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Adoption level and constraints of direct sown rice farmers in Guntur district of Andhra pradesh

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ABSTRACT

The present study was conducted in Guntur district of Andhra Pradesh during 2014-15 to study the level of adoption of recommended technology of direct sown rice cultivation. A total of 120 respondents constituted the sample of the present study. Majority of the farmers (48.33%) studied were found to be low level adopters. Farmers in the study area had fully adopted simple practices like optimum seeding depth (2-3 cm), sowing of DSR with 80-100 mm rainfall, drilling of seed, application of 12kg N at 40-45DAS and 60-65DAS, etc. Overly adopted practices include recommended seed rate, weed control with Oxadiargyl, Pendimethalin, Bispyribac sodium and application of $ZnSO_4$. Partially adopted practices were use of plant protection chemicals. Cultivation of MTU1001 and MTU1010 varieties, spray of $ZnSO_4$ and $FeSO_4$, use of liquid biofertilizers, weed control using Glyphosate, Cyahalofop P butyl, Phenoxoprop P ethyl, 2,4-D sodium salt, poison baiting for rodent control, pest management based on Economic Threshold Level, use of trichocards, use of pheromone traps, Neem Coated Urea were not adopted by most of the farmers. The constraints were grouped as irrigation, production, financial and marketing constraints under which late release of canal water, ineffectiveness of recommended herbicides for management of weeds, high labour costs and lack of remunerative minimum support price were the major constraints. The suggestions perceived by the farmers to overcome the constraints were giving good minimum support price by the government, timely provision of inputs on subsidized rates, development of fine varieties suitable for direct sowing and provision of sufficient godown facilities for storage of their produce.

Keywords: *Adoption, constraints, direct sown rice.*

Rice is an important food crop of India since it is the staple food of more than 70 per cent of the population. India has largest area under rice in the world and second largest producer of rice after China. Within the country, rice occupies one-quarter of the total cropped area, contributes about 40 per cent of total food grain production and continues to play a vital role in national food and livelihood security system.

In order to meet the nation's growing population's needs, there should be a proportionate increase in food grain production. Therefore, yields of rice should be increased because further expansion of area is not possible, in fact it is declining. Therefore, sustainability of rice eco-system and ability to increase production in pace with population growth with reduced water and labour use and climate changes are major concerns in traditional rice cultivation. Direct seeded rice (DSR) is feasible alternative with good potential to save water, reduce labour requirement, mitigation of green-house gas emissions and adaptability to climate risks.

Andhra pradesh is the third largest state in India in area and production of rice. In recent years, farmers of A.P were facing severe water scarcity and labour shortage for transplanting rice seedlings in the main field at right time. Keeping in view the above facts and importance of this technology towards sustainable production of rice for the country and A.P in particular, "An analytical study on direct sown rice cultivation on Guntur district of Andhra pradesh" was conducted. Constraints may be defined as certain forces that prevent the action of others. Despite the advantages, adoption level of recommended direct sown rice cultivation is low. So, the present study was taken up to enlist the constraints faced by the farmers and suggestions perceived by them to overcome the constraints.

MATERIAL AND METHODS

The study was carried out using ex post facto research design during 2015-16 in the Guntur district of Andhra pradesh. A combination of purposive and random sampling procedure was

employed. The district was purposively selected because it has vast area under direct sown rice cultivation. Three mandals Tsunduru, Chebrolu and Duggirala were selected purposively based on highest area in the district. From each mandal, four villages were selected randomly and from each village 10 direct sown rice farmers were randomly selected to make a total sample size of 120. The data was collected using a well structured interview schedule.

RESULTS AND DISCUSSION

1. Adoption level of recommended direct sown rice production technology: The distribution of respondents based on their adoption level about direct sown rice cultivation practices was presented in Table.1. Most of the farmers (48.33%) had low adoption level, 28.34 per cent and 23.33 per cent of the farmers had medium and high levels of adoption recommended direct sown rice technology, respectively. The plausible reasons for low adoption are low level of annual income, medium social participation, medium extension contact and medium contact with reliable information sources. Most of them are middle and old aged and are having low risk orientation, low to medium scientific orientation and medium economic motivation.

2. Content analysis: Results furnished in the table 2. revealed that over adoption of selected production technology by farmers in percentage rank order of their decreasing importance are: application of 12kg N at 15-20DAS, recommended seed rate, weed control with Oxadiargyl at 8-10 DAS, weed control with Pendimethalin (1.5-2.0 L/acre) at 1-2 DAS, weed control with Bispyribac sodium at 20 DAS and application of $ZnSO_4$. The recommended quantity of Nitrogen to be applied for direct sown crop is 32 to 36 kg per acre in three splits. But farmers were indiscriminately using Urea and DAP fertilizers three times in the crop season and adding huge amounts of nitrogen (88 kg N per acre). The recommended amounts of Nitrogen, Phosphorus and Potassium are 36 kg, 24 kg and 24 kg per acre respectively. But farmers were applying 88 kg Nitrogen, 33 kg Phosphorus and 10 kg Potassium per acre. The possible reason for over dosage of these chemicals might be due to lack of knowledge about recommended dosage, over enthusiasm and concentration of all efforts on profit maximization. So the extension agencies should conduct season long training programme on direct sown rice cultivation to improve farmers knowledge on recommended production technology.

Table 2. revealed that cent per cent farmers fully adopted these technologies: optimum seeding depth, sowing of DSR with 80-100 mm rainfall, drilling of seed, application of 12 kg N at 40-45 DAS, application of 12 kg N at 60-65 DAS, application of Paraquat for weed control (5-6 days before sowing) and Use of 80-100 litres of spray fluid per acre with Taiwan sprayer.

The fully adopted technologies with decreasing order of their percentage are: giving irrigation at moisture sensitive stages, weed control with Bispyribac sodium at 20 DAS, weed control with Pendimethalin at 1-2 DAS, use of Buprofezin/ Dinotefuran for controlling BPH, recommended seed rate (10-15 kg/acre), use of Tricyclazole/ Kasugamycin for management of rice blast, use of Hexaconazole/Propiconazole for control of sheath blight, application of 24kg P as basal application, application of $ZnSO_4$ (20 kg/acre), weed control with Oxadiargyl (35-50 g/acre) at 8-10 DAS, use of Flubendamide for control of stem borer, application of 12kg N at 15-20DAS, weed control with Pyrazosulfuran ethyl (80g) at 8-10 DAS and Poison baiting with Bromodiolone for rodent control.

Table 2. revealed that partial adoption of selected production technology by farmers in percentage rank order of their decreasing importance are: use of Flubendamide for control of stem borer, application of 12kg K as basal application, use of Hexaconazole/Propiconazole for control of sheath blight, use of Tricyclazole/ Kasugamycin for management of rice blast, use of Buprofezin/Dinotefuran for controlling BPH, giving irrigation at moisture sensitive stage and dry seed treatment with Carbendazim.

Table 2. also revealed that non adoption of selected production technology by farmers in percentage rank order of their decreasing importance are: dry seed treatment with Carbendazim, cultivation of MTU1001 and MTU1010 varieties for DSR, application of 12kg K at 60 DAS, foliar spray of $ZnSO_4$, application of $FeSO_4$ + Citric acid, use of liquid biofertilizers, use of Azotobacter, use of Phosphorus soluble bacteria, weed control using Glyphosate, weed control with Cyahalofop P butyl at 15 DAS, weed control with Phenoxoprop P ethyl at 15 DAS, weed control by 2,4-D Sodium salt at 35-40 DAS, poison baiting with Zinc Phosphide for rodent control, use of burrow

fumigators, use of Profenophos for management of Panicle mite, pest management based on Economic Threshold Level, use of trichocards for management of stem borer, use of pheromone traps to monitor yellow stem borer, passing ropes over crop for managing leaf folder and use of Neem Coated Urea, poison baiting with bromodiolone for rodent control, weed control with Pyrazosulfuran ethyl at 8-10 DAS, application of $ZnSO_4$, application of 24kg P as basal application, application of 12kg K as basal application, weed control with Oxadiargyl at 8-10 DAS, use of Tricyclazole/Kasugamycin for management of rice blast and use of Flubendamide for control of stem borer.

It is quite evident from the present findings that the simple technologies are relatively adopted to greater extent as compared to complex technologies. Cent per cent farmers were not using MTU 1001 and MTU 1010 varieties due to their coarse grain type. Reason for not applying Potassium fertilizer by most of the farmers was its high cost and also soil testing results of the sample area soils show that soils are rich in Potassium. Lack of knowledge regarding deficiency symptoms of micronutrients like Zinc and Iron was the reason for non-adoption of foliar sprays of Zinc and Iron. Even though, some farmers know about bio-fertilizers, their non-availability in the local markets was the reason for non-adoption. Weed control with Glyphosate was not adopted now-a-days because farmers were preferring Paraquat over Glyphosate because of its residual effect upto 15 days. 2,4-D application for weed control was not followed because farmers were preferring hand weeding at 35-40 DAS as it also improves soil condition. Farmers were using plant protection chemicals based on the crop age rather than Economic Threshold Levels. Farmers were preferring manual methods of rodent control because of inefficiency of the chemicals like Bromodiolone and Zinc phosphide. Cultural practices like passing of ropes over the crop for control of leaf folder was not practiced as labour availability is low and of high labour costs. Probable reason for low adoption of these practices might be due to low extension contact and social participation. ANGRAU and Department of Agriculture should take efforts to make the eco-friendly components like pheromone traps, bio-fertilizers, tricho cards, etc., at mandal level. Government should encourage farmers to adopt these eco-friendly technologies by giving subsidies on these technologies.

3. Constraints faced by the farmers in adoption of direct sown rice cultivation: the constraints were grouped into four categories namely irrigation, production, financial and marketing constraints.

3.1 Irrigation constraints: The data in Table 4. reveals that the constraints related to irrigation in percentage rank order of their importance as late release of canal water, followed by improper implementation of warabandhi system, indiscriminate use of irrigation water by head and middle reach farmers, delay in completion of pulichintala project and lack of full control over water distribution system for WUA members (30.83%). Hence, the Government and Irrigation departments should take suitable measures for proper implementation of irrigation water distribution to the farmers in this area and also ensure proper check on wastage of irrigation water by the head reach farmers to enhance the production.

3.2 Production constraints: Constraints related to production practices in percentage rank order of their importance are: ineffectiveness of recommended herbicides for management of weeds followed by non-availability of fine varieties for direct sown rice cultivation, non-availability of trichocards, non-availability of bio-fertilizers in local markets and non-availability of pheromone traps (*Balu naik and Ramesh babu, 2010*) and therefore, new technologies in pest management are known to the farmers but they are not available to the farmers for adoption. Agricultural university research centres, KVKs, DAATTCs and Agriculture department should focus on getting these new ecological technologies closer to the farmers. These findings were in line with the findings of *Praveen (2014).*

3.3 Financial constraints: The data in Table 4. revealed that the financial constraints in percentage rank order of their importance as high labour costs, followed by high cost of fertilizers and plant protection chemicals leading to high cost of cultivation (*Ambedkar, et al., 2013*), lack of suitable crop insurance policy, non-availability of sufficient credit from nationalized banks, lack of insurance for farmers who do not take loans and high interest rates of private money lenders. These findings were in line with the findings of *Sri Ramana (2014).*

Table 1. Distribution of direct sown rice farmers according to their extent of adoption (n=120)

S.No.	Adoption	Direct sown rice farmers	
		Frequency	Percentage
1.	Low (43-77)	58	48.33
2.	Medium (78-111)	34	28.34
3.	High (112-146)	28	23.33
	Total	120	100.00

Table 2. Content analysis of extent of adoption of selected production technology of direct sown rice farmers. (n=120)

S.No	Production technology	Extent of Adoption							
		Overly adopted		Fully adopted		Partially adopted		Non adopted	
		f	%	f	%	f	%	f	%
I	**Agronomic aspects**								
1.	Recommended seed rate (10-15 kg/acre).	48	40.00	72	60.00	-	-	-	-
2.	Optimum seeding depth (2-3 cm).	-	-	120	100.0	-	-	-	-
3.	Sowing of DSR with 80-100 mm rainfall.	-	-	120	100.0	-	-	-	-
4.	Cultivation of MTU1001 and MTU1010 varieties for DSR.	-	-	-	-	-	-	120	100.0
5.	Drilling of seed (better than broadcasting).	-	-	120	100.0	-	-	-	-
6.	Giving irrigation at moisture sensitive stages (panicle initiation,flag leaf and milky stages).	-	-	101	84.16	19	15.83	-	-
II	**Nutrient management**								
	Nitrogen								
7.	Application of 12 kg N/acre at 15-20DAS.	100	83.33	20	16.66	-	-	-	-
8.	Application of 12 kg N/acre at 40-45DAS.	-	-	120	100.0	-	-	-	-
9.	Application of 12 kg N/acre at 60-65DAS.	-	-	120	100.0	-	-	-	-
	Phosphorus								
10.	Application of 24 kg P_2O_5/acre as basal application.	-	-	50	41.66	-	-	70	58.33
	Potassium								
11.	Application of 12 kg K_2O/acre as basal application.	-	-	-	-	65	54.16	55	45.83
12.	Application of 12 kg K_2O/acre at 60 DAS.	-	-	-	-	-	-	120	100.0
13.	Application of $ZnSO_4$ (20 kg/acre).	12	10.00	36	30.00	-	-	72	60.00
14.	Foliar spray of $ZnSO_4$ (2g/litre).	-	-	-	-	-	-	120	100.0
15.	Application of $FeSO_4$ + Citric acid (6-8g + 2g/litre).	-	-	-	-	-	-	120	100.0
16.	Use of liquid biofertilizers.	-	-	-	-	-	-	120	100.0
17.	Use of Azotobacter (1kg+25kg FYM).	-	-	-	-	-	-	120	100.0
18.	Use of Phosphorus soluble bacteria.	-	-	-	-	-	-	120	100.0
III	**Weed management**								
19.	Weed control using Glyphosate (at 15 days prior to sowing).	-	-	-	-	-	-	120	100.0
20.	Application of Paraquat for weed control (5-6 days before sowing).	-	-	120	100.0	-	-	-	-
21.	Weed control with Pendimethalin(Stomp) (1.5-2.0 L/acre) at 1-2 DAS.	22	18.33	98	81.66	-	-	-	-
22.	Weed control with Pyrazosulfuran ethyl (80g) at 8-10 DAS.	-	-	19	15.83	-	-	101	84.16
23.	Weed control with Oxadiargyl (35-50 g/acre) at 8-10 DAS.	34	28.33	33	27.50	-	-	53	44.16

Cont.....

S.No	Production technology	Extent jof Adoption							
		Overly adopted		Fully adopted		Partially adopted		Non adopted	
		F	%	F	%	F	%	F%	
24.	Weed control with Cyahalofop P butyl (Clincher) (250-300ml/acre) at 15 DAS.	-	-	-	-	-	-	120	100.0
25.	Weed control with Ethoxy sulfuran(Sunrise) (50g/acre) at 30 DAS.	-	-	-	-	-	-	120	100.0
26.	Weed control with Bispyribac sodium 21 (Nominee gold) (100ml/acre) at 20 DAS.	17.50	99	82.50	-	-	-	-	
27.	Weed control by 2,4-D Sodium salt (400 g/acre) at 35-40 DAS.	-	-	-	-	-	-	120	100.0
IV	**Rodent management**								
28.	Poison baiting with Zinc Phosphide for rodent control.	-	-	-	-	-	-	120	100.0
29.	Poison baiting with Bromodiolone for rodent control.	-	-	16	13.33	-	-	104	86.66
30.	Use of burrow fumigators.	-	-	-	-	-	-	120	100.0
V	**Pest and disease management**								
31.	Use of 80-100 L of spray fluid with Taiwan sprayer.	-	-	120	100	-	-	-	-
32.	Dry seed treatment with Carbendazim.	-	-	-	-	-	-	120	100.0
33.	Use of Buprofezin/Dinotefuran for controlling BPH.	-	-	98	81.66	22	18.33	-	-
34.	Use of Flubendamide for control of stem borer.	-	-	30	25.00	77	64.16	13	10.83
35.	Use of Profenophos for management of Panicle mite.	-	-	-	-	-	-	120	100.0
36.	Use of Hexaconazole/ Propiconazole for control of sheath blight.	-	-	63	52.50	57	47.50	-	-
37.	Use of Tricyclazole/Kasugamycin for management of rice blast.	-	-	64	53.33	24	20.00	32	26.66
38.	Pest management based on Economic Threshold Level.	-	-	-	-	-	-	120	100.0
39.	Use of Trichocards for management of stem borer.	-	-	-	-	-	-	120	100.0
40.	Use of Pheromone traps to monitor yellow stem borer.	-	-	-	-	-	-	120	100.0
41.	Passing ropes over crop for managing leaf folder.	-	-	-	-	-	-	120	100.0
42.	Use of Neem Coated Urea.	-	-	-	-	-	-	120	100.0

Table 3. Constraints faced by the farmers in direct sown rice production technology.

S.No	Constraints	Direct sown farmers		
		Frequency	Percentage	Rank
1.	**Irrigation constraints**			
a.	Late release of canal water.	120	100.00	I
b.	Improper implementation of warabandhi system.	78	65.00	II
c.	Lack of full control over water distribution system for WUA members.	37	30.83	V
d.	Delay in completion of pulichintala project.	48	40.00	IV
e.	Indiscriminate use of irrigation water by head and middle reach farmers.	60	50.00	III
2.	Production constraints			
a.	Ineffectiveness of recommended herbicides for management of weeds.	108	90.00	I
b.	Non-availability of fine varieties for direct sown rice cultivation.	96	80.00	II
c.	Non-availability of bio-fertilizers in local markets.	44	36.66	IV
d.	Non-availability of trichocards.	86	71.66	III
e.	Non-availability of pheromone traps.	35	29.16	V
3.	Financial constraints			
a.	Non-availability of sufficient credit from	52	43.33	IV
b.	High interest rates of private money lenders.	27	22.50	VI
c.	Lack of insurance for farmers who do not take loans.	30	25.00	V
d.	Lack of suitable crop insurance policy.	72	60.00	III
e.	High labour costs.	120	100.00	I
f.	High cost of fertilizers and plant protection chemicals leading to high cost of cultivation.	113	94.16	II
4.	Marketing constraints			
a.	Insufficient godown facilities either at village level/ AMC level.	63	52.50	II
b.	Lack of remunerative MSP.	77	64.16	I
c.	Insufficient public purchase centres for selling of the produce.	42	35.00	IV
d.	Lack of awareness regarding fluctuations in market prices.	57	47.50	III
e.	Restrictions in marketing of produce in other states.	16	13.33	V

Table 4. Suggestions elicited by direct sown rice farmers to arrive at the strategy for in creasing production (n=120)

S.No.	Suggestions*	Frequency	Percentage	Rank
1	Digging of farm ponds.	48	40.00	XI
2	Bringing awareness to the head and middle reach farmers about judicious use of irrigation water.	63	52.50	VII
3	Early completion of pulichintala project.	72	60.00	VI
4	Development of fine varieties suitable for direct sown rice cultivation.	96	80.00	III
5	Production of bio-fertilizers on large scale and making them available in local markets.	35	29.16	XIII
6	Making Trichocards and Pheromone traps available in local markets.	42	35.00	XII
7	Timely provision of credit facility at low interest rates and subsidies on seeds, fertilizers and plant protection chemicals.	77	64.16	V
8	Farmer friendly insurance schemes from the government at the time of adverse climatic conditions.	52	43.33	X
9	Timely provision of seed, fertilizers and plant protection chemicals on subsidized rates.	108	90.00	II
10	Provision of sufficient godown facilities at AMC level.	88	73.33	IV
11	Setting up of sufficient number of public purchase points at local level by the government.	60	50.00	VIII
12	Giving good Minimum Support Price by the government.	113	94.16	I
13	Provision of timely updates regarding fluctuations in market prices.	57	47.50	IX
14	Giving skill oriented training programmes on weed management.	35	29.16	XIV

Hence, Government should provide inputs like fertilizers and pesticides at subsidized rates to the farmers. It is much needed to ensure a suitable crop insurance policy to the farmers of study area by the Government and provide timely credit to the farmers by nationalized banks at reasonable interest rates.

3.4 Marketing constraints: Constraints related to marketing of agricultural produce in percentage rank order of their importance are: lack of remunerative MSP, followed by insufficient godown facilities either at village level/ AMC level, lack of awareness regarding fluctuations in market prices, insufficient public purchase centres for selling of the produce and restrictions in marketing of produce in other states. Therefore, government should provide remunerative minimum support price to the farmers, build sufficient storage facilities for storing their produce, set up sufficient public points for sale of produce and give proper assistance to the farmers to market their produce in other states.

4. Suggestions as perceived by the farmers to overcome the constraints: Table 4. clearly showed that suggestions elicited from the direct sown rice farmers in percentage rank order of their decreasing importance as: giving good Minimum Support Price by the government, timely provision of seed, fertilizers and plant protection chemicals on subsidized rates, development of fine varieties suitable for direct sown rice cultivation, provision of sufficient godown facilities at AMC level, timely provision of credit facility at low interest rates and subsidies on seeds, fertilizers and plant protection chemicals, early completion of pulichintala project, bringing awareness to the head and middle reach farmers about judicious use of irrigation water, setting up of sufficient number of public purchase points at local level by the government, provision of timely updates regarding fluctuations in market prices, farmer friendly insurance schemes from the government at the time of adverse climatic conditions, digging of farm ponds, making trichocards and pheromone traps available in local markets, production of bio-fertilizers on large scale and making them available in local markets and giving skill oriented training programmes on weed management.

Thus, it is the responsibility of the government, extension agency and research institutions to provide the above suggested facilities to the direct sown rice farmers for better adoption of recommended technology of direct sown rice.

CONCLUSION

Most of the farmers (48.33%) had low adoption level, 28.34 per cent and 23.33 per cent of the farmers had medium and high levels of adoption recommended direct sown rice technology. Major constraints in the adoption of direct sown rice cultivation practices were late release of canal water, weed management, improper implementation of warabandhi system and insufficient godown facilities to store their produce. So, to increase the level of adoption of direct sown rice production technology, the suggested facilities should be provided by the government. The department of agriculture and ANGRAU can organise skill oriented training for the farmers on integrated weed management.

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