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Extent of adoption of paddy cultivation technologies of ANGRAU among farmers in Guntur District of Andhra Pradesh

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Abstract

Adoption of improved technologies is the only way to minimize the cost of cultivation. The present study was formulated to investigate the extent of adoption of ANGRAU Technologies among the farmers in Guntur district. A total of 120 farmers were selected randomly for the present investigation. Finding revealed that majority of the farmers were marginal (43.33%) having middle age (51.67%) with primary school education (36.67%) doing farming as an occupation (86.67%), having less than 1 lakh of annual income (47.50%), friends are the source of information (42.50%), had no social participation (80.83%), sought the information occasionally (48.33%) and had medium level of risk-taking ability (59.17%) in adoption of technology. 100% of the farmers adopted BPT 5204 followed by other varieties. With respect to nutrient management, majority (65.00%) were applying zinc sulphate as foliar spray followed by proper time of application of nitrogen (70.83%). Two third to three fourth of the farmers applied the pre and post emergence herbicides as recommended to control monocot and dicot weeds followed the pest and disease management measure. More than three fourth (80.83%) of farmers expressed that believing high input leads to higher yields followed by influence of local private dealers (75.83%) were the major reasons for non-adoption of recommended dose of fertilizers and pesticides. Farmers suggested the ways to overcome the reasons that the both farmers and dealers need to be educated about the merits of improved technologies as well as demerits of over use of chemicals.

Keywords: Adoption, awareness, chemicals, over use, paddy & technology

Introduction

The Green Revolution ushered in a new era of agricultural development in the country beginning in 1966. Agricultural universities played a vital role in green revolution by transforming the nation from subsistence farming to a self-reliant agricultural system by introducing high-yielding varieties and advanced technologies, thereby ensuring continuous food security for the rapidly growing population. To contribute to the nation's development, Acharya N.G. Ranga Agricultural University (ANGRAU) was established in 1964 with the objective to serve the farming community by introducing numerous high-yielding and disease-resistant varieties along with improved technologies in a wide range of crops specifically in paddy, benefiting not only Andhra Pradesh but other states across the country. Contribution of paddy production from India over globe is increasing year after year. India shares 21.76% in the world rice production in 2013 has become 25.27% during the year 2022. As ANGRAU has served the farmers for the last six decades, the present investigation took place to study the

extent of adoption of Paddy cultivation technologies given by ANGRAU for the benefit of the farming community as the crop occupies major cultivable area in the state.

Materials and Methods

Ex-post facto research design was employed to collect the data from the farmers with the help of Structured Interview schedule. Out of 57 mandals in the districts, 4 mandals and from each mandal 2 villages were selected during the year 2019-20 where the paddy is grown extensively. A total of 120 farmers at the rate 15 farmers from each village were selected randomly. Thus, a total sample was 120. Awareness and adoption of the technology was studied among farmers with two-point continuum *i.e.* aware; unaware and adopted; not adopted with assigned score of 1 and 2. Further, the reasons for non-adoption of the technology as well as suggestion to overcome the reasons were also prioritized by assigning ranks. Statics *viz.*, frequency, percentage, mean and standard deviation were used to analyse and interpret the data.

Profile characteristics of the farmers**Table 1:** Profile characteristics of the paddy farmers under the study $n = 120$

Sl. No.	Profile characteristics	Category	Frequency	Percentage
1	Age	Young (> 18 to 35 years)	15	12.50
		Middle (> 36 to 54 years)	62	51.67
		Old (>54 years)	43	35.83
2	Education	Illiterate	22	18.33
		Primary school	44	36.67
		Secondary school	30	25.00
		Intermediate	15	12.50
		Higher education	9	7.50
3	Occupation	Farming	104	86.67
		Farming + business	16	13.33
4	Farming experience	Low (< 15 years)	18	15.00
		Medium (15-30years)	59	49.17
		High (>30 years)	43	35.83
5	Landholding Size	less than 2.5 acres	52	43.33
		2.5 to 5 acres	41	34.17
		5 to 7.5 acres	15	12.50
		above 7.5 acres	12	10.00
6	Annual income	Low (<1 lakh)	57	47.50
		Medium (1 to 2 lakh)	45	37.50
		High (> 2 lakh)	18	15.00
7	Information source	AO/AEO	22	18.33
		Scientist	12	10.00
		Friend	51	42.50
		Neighbour	35	29.17
8	Social Participation	Member of organizations	23	19.17
		Not a member of any organization	97	80.83
9	Information seeking behaviour	Frequently	21	17.50
		Occasionally	58	48.33
		Rarely	41	34.17
10	Risk orientation	low	37	30.83
		Medium	71	59.17
		High	12	10.00

Study of the profile is required to know the basic information of the respondents who are under study to distinguish their levels of education, economic background and social participation and other required characteristics which are highly required while analysing and interpreting the data.

From the table it was observed that half (51.67%) of the paddy farmers were middle aged followed by old (35.83%) and young (12.50%) farmers. More than one third (36.67%) of the paddy farmers had primary school education followed by secondary school (25.00%), illiterate (18.33%), intermediate (12.50%) and higher education (7.50%). Out of the paddy farmers' majority (86.67%) of them had farming as an occupation whereas only less number (13.33%) of them were doing farming along with businesses. It was also observed that majority (43.33%) of the farmers were marginal followed by small (34.17%), medium (12.50%) and big farmers (10.00%). Even with respect to their income levels, near to half (47.50%) of them had less than 1 lakh of annual income followed by 1 to 2 lakh (37.50%) and more than 2 lakhs (15.00%).

To be aware of or adopt any technology, source of information is important. Study revealed that friends (42.50%) and neighbours (29.17%) were the primary information source for the farmers followed by department officials 18.33%) and scientists (10.00%). Further, majority (80.83%) of the farmers had no social participation in terms of no membership in any organization and only considerable number (19.17%) of the farmers had social participation. Results also revealed that nearly half (48.33%) of the farmers sought for the information occasionally followed by rarely (34.17%) and only 17.50% of them sought the information frequently. In order to adopt any new technology, farmers need to take moderate risk. It was observed from the study that more than half (59.17%) of the respondents had medium level of risk-taking ability followed by low (30.83%) and only 10% of farmers had high risk-taking ability in farming. Similar observation was made by Poshia *et al.*, 2020^[5] in their study that majority (71.00%) of the respondents belonged to middle age category, equal (35.00%) respondents had education up to the secondary level and medium land holdings (1.1 to 2 ha).

Table 2: Extent of adoption of ANGRAU technologies in paddy among farmers $n = 120$

Sl. No.	Technology developed by ANGRAU in paddy	Aware	Unaware	Adopted	Not adopted
Varietal management					
1	Improved variety -BPT 5204	120 (100)	0 (0.00)	120 (100.00)	0 (0.00)
2	Improved varieties Other than the BPT 5204	92 (76.67)	28 (23.33)	24 (20.00)	96 (80.00)
3	Using 40 kg seed/ha for dry direct sowing	62 (51.67)	58 (48.33)	46 (38.33)	74 (61.67)
4	Treating the seed with 3 g of Carbendazim /kg seed	79 (65.83)	41 (34.17)	55 (45.83)	65 (54.17)
Nutrient management					
1	Application of zinc @ 50 kg /ha for once in two crop seasons	57 (47.50)	63 (52.50)	44 (36.67)	76 (63.33)
2	Spraying of zinc sulphate @ 2 gm/l twice with 5 to 1 week interval against zinc deficiency as per the	89 (74.17)	31 (25.83)	78 (65.00)	42 (35.00)
3	Spraying of ferrous sulphate @ 2.5 kg + citric acid @ 500 g/ha twice with five to one week interval against iron deficiency	43 (35.83)	77 (64.17)	36 (30.00)	84 (70.00)
4	Application of recommended dose of fertilizers NPK (90-60-50) /ha	34 (28.33)	86 (71.67)	22 (18.33)	98 (81.67)
	Application of N fertilizer in 3 splits at basal, booting, panicle initiation stages	92 (76.67)	28 (23.33)	85 (70.83)	35 (29.17)
5	Application of P fertilizer in basal dose	47 (39.17)	73 (60.83)	34 (28.33)	86 (71.67)
6	Application of K fertilizer in 2 splits at basal and panicle initiation stage	41 (34.17)	79 (65.83)	23 (19.17)	97 (80.83)
Weed management					
1	Spraying of Pendimethalin @ 2.5-3 litre/ ha as a pre- emergency herbicide.	112 (93.33)	8 (6.67)	104 (86.67)	16 (13.33)
2	Spraying of Cyhalofopbutyl @ 1.0 litre/ha after 15 days of sowing against Echinochloa	53 (44.17)	67 (55.83)	38 (31.67)	82 (68.33)
3	Spraying of Bispyribac sodium 250 ml/ha as post emergence herbicide at 15-20 days after sowing to control both monocot and dicot weeds.	110 (91.67)	10 (8.33)	97 (80.83)	22 (19.17)
4	Spraying of 2,4 D Sodium Salt 1.0 kg/ha or Ethoxysulfuron @ 125 g/ha at 25-30 days after sowing to control dicot weeds.	81 (67.50)	39 (32.50)	75 (62.50)	45 (37.50)
5	After 30 days of sowing, spraying of metsulfuron methyl + chlorimuron ethyl @ 20 g/ha to control monocot and dicot weeds	87 (72.50)	33 (27.50)	78 (65.00)	42 (35.00)
Pest management					
1	Spraying of chloropyrifos 2.5 ml/l or chlorantraniliprole 0.3 ml/l against stem borer & Leaf Folder	89 (74.17)	31 (25.83)	72 (60.00)	48 (40.00)
2	Spraying of acephate 1.5 g/l or etofenprox 2.0 ml/l or Imidacloprid + ethiprole 0.25 g/l or pymetrozine 0.6 g/l or dinotefuran 0.4 g/l or triflumezopyrim 0.48 ml/l of water and avoid spraying of synthetic pyrethroids against BPH/WBPH	88 (73.33)	32 (26.67)	76 (63.33)	44 (36.67)
3	Spraying of wettable sulphur 50% @ 3.0 g/l or profenophos @ 2.0 ml/l of water against Leaf mite	26 (21.67)	94 (78.33)	22 (18.33)	98 (81.67)
Disease management					
1	Spraying of tricyclozole 0.6 g/l of water against blast. Spraying of Kasugamycin 2.0 ml/l may be sprayed after emergence of panicle. Delay top dressing of N fertilizers when infection is noticed	86 (71.67)	34 (28.33)	72 (60.00)	48 (40.00)
2	Reducing of N application and apply N in split doses and apply K fertilizer in 2 splits at basal and panicle initiation stage against Bacterial Leaf blight	31 (25.83)	89 (74.17)	14 (11.67)	106 (88.33)
3	Spraying of propiconazole 1.0 ml/l or hexaconazole 2.0 ml/l or validamycin 2.0 ml/l of water against Sheath blight/stem rot. Second spray should be given at 15 days after the first spray if needed by altering the chemical. Reduce or delay top dressing of N fertilizers and apply in 2 or 3 split doses. Practice the Alternate wetting drying the field	85 (70.83)	35 (29.17)	93 (77.50)	27 (22.50)
4	Carbendazim 1 g/l or propiconazole@1 ml/l or Carbendazim + Mancozeb 2 gm/l at the time of dough stage and 7 days after 1st spray against Sheath rot.	62 (51.67)	58 (48.33)	37 (30.83)	83 (69.17)
5	Apply propiconazole 1 ml/l or carbendazim 1 gm/l at the time of panicle emergence and 1week after 1st spray against false smut.	51 (42.50)	69 (57.50)	32 (26.67)	88 (73.33)
Rodent management					
1	Setup local traps@ 20/ha	120 (100.00)	-	85 (70.83)	35 (29.17)
2	Installation of permanent bait (96% broken rice + 2% oil + 2% bromadiolone poison) stations from planting to flowering @ 10-15 g per bait station and replenished twice in a week.	34 (28.33)	86 (71.67)	18 (15.00)	102 (85.00)

Figures in parentheses indicate percentages

Varietal management

It was observed that from the table 2 that all (100.00%) the farmers in the study area were cultivating BPT 5204 and only 24.00% of them cultivating new varieties beside BPT 5204. With regard to seed rate, only 38.33% farmers were practising the recommended seed rate followed by seed treatment (45.83%). Satish *et al.*, 2024 ^[7], expressed that BPT 5204 is the most extensively cultivated fine variety, covering 35.29% of the area, while RNR 15048 is the second most popular fine variety, representing 20% of the area in Telangana. Balamurugan and Manikandan (2019) ^[2] reported in their study that only 35.83% of the respondents had adopted seed treatment practices in paddy cultivation Ariyalore district of Tamil Nadu.

Nutrient management

With regard to nutrient management, more than three fourth (65.00%) of the farmers followed the foliar application of zinc than the soil application as they were not aware of the soil application as majority of them (52.50%) were not aware of the soil application of zinc. Only less than one third (30.00%) of the farmers adopted the measures to overcome the iron deficiency as near to two third (64.17%) of the famers not aware of the symptoms and measures to be followed against the iron deficiency. More than three fourth of them (71.67%) did not know about the recommended dose of the fertilizer and only 18.33% of the farmers were following recommended dose of fertilizer *i.e.* 90-60-50 kg ha⁻¹. With respect to application, majority (70.83%) of the farmers followed the time of application against the nitrogen fertilizer whereas, only 23.33% of the farmers applied the phosphorous as a basal followed by split application of potassium fertilizer (19.17%). The results are in line with the Rufaidda and Singh (2022) that 69.3% of the farmers applying scientific recommendations against urea followed by DAP (65.3%) and MOP (42.0%). Priya and Syed reported in 2024 that majority (60.83%) of the respondents had not adopted the precision agriculture practice followed

by 21.67% who had fully adopted the practice, and partially adopted the practice (17.50%) in rice cultivation.

Weed management

It was affirmed that, Most (86.67%) of the farmers applied pendimethalin as pre-emergence herbicide followed by the post emergence herbicides *viz.*, Bispyribac sodium (80.83%) and metsulfuron methyl + chlorimuron ethyl (65.00%) to control both monocot and dicot weeds followed by 2,4 D Sodium Salt or Ethoxysulfuron (62.50%) against dicot weeds. only 31.67% of the farmers applied Cyhalofopbutyl against Echinochloa weed in paddy

Pest management

In order to reduce the pest incidence, majority (60.00%) of the farmers applied chlorantraniliprole to control stem borer and leaf folder and two third (63.33%) of them applied either pymetrozine or triflumezopyrim against BPH and WBPH, whereas, to control leaf mite only 18.33% of them sprayed appropriate chemical. Study found that farmers applied the appropriate chemicals but in higher dose than the recommended to control the incidence of pest.

Disease management: it was noticed that more than 60% of the farmers were spraying appropriate chemicals against rice blast followed by stem rot. On the other hand, majority of them have not applied appropriate chemical against Bacterial Leaf blight (88.33%), false smut (73.33%) and sheath rot (69.17%) as they failed to identify the diseases.

Rodent management

Though, cent% of the farmers aware about the advantages of local traps for rodent control, among, 70.83% of them set up the traps and the rest (29.17%) had not adopted the technology. The ratio of the farmers come to very less while placing the poison bait during the crop season. Less than the one fifth (15.00%) of the farmers had only maintained the bait stations and rest (85.00%) had not maintained the bait stations.

Table 3: Reasons for non-adoption of ANGRAU Technology

S. No.	Reasons	f	%	Rank
1	Lack of awareness on ANGRAU technologies other than varieties	69	57.50	4
2	Lack of skilled labour to adopt the technology	64	53.33	6
3	Influence of local fertilizers & Pesticide dealers	91	75.83	2
4	Influence of local farmers	71	59.17	3
5	Believing high input leads higher yields than the recommended	97	80.83	1
6	Low applicability	38	31.67	8
7	Low market opportunities for new varieties	67	55.83	5
8	Lack of input availability	57	47.50	7

It was inferred from the table 3 that there were key reasons expressed by the farmers which hamper the adoption of Technologies developed by ANGRAU. Believing high input leads higher yields than the recommended (80.83%) was ranked first as expressed by the majority of the farmers followed by Influence of local private dealers (75.83%), Influence of local farmers (59.17) to select the chemicals and Lack of awareness on ANGRAU technologies other than varieties (57.50) and Low market opportunities for new

varieties (55.83%) were the major constraints. Adeyongo *et al.*, 2022 ^[1] reported in their study that 80.7% of the farmers expressed unfavourable market prices (80.7%) as one of the major constraints in adoption of innovations in rice technology. Okeke *et al.*, 2019 ^[4] also expressed the similar opinion of the farmers that inadequate extension services, farmers low level of education unfavourable market were the major constraints for adoption of improved rice production technologies by the farmers.

Table 4: Suggestions for improving the adoption of ANGRAU Technology

S. No.	Suggestions	f	%	Rank
1	Need to create market opportunities to adopt new varieties	96	80.00	2
2	Need to develop low-cost machinery to reduce the drudgery	85	70.83	4
3	Need to conduct Pre-Kharif and Pre-Rabi campaigns at village level	76	63.33	6
4	Need to Create awareness about the technology through various means	107	89.17	1
5	Need to train the input dealers to suggest right input at right time	91	75.83	3
6	Need to develop the location specific and problem-based technology	78	65.00	5
7	Need to maintain optimum price on NPK fertilizers	72	60.00	6

In order to adopt the technology developed by ANGRAU, Majority (89.17) of the farmers expressed that create awareness about the improved technology through various means such as result demonstrations, trainings and interaction with successful farmers. Whereas, 80.00% of them expressed that market opportunities must be created to adopt new varieties followed by train the input dealers to suggest right input at right time (75.83%), development of low-cost machinery to reduce the drudgery (70.83%) were the major suggestions given by the paddy practising farmers. This is supported by Shanila (2025) ^[8] that the introduction of farmer friendly implements was suggested by 80.95% of farmers to ease labour dependency. Although, there are number of varieties realising from ANGRAU, farmers cultivate paddy variety BPT 5204 at very large scale as it is being accepted in the market and no other fine grain varieties having market acceptance though the cooking quality is good. Majority of the farmers applied chemicals more than the recommended in order to get higher yields believing that recommended chemicals are not sufficient to get higher yields.

Conclusion

Study found that as a result of ANGRAU, most of the technologies were penetrated into the farming with regard to varieties, nutrient management, pest and disease management. All the sample farmers were cultivating BPT 5204 whereas, only 24% of them cultivating other new varieties in addition to BPT 5204. Using the same variety years together resulting high incidence of pest and diseases. Hence, market opportunities should be strengthened to adopt new varieties. Further, only 18.33% of the farmers were applying the primary nutrients as per the recommended dose against and only a smaller number of the farmers applied the phosphorous as a basal followed by split application of potassium fertilizer at basal as well as at panicle initiation stage. Both the excessive use coupled with improper time of application leads to negative impacts on farming resulting high pest and disease incidence led to high cost of cultivation. Farmers were applying fertilizers coupled with plant protection chemicals more than the recommended dose due to the fear of losing yields. To reduce the indiscriminate use of chemicals, farmers as well as local dealers need to be educated through trainings and demonstrations prior to the crop season consistently.

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