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Adoption of Pulse Technology: An Effective Way to Meet Protein Deficiency of Rural People

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Abstract— Pulses are the integral part of farming system of Odisha. The production and productivity of pulses has not been increased for a long period. To supplement protein requirements of the rural population there is need to increase production level through adoption of recommended technologies. Besides to improve overall farming system the contribution of pulses in terms of enriching soil fertility, conservation of moisture and controlling of weeds are to be kept in mind. The present transfer of pulse technology system is quite weak which needs strengthening. The rate of adoption of pulse technologies stands with a gap of more than 50% along with problems of non availability of quality seeds and other inputs in time. To look at the future of pulse production in the state the steps like cluster approach, establishing of seed production centres,, variety wise seed plan, strengthening of Extension support, making input available in time at affordable cost, research linkage, year wise Production Program and Development of marketing chain for pulse are suggested based on the findings of the study.

Key words: Adoption, cluster approach, Pulse technology, quality seeds

I. INTRODUCTION

The vegetarians of our country need cereal proteins which are abundantly found in different pulses. Since time of immemorial our farmers have included pulses as an important crop next rice and wheat in their farming system. Our food baskets contain 6-7% of plant proteins which come from pulses. Besides being good source of protein, the pulses also contribute to overall farming system in terms of fixing nitrogen through root nodules. It is a gift of nature to provide protein to human beings through pulse crops.

In India, pulses are grown using minimum resources compared to other cash crops. The plant proteins are less costly than animal protein. Pulses are grown as single crop or as intercrop or even somewhere as mixed crop. Even in such conditions, pulses give better returns. The unique characteristics of pulse crops are that besides being cheap source of protein, they improve soil fertility and physical structure. The green pods of pulses also serve as good vegetable for the poor.

The productivity and production level of the pulses remained stagnant in India for a very long period. With national emphasis in food production the pulses were given due emphasis for which the required infrastructure were developed in terms of seed production, seed processing, application of production technology and extension net work. The continuous efforts at all levels, the productivity level reached 764 kg/hectare during 2013-14 with increase of area under pulses. The pulse research activities were accelerated both at national and state level along with food grain production. The present pulse production scenario has proved that our efforts are moving towards national and international agenda of food security. The UN declaration 2016 as international year of pulses has ensured that pulses are within orbit of smart food basket along with its role in farming system reaffirming our old concept of rice-dal roti dal as common food items of Indians and more particularly rural people.

Role of Pulses in Indian Agriculture:

The pulses are important in our food composition. The people of eastern part of the country are conscious of food basket with pulse, vegetable and rice. Our population is predominately vegetarian and for them pulses are good sources of protein. Being leguminous, the pulses take very little from soil but add much in return and quite adaptable to low nutrient contained soil conditions to dry land condition.

The cereal production level of India has reached all time record because of scientific research, extension net work and awareness of people. The national and state authorities have initiated multiple programs like high yielding, hybrid and crop intensive approaches which solved our food problem. The attention towards short supply of pulses warrants needful action at different levels. The per capital availability of pulses has been reduced greatly than the past.

The major problems in pulse production are agro-climatic factors like area under rain fed situation, erratic rain fall, infertile soil condition and sensitiveness of pulses to alkali, acidic and water logging condition. The other factor is that pulses are not that remunerative as high yielding cereals. The factors of low productivity of pulses are reported to be non-availability of high yielding varieties, poor crop management, short supply of rhizobium culture, delayed sowing, inadequate seed rate, infestation of weeds and poor attention of the pulse growers compared to cereals.

The role of pulses in our day to day life and in farming system has been realized by the farmers of our country. The roles are described below,

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1. Pulses are good source of protein in our daily diet**:** Pulses contain a good number of amino acids. The pulses are good source of Vitamin A. It contains Vitamin B-1 in higher quantity and vitamin C is also found in sprouting seeds.

2. Pulses in soil fertility**:** Pulses are leguminous crops. They fix atmospheric nitrogen and leaves of the plants become source of nitrogen for the succeeding crop. The nitrogen percentages of pulses like, urd, moong, lentil, peas and cow pea are 0.41, 0.53.0.70.0.36, and 0.51 respectively.

4. Pulses as superior fodder for cattle: The pulses have the advantage of better leave coverage proving excellent fodder for the domestic animals. It is said that to keep cow or goat the farmers should devote land for pulse cultivation.

5. Pulses in controlling weeds**:** Pulses are grown in upland and that too with little moisture content. Weed in upland situation is a problem for farmers. The pulse crops help to reduce intensity of weeds because of their vegetative coverage. The farmers in eastern India usually include pulses in farming system to control weeds which otherwise required more man power to remove the weeds.

Keeping this objective in mind an attempt was made to determine gap between field potential productivity of pulse crop and realized productivity at field level in the district of Mayurbhanj district of Odisha taking **240 f**armers of different categories.

II. REVIEW OF LITERATURE

Knight (2000) reported that India produces about 27% of pulses in world. Out of total production major portion goes for consumption while less proportion of the production used for feed. India faces problems as the price of pulse rises and people seek other alternatives. This requires multi objective programme to increase production so that adequate pulses are available for mass consumption with less price.

Gupta (2001) stated that farmers in general prefer cereals like rice and wheat over pulses as it is grown as inter crop. Lack of information about better technology, non use of rise of culture and absence of high yielding varieties are the major reason of low productivity of pulses. Since farmers do not have direct accesses to market they fail to fetch good market price. The subsidy on inputs and price support can be facilitate more production of pulses.

Selvaraj (2002) concluded that expansion of area under pulses and its productivity is related to demand and supply. Technological support can eliminate major constraints in pulse production.

Tripathi (2003) while discussing problem of pulse production indicated need for technological information and remunerative price. In his opinion the farmers do not get correct price of pulses.

Landes and Govindan (2003) concluded that Indian consumers change stand with rise of price of community and look for alternative. Therefore purchasing behaviour of consumers influence cost of price of pulses. The interest of the pulse growers is to be protected through meaningful marketing system.

Brahmaprakash (2004) without looking into causes of low production emphasized need for breeding technology, production system and policy structure.

Sathe and Agarwal (2004) found out positive relationship between pulse production, price and imports. The Indian pulses have to get fair price in world market so that there would be better inflow of cash to the hand of farmers. They further observed that price of pulses is always higher than the price of other food grains which require more production and area of expansion.

Mathur and Henry (2004) observed that value of import share of pulses do not benefit farmers because of non systematic marketing system.

Reddy (2004) stated that expansion of area under pulses relate to regional consumption parttern. According to him improved package of practices and technological intervention would enable the farmers to opt for pulses.

Savadatti (2007) advocated that pulse grown in rain fed area to be supported by better input management system. The decision of the farmers for pulses is conditioned by situation.

Rahman and Imam (2008) concluded that instability in pulse production relates to a variety of factors. The specific pulses are grown to meet the local needs. The farmers are to be motivated to produce more because of high return per unit area through extension system.

Moe (2008) while discussing on pulse production emphasized role of International trade which puts a number of restriction against the export. Further he stated that better International Trade on pulses would stimulate the growers to earn better than past leading to expansion of area under pulses.

Reddy (2009) while dealing with Pulses production technology and advised more adoption of recommended practices which would enable farmers increase productivity for unit area.

Bera and Nandi (2010) while working on pulse production in west Bengal reveal that area under pulses would increase along with productivity provided there is market demand.

Pandey and Mahatma (2011) on field level study reported that more intensive research is required to eliminate constraint. The research activities on pulses should be enlarged taking agro climatic situation into consideration.

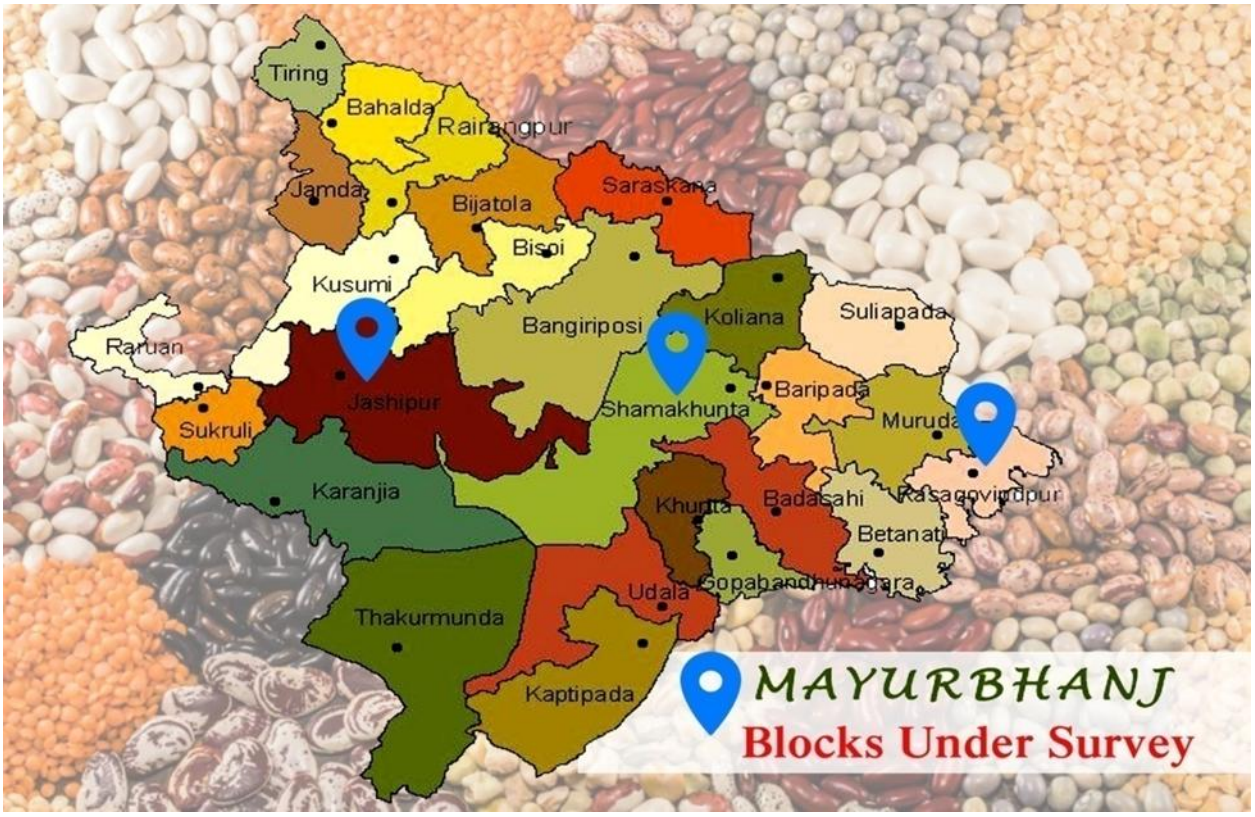
Naphade (2011) reported that to attract farmers for pulse cultivation, temporal fluctuation in yields and prices have to be taken care up. There is need to protect interest of the farmers in terms of price structure.

III. METHODOLOGY

The study included 240 farmers consisting of small and marginal from three blocks of Mayurbhanj district covering 14 villages.

Table 1: Block, Village and Farmers under study

Sl. No.	Block	Village	Farmers selected	Marginal Farmer	Small Farmer
1.	Joshipur	Basol	20	10	10
		Bidhakudor	20	10	10
		Itamundi	20	10	10
		Sarjanposh	20	10	10
2.	Rasagobindapur	Tikayatpur	20	10	10
		Haripur	20	10	10
		Barhampur	20	10	10
		Tambakhdi	20	10	10
3.	Shamakhunta	Ambadubi	20	10	10
		Sindurgour	20	10	10
		Mudrajodi	20	10	10
		Baunsatila	8	4	4
		Bahadurpur	6	3	3
		Bajratundi	6	3	3
	Total	**14**	**240**	**120**	**120**



Pulse crops Selected for survey:

1. Arhar (Red Gram/ Pigeon Pe) Cajanus cajan
2. Green Gram (Moong) Phaseolus Gureus
3. Bengal gram (Gram)

Pulse technologies selected are as follows.

1. Seed and varieties
2. Seed Treatment
3. Cultural Practices
4. Fertilizer Application
5. Application of micro nutrient
6. Plant protection measures
7. Post harvest technology

The selected sample farmers were personally interviewed to obtain desired information on a scheduled developed on the basis of the objectives of the study.

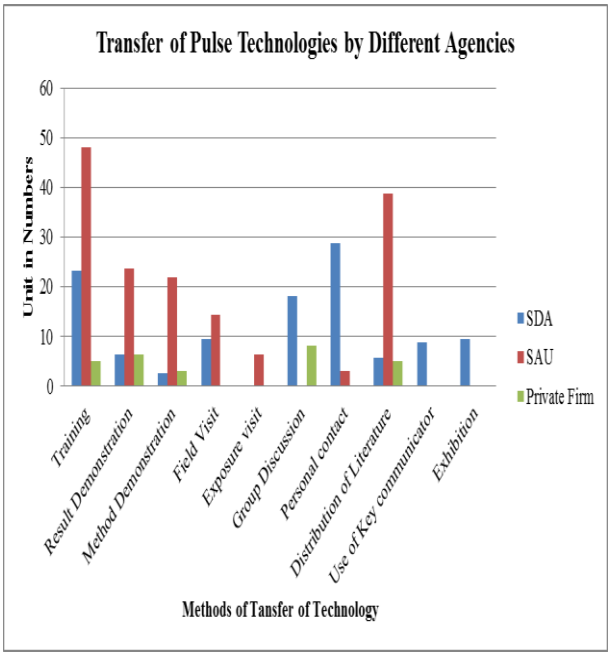
IV. FINDINGS

The results have been presented under the headings of transfer and adoption of pulse technology.

1. Transfer of pulse technologies by different agencies: In Odisha, the State Department of Agriculture (SDA), State Agriculture State Agriculture University (SAU) that is Orissa University of Agriculture and Technology (OUAT) and NGOs perform the task of transfer of technology. The composite analysis reveals the position of these agencies in transfer of pulse technologies.

Table 2: Methods of transfer of Pulse technology by different agencies

Sl. No	Methods of Transfer of Technology	SDA	SAU	Private Firm
1.	Training	23.12	48.12	5.00
2.	Result Demonstration	6.25	23.75	6.25
3.	Method Demonstration	2.5	21.87	3.12
4.	Field Visit	9.37	14.37	0.00
5.	Exposure visit	0.00	6.25	0.00
6.	Group Discussion	18.12	0.00	8.12
7.	Personal contact	28.75	3.12	0.00
8.	Distribution of Literature	5.62	38.75	5.00
9.	Use of Key communicator	8.75	0.00	0.00
10.	Exhibition	9.37	0.00	0.00
	Average	**11.18**	**15.62**	**2.74**

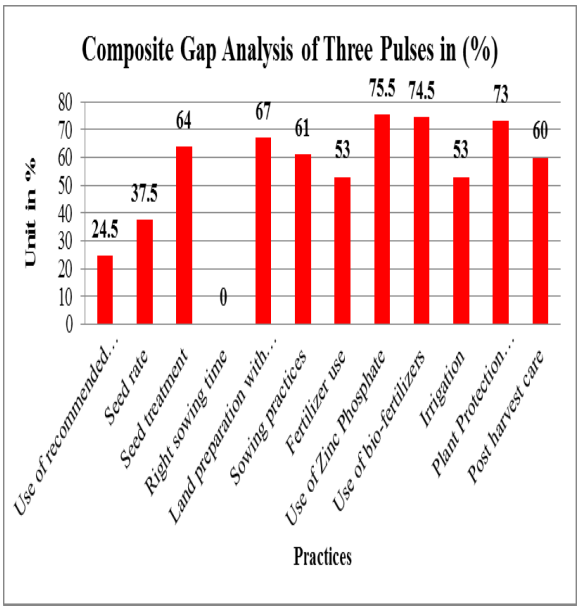


Comparison analysis reveals that State Agriculture University have better role than State Department of Agriculture in transfer of pulse technology. However, the role of NGOs in transferring pulse technology is minimum.

2. Following of recommended technology: The pulses like red gram, green gram and gram add to the pulse status of the state. The gaps in adoption of technologies relating to three crops are given below.

Table 3: Composite Analysis of three pulses

Sl. No	Practices	Bengal gram	Green Gram	Red gram	Average	Gap (%)
1.	Use of recommended varieties	1.30	1.05	1.68	1.51	24.50
2.	Seed rate	1.18	1.63	1.25	1.25	37.50
3.	Seed treatment	0.72	0.72	0.71	0.72	64.00
4.	Right sowing time	2.00	2.00	2.00	2.00	0.00
5.	Land preparation with compost	0.75	0.80	0.45	0.66	67.00
6.	Sowing practices	0.66	0.33	1.37	0.78	61.00
7.	Fertilizer use	0.75	0.77	1.10	0.94	53.00
8.	Use of Zinc Phosphate	0.35	0.65	0.48	0.49	75.50
9.	Use of bio-fertilizers	0.52	0.60	0.40	0.51	74.50
10.	Irrigation	0.90	0.66	1.27	0.94	53.00
11.	Plant Protection Measures	0.53	0.62	0.62	0.54	73.00
12.	Post harvest care	0.55	1.22	0.62	0,80	60.00
	Average	**0.86**	**0.92**	**0.99**	**0.94**	**53.58**
	Gap (%)	**60.00**	**54.00**	**50.50**	**80.00**	**-**



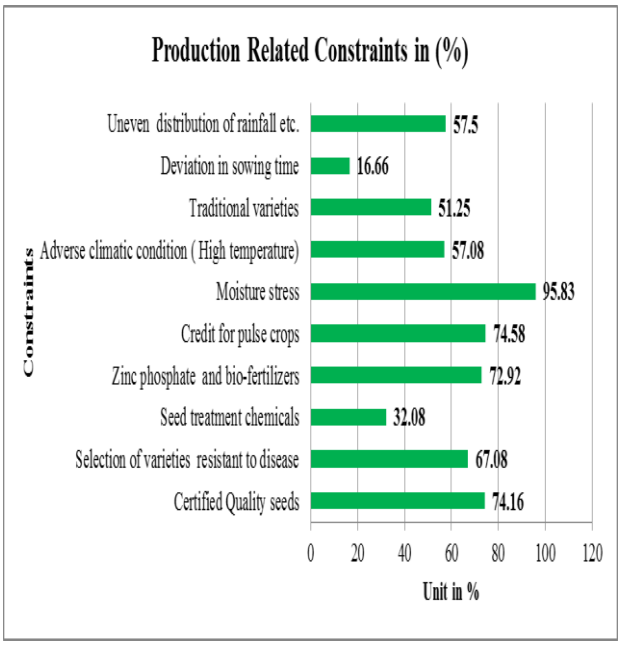
It is found that the highest gap is observed in case of adoption of Zinc phosphate which is new in pulse farming following adoption of bio-fertilizer. These two practices are recommended by Scientist as well as extension worker as essential input to increase pulse production.

3. Production constraints: The pulse crops are grown by small and marginal farmers. Again these crops are given importance next to cereals by the farmers. The study examined the constraints relating to production aspect of pulses. The table given below contains the response of sample farmers regarding production constraints.

Table 4: Production related constraints

Sl. No.	Constraints relating to	Sample farmers (N=240)		
		Total	%	Rank
1	Certified Quality seeds	178	74.16	III
2	Selection of varieties resistant to disease	161	67.08	V

3	Seed treatment chemicals	77	32.08	IX
4	Zinc phosphate and bio-fertilizers	175	72.92	IV
5	Credit for pulse crops	179	74.58	II
6	Moisture stress	230	95.83	I
7	Adverse climatic condition (High temperature)	137	57.08	VII
8	Traditional varieties	123	51.25	VIII
9	Deviation in sowing time	40	16.66	X
10	Uneven distribution of rainfall, untimely rainfall at the time of flowering	138	57.50	VI



As per data contained in table, absence of crop insurance, credit for pulse cultivation, and adequate certified improved seeds are that major constraints that inhibit production and productivity of pulses. Following the above three factors, the non- availability of Zinc phosphate, bio-fertilizers, disease resistant varieties, quality seed treating chemicals also act as barrier to increase pulse production. The adverse climatic condition at the growing stage of pulses is a continuous problem for pulse production every year in many parts of the state. Traditional varieties, deviation in sowing time, untimely rain fall also contribute to low production and yield of pulses.

The strategy is based on the following directions.

4. Strategy to increase pulse production in the state:

1. Cluster Approach: The cluster approach to increase production of pulses need pulse growers association at village or panchayat level. This association will examine the rice fallow, intercropping, and mixed cropping possible in area and plan clusters to grow pulses. The association may be backed by Extension Officers of the block. To start with at least one cluster in each block should be initiated.

2. Seed Production centres: There is need to establish seed production centres. The Government farms or KVK farms can be utilized for the purpose. A minimum of 10-15 hectares of land is required to grow pulse seeds to meet requirements of the district. The seeds of red gram, green gram and Bengal gram of equal proportion are to be produced following prescribed norm. The selection of land for seed hubs is to be done with care.

3. Variety wise seed plan: The findings of the study suggest that there is need to develop variety wise production of seeds and area coverage. The replacement of seed in the state is very low. A definite road map is necessary to have 20% placement of the pulses like green gram, black gram, red gram and Bengal gram. The seed production centres have to grow improved verities of pulses for higher production. The vertical expansion or improvement of yield can be achieved through new verities of green gram, red gram and Bengal gram. The existing varieties like, Sujata, Pusa and Baisakhi of green gram, UPAS-20, Sarada of arhar and Vishal, Pusa-391 of Bengal gram is old verities which need to be replaced.

4. Strengthening of Extension support for capacity building: For diffusion and adoption of pulse technology the role of extension support needs no emphasis. The Department of Agriculture, KVK (SAU) and NGOs need to evolve effective extension methods. The methods like result and method demonstration, group discussion, field visit and training programme need to be organized within close proximity of the growers. To aid to the process slide show posters and literature may be used as per findings of the study to strengthen extension support. Moreover, continuous flow of information about pulse cultivation and market price to sensitize farmers for pulse production.

5. Making production input available in time and affordable cost: The production inputs like quality seeds, fertilizers, micro nutrients and implements along with credit for pulse cultivation are to be planned and delivered. The use of Zink Phosphate and Bio-fertilizer should be made compulsory for all pulse seed purchasers.

6. Research Linkage: The pulse growers, extension officers concern with pulse production should have linkage with research station. The SAU(OUAT) has eleven Regional Research Stations and 30 KVKs which can be inter linked along with pulse growers to have update information regarding new verities, package of practices, insects and pest control and post harvest technology to enhance production of pulses in the state.

7. Year wise Production Program: The pulse production programme should be phased year wise, crop wise and season wise for different ten agro-climatic zones of the state. To increase production and productivity of pulses, the year wise production programme has to be implemented in the state.

8. Development of marketing chain for pulse: For pulses minimum support price is fixed every year by the Govt. but in reality the market gives a different picture. To have good marketing of pulses there is need for linkage with purchasers on a regular basis. Moreover, there is need for store house of grains at different locations depending upon volume of production. Every pulse grower should be updated with marketing information with regard to price and place of sale.

V. CONCLUSION

The study 'Adoption of pulse technology: An effective way to meet protein deficiency of rural people' conducted in the Mayurbhanj district of Odisha with 240 pulse growers reach at the flowing conclusion.

1. The methods of transfer of pulse technology by State Department of Agriculture. State Agriculture University and NGOs are not much effective as the gap in adoption rate is considerably high.

2. The gap in adoption of recommended pulse technology is as high as53.58% which needs attention of concerned authorities to modify to increase adoption rate of pulse technology.

3. Availability of quality seeds, good varieties, zinc phosphate and bio-fertilizers are the main constraints in adoption of pulse technologies.

4. The strategies like cluster approach, seed production centres,, variety wise seed plan, Strengthening of Extension support, Making production input available in time and affordable cost, Research Linkage, Year wise Production Program and Development of marketing chain for pulse are some of the effective steps to increase production and productivity of pulses in the state of Odisha.

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