



Impact of Technologies on Pulses Production in North Eastern Region

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Impact of Technologies on Pulses Production in North Eastern Region

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First Published: 2018

Published by:

ICAR-Agricultural Technology Application Research Institute (ATARI)

Umiam, Meghalaya

Printed at :

Rumi Jumi Enterprise

Sixmile, Guwahati-781022

PREFACE

India is the largest producer, consumer and importer of pulses in the world. Pulses account for around 20 per cent of the area under foodgrains and contribute around 7-10 per cent of the total foodgrains production in the country. Though pulses are grown in both Kharif and Rabi seasons, Rabi pulses contribute more than 60 per cent of the total production. Since ages, pulses have been well integrated into the farming system of our country as the farmers could produce them by using their own seeds and family labour without depending much on external inputs. With the advent of Green Revolution, which promoted rice and wheat using external inputs and modern varieties of seeds, pulses were pushed to the marginal lands. This resulted in decline in productivity and land degradation. Thus, pulses are still cultivated on the marginal and sub marginal land, predominantly under un-irrigated conditions. The trend of commercialisation of agriculture has further aggravated the status of pulses in the farming system.

It is a known fact that a significant population in the country is vegetarian and they consume pulses in high quantities. Per capita net availability of pulses in India, however, has reduced from 51.1 gm/day (1971) to 41.9 gm/day (2013) as against WHO recommendation of 80gm/day. This raises question about the nutritional aspect as pulses are considered to be 'poor man's protein'. Looking into the above facts, the Ministry of Agriculture and Farmers' Welfare, Govt. of India had initiated a nationwide cluster frontline demonstration programme on Pulses under National Food Security Mission-Pulses (NFSM-Pulses). Under this programme, ICAR through its KVKs across the country has been conducting cluster frontline demonstrations in different pulse crops in last three years. During 2016-17, ICAR-ATARI, Umiam through its 43 KVKs, a total of 6119 demonstrations were conducted on various pulse crops like Blackgram, Greengram, Lentil, Arhar, Rajma, Field pea and Lathyrus covering an area of 2392 ha across the states of Assam, Arunachal Pradesh, Mizoram, Manipur, Nagaland, Sikkim and Tripura.

This publication focuses on major technologies popularised among the farmers through the cluster frontline demonstrations in the commonly grown pulse crops. We express our sincere thanks and gratitude to DAC, Ministry of Agriculture and Farmers' Welfare, Govt. of India, Dr. A.K. Singh, DDG (Ag. Extension), Dr. V.P. Chahal, ADG (Ag. Extension) and all the colleagues of Agricultural Extension Division in Council HQ for financial support and their constant encouragement, guidance and support in executing the programme. We sincerely acknowledge the services rendered by the scientists of the KVKs and ICAR-ATARI, Umiam including the RAs/SRFs/DEOs for successfully conducting the demonstrations and bringing out this publication.



(Bidyut C. Deka)
Director

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Cluster Front line demonstrations on Pulses

Introduction:

Front line demonstrations (FLD) of pulses is a unique approach to provide a direct interface between researchers and farmers as the scientists are directly involved in planning, execution and monitoring of the demonstrations for the technologies developed by them and get direct feedback from the farmers fields about production in general and technology being demonstrated in particular. Thus, FLDs provide an opportunity to researchers and extension personnel for understanding the farmers resources and requirement to fine tune and modify the technologies for easy adoptability at farmers fields. FLDs on pulses were conducted under close supervision of the scientists of the Krishi Vigyan Kendras. 43 KVKs were actively involved for conducting the FLDs under close supervision and guidance of ICAR-ATARI, Umiam, Meghalaya. Besides FLDs, field days, trainings, workshops, seminars, farmers-scientists interaction *etc.* were also conducted to facilitate interactions between researchers, extension workers and farmers/farm women. During these interactions, knowledge/experiences/constraints were exchanged for improving the performance of different technological packages under FLDs. Hence, adoption of proven agricultural technologies on large scale could be ensured among farming communities.

During 2016-17, a total of **6119** demonstrations were conducted on various pulse crops like Blackgram, Greengram, Lentil, Arhar, Rajma, Field pea and Lathyrus covering an area of **2392 ha**. (Table 1). Among the pulse crops, the highest number of demonstrations were conducted in Lentil covering 775 hectare area and the highest increase in yield level over check *i.e.* 65.22 % was obtained in Pigeon pea. The most promising B:C ratio was observed in Lentil during the period.

Table 1: Frontline Demonstration on Pulses during 2016-17

Sl. No.	Crop	No. of Demo.	Area (ha)	Average yield (q/ha)		Avg. % Increase over check	Avg. cost of cultivation (Rs./ha)		Avg. Benefit Cost ratio
				Demo.	Check		Demo.	Check	
1	Arhar	80	30	11.40	6.90	65.22	16400	21260	2.1
2	Blackgram	1305	480	8.17	5.98	36.62	21988	20859	1.98
3	Field pea	1507	607	13.08	9.07	44.21	26923	25383	2.20
4	Greengram	654	270	7.65	5.91	29.44	27966	25411	2.3
5	Lathyrus	115	40	8.12	6.41	26.74	20185	20629	2.22
6	Rajmah	492	190	16.73	11.59	44.35	44331	44394	2.12
7	Lentil	1966	775	6.72	5.90	13.89	21901	18901	2.26
	Total	6119	2392						

Blackgram

Black gram is cultivated in the North Eastern Region of India in all three crop seasons *viz.* Kharif (August-September), Rabi (September-November) and Zaid (February-March) under rainfed conditions. It may be grown as a sole crop, mixed crop, catch crop or sequential crop. Black gram is a tropical crop which requires hot and humid climate and is able to tolerate high temperature. As such, these are short day plants, however presently neutral varieties are also available for cultivation during the summer season. This crop is highly nutritive and contains high proportion of digestible protein with many essential amino acids, minerals and vitamins. Soil related constraints, temperature, moisture stress and agro-techniques related difficulties pose constraints in the production of pulse in the North Eastern region.

Cluster Frontline Demonstrations (FLDs) on Blackgram were conducted during Kharif, Rabi and Summer season in 21 KVKs across Assam, Arunachal Pradesh, Manipur, Sikkim and Tripura. A total number of 1305 demonstrations were conducted covering an area of 480 ha.

Technology demonstration

Use of Improved varieties: The varieties which were utilized for demonstrations are:

- Kharif: IPU-94-1, PU-19, PU-31, T-9 and SKPD-3
- Rabi: PU-31 and Tripura Maskolai
- Zaid: IPU-94-1, PU-31 and Shekhar

Seed Rate: Seed rate of 25 kg/ha

Seed treatment: Seed treatment with rhizobium culture and Phosphate Solubilising Bacteria @ 50 g/kg seed, *Trichoderma viride* @ 5 g/kg seed

Cropping System: Rice-pulse based 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 P₂O₅ and 25 kg K₂O.

Pest and Disease Management: Seed treatment with Mancozeb and Carbendazim @2 g/kg. Spraying with Chloropyrifos 20 EC against infestation of leaf eating caterpillar.

Performance of blackgram during Kharif season (2016-17)

The programme envisaged to demonstrate the production potentiality of newly developed technologies/ varieties of blackgram at farmers fields by the KVKs of the region. A total of 886 demonstrations were conducted across the states of Assam, Arunachal Pradesh, Manipur and Sikkim covering an area of 330 ha. Various interventions like HYVs, seed treatment with Rhizobium and fungicides, IPM and organic cultivation practices along with technical know-how were demonstrated in farmers' fields. A total number of 40 training programmes were organized during the season which benefitted 1254 number of farmers

(Male-937, Female-317). The varieties like IPU-94-1, PU-31, PU-19, SKPD-3 outperformed over the local varieties with a significant yield difference.

The State of Sikkim with the variety SKPD-3 recorded highest yield of 10.20 q/ha against local check yield of 6.40 q/ha with a yield increase of 59.38%. Arunachal Pradesh, Assam and Manipur recorded the yield of 9.88 q/ha, 7.44 q/ha and 5.00 q/ha respectively.



CFLD on Kharif Blackgram, KVK Jorhat

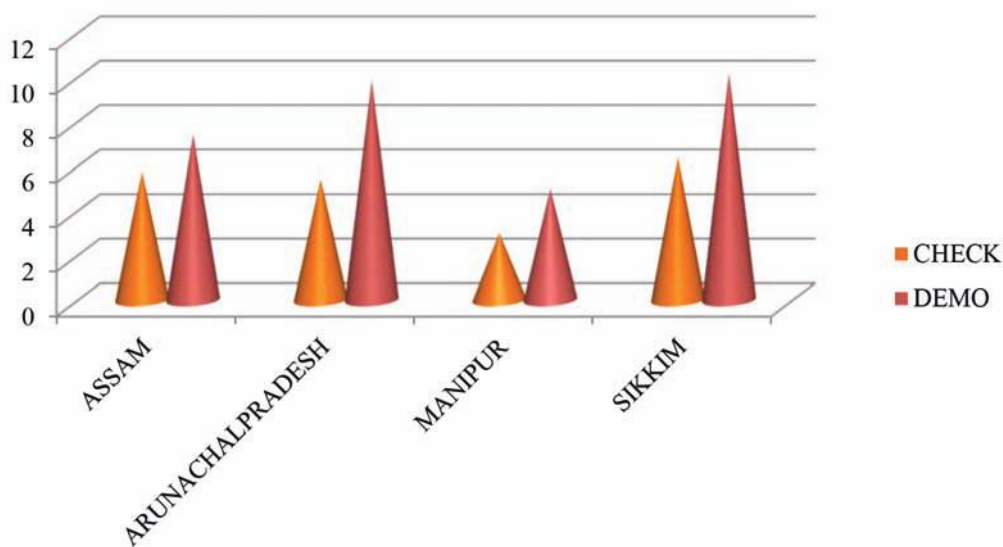


Figure 1: Average yield of Blackgram during Kharif 2016-17

Performance of Blackgram during Rabi season (2016-17)

The FLDs on blackgram envisaged to demonstrate the production potentiality of improved technologies/varieties at farmers fields through KVKs. A total of 224 demonstrations were conducted in 70 ha of area in Assam and Tripura with the varieties PU-31 and Tripura Maskolai, respectively. The average yield under demonstration was 9.0 q/ha and 8.05 q/ha in Assam and Tripura, respectively compared to local variety 6.5 q/ha. Under demo a yield advantage of 38.46 % in Assam and 23.85% in Tripura was observed.

Performance of Blackgram during Summer season (2016-17)

To exhibit the production potential of improved varieties and technologies, FLDs on blackgram were conducted in an area of 80 ha with a total number of 195 demonstrations in Assam. Varieties utilized in conducting FLDs included PU-19, PU-31, IPU-94-1 and Shekhar. The FLDs were conducted in 16 villages of Assam. The demonstrations were mainly based on HYVs, INM and IPM. The average yield under demonstration was 7.73 q/ha with the net return of Rs.11860/- /ha compared to local check (6.47 q/ha). Under demo a yield advantage of 19.95 % was observed.



CFLD on Summer Blackgram, KVK Sonitpur

Greengram

Green gram is a leguminous crop of the species *Radiata*. Green gram is a nutritious source of food with 25% protein content and can also be grown for hay, green manure and cover crop. In the North Eastern Region of India, Green gram is grown in Kharif (July-September) and Zaid (February-April) under rainfed and irrigated conditions. Short duration and photo insensitive varieties fit well in many intensive cropping systems across the country. The crop needs high temperature, less humidity and moderate rainfall of about 60-80 cm. Water logging is fatal for root development and nitrogen fixation during early vegetative stage. It is cultivated as a catch crop in summer/spring in between Rabi and Kharif crops, after the harvest of Rabi crops.

Cluster Frontline Demonstrations (FLDs) on Greengram were conducted during Kharif and Summer season in 9 KVKs across Assam, Manipur, Sikkim and Tripura. A total number of 654 demonstrations were conducted covering an area of 270 ha.

Technology demonstration

Use of Improved varieties: The varieties which were utilized for demonstrations are:

- Kharif: IPM-2-3, Pratap, PDC-3 and Tripura Mung 1
- Zaid: IPM-2-3, Pratap and Tripura Mung 1

Seed treatment: Seed treatment with rhizobium culture and Phosphate Solubilising Bacteria @50 g/kg seed.

Line sowing: Line sowing of 45cm X 15cm.

Nutrient Management: 25 kg N, 50 kg P₂O₅ and 25 kg K₂O, application of vermicompost @ 1.0 t/ha and 13.1 q of lime as soil amendment.

Pest Management: Chloropyriphos @ 2.5 ml/l of water for controlling caterpillar attack at vegetative stage, use of Neembicidine @ 3 ml/l against sucking pests.

Disease Management: Application of *Pseudomonas fluorescence* @ 5 ml/l against leaf spot and Anthracnose, Seed treatment with Carbendazim @2 g/kg.

Performance of Greengram during Kharif season (2016-17)

Improved varieties of greengram along with technical packages were included under FLDs of greengram during Kharif season. The varieties IPM-2-3, Pratap have shown a significant yield difference when compared to the local check.

The variety PDC-3 in the FLDs conducted by Sikkim state recorded highest yield of 8.93 q/ha with a yield increase of 10.79% over the local check. Highest yield was recorded in Assam (7.95 q/ha) followed by Tripura (7.25 q/ha), where the varieties like Pratap, IPM-2-3 and Tripura Mung 1 were demonstrated in the states of Assam and Tripura respectively.



CFLD on Kharif Greengram, KVK Nagaon

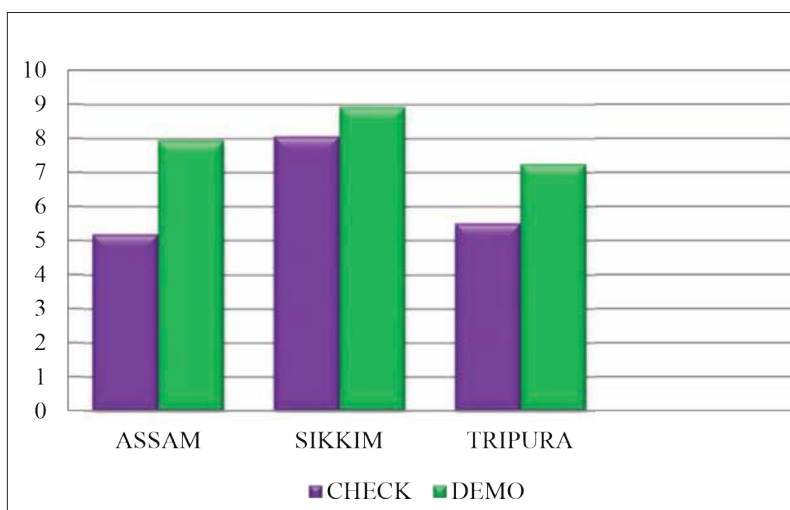


Figure 2: Average yield of Greengram during Kharif 2016-17

Performance of Greengram during summer season (2016-17)

The FLDs in greengram were conducted in the states of Assam, Manipur and Tripura covering an area of 110 hectares. A total number of 247 demonstrations were conducted across 17 villages. Capacity building through various trainings, workshops, exposure visits, field days, kisan melas etc. was organized for maximizing their returns. The varieties namely Pratap, IPM-2-3 and Tripura Mung-1 had a significant yield difference when compared to the local check. The average yield under demonstration was 10.41 q/ha, 5.26 q/ha and 7.25 q/ha compared to local variety 6.65 q/ha, 4.02 and 5.5 q/ha in Assam, Manipur and Tripura respec-

tively. Under demo a yield advantage of 56.54 %, 30.85% and 31.82 % was observed in Assam, Manipur and Tripura respectively.



CFLD on Summer Greengram, KVK Bishnupur

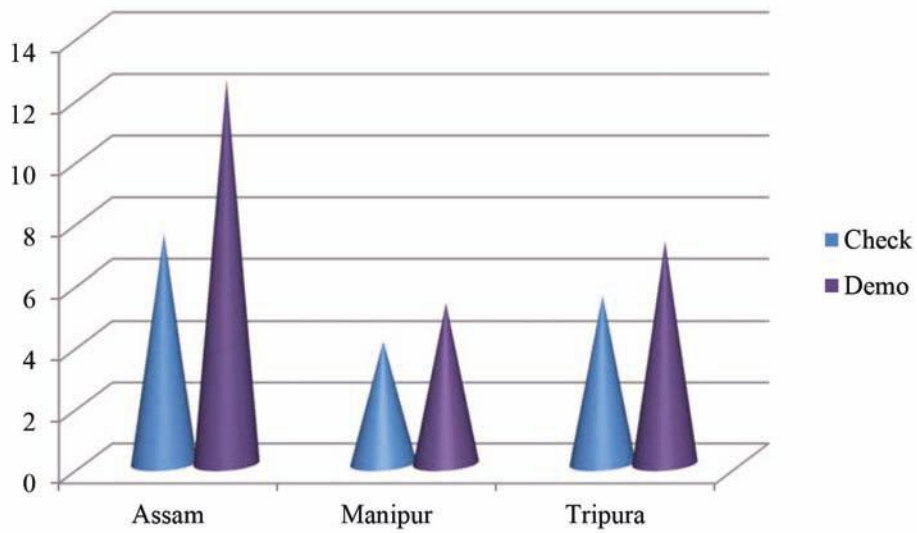


Figure 3: Average yield of Greengram during Summer 2016-17

Rajma

Rajma or Kidney beans are termed as “King of Nutrition”. Red kidney beans are popularly known as “Rajma” in Northern India. This crop grows well in tropical and temperate areas receiving 60 to 150 cm of rainfall annually. Ideal temperature for better yield is 15°C to 25°C. Well drained loamy soils are best suited for its cultivation. This crop is very sensitive to salinity and soil pH should be 5.5 to 6.0 to obtain better yields. It is grown in Maharashtra, H.P., U.P., J&K., and NE states covering 80-85 thousand ha area. Rajma is valued for its protein rich (23%) seeds. Seeds are also rich in calcium, phosphorus and iron. The fresh pods and green leaves are used as vegetable. In the North East, Rajma is grown during late Kharif (August-September) and Rabi (November-December) seasons under irrigated and rainfed conditions.

Cluster Frontline Demonstrations (FLDs) on Rajma were conducted during Kharif and Rabi season in 8 KVks across Assam, Arunachal Pradesh, Mizoram and Sikkim. A total number of 492 demonstrations were conducted covering an area of 190 ha.

Technology demonstration

Use of Improved varieties: The varieties which were utilized for demonstrations are:

- Kharif: Tripura Rajma Sel 1
- Rabi: Ambar (IIPR 96-4), Uday (PDR-14), Utkarsh and Jwala

Seed treatment: Seed treatment with rhizobium culture and Phosphate Solubilising Bacteria @200 g/10 kg seed.

Seed rate: Seed rate of 50kg/ha

Line sowing: Line sowing @ 30cm X 15cm.

Cropping System: Rice-pulse based cropping system

Nutrient Management: Application of 66 kg/ha Urea, 250 kg/ha of SSP, 34 kg/ha of MOP.

Pest Management: Application of Neembicidine @ 3 ml/l against sucking pests.

Disease Management: Seed treatment with Captan @ 3 g/kg.

Performance of Rajma during Kharif season (2016-17)

Rajma demonstrations were laid out in an area of 10 ha in Sikkim with a total number of 35 demonstrations. The inputs like seeds of the variety Tripura Rajma Sel-1 along with neem based formulations were distributed to the farmers. The average yield of the demo variety was 16.60 q/ha compared to local variety (10.40 q/ha). Under demo a yield advantage of 59.62% was observed.



CFLD on Kharif Rajma, KVK North Sikkim

Performance of Rajma during Rabi season (2016-17)

Rajma demonstrations were laid out in an area of 180 ha across the states of Assam, Arunachal Pradesh, Mizoram and Sikkim. A total number of 457 demonstrations were conducted across 13 villages. Various interventions like varietal evaluation and package of practices were demonstrated in farmers' fields.

Highest yield was recorded in Arunachal Pradesh (23.6 q/ha) followed by Sikkim (16.59 q/ha), Assam (15.72 q/ha), and Mizoram (15.00 q/ha).

Table 2: Performance of Rajma during Rabi 2016-17

S.No	State	Average yield (q/ha)		Yield increase (%)	Difference of yield between demo and local (q/ha)
		Check	Demo		
1	Assam	11.6	15.72	35.51	4.12
2	Arunachal Pradesh	19.4	23.6	21.65	4.2
3	Mizoram	0.00	15.00	-	15.00
4	Sikkim	10.73	16.59	54.69	5.87



CFLD on Rabi Rajma, KVK Hailakandi

Pigeon pea

Pigeon pea (Arhar) commonly known as red gram or tur is the second most important pulse crop in the country, after gram. Arhar grows well in warm tropical and subtropical climate. The crop prefers a fairly moist and warm climate during the periods of its vegetative growth. It is highly susceptible to frost at the time of flowering. Cloudy weather and excessive rainfall at flowering time damage the crop to a great extent. Being a deep rooted crop, soil must be very deep, well drained, free from soluble salts and neutral in reaction. The crop is rich source of protein and supplies a major share of the protein requirement of the vegetarian population of the country. Seeds of arhar are also rich in iron, iodine, essential amino acids like lycine, tyrocene, cystine and arginine. The outer covering of its seed together with part of the kernel, provides a valuable feed for milch cattle. The husk of pods and leaves obtained during threshing constitute a valuable cattle feed. Woody parts of the plant are used for fuel. It is a legume crop and, consequently, possesses valuable properties as restorer of nitrogen to the soil. The optimum date of sowing recommended for pigeonpea is in the month of June. However, many a time, in the North East the monsoon delays sowing beyond second fortnight of August in this region causing conspicuous reduction in yield.

Cluster Frontline Demonstrations (FLDs) on Pigeon pea were conducted during Kharif season in KVK Tirap, Arunachal Pradesh. A total number of 80 demonstrations were conducted covering an area of 30 ha.

Technology demonstration

Use of Improved varieties: The variety which was utilized for demonstrations was UPAS-120.

Seed treatment: Seed treatment with *Trichoderma viride* @ 4g/kg seed.

Insect Management: Integrated Pest Management by application of monocrotophos @ 2 – 2.5 ml/l and Pheromonone trap @ 6 nos/ha (helilure).

Performance of Pigeon pea during Kharif season (2016-17)

Pigeonpea demonstrations were laid out in 30 ha in Arunachal Pradesh. The inputs like seeds, weedicides and pheromone traps were distributed to the farmers. Three training programmes were organized during the season which benefitted 100 numbers of farmers (Male-39, Female-61). The average yield of the variety UPAS-120 was 11.40 q/ha compared to local variety (6.90 q/ha). Under demo a yield advantage of 65.22% was observed.



CFLD on Kharif Pigeon pea, KVK Tirap

Lathyrus

Grass pea (*Lathyrus sativus* L.) is a crop of immense economic significance. It is often broadcast-seeded into standing rice crops one or two weeks before harvest of paddy. This allows grass pea to effectively exploit the residual moisture left after harvest. The crop is tolerant to drought and also has tolerance to excess precipitation and flooding. It has a hardy and penetrating root system suited to a wide range of soil types including very poor soil and heavy clays. Grasspea contains 34% protein and other essential micro-nutrients and may provide nutritional security to the low income people in the society. The crop holds tremendous potential as a functional food to improve health conditions associated with cardiovascular diseases, hypoxia, and hypertension. Lathyrus is grown during Rabi season in North East during the month of November under rainfed conditions and as a relay crop.

Cluster Frontline Demonstrations (FLDs) on Lathyrus were conducted during Rabi season in 3 KVKs of Assam. A total number of 115 demonstrations were conducted covering an area of 40 ha.

Technology demonstration

Use of Improved varieties: The variety which was utilized for demonstrations was Ratan.

Seed treatment: Seed treatment with Azotobacter and Phosphate Solubilising Bacteria @ 50g/kg of seed.

Cropping System: Sown as a relay crop, 15-20 days before the harvest of winter rice when soil is moist.

Nutrient Management: Application of 45 kg/ha Urea and Vipul granules @ 500 kg.

Performance of Lathyrus during Rabi season (2016-17)

Sweet pea (var. Ratan) demonstrations were conducted in Assam covering an area of 40 ha with a total number of 115 demonstrations to exhibit the production potential of improved varieties. Capacity building through various trainings, workshops, exposure visits, field days and kisan melas etc. were conducted for maximizing their returns. The average yield under demonstration was 8.12 q/ha with the net return of Rs.25755/-/ha compared to local variety 6.41 q/ha. Under demo a yield advantage of 39.36 % was observed.



CFLD on Rabi Lathyrus, KVK Nagaon

Lentil

Lentil is one of the important and most nutritious Rabi pulses. It derives the name Lens from the lens shaped seeds. It is rich in calcium (560 ppm), iron, and niacin. The crop has the potential to cover the risk of rainfed farming. It is also used as a cover crop to check the soil erosion. The plants are ploughed back into the soil as green manure. The growth of lentil crop is adversely affected at temperatures above 27°C. Unlike gram, it remains unaffected by rain at any stage of its growth including flowering and fruiting. The plant is hardy and can tolerate frost and severe winter to a great extent. It is moderately drought tolerant crop. Lentil requires cold temperature during its vegetative growth and warm temperature at the time of maturity. The optimum temperature for growth is 18°-30°C. In the North East India, the crop is grown during the Rabi season in the month of November predominantly under rainfed conditions.

Cluster Frontline Demonstrations (FLDs) on Lentil were conducted during Rabi season in 29 KVKs across Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland and Tripura. A total number of 1966 demonstrations were conducted covering an area of 775 ha.

Technology demonstration

Use of Improved varieties: The varieties which were utilized for demonstrations are:

- Rabi: HUL-57, Moitree (WBL-77) and KLS-218

Seed treatment: Seed treatment with rhizobium culture and Phosphate Solubilising Bacteria @50 g/kg seed, *Trichoderma viride* @ 5 g/kg seed, Seed Priming in lentil.

Seed rate: Seed rate of 80kg/ha

Line sowing: Line sowing @ 30cm X 10cm.

Cropping System: Rice-pulse cropping system

Nutrient Management: Application of NPK @ 10:35:0 kg/ha along with application of micronutrient mixture @ 7.5 kg/ha, Neem oil @ 2.6 lt. /ha and nutrient complex Tricontanol (Vipul) @ 52.5 lt. /ha.

Disease Management: Seed treatment with Carbendazim @ 2 g/kg.

Performance of Lentil during Rabi season (2016-17)

Lentil demonstrations were laid out in an area of 775 ha across Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland and Tripura. A total number of 1966 demonstrations were conducted during the season. Various inputs like seeds of the variety HUL-57, Moitree, Nutrients, fungicides, Rhizobium and Phosphate solubilising bacteria (PSB) were distributed among the farming community. A total number of 48 training programmes were conducted to provide technical know-how to the farmers which benefitted 1573 numbers of farmers.

Tripura recorded highest yield of 8.46 q/ha with variety HUL-57 over local variety (5.90 q/ha) with yield increase of 43.38 %. This was followed by Assam with yield of 7.98 q/ha, Manipur (7.57 q/ha), Nagaland (6.40 q/ha), Arunachal Pradesh (5.73 q/ha) and Mizoram (4.20 q/ha).

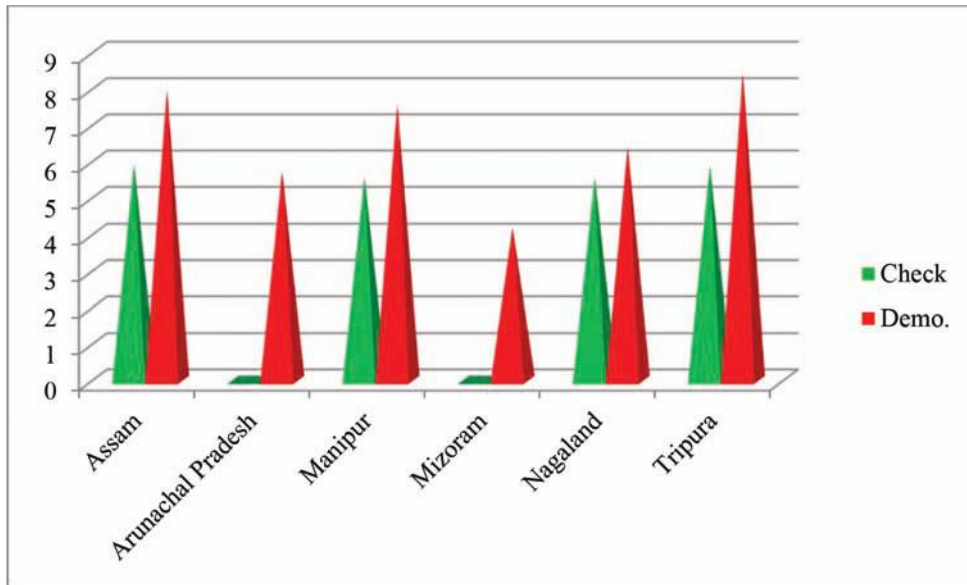


Figure 4: Performance of Lentil during Rabi 2016-17



CFLD on Rabi Lentil, KVK Dhubri

Field pea

Pea is the third most important pulse crop at global level, after dry bean and chickpea and third most popular Rabi pulse of India after chick pea and lentil. Being a winter season crop it requires a cool growing season with moderate temperature throughout the life. High temperature is more injurious to pea crop than frost. Optimum monthly temperature suitable for growth is 13°-18°C. A well-drained loamy soil free from excessive soluble salts with neutral pH range of 6.5 to 7.5 is suitable for successful cultivation of the crop. The mature seeds are used as whole or split into dal and put to use in various ways for human consumption. It is also grown as a forage crop for cattle and cover crop to prevent soil erosion but mainly for mature seed for human consumption. Field pea is cultivated mainly during the Rabi season in the North East (November-December) under rainfed conditions.

Cluster Frontline Demonstrations (FLDs) on Field pea was conducted during Rabi season in 28 KVKs across Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland and Tripura. A total number of 1507 demonstrations were conducted covering an area of 607 ha.

Technology demonstration

Use of Improved varieties: The varieties which were utilized for demonstrations are:

- Rabi: Prakash, VL Matar-42, Rachna, HUP-2, HUDP-15, V-10

Seed treatment: Seed treatment with rhizobium culture @ 50 g/kg seed, Bavistin @ 2.0 g/kg seed and *Trichoderma viride* @ 4 g/kg seed.

Seed rate: Seed rate of 70kg/ha.

Line sowing: Line sowing @ 30cm X 10cm with minimum tillage.

Cropping System: Rice-pulse cropping system

Nutrient Management: Application of vermicompost @ 1q/bigha, 65.5 kg/ha of lime as soil amendment, nutrient complex Tricontanol @ 0.75 l/ha and Borax @ 10kg/ha. Basal fertilizer application viz. 25 kg N, 50 kg P₂O₅ and 25 kg K₂O.

Disease Management: Seed treatment with Carbendazim @ 2 g/kg against infestation of powdery mildew.

Performance of Field pea during Rabi 2016-17

The FLDs on Fieldpea are being undertaken across the states of Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland and Tripura. A total number of 1507 demonstrations were conducted in an area of 607 ha focusing on increase in production and productivity and to bring improvements in areas like resource management, climate resilient pulse production etc. Varietal evaluation, INM are the main technologies demonstrated during the cropping period. A total number of 55 training programmes were organized which benefitted 2062 number of farmers.

The varieties Prakash and Rachna recorded the highest yield of 17.41 q/ha over local check yield of 10.40 q/ha in Arunachal Pradesh. Performance of other states in terms of yield included Manipur (14.87 q/ha), Nagaland (13.50 q/ha), Tripura (12.27 q/ha), Mizoram (10.41 q/ha) and Assam (10.04 q/ha).

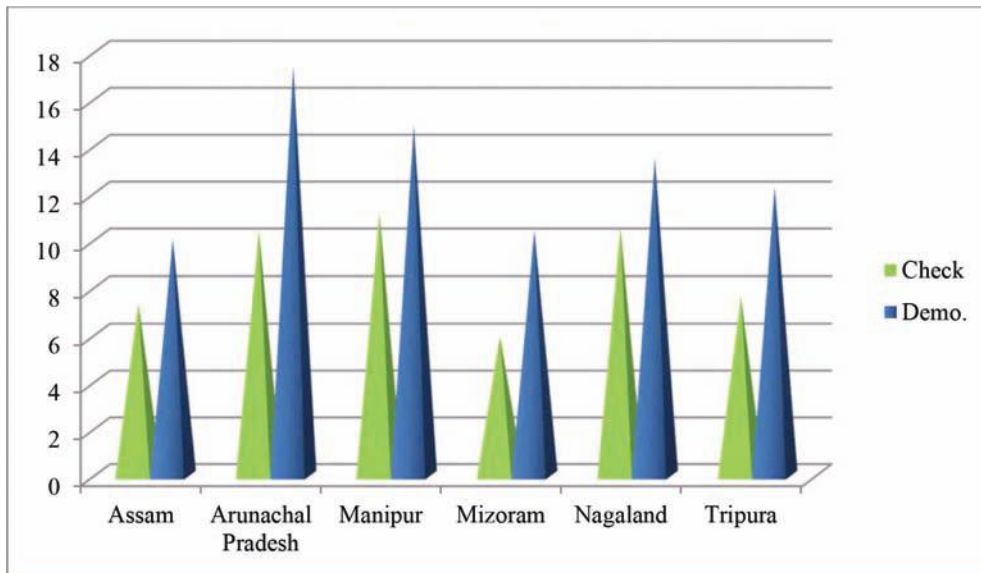


Figure 5: Performance of Field pea during Rabi 2016-17



CFLD on Rabi Field pea, KVK Mon



CFLD on Rabi Field pea, KVK Jorhat

YIELD COMPARISON OF PULSE CROPS ACROSS STATES

The Cluster Frontline Demonstration on Pulses was conducted in 7 crops viz. blackgram, greengram, rajma, pigeon pea, lathyrus, lentil and field pea. A comparative analysis of the demonstration yield obtained against the state average yield reveals that maximum difference in state yield was obtained in CFLD on Field pea where Arunachal Pradesh exhibited a demonstration and state average yield of 17.41 q/ha and 10.00 q/ha respectively with a difference of 7.41 q/ha. In rajma, highest difference was observed in Assam where demonstration yield of 15.72 q/ha was recorded over state average yield of 8.33 q/ha with a difference of 7.39 q/ha. In blackgram, highest demo yield of 9.88 q/ha was noticed in Arunachal Pradesh against a state average yield of 5.75 q/ha which exhibited a yield difference of 4.13 q/ha. In greengram, maximum difference in state average yield was obtained by Assam (3.17 q/ha) followed by Tripura (1.96 q/ha). In lentil, the difference between demonstration and state average yield was maximum in Assam (1.41 q/ha) followed by Tripura (0.63 q/ha).

Crop	State	No. of KVKs	Highest average yield (q/ha)	Lowest average yield (q/ha)	Average Demo. yield (q/ha)	State average yield (q/ha)	Difference between State and Demo. average yield (q/ha)
Blackgram	Assam	15	8.55	6.41	7.71	6.06	1.65
	Arunachal Pradesh	2	10.79	8.98	9.88	5.75	4.13
	Sikkim	1	10.70	9.70	10.20	9.02	1.18
	Tripura	2	10.00	6.20	8.05	5.75	2.30
Greengram	Assam	6	10.03	8.04	9.18	6.01	3.17
	Tripura	1	9.00	5.50	7.25	5.29	1.96
Rajma	Assam	3	17.86	13.56	15.72	8.33	7.39
	Arunachal Pradesh	1	25.20	22.00	23.60	NA	-
	Mizoram	1	13.00	9.00	11.00	10.30	0.70
	Sikkim	3	18.06	15.22	16.60	11.97	4.63
Pigeon pea	Arunachal Pradesh	1	13.60	9.20	11.40	8.79	2.61
Lathyrus	Assam	3	9.78	7.97	8.12	6.06	2.06
Lentil	Assam	18	9.45	6.73	7.98	6.57	1.41
	Arunachal Pradesh	1	7.20	5.14	5.73	NA	-
	Mizoram	1	6.20	2.20	4.20	NA	-
	Tripura	4	9.80	6.30	8.46	7.83	0.63

Field pea	Assam	14	11.38	8.82	10.04	9.09	0.95
	Arunachal Pradesh	3	21.86	13.97	17.41	10.00	7.41
	Manipur	3	15.76	11.97	14.87	9.20	5.67
	Mizoram	2	16.00	5.95	10.41	9.28	1.13
	Nagaland	2	15.00	12.00	13.50	6.25	7.25
	Tripura	3	13.46	9.36	12.27	11.83	0.44

CAPACITY BUILDING

Training Programmes conducted under CFLD Pulses programme 2016-17

Various training programmes were organized during Kharif, Rabi and Summer Season. Trainings were conducted to impart know how on Integrated Nutrient Management, Production technology and bio-control of pests, Package & practices, Integrated Pest Management and other awareness programmes aimed at Integrated farming approaches for livelihood and nutritional security. A total of 6764 farmers participated in the training programmes conducted across 7 states viz. Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura during three seasons *i.e.* Kharif (1658), Rabi (4578) and Summer (528).

Table 3: Training programmes conducted under CFLD Pulses programme 2016-17

Season	Crop	Participant farmers (General)-A			Participant farmers (SC/ST)-B			Total participants (A+B)		
		Men	Women	Total	Men	Women	Total	Men	Women	Total
Kharif	Blackgram	553	89	630	382	230	597	937	317	1249
	Greengram	57	27	84	131	38	169	188	65	253
	Rajma	13	24	37	8	11	19	21	35	56
	Pigeon pea	0	0	0	39	61	100	39	61	100
	Sub total	623	140	751	560	340	885	1185	478	1658
Rabi	Blackgram	66	8	74	35	20	55	95	34	129
	Field pea	601	114	724	779	558	1370	1332	661	2062
	Lathyrus	61	39	105	57	27	86	120	66	217
	Lentil	676	90	780	516	218	771	1214	305	1573
	Rajma	170	28	198	201	193	399	371	221	597
	Sub total	1574	279	1881	1588	1016	2681	3132	1287	4578
Summer	Blackgram	195	34	229	49	18	67	232	50	282
	Greengram	107	23	130	87	26	113	194	52	246
	Sub total	302	57	359	136	44	180	426	102	528
Total		2499	476	2991	2284	1400	3746	4743	1867	6764



Training on Blackgram by KVK Bishnupur



Training on Field pea by KVK Kohima



Training on Rajma by KVK East Sikkim



Training on Lentil by KVK Bongaigaon

Field days conducted under CFLD Pulses programme 2016-17

Various field days on seed production of various pulse crops were conducted during Kharif, Rabi and Summer Season 2016-17. A total of 3992 farmers and extension personnel participated in the field days conducted across 7 states viz. Assam, Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim and Tripura during the three seasons i.e. Kharif (770), Rabi (2726) and Summer (496) during 2016-17.

Table 4: Field days conducted in CFLD Pulses programme 2016-17

Season	Crop	Participant farmers			Participant extension personnel		
		Men	Women	Total	Men	Women	Total
Kharif	Blackgram	304	130	434	13	1	14
	Greengram	135	77	212	5	3	8
	Pigeon pea	28	23	51	-	-	51
	Sub total	467	230	697	18	4	73
Rabi	Blackgram	54	12	66	1	0	1
	Field pea	609	194	793	102	34	136
	Lathyrus	79	20	99	4	0	53
	Lentil	690	235	1081	50	5	128
	Rajma	224	120	344	14	11	25
	Sub total	1656	581	2383	171	50	343
Summer	Blackgram	372	108	480	12	4	16
	Sub total	372	108	480	12	4	16
	Total	2495	919	3560	201	58	432



Method Demonstration on Blackgram & Greengram by KVK Jorhat



Field day on Rajma by KVK West Kameng



Field day on Field pea by KVK Senapati



Field day on Greengram by KVK Khowai

Success Stories

1. Pea Production during Rabi Usher Prosperity to Farmers

Introduction:

Agriculture is the way of life that is deeply interwoven with Naga cultures and traditions, this clearly indicates the dependency on agricultural sector. The prevailing practice of agriculture is Terrace Rice cultivation (TRC) and Jhum cultivation. Though there is ample potential of agriculture, the district is striving hard to be self-sufficient in food grains. Farmers do not take up cultivation on large scale. During kharif season paddy is grown in terrace fields and left fallow during rabi 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 Rabi pulse production, the KVK, Kohima identified and motivated certain farmers to take up additional farming during winter season for additional income through minimum effort.

KVK Intervention:

KVK, Kohima had identified the potentiality to take up double cropping in Kohima district and to enhance the cropping intensity in certain pockets of the district. With this, the implementation of National Food Security Mission (NFSM) on Pulses (Pea) in the district has aided in boosting the morale of the farming community by providing opportunity for the KVK to intervene for better farming. Under this programme trainings and demonstrations on the package of practices of the Pea crop (var. HUDP-15) were conducted to showcase the latest technologies. Through this programme 15 farmers during 2015-16 and 18 farmers during 2016-17 covering 20 villages were directly benefited.

Output and Outcome:

Great enthusiasm was aroused among the farmers of the village to cultivate pea during Rabi. Initially 15 farmers cultivated pea in an area of 10 hectares. Now, 18 farmers started cultivating pea in 20 hectares area.

Economic parameters

Sl. No.	Year	Variety	Existing farmer plot(Rs/ha)				Demonstration plot(Rs/ha)			
			Gross cost	Gross return	Net return	B:C ratio	Gross cost	Gross return	Net return	B:C ratio
1	2015-16	HUDP-15	9500	19100	9600	2.01	10000	23500	13500	2.35
2	2016-17	HUDP-15	7500	15500	8000	2.07	8300	18300	10000	2.20



Training and demonstration on Field pea in Kohima district, Nagaland



Land preparation in field pea field, Kohima, Nagaland



Cluster Frontline Demonstration on Field pea in Kohima district, Nagaland



Harvesting of Field pea at Kohima

2. Enhancing Pulse production in Dhubri District of Assam

Introduction

Dhubri is a District of Lower Brahmaputra Valley of Assam. Due to its geographical location and high rainfall, various crops are grown throughout the year excepting areas under flood situation. Most of the farmers are marginal with small land holdings, therefore observations and monitoring of the field becomes easy and convenient. Cropping intensity of the District is more than two hundred percent. Pulse crop such as Lathyrus, Lentil, Blackgram, Pea, Green gram etc. are popularly grown in the District. Though most of the locations of the District is gifted with high soil fertility status the productivity of the crops are not up-to the mark as they were not following improved cultivation practices. Moreover, most of the crops grown were found to be of inferior quality and pulse crops were generally grown in neglected areas which are not suitable for paddy or any other crop and the pulse crops in the district were never given the status of main crop.

KVK Intervention

Previously few FLDs and OFTs were conducted in various locations of the District which was not sufficient to cover all the areas. KVKs interventions were highly appreciated by the people marching under NFSM and moreover local authorities were also very much satisfied with the programmes conducted in the district. Scientific Interventions such as improved varieties, soil based fertility management; integrated pest and disease management etc. were taught to them. Bio-fertilizers such as Rhizobium and PSB were used and different methods of seed treatment were practically shown to them. Due to less knowledge on soil health, the tendency of using chemically compounded fertilizers in the area was very high. However, with the KVKs interventions, the farmers were taught about soil health and their management with detrimental effects of using chemicals in uncontrolled manner and this has highlighted them in following a new path towards raising crops. Following crops along with varieties and year of introduction is given in the manner as:

Sl. No.	Crop	Season	Variety	Area (ha)	Average productivity (q/ha)	Technology
Year: 2015-16						INM and IPM
1.	Lentil	Rabi	HUL 57	10	9	
Year: 2016-17						
2.	Lentil	Rabi	HUL 57	20	8	

This variety, HUL-57 is resistant to rust and therefore makes it superior in comparison to the local varieties grown by the farmers. This variety became very popular throughout the nearby localities and farmers from various locations of the District booked and purchased the seed of the variety for further cultivation.

Output and Outcome

The improved variety which was introduced in the farmer's fields was found to be highly superior compared to locally grown varieties. The farmers were able to get a net return of Rs. 20970 in 2015-16 followed by a net return of Rs. 16570 in 2016-17. Due to organic management practices, the productivity is slightly lesser than the previous year.

Impact

Looking into the success of lentil cultivation, other farmers of the village started cultivating high yielding variety of lentil and presently the cultivation is spreading horizontally in nearby villages covering an area of 20 ha.

These efforts of the KVK have motivated the farmers to adopt the scientific methods of lentil cultivation.

As a result, both production and area under lentil in Dhubri district has started improving.



Cluster FLD on Lentil in Darrang district, Assam

3. Lentil variety Moitree increases net returns of farmers

Introduction:

Cultivation of Pulse crops was almost neglected in Barpeta district of Assam. Among the pulse crops cultivated in the district, blackgram, greengram, lentil, pea, arahar and lathyrus are worth mentioning. In Barpeta district, lentil was cultivated in 4716 ha with production of 3759 MT with average productivity of 797 kg/ha. Due to the cultivation of long duration winter paddy, it is difficult to fit the pulse crops under the existing cropping system. However, cluster front line demonstration was started under National Food Security Mission, 2016-17 in 50 ha area with 125 farm families in 10 numbers of clusters under 13 villages in fallow land as well as in the area in which short duration paddy varieties were cultivated. The Charcharia and Mini Simla cluster under Kalgachia Development Block was successful among the CFLD cluster of the year 2016-17. The cluster has 11 numbers of farmers with an area of 5.72 ha under the leadership of progressive farmer Mr. Azizul Hoque of the village Mini Simla under Beki river Char.

KVK intervention:

Krishi Vigyan Kendra, Barpeta intervened in all the technologies followed by the farmers starting from selection of HYV. The KVK supplied the certified seed of the lentil variety Moitree with other technologies like organic manure Tata Bhusudha, biofertilizer Rhizobium, micronutrient mixture, neem oil and the growth promoter Tricontanol. Emphasis was given to reduce the application of chemical fertilizers and pesticides in the demonstrations. For successful production of the crop, KVK, Barpeta organized a training programme for lentil growers under CFLD Pulses. Frequent field visits were carried out to encourage the farmers in the entire cultivation process and to monitor the pests and disease problems encountered during the crop growth.

Output and outcome:

In the area under cluster demonstrations, average yield of 9.6 q/ha was obtained with B:C ratio of 3.98 compared to the farmer's practice (average yield of 6.8 q/ha and B:C ratio of 3.27). There was an increase of 41.17% yield in technology over the farmer's practice.

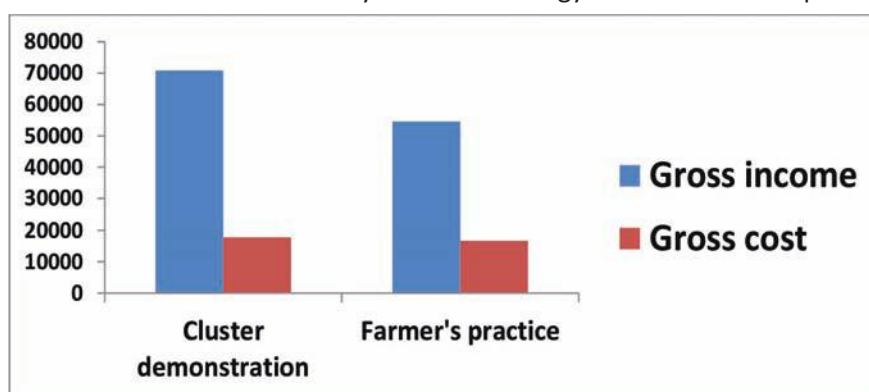


Figure 6. Comparison of gross income and gross cost of lentil under cluster demonstration (2016-17) with existing farmer's practice.

Impact:

Farmers of Charcharia and Mini Simla kept the seed of lentil var. Moitree of last year for cultivation of the crop for this year also. The beneficiaries of cluster demonstration of last year sold the seeds of the variety to other farmers. A total of 11.2 ha of area of lentil variety Moitree was started without the direct intervention of KVK, Barpeta in this year (2017-18). An area expansion of 95.8 per cent is observed at Charcharia and Mini Simla village under lentil variety Moitree. Farmers of nearby villages also developed interest to cultivate the lentil var. Moitree because of high productivity and quality of the variety.



Cluster FLD on Lentil in Barpeta district, Assam

4. Micronutrient and Bio Fertilizer Management boosts Lathyrus production

Introduction:

Baksa is one of the districts under BTAD, Assam. There are around 1, 63, 956 nos. of farm families in the district. The farmers of the locality are cultivating Pulses (Pea, Lentil, and Lathyrus, etc.) covering area around 4000 ha traditionally with local varieties, which result in low productivity and lesser yields. The production potentiality of Pulse crops in the district is not so poor as the soils are more fertile.

KVK Intervention:

Based on the interest of the farmers to take up Pulse cultivation, KVK, Baksa conducted few training programmes on scientific production technology of Pulses with method demonstration on inoculation of Bio-fertilizer like Azotobacter, PSB, etc. The KVK, Baksa introduced HYV of Lathyrus, var-Ratan at Ulubari, Dhepargaon villages etc. with the intervention of Micronutrient and BioFertilizer Management in Pulses to increase productivity.

Output and Outcome:

The performance of the variety Ratan was much better compared to the local variety. The yield of the variety is higher (7.0 q/ha) compared to the check 6.0 q/ha. An increase in yield of 17% over the local variety was observed. The benefit cost ratio in case of Lathyrus with HYV var-Ratan was 1.65.

Impact:

The farmers involved under these demonstrations were highly satisfied with the performance of the technology and the other farmers of the locality were highly motivated. The demonstration programme conducted during 2016-17 has shown very positive impact and subsequently during 2017-18 the technology was expanded horizontally in that locality with the same HYV.



Cluster FLD on Lathyrus in Baksa district, Assam