

ANNUAL TECHNICAL REPORT
Variety, Technology and Seed System Development
for Pulses in Odisha
(2018 – 2019)

International Center for Agricultural Research in the Dry Areas (ICARDA)



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Pulses Project MoU Signing with Govt. of Odisha

ODISHA PULSES DEVELOPMENT PROJECT

1.0 Introduction

Pulses have a significant role in adding nutritional value to human and livestock food and fodder and is an important crop in agriculture (cropping system, soil fertility), and contribute to climate resilient sustainable farming. Pulses are protein-rich, low-fat and high in fibre. They also improve the health of soil through nitrogen fixation. Pulse crops are water efficient, low water demand, resilient to adverse climatic conditions and even grow in dry regions without irrigation.

India, being the largest producer and consumer of pulses, ranks first in the globe having around 25 million ha of pulses area with an annual production of nearly 19.5 million tonnes with an average productivity of 0.78 tons per hectare.

In Odisha, pulses are grown in a 20.8 lakh ha, which constitutes 8.27% of the total pulses area of India. Total pulse production in Odisha is 1.06 million tons (5.49% of total pulse production of the country) with an average productivity of 0.51 tons per ha. Unfortunately, the state has an annual deficit of 0.22 million tons of pulses. There is low per capita availability and consumption of pulses in the state ranging 11-23 grams in different districts in the state.

The vast potential for cultivation of pulses, particularly in rice fallows and other fallows, is yet to be explored. ICARDA in collaboration with the government of Odisha and State Agriculture University

and research institutes has taken the initiative since 2016 to introduce and evaluate new pulse crops and varieties that are high yielding and suitable to the agro-climate of the state, promote improved variety and technology for pulses cultivation, and strengthen seed systems to improve in-time seed availability with farmers in the state. This collaborative arrangement was agreed between the Department of Agriculture, government of Odisha and ICARDA under the RKVY scheme of the government of India.



ICARDA – Odisha Pulses Project Districts

2.0 Goal

Enhancing pulse production through suitable varieties and technologies in crop fallows in order to increase the farm family income, nutrition and food security in Odisha;

3.0 Objectives

- Extend Farmer Field Evaluation Trials of pulses to more agro-climate zones of Odisha;
- Non-conventional pulses nurseries; advance lines introduction and trial in SAU, research agencies, and farmers' fields;
- Elite varieties participatory evaluation (PVS), and recommendation of preferred varieties and technologies suitable for different agro-climates;
- Zero-tillage and Conservation agriculture equipment and technology promotion to ensure timely pulses sowing in rabi crop fallows without losing time, soil moisture and resources for conventional land preparation;
- Pilot establishment of Seed System (Village Seed Hubs);
- Model FPOs for market interventions in pulse seed and grain, and supplement to the state systems;
- University scientist exchanges, and PG/Ph.D. studentship;
- Capacity development of farmers and other stakeholders (gender and youth focused).

4.0 Varieties & Advanced lines

International Nursery/ Advanced Lines/ Variety Screening in SAU/ Research Institutes;

- 676 advance lines procured from ICARDA HQ, Bangladesh, Afghanistan, and states of India
- Evaluated at SSTL and OUAT stations at Khurdha, Keonjhar, Bhawanipatna, Mayurbhanj;
- National Collection (Advanced Line/ Variety) Screening at SSTL and CPR, OUAT (251 advance lines supplied to OUAT and SSTL);
- International nurseries research trial at FLRP, Amlaha; 11,456 entries of grasspea, chickpea, lentil and fababean evaluated; out of which, 1,733 selected for traits like high yield, disease resistance, and early maturity.
- Suitable material screened for trial in districts of Odisha, and FPVS and VSH;



5.0 Germplasm screening, varietal evaluation trial, and breeding experiment

Screening, evaluation trial and breeding experiments for pulse varieties are conducted at RRTS, Keonjhar; RRTS, Bhawanipatna; CPR, Berhampur; and SSTL, Khordha for different advanced/ elite lines from international and national sources. OUAT Research Station (RRTTS, Keonjhar) is supplied with 649 of advanced lines for which screening is done and MLT (multi-location trials) are done for 8 chickpea, 7 grasspea, and 4 lentil varieties. Similarly, OUAT Station at CPR, Berhampur received 85 greengram and 37 blackgram varieties, and SSTL, Khordha received 102 greengram, 66 blackgram and 6 chickpea varieties for varietal evaluation. They screened suitable varieties and also for MLT in coming years. OUAT and SSTL are expected to release promising lines/varieties of greengram, blackgram, chickpea and grasspea in the state

5.1 International Nursery/Advanced Line/Variety Screening

Supplying Agencies	Year of Supply	Receiving Research Agencies	Advanced Lines/ International Nursery Supplied	
			Crop	Total Nos
ICARDA HQ	2016-17	RRTTS, Keonjhar (OUAT)	Chickpea-75, Grasspea-48, Lentil-25, Fababean-48	196
ICARDA HQ	2017-18	RRTTS, Keonjhar (OUAT)	Chickpea-64, Grasspea-64, Lentil-72, Fababean-25	225
ICARDA HQ	2018-19	RRTTS, Keonjhar (OUAT)	Chickpea-81, Grasspea-72, Lentil-50, Fababean-25	228
Bangladesh-BARI/ ICARDA	2017-18	SSTL, Khordha	Greengram-10, Blackgram-8	18
	2018-19	CPR, Berhampur, OUAT		
Afghanistan-ICARDA	2018-19	CPR Berhampur/ RRTTS, Keonjhar/ RRTTS Bhawanipatana	Greengram-9 (Cold Tolerant Varieties)	9
		Total		676

5.2. National Collection Advanced Line/Variety Screening

Supplying Agencies	Year of Supply	Receiving Research Agencies	Advanced Lines/ International Nursery Supplied	
			Crop	Nos
ICARDA Research Collaborative Project	2017-18	SSTL, Khordha	Greengram-92, Blackgram-58, Chickpea-6	156
ICARDA Research Collaborative Project	2018-19	CPR, Berhampur, OUAT	Greengram-66, Blackgram-29,	95
		Total		251

5.3 International Nursery/ Advanced Line/ Variety Screening at FLRP, Amlaha

Year	Crop	No. of entries evaluated	Target Traits	Achievements
2016-17	Lentil	1591	Super-Early, High Yield, Disease resistance, ,	➤ 158 entries selected
	Chickpea	1293	Early, MH, High yield, Disease resistance	➤ 135 entries selected
	Grasspea	590	HB, Low-ODAP, High yield, Early	➤ 145 entries selected
2017-18	Lentil	1906	Super-Early, High Yield, Disease resistance,	➤ 498 entries selected
	Chickpea	1325	Early, MH, High yield, Disease resistance	➤ 267 entries selected
	Grasspea	279	HB, Low-ODAP, Early, High yield	➤ 44 entries selected
2018-19	Lentil	1876	Super-Early, High Yield, Disease resistance, MN	➤ 221 entries selected
	Chickpea	1865	Early, MH, High yield, Disease resistance	➤ 229 entries elected
	Grasspea	731	HB, Low-ODAP, Early, High yield, Disease resistance	➤ 36 entries selected

5.4 International Nursery/Advanced Line/Variety Screening at RRTTS, Keonjhar

CROP	2016-17		2017-18		2018-19	
	No. of Entries	Varietal Screening	No. of Entries	Varietal Screening	No. of Entries	Varietal Screening
Lentil	25	8 entries i.e FLIP2012-272L FLIP2012-240L FLIP2012-121L FLIP2014-094L FLIP2012-54L FLIP2013-86L FLIP2011-64L FLIP2014-029L on the basis of yield (3-6 qtl/ha) were selected for re-evaluation	72	Four entries i.e FLIP 2012-240L, FLIP 2014-029L, FLIP 2011-64L, FLIP 2014-094L yielding more than >500kg/ha selected	50	MLT for 7 nursery, Screening and Evaluation of 2 new nursery, 25 entries of large and small seeded nursery
Grasspea	48	7 entries of GIYT-E-IRP nursery & 8 entries of GIYT-LOW-IRP nursery (Low BOAA content) selected for re-evaluation	64	4 entries i.e GIYT-E-IRP nursery (116,1036,1105,68) & GIYT-LOW-IRP nursery (728,17,18,973) yielding more than >775kg/ha selected	72	MLT for 3 low BOAA content
Chickpea	75	Four entries i.e ILC482, FLIP93-93C, FLIP09-281C, FLIP09-280C yield potency 6.2 to 7.5 qtl with yield advantage 29 to 56 % than check.	64	4 entries i.e ILC482, FLIP93-93C, FLIP09-281C, FLIP09-280C	81	MLT for 4 selected entries, screening of new nursery (81 entries)
Fababean	48		25	-	25	

5.5 International Nursery/Advanced Line/Variety Screening at Center of Pulses Research (CPR), OUAT

CROP	No. of Entries	Varietal Screening
Greengram	85	Variety evaluated for three seasons
Blackgram	37	Variety evaluated for three seasons

5.6 International Nursery/Advanced Line/Variety Screening at SSTL, Khordha

CROP	2017-18		2018-19	
	No. of Entries	Varietal Screening	No. of Entries	Varietal Screening
Greengram	102	30 varieties having yield potency ranging from 10-19 quintals per ha selected for re-evaluation trial; BARI MOONG - 6, BINA MOONG – 8, BU MOONG – 4, BMX08011-8, BMX10012-2, BMX10009-4 have yield potential of 13-21 qtl/ ha	54	10 advance lines selected for MLT
Blackgram	66	49 varieties having yield potency of 10-21 qtl per ha selected for re-evaluation trial; BARI Mash- 3, BBLX 08010-4-1, BBLX 08010-2-1, BBLX 02005-1 of Bangladesh having yield potency 13-17 qtl/ha	42	10 advance lines selected for MLT
Chickpea	6	Recommended for early sowing in inland district.		

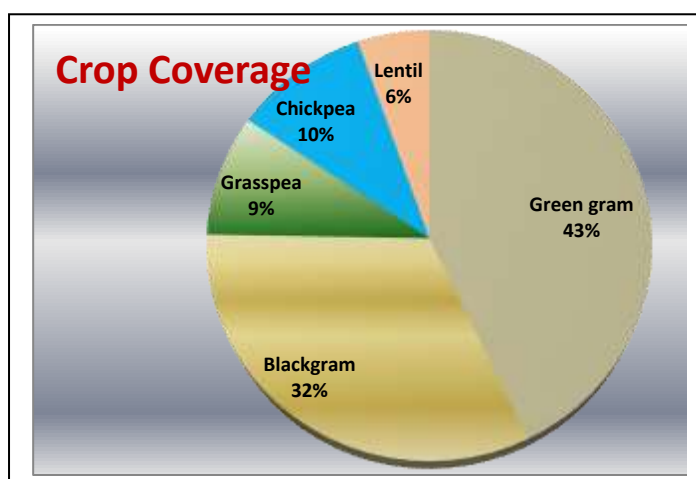
6.0 Plan for Release of Varieties:

- ICARDA has successfully introduced various advance lines/ varieties of greengram, blackgram, chickpea, grasspea and lentil, and state university and research agencies have played their mandated role to evaluate and screen suitable materials for the state.
- OUAT and SSTL screened Chickpea (8), Lentil (4) and Grasspea (8) material and are required to evaluate at multi-location/multi stations (Keonjhar, Kirei and Jeypore) for few more seasons i.e. 2019-20 and 2020-21, and observe parameters on plant morphology, suitable traits, agronomy, pest protection and yield aspects.

- OUAT and SSTL are to facilitate this process as the premiere agencies for such variety evaluation and release; selected entries to be promoted for release after another MLT – Chickpea – ILC 482 and FLIP 93-93C, Lentil – BM-5 and BM-7, and sent for inclusion in IVT trials under AICRP on respective crops as per procedures for variety release; SSTL, Bhubaneswar has selected 10 varieties of greengram and 10 varieties of blackgram for multi locational trial.
- OFTs (on-field trials) will be conducted through KVKs to assess the performance of these entries in farmer fields.

7.0 Technology on Farmer's Field

- ☞ Ensuring timely seed treatment, Rhizobium culture, seed priming and use of balanced fertilizer
- ☞ Line sowing through ZT machine/seed drill
- ☞ Ensuring 2% DAP spray at flowering- and pod formation stages
- ☞ Provision of critical irrigation at flowering- and pod formation stages
- ☞ Appropriate prophylactic plant protection measure



7.1 Farmers' Participatory Trial and Technology Demonstration

21 varieties of different pulses (greengram, blackgram, chickpea, grasspea and lentil) were grown in 126.4 ha under farmer participatory trial. Similarly, 1,660.67 ha were planted for technology demonstration. A total of 4,794 farmers participated in both trial and demonstration programs, out of which 5,404 are male farmers and 390 are female.

8.0 Seed System & Village Seed Hub (VSH)

Name of the Crop	Total Crop Area (Ha.)	Total Production (Qtl)	Area under Seed Production (Ha.)	Quantity Quality Seed Produced (Qtl.)
Greengram	738	7,453	49	441
Blackgram	529	5,491	179	1,612

126 Village Seed Hubs established in each project GP and each VSH has been provided with 1 Spiral Seed

Grasspea	138	1149	71	276
Chickpea	172	1451	78	170
Lentil	83	687	27	82
Total	1660	16231	404	2581

Grader, 1 Weighing Machine, 1 Bag Closer (Stitching Machine), and Gunny Seed Bags. All VSH members scientifically trained for seed production, processing, storage, post-harvest management, marketing and business plan preparation at their level.

9.0 Custom Hiring Centres (CHC)

CHCs have been established in 126 project GPs to make the farm equipment easily available and accessible to farmers at the time of need at a nominal hiring charge. The Centre is managed by a committee constituted by farmers.

Zero tillage equipment is helpful for farmers to ensure timely mechanical sowing of pulses (blackgram, chickpea) in rice fallows under residual moisture conditions (Zero tillage equipment is key to bring rice fallow under pulses). Also, the equipment is useful in helping farmers to line sow pulse and other crops.

10.0 Technical training activities

85 technical training/ FFDs were conducted covering 4,932 farmers (Male – 3,987 and Female – 945) from 504 villages in 14 districts. The training programs covered different aspects of production technologies, package of practices, introduction of new varieties and selection of farmer preferred varieties, Integrated Nutrient Management (INM), Integrated Pest Management (IPM), Seed Production, Post-harvest Management, and Value Addition.

The farmers and women groups were provided training on management of Village Seed Hubs (VSH) and Custom Hiring Centres (CHC). Both male and female farmers attended the training programs.

Farmer Field Days were also conducted to facilitate cross-learning among the farmers – to see results in field of those farmers who have adopted the recommended practices, and those who are still continuing with traditional practices.

11.0 Farmer Producer Groups (FPO)

The FPO promotion process began in Nayagarh district of Odisha. Sensitization cum orientation programs are conducted in a series of village level meetings involving farmers and key stakeholders. FPO orientation and business plans are made. FPOs would play a crucial role to market link the seed and grain produces with VSB; and link with formal seed and grain markets in the state and outside.

12.0 Exposure Visit

The ICARDA team along with scientists from OUAT participated in a learning-exposure visit to FLRP, Amlaha, Madhya Pradesh, and to BCKV, West Bengal to see varietal trials and performance of crops and varieties that are introduced in Odisha. The state team members as well as a team of officials from the Department of Agriculture and Farmers' Empowerment, Government of Odisha and Odisha State Seed Corporation Ltd. visited the ICARDA-IFAD Research Trial fields at Bidhan Chandra Krishi Vishwabidyalaya (BCKV), Kalyani, West Bengal.

The officials also visited the Chapra Dhantal Samabay Krishi Unnayan Samity Ltd. (CDSKUSL) in the Nadia district of West Bengal, a successful cooperative dealing with seed and agricultural input business.

The purpose of the visit was to learn from the experiences of different research trials on pulse crops, particularly greengram and blackgram, conducted by BCKV. In addition to this, the experiences of CDSKUSL inspired the team to promote viable seed business in Odisha through farmers' organizations towards self-sufficiency in pulse seeds.



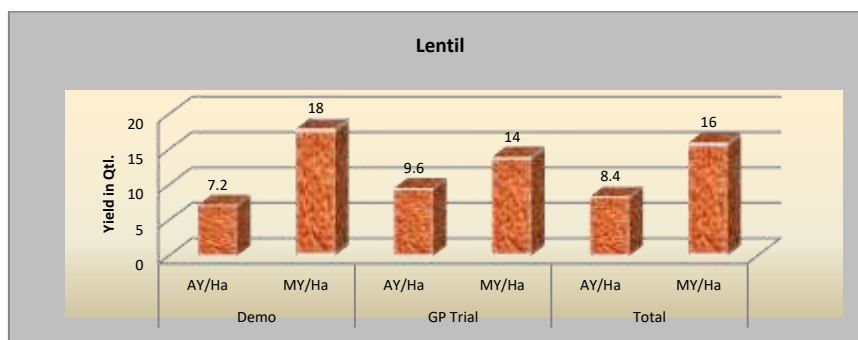
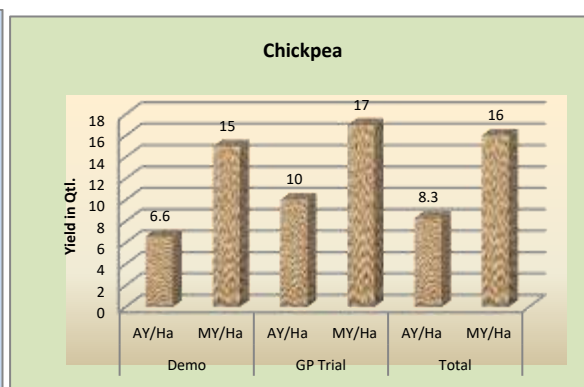
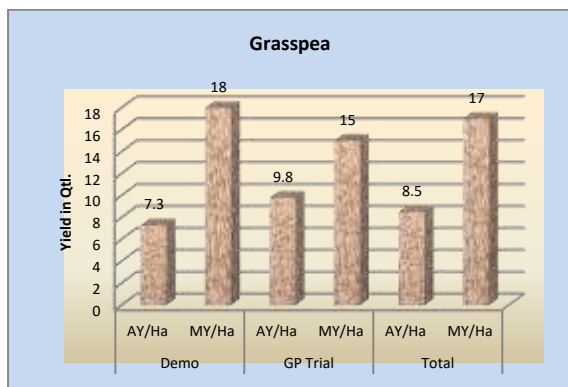
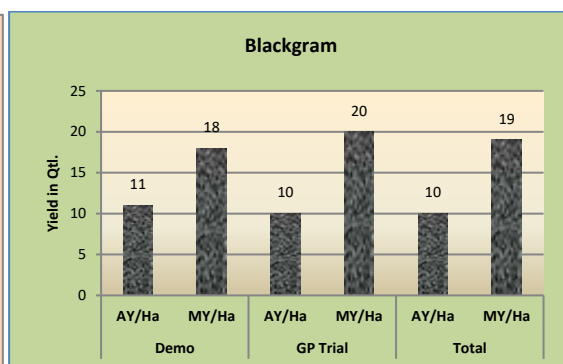
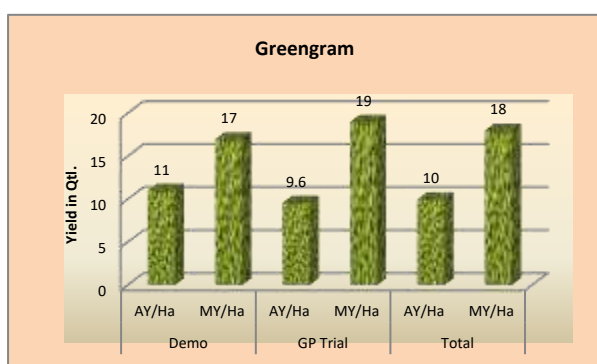
Interaction with PhD Students on Research Trial at BCKV



Government Officials in research trial field of BCKV

13.0 Yield impacts under Demonstration and GP Level Trials

	Demo		GP Trial		Overall	
	Avg Yld/ ha (Qtl)	Max Yld/ ha (Qtl)	Avg Yld/ ha (Qtl)	Max Yld/ ha (Qtl)	Avg Yld/ ha (Qtl)	Max Yld/ ha (Qtl)
Blackgram	11	18	10	20	10	19
Greengram	11	17	9.6	19	10	18
Grasspea	7.3	18	9.8	15	8.5	17
Chickpea	6.6	15	10	17	8.3	16
Lentil	7.2	18	9.6	14	8.4	16



14.0 Progress achieved

SL,	Budget Head	Unit	Total Phy. Tgt	Phy Trget for 2018-19	Achv in 2018-19	Target for 2019-20	Achiev as on 31 st Aug 2019
1	Farmer participatory trial	ha	378	126	126.43	126	0
2	Participatory Var Selection & Technology Demo.	ha	4536	1512	1660.67	1512	114
3	Germplasm Trial, Amlaha	LS		8	10.51		
4	Seed import, exchange	LS	3	1	1	1	1
5	Village Seed Hubs	No.	126	126	126	126	126
6	Capacity building	No.	252	84	85	84	5
7	Workshop/review	LS	3	1	1	1	1
8	Report, handout	LS	3	1	1	1	1
9	Custom hiring centers, with Zero tillage line sowing machine	No.	126	50	126	126	126
10	FPO formation and Capacity building on seed systems	No.	14	3	-	3	1
11	Web- mobile App	No.	1	1	1	1	1

15.0 Review & Planning Workshop

The Annual Review and Planning Workshop of GoO-ICARDA collaborative projects was held on 1 July 2019 at Bhubaneswar, the capital city of Odisha, which was attended and actively participated by around 300 persons, including senior Government Officials, Scientists from SAU, research agencies, and farmers.

The progress of the first year of Phase-II of the project was discussed at length including the participatory processes followed, strategies adopted, science and technologies used, institutions built up and sustainability planned. The scientists from SAU and research institutes presented their experience on advance lines/ variety screening and entries of pulses and cactus varieties evaluated through research trials. The achievements in mobilizing the farmers/ communities, field trials of pulses and cactus varieties, facilitating institution building process, capacity building initiatives, introduction of appropriate technologies, etc. exceeded the original targets.

The project team along with the research institutes presented the action plan for 2019-20 and it was approved after a prolonged discussion regarding the varietal research trial, input procurement, strengthening village level farmers' institutions and moreover the sustainability of the initiatives carried out in the field.



Participants of the Review & Planning Workshop (1 July 2019 at Bhubaneswar, Odsha)