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ADOPTION AND CONSTRAINTS OF CROP CULTIVATION TECHNOLOGIES IN MAIZE BY TRIBAL FARMERS IN ALLURI SITHARAMA RAJU DISTRICT, ANDHRA PRADESH

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ABSTRACT

An explorative research study was conducted in agency mandals of ASR district, Andhra Pradesh during the year 2021-22 through survey in selected villages. Among the 10 tribal agency mandals of ASR district comprising of 6962 ha (DHB, 2020) area of maize, two mandals *viz.,* Chintapalli and Guden Kothaveedi had documented more than 50 per cent of districts maize cultivation with 3379 ha area. Hence, the present study was executed in above two mandals only and from each mandal, two villages were opted and from each opted village 15 farmers were randomly selected, so a total of 60 tribal farmers were chosen for recording their responses through personal interview. The results inferred that among all the schedules, majority farmers had adopted the practice of sowing the maize crop in time (68.33%) with recommended seed rate (71.67 %) following thinning operations (96.67 %) and adopting inter cropping system (68.33%) many farmers had not adopted the recommended practices like seed selection, application of FYM, ridges and furrows making, adopting spacing, seed treatment, application of recommended NPK fertilizers, weed control, inter-cultivation, irrigation at critical stage, pest and disease management and drying the harvested cobs with 65.00, 70.00, 86.67, 63.33, 80.00, 98.33, 75.00, 83.33, 76.67, 86.67 and 80.00 per cent responses, respectively. The major constraints include low market facilities intended with low price for sale, incidence of fall army worm and low yields. Through training programmes, method and result demonstrations information on water, weed, pest and disease management in maize crop are to be disseminated to the tribal farmers.

KEY WORDS: Maize, Cultivation practices, Adoption levels, Constraints

INTRODUCTION

Maize is well known as queen of cereals because of its highest genetic yield potential among the cereal crops. In Andhra Pradesh, maize is cultivated in an area of 3.42 L ha with a production of 20.49 L T and productivity of 5991 kg ha^{-1}. Maize cultivation in A.P. contributes 6.09 per cent of total country's production (des.ap.gov.in, 2021-22). High altitude tribal agency area of Alluri Sitharama district of Andhra Pradesh is known for its subsistence farming as most of the tribal farmers cultivate the crops in their outmoded manner and cultivation practices were quite different (Kadiri, 2023). Maize is a predominant market surplus crop of these tribal farmers in high altitude hilly agency areas of ASR district, which is cultivated in an area of 6962 ha during the year 2021-2022. Primarily, like other crops tribal farmers used to raise the maize crop also in their own traditional methods. However, due to enhanced reliable profits from maize cultivation farmers shifted their way of cultivation following scientific production packages. Through various extension activities from officials, sponsors and volunteers maize farming by farmers in hilly areas was increased by following suggested scientific

based package of practices. Adoption of improved maize production technology is greatly influenced by agro ecologicalconditions, technology application and marketability (Eunice Cavane, 2011).

In order to design or revalidate the scientific crop cultivation practices the information on adoption level of recommended practices is quite essential to frame the technologies and transfer them to the tribal farmers. A set of recommended practices especially for these agency areas were also developed, but the extension of these advanced production practices were at different stages. Information on technology adoption gaps are to be assessed for modifications or redesigning the package of practices which are well suited at hilly areas of ASR district. Further, various constraints being faced by the farmers in maize cultivation need to be identified,so that based on the identified needs, extension activities can be planned to solve the constraints. The information on adoption levels of recommended cultivation practices including constraints in adoption from farmer responses in spread of technology aspects will definitely aid to formulate an assortment of extension activities to increase the maize crop cultivation with more remuneration to the tribal farmers.

Hence, present study was undertaken to examine the extent of production technologies adopted by the tribal farmers in agency areas of ASR district, Andhra Pradesh to assess the technology spread of maize cultivation practices.

MATERIALS AND METHODS

The survey was conducted in agency mandals of ASR district, Andhra Pradesh during the year 2021-22 by means of exploratory research design methodology. Among the 10 tribal agency mandals of ASR district comprising of 6962 ha area of maize, two mandals *viz.,* Chintapalli and Guden Kotha Veedi Mandal had documented highest area of maize cultivation with 1896 and 1479 ha area, respectively. Hence, the present study was carried out in above two mandals only and from each mandal, two villages were opted and from each opted village 15 farmers were randomly selected, so a total of 60 tribal farmers were chosen for recording their responses through personal interview. A set of 15 critical recommended maize crop production practices from seed to storage were considered for developing an questionnaire to record farmer responses from the university recommended package of practices (Annual ANGRAU Farmer's Almanac, 2021-2022). A personal interview was made for each selected farmer and their responses with regards to adoption levels of recommended crop management practices, constraints in adoption and farmers perceived opinions on maize crop were recorded. The recorded data was subjected to suitable statistical analyses and the results were documented.

RESULTS AND DISCUSSION

The farmer responses with respect to adoption of critical recommended practices in maize crop cultivation and constraints in adopting were recorded and the results are discussed and interpreted herewith.

Adoption of maize crop cultivation technologies

A set of 15 selected recommended practices prepared in an questionnaire was utilised to recorded the farmer responses with respect to levels of adoption and non adoption (Table 1).

The results from the sixty farmer's responses on adoption of maize cultivation practices inferred that among the various recommended practices, selection of suitable varieties / hybrids were adopted by only 35 per cent farmers and majority (65.00%) of farmers are not adopting the practice of selecting suitable varieties/hybrids asmany farmers retain their previous crop (local variety) seed for next season in an opinion of saving the cost incurred on purchasing seed material. Few farmers are interested to purchase high yielding hybrid seeds, available local fares/markets and also from the government agencies (Rythu Barosa Kendras). As reported by Rajesh Singh *et al.*, 2012, hybrids were more adopted due to their superiority in yield output was also evident from this study. If the seed pertaining maize hybrids with high yielding and suitable to the hilly areas were supplied to farmers on subsidy basis and also before the ensuing season, definitely farmers will adopt to cultivate the suitable maize varieties.

Application of farm Yard manure (FYM) at the recommended dose *i.e.*, 10 t ha^{-1} was also not adopted by many farmers (70.00%) even though FYM availability is ample in hilly areas. Farmers (30%) are applying the FYM before sowing but at lower (2-3 tonnes/ha) doses compared to the recommendation. The reason is farmers are unaware of the importance of application of FYM as manure

to improve soil fertility and majority were unaware of the required dosage. Brar *et al*. (2001) confirmed that for getting yield in maize crop FYM @ 10 tones/ ha is required in addition to recommended dose of fertilizers.

The practice of cultivation by making ridges and furrows were also not adopted by majority (86.67%) of tribal farmers, only few farmers (13.33%) are practicing the ridges and furrows method of planting. This is due to fact that, farmers in this area were accustomed to cultivate mixed crops in their available small patch of land. Farmers simply broadcast/sow the maize seeds in rows on levelled field/ land due lack of awareness on significance of adopting ridges and furrow method for maize planting. Mensah *et al*. (2022) confirmed that there was a yield increase of 33.10 per cent in maize sown with ridges and furrows compared to flat planting.

The recommended time of sowing is being followed by majority (68.33%) of tribal farmers, but few farmers were sowing the crop during May month also after receiving first monsoon showers. Regarding seed rate majority (71.67%) farmers adopting the recommended doses, but few farmers who are cultivating in very small size farm plots and as mixed crop were not adopting the recommended seed rate (28.33). Similarly, spacing of 60 cm x 20 cm was not adopted by majority (63.33%) due to staggeredplanting in very small plots. Prophylactic recommended plant protection practices like seed treatment, neem-based sprayings and recommended chemicals werealso not adopted by majority (80.00%) of tribal farmers. The vital reason for the above issue is tribal farmers in agency area were not using any agrochemicals. However, farmers cultivating private hybridsare receiving the treated seeds in packets.

Regarding thinning operation, majority (96.67%) of farmers are adopting the practice as they plant the crop manually by dibbling method. With regards to plant nutritional recommendations of NPK, majority (59.00%) of tribal farmers are not applying any chemical fertilizers. Tribal farming is less input oriented and more of organic method of cultivation and farmers generally never impose fertilizers to enhance the crop growth. Kalhapure *et al.*, 2013 clearly indicated that integrated nutrient management in maize will increasethe productivity with sustainability. Yadav *et al.*, 2007 and Prasad, 2009 reported that tribal farmers apply more FYM.

In relation to weed control practices, majority (45.00%) of farmers were not following suggested chemicals and also critical phases of weed management. The reason might be tribal farming is less input oriented and more of organic method of cultivation where in farmers invest less external inputs like engaging labour for weeding operations. Besides, non-availability of weeding implements and machinery for weed management also is considered as major issue. Neelam and Manisha 2022 also stated that maize yield and weed concentration has a long history of reciprocal correspondence.

The climate in hilly areas is mostly moist with

Table 1. Adoption of maize crop critical recommended practices by Tribal farmers (n=60)

S. No.	Recommended practices	Farmers response			
		Adopted		Notadopted	
		F	%	F	%
1	Selection of suitable varieties / Hybrids	21	35.00	39	65.00
2	Application of 10 tonnes of farm yard manure per hectare	18	30.00	42	70.00
3	Preparation of ridges and furrows	8	13.33	52	86.67
4	Time of sowing (*kharif* June 15th to July 15th)	41	68.33	19	31.67
5	Seed rate/ acre (Hybrid 8kg; sweet corn 4 kg; Pelala (*Desi*) 5 kg)	43	71.67	17	28.33
6	Spacing (60 cm x 20 cm)	22	36.67	38	63.33
7	Seed treatment 3 g Macozeb per kg seed	12	20.00	48	80.00
8	Thinning operation	58	96.67	2	3.33
9	Recommended Dose of Fertilizers (72 N: 24P2O5:20K in *Kharif*)	1	1.67	59	98.33
10	Weed control practices	15	25.00	45	75.00
11	Inter-cultivation operation at 30-35 DAS	10	16.67	50	83.33
12	Inter crops Cultivation with crops like Redgram/ Groundnut/ Greengram/Blackgram/Cowpea/Soya	41	68.33	19	31.67
13	Irrigation at critical stages	14	23.33	46	76.67
14	Pest and disease control measures	8	13.33	52	86.67
15	Drying after harvesting to maintain desired moisture level	12	20.00	48	80.00

low temperatures that favour the weed growth and farmers never attempted the practice of weeding since years together, they simply let the crop grow along with weed on par. Similarly, inter-cultivation operations at 30-35 DAS as recommended were also not adopted by majority (83.33%) tribal farmers. This is due to no control on weed growth, less investment on crop and lack of awareness. Hence, farmer meetings, demonstrations on weed management have to be enhanced in tribal areas to reduce the weed inoculums.

Majority (68.33%) of the tribal farmers cultivating the maize crop along with other intercrops but not at the recommended ratios as suggested. Few farmers cultivate sole crop in small size plots (31.67%). With respect to irrigation practices recommendations adoption, majority (46.00%) of tribal farmers were not adopting due to fact that, the entire area is under rainfed cultivation and few farmers who cultivate on the banks of water spring flow canals were only providing irrigation. Similar results reported by Yadav, *et al*., 2011.

Pest and disease control measures were major for maize cultivation, but majority (86.67%) of farmers were not adopting any recommended management practice. Besides fall army worm maize stem borers also result in yield loss. The reasons for this include traditional and organic way of cultivation, no input intensive cultivation and no agro chemicals usage by farmers. During the survey it was quite astonishing to record that if severe pest incidence like farm army worm was noticed and causing peak level of damage then farmers simply leave the crop but not opting to spray any recommended chemical. Rani *et al*., 2018 in their research trials inferred that the maize stem borer larvae had ranged from 1.2 to 7.8 larvae/plant during the study period and causedan average leaf injury and per cent dead hearts of 23.05 per cent and 19.72 per cent, respectively.

Post-harvest recommended practice of drying for desired moisture level, majority (80.00%) of tribal farmers were not practicing the same. The reasons include, farmers selling as green corns in local weekly fairs, selling by the farmers themselves by boiling or firing on the road sides, not selling as seeds and also more staggered harvesting.

The reasons for not adopting many of the recommended cultivation practices in maize might be lack of awareness and no economical profits due to lack of proper marketing facilities. Therefore, extension activities like training programmes, group discussions and demonstrations are to be properly planned in time and organised to the maize growing tribal farmers in agency.

Constraints in maize crop cultivation

Even though maize cultivation in tribal area had shifted to scientific way from traditional method of cultivation, the crop cultivation has some perceived constraints as tabulated in Table 2. The major constraints documented through farmers perceptions/views were ranked accordingly based on number of farmers perceived.

The major constraints identified include, very less market prices (Rank I), incidence of fall army worm as an outbreak lead entire crop loss at earlier stages (Rank II), no premium prices even though cultivated organically (Rank III), less market surplus forcing farmers to sell locally (Rank IV) and low yields (Rank V).

As the agency area is far off from the urban or metro cities which need transportation, the farmers were selling the fresh produce locally and also no processing and storage facility was available in the area. Whenever fall army worm incidence occurs, farmers were ploughing the land for another crop or letting the land vacant for the next season/year. In the agency area, tribal farmers cultivate the maize crop organically without application of any agro chemicals, still the produce was not fetching any addition premium prices due to lack of organic certification and supply chain market networks. As the tribal farmers yield maximisation aspirations and economic motivation levels were very low,

Table 2. Constraints perceived by the farmers in cultivation of Maize (n=60)

S. No.	Perceived constraint	No of farmers perceived	Rank
1	Very less market prices	58	I
2	Incidence of fall army worm	46	II
3	No premium prices even though cultivated organically	34	IV
4	Less market surplus forcing farmers to sell locally	35	III
5	Low yields	26	V

farmers reap whatever the crop yield they get with optimum or potential yield metrics. A similar finding was reported by Swapnali Goswami *et al*., 2023 that market prices influences adoption. Also reported by Augustine J. Udoh, 2009, it also can be inferred from this study that once the famers are assure of market, their adoption of complete advanced production technology also will improved. Many farmers pre selling the crop at vegetative phase to traders and traders will harvest crop and pay the pre fixed amount to farmers. Some farmers are selling fresh cobs due to more drudgery in processing the crops to sell the seeds and this similar trend was reported by Alka Singh *et al.,* 2010.

Similar studies on knowledge and adoption of *kharif* maize production technology among farmers in Maharashra by Sharda *et al*. (2018) revealed that majority (68.33%) of farmers had medium level of adoption followed by 16.67 and 15.00 per cent respondents had low and high level of adoption levels in recommended practices of maize production technology. Khuvung *et al*. (2022) also studied the same in Nagaland and their findings stated that 69.0, 19.33 and 11.67 per cent responding have moderate, high and low adoption levels for recommended cultivation practise of maize.

CONCLUSION

From the present investigation, it was clear that the major critical cultivation practices for maize crop is not being adopted by the tribal farmers with respect to selection of seed, application of FYM, integrated weed, water, pest and disease management which are the major limiting factors for yield reduction. Incidence of farm army worm, low yields, organic certification and market price related issues are the major constraints faced by the tribal farmers in maize cultivation. Farmers need to be sensitised for yield maximisation through adoption of scientific technologies. Hence, extension activities like training programmes, method and results demonstrations are to be conducted to create awareness among tribal farmers on weed, pest and disease management. Village level seed multiplication or production is to be popularised for maintaining sufficient seed required for sowing in time in larger inclined areas. The identified constraints need to attend through available options like demonstration of scientific cultivation methods, formation of farmer's organisations for more market surplus and linking with urban markets.

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