphal East	10	27	5.52	6.82	23.55	10450	1.53	19360	1.9
Senapati	10	25	5.73	8.23	43.63	87200	1.61	177275	2.16
Tamenglong	10	26	7.26	9.4	29.48	16882	1.69	24380	2.19
Total/ Average	60	148	5.96	8.24	38.7	30416.4	1.652	58955	2.19

Greengram (IPM-2-3) <i>kharif</i>									
Imphal East	10	30	-	6.35	-	-	-	27400	2.17
Lentil (HUL-57) <i>rabi</i>									
Chandel	10	25	6.85	9.5	38.69	30450	1.98	53680	2.68
Field pea (Aman) <i>rabi</i>									
Bishnupur	20	50	7.56	11.12	47.09	16660	1.58	36220	2.19
Chandel	10	25	10.12	13.65	34.88	43840	2.62	64723	3.12
Imphal East	37	92	6.5	7.15	10	22250	1.78	26000	1.83
Imphal West	20	40	10.9	15.27	40.09	23500	1.76	43350	2.31
Senapati	10	25	10.76	15.42	43.31	105700	1.49	217970	1.89
Tamenglong	10	22	7.5	8.5	13.33	13500	1.56	16550	1.64
Total/ Average	107	254	8.89	11.85	31.45	37575	1.80	67468.8	2.16



CFLD on blackgram (PU-31) at KVK Senapati and Tamenglong, Manipur



CFLD on greengram (IPM-2-3) at KVK Imphal East, Manipur



CFLD of field pea (Aman) conducted at KVK Imphal East, Manipur



CFLD of lentil at KVK Chandel, Manipur

5.2. Performance of pulse crops during *rabi* season in Meghalaya

CFLDs on Field pea (var. Aman) and Lentil (var. WBL-77) was conducted in an area of 10 ha and 30 ha respectively in 2 districts of Meghalaya. Results showed that the average demonstration yield of Field pea was 19.6 q/ha which was 53.13% higher than local check (Table 5.2). The lentil variety WBL-77 yielded 9.12 q/ha and a B:C ratio of 2.14 (Table 5.2).

Table 5.2. Performance of Pulse crops during *Rabi* Season

KVK	Area (ha)	No. of Demo.	Yield (q/ha)		% Increase in yield over check	Economics of local check (Rs./ha)		Economics of demonstration (Rs./ha)	
			Check	Demo		Net return	B:C ratio	Net return	B:C ratio
Field pea (Aman)									
Ri Bhoi	10	25	12.8	19.6	53.13	21000	1.70	45800	2.40
Lentil (WBL-77)									
West Garo Hills	30	50	5.89	9.12	54.84	13840	1.64	29183	2.14



CFLD of field pea variety Aman demonstrated at RiBhoi District, Meghalaya



Shri Maxparton Areng, DAO, Tura visiting lentil demonstration plot of Shri Haque

5.3. Performance of pulse crops during *rabi* season in Mizoram

A total 160 numbers of CFLDs on *rabi* field pea, lentil and rajma were demonstrated in the state of Mizoram covering total area of 94 ha. Among the demonstrations conducted, the highest yield was observed in Rajma with 11.7 q/ha under KVK Serchhip. Lentil variety of HUL-57 recorded yield of 7.48 q/ha in the year 2019-20. Field pea was conducted in Champai district covering an area of 20 ha having demonstration yield of 8.52 q/ha and B:C ratio of 1.68.

Table 5.3. Performance pulse crops during *rabi* season

KVK	Area (ha)	No. of Demo.	Yield (q/ha)		% Increase in yield over check	Economics of local check (Rs./ha)		Economics of demonstration (Rs./ha)		
			Check	Demo		Net return	B:C ratio	Net return	B:C ratio	
Field pea (Aman)										
Champai	20	20	7.2	8.52	18.33	14400	1.5	20470	1.68	
Lentil (HUL-57)										
Lawngtlai	15	30	6.53	7.15	9.49	34100	2.38	38480	2.50	
Serchipp	24	30	4.2	7.8	85.71	6790	1.37	25500	2.15	
Total/Average	39	60	5.37	7.48	47.60	20445	1.88	31990	2.33	
Rajma (Arun)										
Lawngtlai	15	30	13	16	23.07	52500	2.17	75000	2.67	
Serchipp	20	50	9	11.7	30	18000	1.8	28859	2.28	
Total/Average	35	80	11.00	13.85	26.54	35250	1.99	51929.5	2.48	
Total	94	160								



Demonstration of field pea (Aman) at Champai district Mizoram



CFLD of rajma at KVK Serchhip and lentil at Lawngtlai, Mizoram

5.4. Performance of pulse crops during *rabi* season in Nagaland

During the year 2019-20, a total 363 numbers of CFLDs on *rabi* field pea were demonstrated in the state of Nagaland covering an area of 120ha. An average yield of 12.1 q/ha was recorded in field pea where highest yield was recorded in the district of Kohima with 14.75 q/ha. Highest B:C ratio was observed Zunheboto district of Nagaland with a ratio of 3.15. (Table 5.4)

Table 5.4. Performance pulse crops during *rabi* season

KVK	Area (ha)	No. of Demo	Yield (q/ha)		% Increase in yield over check	Economics of local check (Rs. /ha)		Economics of demonstration (Rs. /ha)	
			Check	Demo		Net return	B:C ratio	Net return	B:C ratio
Field pea (Aman)									
Kohima	20	50	11.00	14.75	34.09	12100	2.01	15500	2.15
Mon	30	50	8.75	11.50	31.43	19500	2.26	25820	2.67
Tuensang	40	172	10.09	14.16	40.34	11892	1.89	20467	2.37
Zunheboto	10	41	10.80	13.30	23.15	43750	2.47	63980	3.15
Field pea (Prakash)									
Wokha	20	50	7.5	7.02	-6.4	29600	1.97	24200	1.7
Total/ Average	120	363	9.628	12.1	24.5	23368	2.12	29993	2.41



CFLD of field pea at KVK Zunheboto and KVK Wokha, Nagaland

5.5. Performance of pulse crops during *rabi* season in Tripura

CFLDs on field pea, lentil and blackgram were conducted in an area of 90 ha and demonstration of 235 by KVKs of Tripura. Variety Prakash of field pea was conducted in two districts of Tripura having a demonstration yield of 9.87 q/ha with yield increase of 77.14% as compared to farmers existing yield (6.15 q/ha). Lentil and blackgram were demonstrated by KVK North Tripura and obtained a demonstration yield of 6.3 q/ha and 8.81 q/ha respectively. (Table 5.5)

Table 5.5. Performance pulse crops during *rabi* season

KVK	Area (ha)	No. of Demo.	Yield (q/ha)		% Increase in yield over check	Economics of local check (Rs. /ha)		Economics of demonstration (Rs. /ha)		
			Check	Demo		Net return	B:C ratio	Net return	B:C ratio	
Field pea (Prakash)										
Khowai	30	60	4	9	125	11000	1.44	31000	1.97	
North Tripura	20	50	8.3	10.73	29.27	35613	2.58	52623	3.34	
	50	110	6.15	9.87	77.14	23306.5	2.01	41811.5	2.66	
Field pea (TRCP-8) Pod yield										
West Tripura	10	25	25	35	40	37000	1.97	100000	3.5	
Lentil (WBL-77)										
North Tripura	10	25	3.79	6.33	67.02	10880	1.7	24460	2.23	
Blackgram (Tripura Maskolai)										
North Tripura	20	75	6.65	8.81	32.48	22400	2.28	35360	3.02	
Total	90	235								



CFLD of field pea at KVK West Tripura and KVK Khowai, Tripura



CFLD of field pea at KVK West Tripura and KVK Khowai, Tripura



Chapter 6

CAPACITY BUILDING

6.1. Training programmes conducted under CFLD pulses programme (2019-20)

Various training programmes were organized during *kharif* and *rabi* seasons. Trainings were conducted to impart know how on integrated nutrient management, production technology and bio-control of pests, package and practices, integrated pest management and other awareness programmes aimed at integrated farming approaches for livelihood and nutritional security. A total of **1294 farmers** attended the training programmes conducted across 5 states *viz.* Manipur, Meghalaya, Mizoram, Nagaland and Tripura during the two seasons *i.e., kharif* (189 farmers) and *rabi* (1105 farmers).

Table 6.1. Training programmes conducted under CFLD pulses programme (2019-20)

Season	Crop	Participant farmers (General)-A			Participant farmers (SC/ST)-B			Total participants (A+B)		
		Men	Women	Total	Men	Women	Total	Men	Women	Total
<i>Kharif</i>	Blackgram	31	19	50	58	61	119	89	80	169
	Greengram	17	3	20	0	0	0	17	3	20
	Sub total	48	22	70	58	61	119	106	83	189
<i>Rabi</i>	Blackgram	0	0	0	0	0	0	0	0	0
	Field pea	78	47	125	418	350	768	496	397	893
	Lentil	56	9	65	62	22	84	118	31	149
	Rajma	0	0	0	36	27	63	36	27	63
	Sub total	134	56	190	516	399	915	650	455	1105
Total		182	78	260	574	460	1034	756	538	1294



Training programme on field pea organized at KVK RiBhoi

Various field days on seed production of various pulse crops were conducted during *kharif* and *rabi*. Field days were conducted across 5 states *viz.* Manipur, Meghalaya, Mizoram, Nagaland and Tripura during the three seasons with participants of 13 (*kharif*), 47 (*rabi*) during 2019-20. (Table 6.2)

Table 6.2. Field days conducted in CFLD pulses programme (2019-20)

Season	Crop	Participant farmers			Participant extension personnel		
		Men	Women	Total	Men	Women	Total
<i>Kharif</i>	Blackgram	76	88	164	6	7	13
	Greengram	5	16	21	0	0	0
	Sub total	81	104	185	6	7	13
<i>Rabi</i>	Blackgram	31	11	42	0	0	0
	Field pea	260	173	433	28	11	39
	Lentil	90	11	101	6	0	6
	Rajma	36	21	57	1	1	2
	Sub total	417	216	633	35	12	47
Total		498	320	818	41	19	60



Field days conducted under CFLD pulses programme

Chapter 7

SUCCESS STORIES

7.1. Success Stories of Blackgram (Manipur)

Name of KVK	KVK Senapati, Manipur
Crop and variety	Blackgram var. PU 31
Name of farmer & address	Achow Thuimai, Makhan village
Background information about farmer field	He had a farm area of 0.4 ha located at mid hill growing blackgram followed by winter vegetables like cabbage, potato etc. The fertility level of the soil ranges from low to medium.
Details of technology demonstrated	INM- INM- NPK @ 10:20:15 along with FYM 1 t/ha as basal and seed inoculation with Rhizobium and PSB @ 50 g/kg of seed
Institutional involvement	Supply of critical inputs, training, demonstration and periodic field visits
Success point	Give higher yield as compared to the local check
Farmer feedback	High preference and high level of acceptance of the technology
Yield (q/ha)	
- Potential yield of variety	12-15
- District average (Previous year)	7.40
- State average (Previous year)	6.30

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C ratio
Farmer practices	5.73	28400	45840	17440	1.61:1
Demonstration	8.25	35455	65840	30385	1.86:1
% Increase	44				



CFLD on blackgram during *rabi* season, KVK Senapati, Manipur

7.2. Success Stories of Blackgram (Manipur)

Name of KVK	KVK Tamenglong
Crop and variety	Blackgram var. PU 31
Name of Farmer & Address	Mr. Lungnibon Kamshuan Tupul, Village
Background information about farmer field	Tupul village lies under Noney Sub Division of Tamenglong district, Manipur where traditional way of cultivation or organic farming is popular without the use of chemicals. Pulses are grown in terrace/lowland rice fallow. Foothills are abundant in the village and land where paddy cultivation is not possible; farmers go for soybean or black gram along with maize.
Details of technology demonstrated	Blackgram var. PU 31 was provided @ 40 kg per ha with Rhizobium @ 200 g per 10 kg as seed treatment at the time of sowing in the field.
Institutional involvement	Training cum awareness programme on scientific cultivation of <i>kharif</i> pulses was given to the farmers before the seeds were distributed. Trainings were conducted and Blackgram seeds @ 40 kg/ ha were distributed along with bio fertilizers for seed treatment. Demonstrations on Blackgram were done in 10 ha area covering 26 farmers in the adjoining areas of Tupul and Noney villages.

Success point	Blackgram can be successfully grown in the foothill areas where paddy cultivation is not possible. So, farmers get extra additional income from a piece of land as well as it improves the soil fertility and act as a source of protein and additional income for the family expenses.
Farmer feedback	Farmers prefer to show the seeds in the months of June so timely availability of quality seeds is a must. Small and black seeded varieties are mostly preferred.
Yield (q/ha)	
- Potential yield of variety	12.30
- District average (Previous year)	8.37
- State average (Previous year)	10.23

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	7.26	24500	41382	16882	1.69:1
Demonstration	9.4	29200	53580	24380	1.83:1
% increase	29.48				



CFLD on blackgram (var. PU-31) at KVK Tamenglong, Manipur

7.3. Success Stories of Lentil (Manipur)

Name of KVK	KVK Chandel
Crop and variety	Lentil var. HUL-57
Name of farmer & address	Kh. Kobeng, Chandel District, Manipur
Background information about farmer field	The farmer's field is located at the bank of Chakpi river in Chandel.
Details of technology demonstrated	Demonstration of lentil var. HUL-57 in rice fallows
Institutional involvement	Supply of inputs and imparting the technology know-how to the farmers
Success point	Lentil performs very well in rice fallows and enhances the production and productivity of pulses in the foot hills of the district.
Farmer feedback	Farmers are very happy with the new technology.
Yield (q/ha)	
- Potential yield of variety	14.00
- District average (Previous year)	6.85
- State average (Previous year)	6.85

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	6.85	31200	61650	30450	1.98:1
Demonstration	9.85	32000	88650	56650	2.77:1
% Increase	30.45				



CFLD on lentil (var. HUL-57) at KVK Chandel, Manipur

7.4. Success Stories of Lentil (Mizoram)

Name of KVK	KVK Lawngtlai
Crop and variety	Lentil var. HUL 57
Name of farmer & address	Henry VL Thakima, Chawnhu, Lawngtlai District
Background information about farmer field	Lentil was cultivated under both irrigated and rainfed condition in <i>Jhum</i> land and terrace area in a cluster area within chawnhu community land.
Details of technology demonstrated	Line planting lentil variety HUL 57 with recommended dose of fertilizers. Pest and disease management was also done.
Institutional involvement	Most of the input like seed, fertilizers, chemicals and other instruction for proper functioning of the crop management were given by KVK. The field visit was also done often when necessary.
Success point	The production of crop was not much but lentil cultivation proves to be very potential within the district. Farmers are getting good return as demand for fresh Lentil is very high.
Farmers' feedback	Farmers find it economically profitable as compared to other crops. The package of practices provided by KVK is simple and convenient. Lentil is a very high demand crop in the local market. Farmers are ready to expand area under lentil cultivation.
Yield (q/ha)	
- Potential yield of variety	7.65
- District average (Previous year)	5.00
- State average (Previous year)	5.50

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	6.53	24670	58770	34100	2.38
Demonstration	7.15	25600	64080	38480	2.50
% Increase	9.50				



CFLD on lentil (var. HUL-57) at KVK Lawngtlai, Mizoram

7.5. Success Stories of Fieldpea (Manipur)

Name of KVK	KVK, Imphal East
Crop and variety	Field pea variety Aman
Name of farmer & address	Mr. Brojen Singh, Tiger Camp, Imphal East
Background information about farmer field	The field is situated at around 20 km from Imphal and total area of the farm is about 6 ha. The farm is an organic farm and the farmer is using only organic inputs for his production system. Seasonal crops like paddy, maize, pulses like blackgram, greengram, beans, cucumber, cabbage, cauliflower are grown from time to time.
Details of technology demonstrated	<p>Technology Improved cultivation of field pea var. IPF 5-19 (Aman)</p> <p>Duration: 130 days</p> <p>Salient features Lodging resistant because of presence of tendrils, high degree of resistance to powdery mildew diseases, moderately resistant to rust diseases and to pod borer and stem fly incidences. Seeds are round, smooth and white.</p> <p>Seed rate: 80 kg/ha Seed treatment: Rhizobium 10 ml/kg seed Trichoderma: 10 g/kg seed Yield potential: 15 q/ha (under irrigated condition) Sowing method: Line sowing with straw mulching Spacing: 30 cm × 10 cm</p>

Institutional involvement

In this district, field pea was not cultivated on large scale but in the past 3-4 years its cultivation has been increasing. It is mainly grown for vegetable purpose, food and feed. The grains are consumed as dal and flour. The field was selected by KVK, Imphal East for taking up demonstration on scientific cultivation of field pea variety Aman on 2 ha area under CFLD pulses during *rabi* season 2018-19. Training cum input distribution programme was organized at KVK, Imphal East on where the farmer also participated. The farmer was provided 160 kg seed of field pea variety Aman, *Rhizobium* and *Trichoderma* for seed treatment. Sowing of the crop was done during 3rd week of November, 2018 after harvest of paddy. Monitoring and diagnostic visits was done by KVK personals during the crop period.

Dr. A.K. Singha, Principal Scientist, ATARI, zone VII visited the Demonstration Field on 22nd Feb., 2019 and very impressed by the performance. Farmers' Field day was organized on 25th Feb., 2019 to celebrate the success of the demonstrating farmer and also for disseminating the technology to other farmers. The programme was participated by 52 farmers from Tiger camp as well as adjoining villages. During pod formation stage, the crop was attacked by pod borer and aphid and it was managed by Neem based insecticide (Multineem) provided to the farmer from CFLD fund.

Success point

The farmer is really very hard working and he was keen to make the demonstration a success. He sowed the seeds in line as directed and just after sowing was completed, he spread paddy straw for Mulching over the whole field of 2 ha area for retention of moisture as rainfall was not sure during winter months, the region being rainfed. He also procured a mini sprinkler set from State Department of Agriculture under subsidy and irrigated the field 3 times during crop stand when water was most required by the crops. Not only use of Quality Certified Seed and Plant protection measures but also timely technological intervention of the farmer led to success of the demonstration. The farmer obtained the highest yield among all the clusters of CFLD pulses during *rabi* 2018-19.

Farmers' feedback

The variety Aman performs very well; however as compared to the farmer's long preferred variety Rachna, its seed are smaller after drying. Farmers are asking for a better and bolder seed variety so that higher seed/grain yield may be obtained. They also prefer a shorter duration variety that will be more suitable under the water scarcity rainfed situation of the region.

Yield (q/ha)	
- Potential yield of variety	12.8
- District average (Previous year)	9.7
- State average (Previous year)	9.4

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	7.2	35500.00	54000.00	18500.00	1.52
Demonstration	12.8	44800.00	96000.00	51200.00	2.14
% Increase	77				



CFLD on field pea (var. Aman) at KVK Imphal East, Manipur

7.6. Success Stories of Field Pea (Manipur)

Name of KVK	KVK Imphal West
Crop and Variety	Field pea var. Aman
Name of farmer & Address	Y. Sangita Devi of Maklang Village
Background information about farmer field	Small farmer Area 0.50 ha
Details of technology demonstrated	Popularization of improve field pea variety Aman Seed rate @ 80 kg/ha, Seed treatment with rhizobium @ 200 g/10 kg of seed, fertilizer 20:50:20 kg/ha NPK
Institutional involvement	Provided technical knowledge and critical inputs like seeds and rhizobium. Demonstrated seed treatment with rhizobium, field inspection as and when required.
Success point	After the harvest of rice, farmers generally keep the field as fallow land. For growing of second crop to fill up the fallow, farmers were selected based on their willingness and interest. Although we have provided key inputs i.e., seeds, farmers contributed their own labour for sowing, fertilizing and managing fields, and for harvesting and threshing. Field pea var. Aman gave higher yield as compared to local check.
Farmer's feedback	Field pea variety Aman was introduced as new crop by KVK Imphal West. It was difficult to convince the farmers to introduce the crop. However, various training and awareness programmes were organized to raise their interest on the particular crop. Miss Y. Sangita Devi, a farmer of Maklang village of Imphal West district cultivated the crop in a small area 0.5 ha land. After observing a huge change in her income, she has developed much interest and willing to grow the crop in larger areas in the next season.
Outcome Yield (q/ha)	
- Demonstration	16.00
- Potential yield of variety/technology	22-25
- District average (Previous year)	9.50
- State average (Previous year)	8.50

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	9.90	31000	49500	18500	1.60
Demonstration	16.00	33000	80000	47000	2.42
% Increase	61.61				



CFLD on field pea (var. Aman) at KVK Imphal West, Manipur

7.7. Success Stories of Fieldpea (Manipur)

Name of KVK	KVK Tamenglong
Crop and variety	Field pea var. Aman
Name of Farmer & Address	Mr. Tadedbao, Khundong Village
Background information about farmer field	<p>Khundong village lies under Haochong Sub Division of Tamenglong district, Manipur where Traditional way of cultivation or Organic by default type of farming is popular without the use of chemicals. Vegetables are grown whole round the year as their fields lie at an altitude of 500 to 700 MSL as compared to other areas of the district. Cole crops like Cabbage, potato, beans, leafy vegetables, peas both field pea and Garden pea can be grown whole round the year without any problem of insect pest and diseases as the area lies is interior part of the Tamenglong district. Jhum rice followed by toria/mustard is also grown in the fields which creates and additional income after the harvest of jhum rice.</p>

Details of technology demonstrated	Field pea variety Aman was provided @ 60 kg per ha with Rhizobium @ 200 g per 10 kg as seed treatment at the time of sowing in the field.
Institutional involvement	Training cum awareness programme on scientific cultivation of pulses was given to the farmers before the seeds were distributed. Selection of farmers done after the training and seeds @ 60 kg/ ha were distributed along with bio fertilizers for seed treatment. Demonstrations on field pea were done in 10 ha area covering 22 farmers in the Haochong and Khundong village.
Success point	As field pea can be grown whole round the year the farmers can sell their produce in the local/ Imphal market during the off-season time at a higher rate as compared to normal season crop. So, farmers get extra additional income from a piece of land as well as it improves the soil fertility.
Farmer feedback	Farmers prefer to sell the Green pods instead of grains as it fetches more income. So, farmers want Garden pea in place of Field pea in the area.
Yield (q/ha)	
- Potential yield of variety	12.0
- District average (Previous year)	9.12
- State average (Previous year)	8.42

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	7.56	24000	37500	13500	1.56:1
Demonstration	8.51	26000	42550	16550	1.64:1
% increase	12.57				



Field pea Aman during *rabi* 2019



Training cum Awareness programme



News paper cutting

7.8. Success Stories of Fieldpea (Meghalaya)

Name of KVK	KVK Ri Bhoi
Crop and variety	Field pea variety Aman
Name of farmer & address	Mr. Daohipaya Dohling Village: Umeit, Block: Bhoirymbong, Dist.: Ri Bhoi
Background information about farmer field	The Farmer is an educated youth. He completed his HSLC in the year 2009. He engaged himself in agriculture from his childhood. But after finishing his study he started his livelihood by doing agriculture as a primary occupation and now successfully running his family with his wife and three kids. He cultivated kharif and rabi crops as primary crop and secondly, he earned money by selling of FYM, vermicompost and earthworms.

Details of technology demonstrated	Field pea variety Aman with recommended package of practices
Institutional involvement	Provided 32 kg seed for 0.4 ha of land. Provided training and demonstration from KVK Ri Bhoi for successful cultivation of pea crop for maximum return. The follow up was done for entire period of cultivation.
Success point	He harvested the crop successfully on time and sold his produce at the market and achieved satisfactory return.
Farmer's feedback	He is very satisfied with the variety as the crop gave him successful return on time.
Yield (q/ha)	
- Potential yield of variety	22
- District average (Previous year)	11.07
- State average (Previous year)	15.28

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	12.8	30200	51200	21000	1.7
Demonstration	19.5	32600	78000	47900	2.39
% Increase	52.3				



Seed distribution and training at farmer's field by KVK RiBhoi



Training cum Awareness programme

7.9. Success Stories of Fieldpea (Nagaland)

Name of KVK	KVK Wokha
Crop and variety	Field pea var. Prakash
Name of farmer & address	Mrs. Eyilo, Wokha Village
Background information about farmer field	Mrs. Eyilo is a farmer from Wokha Village of Wokha District, Nagaland. She has been doing pea cultivation after the harvest of paddy with her SHG which earns a high income for her SHG during <i>rabi</i> season. In the year 2019, she along with her SHG cultivated field pea in an area of 0.4 ha.
Details of technology demonstrated	Field pea var. Prakash Seed rate: 80 kg/ha Spacing: 30 × 20 cm DOS: 08.11.19
Institutional involvement	Inputs, Training, Field visit, Advisory services
Success point	Mrs. Eyilo along with her SHG received 30 kg of fieldpea var. Prakash from KVK Wokha under CFLD on pulses (<i>rabi</i>) and could harvest about 1200 kg green pods which she has used for home consumption as well as for sell in the market
Farmer's feedback	Field pea var. Prakash is a good technology from pulse point of view. However, consumer prefers the green pod and the green pod of field pea is not as sweet as the garden pea. Since they cultivate pea after harvest of paddy in the month of November, cultivation for pulse purpose results in high infestation of powdery mildew as powdery mildew sets in the month of February onwards.
Yield (q/ha)	
- Potential yield of variety	22
- District average (Previous year)	10.4
- State average (Previous year)	11.0



Performance of technology vis-à-vis Local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	7.5	30400	60000	29600	1.97:1
Demonstration	8	32000	64000	32000	2:1
% Increase	6				



CFLD Training and Field Day on field pea (var. Prakash) at KVK Wokha, Nagaland

7.10. Success Stories of Fieldpea (Nagaland)

Name of KVK	KVK, Zunheboto
Crop and variety	Field pea Aman
Name of farmer & address	Husheto, Vill- Lumithsami, Akuluto Block, Zunheboto, Nagaland
Background information about farmer field	Terrace field with paddy previously grown
Details of technology demonstrated	Paddy followed by pea, var. Aman, Planting distance 35 × 10 cm, DOS:15/10/2019
Institutional involvement	KVK provided the seeds and monitored throughout the programme.
Success point	Cropping intensity increased, Farmers' income doubled, Employment generated
Farmer's feedback	Farmers are happy with the CFLD programme and are ready to take up even other programme

Yield (q/ha)

- Potential yield of variety 14
- District average 10.5
(Previous year)
- State average (Previous 10.5
year)

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	10.5	29750.00	73500.00	43750.00	2.47
Demonstration	13.3	29750.00	93730.00	63980.00	3.15
% Increase	26.6%				



CFLD on field pea (var. Aman) at KVK Zunheboto, Nagaland

7.11. Success Stories of Fieldpea (Tripura)

Name of KVK	KVK Khowai
Crop and variety	Field pea, Prakash
Name of farmer & address	Hiralal Das, RC Ghat, Khowai
Background information about farmer field	The field is situated near khowai river and during <i>kharif</i> the field is utilized to grow paddy but in <i>rabi</i> various pulses crops are grown.

Details of technology demonstrated	Seed Treatment: <i>Trichoderma viridae</i> @ 4 g/kg seed, Rhizobium culture @ 200 g/kg and Phosphobacteria @ 2 kg/ha, soil application of ZnSO ₄ @ 25kg/ha Plant protection measures: 1. Coriander crop was grown around the field to attract natural enemies 2. Erection of 20 bird perches/ha. 3. Pheromone traps for two insects viz. <i>Helicoverpa armigera</i> and <i>Spodoptera litura</i> @ 25/ha will be installed. Traps will be fixed with supporting poles at a height of 1 foot above crop canopy 4. Spraying of Azadirachtin 0.03% (300 ppm) @ 3 ml/l from pre-flowering stage to maturity stage at 15 days interval.
Institutional involvement	Under National Food Security Mission (NFSM), KVK has demonstrated the technology in farmer's field, organized training programmes on scope and importance of cultivation of HYV, the package and practices of field pea cultivation and management of pod borer, i.e of the major pest of pea. High yielding variety of field pea (Prakash) was collected from the ICAR Research Centre, Tripura and distributed among the farmers. KVK scientists visited fields regularly and advised different problems raised by the farmers. A total of 30 ha pea was grown in the district and 60 farmers of different villages of Khowai viz. Chebri, R.C. Ghat, Namapara, Krishnapur, kalyanpur, Ratia, Kaminipara were involved actively.
Success point	Previously farmers used to grow only old varieties and due to unscientific management of the crop, farmers obtained low yields. But after introduction of the HYV and the management practices suggested by the KVK scientists, farmers obtained handsome yield. High yielding variety (Prakash) lured many farmers of the villages where technology was demonstrated and farmers from the adjacent villages also showed interest to grow pea.
Farmer's feedback	They are satisfied with the technology and demanded timely distribution of seeds and other inputs.

Yield (q/ha)

- Potential yield of variety 14
- District average 10
(Previous year)
- State average (Previous 12
year)

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	6	24980	33240	8260	1.33
Demonstration	11.75	31580	63450	31870	2.01
% Increase	95.83				

**CFLD on field pea (var. Prakash) at KVK Khowai, Tripura****7.12. Success Stories of Fieldpea (Tripura)**

Name of KVK	KVK North Tripura
Crop and variety	Field pea var. Prakash
Name of farmer & address	Mr. Gopendra Debnath, Jalabasa, North Tripura
Background information about farmer field	Medium low land and rice is the main crop grown here. Earlier there were no crops grown after rice cultivation during Aman season. Since last year field pea cultivation started in rice fallow land during Oct - Nov.

Details of technology demonstrated	Main technology is rice –pulse cropping system with NPK-15-40-0, along with 5 t FYM/ha.
Institutional involvement	Supply of quality seeds of field pea var. Prakash
Success point	Crop diversification introduced in the area
Farmer’s feedback	Farmers are happy to grow field pea in rice fallow land, earlier which used to be kept unused due unavailability of seed materials

Yield (q/ha)	
- Potential yield of variety	16
- District average (Previous year)	7.8
- State average (Previous year)	6.9

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	8.3	22487	58100	35613	2.58
Demonstration	10.73	22487	75110	52623	3.34
% Increase	29%				



CFLD on field pea var. Prakash at farmer’s field, North Tripura

7.13. Success Stories of Fieldpea (Nagaland)

Name of KVK	KVK Kohima
Crop and variety	Field pea var. Aman
Name of farmer & address	Shwinkenyun Logwa, Lower Tesophenyu
Background information about farmer field	The main prevailing practice of agriculture is terrace rice cultivation (TRC) and <i>jhum</i> cultivation. Though ample potentially of agriculture prevails, the district is striving hard to be self-sufficient in food grains. Farmers do not take up cultivation on large scale nor modern technology applied to go for bumper harvest in view of being a hilly terrain. During <i>kharif</i> , season paddy is grown in terrace field and left fallow during <i>rabi</i> season. i.e., winter season, due to the fact that irrigation facilities are not sufficiently available as the farmers depend mostly on monsoon rainfall. Therefore, to make available the large unutilized potential areas for <i>rabi</i> pulses production, the KVK have identified and motivated certain farmers to take up additional farming during winter season for additional income through minimum effort.
Details of technology demonstrated	Quality seed, line sowing, inoculation of rhizobium as seed treatment and irrigation at critical growth stage
Institutional involvement	Training and Demonstrations on the package of practices of the pea crop (var. Aman) along with seeds were provided to 40 farmers from 6 different villages covering an area of 20 ha.
Success point	Increase in production and productivity
Farmer's feedback	Rhizobium treated crop gives more yield than untreated crop; moreover, the soil gets enriched for the next cropping season. The income gain from the produce sold were utilized for family expenditure and also used for purchase of seeds, the seeds are suitable and superior to local varieties.
Yield (q/ha)	
- Potential yield of variety	22
- District average (Previous year)	10.9
- State average (Previous year)	11



Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	11	12000	24100	12100	2.01
Demonstration	14.75	13500	29000	15500	2.15
% Increase	34.1				



CFLD on field pea during *rabi* season, KVK Kohima, Nagaland

7.14. Success Stories of Blackgram (Tripura)

Name of KVK	KVK North Tripura
Crop and variety	Black gram var. Tripura Maskolai
Name of farmer & address	Manindra Das, Joyshree, North Tripura
Background information about farmer field	Medium low land and rice is the main crop grown in the village. Earlier there were no crops grown after rice cultivation during aman season. For two years back, blackgram cultivation started in rice fallow land during Sept – Oct.
Details of technology demonstrated	Main technology is rice –pulse cropping system with NPK-15-40-20, along with 5 t FYM/ha.
Institutional involvement	Supply of critical inputs, training, demonstration and periodic field visits
Success point	Crop diversification introduced in the area

Farmer's feedback

Farmers are happy for growing black gram in rice fallow land, earlier which used to be kept unused due to unavailability of seed materials.

Yield (q/ha)

- Potential yield of variety 9.5
- District average (Previous year) 6.75
- State average (Previous year) 6.5

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	6.65	17500	39900	22400	2.28
Demonstration	8.81	17500	52860	35360	3.02
% Increase	32				



CFLD on blackgram var. Tripura Maskolai at KVK North Tripura, Tripura

7.15. Success Stories of Rajma (Mizoram)

Name of KVK	KVK Lawngtlai
Crop and variety	Rajmash variety Arun
Background information about farmer field	Cultivated in upland field in cluster area within Thingkah, Chawnhu and Lawngtlai area. It was cultivated during <i>kharif</i> season under rainfed condition.
Details of technology demonstrated	Line sowing of the rajmash var. Arun was done and recommended dose of fertilizer was applied. Pest and diseases management was done as per need.
Institutional involvement	Most of the input like seed, fertilizers, chemicals and other instruction for proper functioning of the crop management were given by KVK. Monitoring of the field was done at regular intervals.
Success point	The production of crop was not much but the rajmash cultivation was popularized among the farmers. And also, farmer was benefitted from the crop production by selling seeds and also for grain consumption.
Farmer's feedback	Farmers find it economically profitable compared to other crops. Rajmash fetches a good price at local market. The package of practice provide by KVK is simple and convenient. They are willing to cultivate in the coming years.
Yield (q/ha)	
- Potential yield of variety	20
- District average (Previous year)	9
- State average (Previous year)	10

Performance of technology vis-à-vis local check (Increase in productivity and returns)

Used practice	Yield (q/ha)	Gross cost (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B:C Ratio
Farmer practices	13	36000	97500	61500	2.71
Demonstration	16	36000	120000	84000	3.33
% Increase	23.07				



CFLD on rajma var. Arun at KVK Lawngtlai, Mizoram



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7. Krishi Vigyan Kendra, RiBhoi, Meghalaya
8. Krishi Vigyan Kendra, West Garo Hills, Meghalaya
9. Krishi Vigyan Kendra, Champai, Mizoram
10. Krishi Vigyan Kendra, Lawngtlai, Mizoram
11. Krishi Vigyan Kendra, Serchhip, Mizoram
12. Krishi Vigyan Kendra, Kohima, Nagaland
13. Krishi Vigyan Kendra, Wokha, Nagaland
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Annexure-I: KVK-wise summary of Achievements of CFLD Pulses 2019-20

Sl.No	State	KVK	Crop/ Season	Variety	Technology demonstrated	Area (ha)	No. of Demo	Check (g/ha)	Yield			Economics of Local Check (Rs./ha)			Economics of Demonstration (Rs./ha)				
									Demo (g/ha)	% increase	Distict Avg. (g/ha)	Gross Cost	Gross return	Net return	BC ratio	Gross Cost	Gross return	Net Return	BC ratio
Kharif season																			
1	Manipur	Bishnupur	Blackgram	PU-31	Line-sowing Seed treatment, Treatment with Rhizobium leguminosarum	20	40	5.75	8.35	45.22	11.2	26200	46000	19800	1.76	30200	66800	36600	2.21
2	Manipur	Chandel	Blackgram	PU-31	Blackgram var. PU-31	10	30	5.54	8.4	51.62	5.1	26570	44320	17750	1.67	26700	66360	39660	2.49
3	Manipur	Imphal East	Blackgram	PU-31	Improved cultivation of Fieldpea var. Aman	10	27	5.52	6.82	23.55	8.4	19800	30250	10450	1.53	21560	40920	19360	1.90
4	Manipur	Senapati	Blackgram	PU-31	Integrated Nutrient Management	10	25	5.73	8.23	43.63	6.2	142000	229200	87200	1.61	151924	329200	177276	2.17
5	Manipur	Tamejoling	Blackgram	PU-31	Rhizobium @ 200 g per 10 kg as seed treatment in Black gram var. PU 31	10	26	7.26	9.4	29.48	10.26	24500	41382	16882	1.69	29200	53580	24380	1.83
Sub total						60	148	5.96	8.24	38.70		478140	782304	304164	1.7	51613.2	111372	40075.0	2.1
1	Manipur	Imphal East	Greengram	IPM-23	Improved cultivation of greengram var. IPM 2-3	10	30	-	6.35	-	7.8	-	-	-	-	23400	50800	27400	2.17
Sub total						10	30		6.35	-	-	-	-	-	-	23400	50800	27400	2.17
Sub total						70	178												
Rabi Season																			
1	Manipur	Bishnupur	Field pea	Aman	Seed treatment, Liming	20	50	7.56	11.12	47.09	9.2	28700	45360	16660	1.58	30500	66720	36220	2.19
2	Manipur	Chandel	Field pea	Aman	Improved cultivation of Fieldpea var. Aman	10	25	10.12	13.65	34.88	8.1	27000	70840	43840	2.6	30500	95223	64723	3.12
3	Manipur	Imphal East	Field pea	Aman	Improved Cultivation of field pea var. Aman	37	92	6.5	7.15	10.00		28550	50800	22250	1.78	31200	57200	2600	1.83

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4	Manipur	Imphal West	Field pea	Aman	Improved package of practice	20	40	10.9	15.27	40.09	8.5	31000	54500	23500	1.76	33000	76350	43350	2.31
5	Manipur	Senapati	Field pea	Aman	Minimum Tillage	10	25	10.76	15.42	43.31	9.2	217100	322800	105700	1.49	244629.5	462600	217969.5	1.89
6	Manipur	Tamenglong	Field pea	Aman	Improved cultivation of Field pea var. Aman	10	22	7.5	8.5	13.33	9.12	24000	37500	13500	1.56	26000	42550	16550	1.64
7	Meghalaya	Ribhoi	Field pea	Aman	Populisation of field pea var. Aman with Rhizobium inoculation	10	25	12.8	19.6	53.13	11.8	30200	51200	21000	1.70	32600	78400	45800	2.40
8	Mizoram	Champai	Field pea	Aman	Improved var. Aman	20	20	7.2	8.52	18.33	14.4	28800	43200	14400	1.5	30650	51120	20470	1.68
9	Nagaland	Kohima	Field pea	Aman	Improved var. Aman	20	50	11	14.75	34.09	10.9	12000	24100	12100	2.01	13500	29000	15500	2.15
10	Nagaland	Mon	Field pea	Aman	Paddy based cropping with Rhizobium seed treatment at 200 gm/10kgs seeds	30	50	8.75	11.5	31.43	-	15500	35000	19500	2.26	15500	41320	25820	2.67
11	Nagaland	Tuensang	Field pea	Aman	Improved Variety, Improved cultivation practices, Double Cropping	40	172	10.09	14.16	40.34	-	133333	25225	11891.7	1.89	14950	35416.6	20466.6	2.37
12	Nagaland	Zunheboto	Field pea	Aman	Improved var. Aman	10	41	10.8	13.3	23.15	10.5	297500	73500	43750.0	2.47	29750	93730	63980	3.15
13	Nagaland	Wokhta	Field pea	Prakash	Vac. Prakash with recommended practices	20	50	7.5	7.02	-6.40	10.5	30400	60000	29600	1.97	32000	60800	28800	1.90
14	Tripura	Khowai	Field pea	Prakash	Management of pod borer	30	60	4	9	125.00	12	25000	36000	11000	1.44	32000	63000	31000	1.97
15	Tripura	North Tripura	Field pea	Prakash	Rice-Pulse Cropping System	20	50	8.3	10.73	29.28	7.8	22487	58100	35613	2.58	22487	75110	52623	3.34
16	Tripura	West Tripura	Field pea	TRCP-8	Improved variety of Field pea (TRC-P-8)	10	25	25	35	40.00	-	38000	75000	37000	1.97	40000	140000	100000	3.50
Sub total						10	25	25	35	40	0	38000	75000	37000	1.9	40000	140000	100000	3.50
						317	797												



1	Manipur	Chandel	Lentil	HUU-57	Improved cultivation of lentil var. HUU-57	10	25	6.85	9.5	38.69	6.5	31200	61650	30450	1.98	32000	85680	53680	2.68
2	Mizoram	Lawnghlai	Lentil	HUU-57	Varietal evaluation HUU-57	15	30	6.53	7.15	9.49	-	24670	58770	34100	2.38	25600	64080	39480	2.50
						25	55	6.69	8.33	24.09	6.50	27935.00	60210	32275.00	2.18	28800.00	74880.00	46080.00	2.59
3	Meghalaya	West Garo	Lentil	WBL-77	Performance of Lentil var. WBL-77	30	50	5.89	9.12	54.84	-	21,500	35,340	13,840	1.64	25337.5	54720	29182.5	2.14
4	Mizoram	Serchhip	Lentil	WBL-77	Improved var. and INM	24	30	4.2	7.8	85.71	-	18410	25200	6790	1.37	22100	47600	25500	2.15
5	Tripura	North Tripura	Lentil	WBL-77	Rice-Pulse Cropping System	10	25	3.79	6.33	67.02	5.51	15650	26530	10880	1.70	19850	44310	24460	2.23
						64	105	4.63	7.75	69.19	5.51	18520.00	29023.3	10503.33	1.57	22495.83	48876.67	26380.83	2.18
					Sub total	89	160												
1	Manipur	Lawnghlai	Rajma	Arum	Improved var. line sowing and fertilizer application	15	30	13	16	23.08	10	45000	97500	52500	2.17	45000	120000	75000	2.67
2	Mizoram	Serchhip	Rajma	Arum	Varietal evaluation and INM	20	50	9	11.7	30.00	9	22500	40500	18000	1.8	22554	49500	26946	2.19
					Sub total	35	80												
1	Tripura	North Tripura	Blackgram	Tripura Maskohai	Rice-Pulse cropping system	20	75	6.65	8.81	32.48	6.75	17500	39900	22400	2.28	17500	52860	35360	3.02
					Sub total	20	75												
					Total (Rabi)	461	1112												
					Total (Kharif + Rabi)	531	1290												

Annexure-I: KVK-wise summary of CFLD Pulses 2019-20

Sl. No	Crops	State	Target of FLDs approved		Achievements of FLDs		Average yield (q/ha)		Yield increase (%)	Difference of yield between demo and local (q/ha)
			No. of Demos	Area (ha)	No. of Demos	Area (ha)	Demo	Local		
Kharif season										
1	Blackgram	Manipur	150	60	148	60	8.24	5.96	38.26	2.28
2	Greengram	Manipur	25	10	30	10	6.35			
Total (Kharif)			175	70	178	70	7.30	5.96	22.40	1.34
Rabi season										
1	Field pea	Manipur	250	100	254	107	11.85	8.89	33.31	2.96
		Meghalaya	25	10	25	10	19.6	12.8	53.13	6.8
		Mizoram	25	10	20	20	8.52	7.2	18.33	1.32
		Nagaland	300	120	363	120	12.15	9.63	26.15	2.518
		Tripura	150	60	135	60	18.24	12.43	46.73	5.81
3	Lentil	Manipur	25	10	25	10	9.5	6.85	38.69	2.65
		Meghalaya	75	30	50	30	9.12	5.89	54.84	3.23
		Mizoram	100	40	60	39	7.48	5.37	39.33	2.11
		Tripura	25	10	25	10	6.33	3.79	67.02	2.54
4	Rajma	Mizoram	75	30	80	35	13.85	11	25.91	2.85
5	Blackgram	Tripura	50	20	75	20	8.81	6.65	32.48	2.16
Total (Rabi)			1100	440	1112	461	11.40	8.23	38.62	3.18
Grand Total (Kharif + Rabi)			1275	510	1290	531				

Annexure-I: KVK-wise summary of CFLD Pulses 2019-20

Sl. No	Crops	State	Target of FLDs approved		Achievements of FLDs		Average yield (q/ha)		Yield increase (%)	Difference of yield between demo and local (q/ha)
			No. of Demos	Area (ha)	No. of Demos	Area (ha)	Demo	Local		
Kharif season										
1	Blackgram	Manipur	150	60	148	60	8.24	5.96	38.26	2.28
2	Greengram	Manipur	25	10	30	10	6.35			
Total (Kharif)			175	70	178	70	7.30	5.96	22.40	1.34
Rabi season										
1	Field pea	Manipur	250	100	254	107	11.85	8.89	33.31	2.96
		Meghalaya	25	10	25	10	19.6	12.8	53.13	6.8
		Mizoram	25	10	20	20	8.52	7.2	18.33	1.32
		Nagaland	300	120	363	120	12.15	9.63	26.15	2.518
		Tripura	150	60	135	60	18.24	12.43	46.73	5.81
3	Lentil	Manipur	25	10	25	10	9.5	6.85	38.69	2.65
		Meghalaya	75	30	50	30	9.12	5.89	54.84	3.23
		Mizoram	100	40	60	39	7.48	5.37	39.33	2.11
		Tripura	25	10	25	10	6.33	3.79	67.02	2.54
4	Rajma	Mizoram	75	30	80	35	13.85	11	25.91	2.85
5	Blackgram	Tripura	50	20	75	20	8.81	6.65	32.48	2.16
Total (Rabi)			1100	440	1112	461	11.40	8.23	38.62	3.18
Grand Total (Kharif + Rabi)			1275	510	1290	531				



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