Original Research Article

A study on extent of adoption of agri waste management practices by the farmers of Medak district of Telangana

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ABSTRACT

Agricultural waste refers to waste produced from agricultural operations, including waste from farms, poultry houses and slaughterhouses. The present study was focused on, to study the extent of adoption of agri waste management practices and its relationship between the profile of the farmers. The Ex-post facto research design was adopted for the study with a sample of 120, covering Medak district of Telangana state. From the analysis, it was found that majority of the farmers (45.80%) fall under the category of medium adoption, followed by low (27.50%) and high (26.70%) adoption categories with regards to the adoption of agri waste management practices. Correlation analysis between extent of adoption of agri waste management practices and profile characteristics of respondents revealed that, information seeking behavior had positive and significant relationship with adoption at one percent level of significance. The variables education, cropping pattern, infrastructure facilities, innovativeness, achievement motivation, training undergone had positive and farming experience had negative significant relationship with adoption at five per cent level of significance. The remaining variables, age, cropping intensity were negatively and farm size, level of aspiration had positively non-significant relationship with extent of adoption of agri waste management practices.

Keywords: Agriwaste, Management practices, Adoption

INTRODUCTION

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Every year India produces around 550 million tonnes of agriculture waste. More than 149 mt of the residue is un-used, within that 90 mt of residue is burned. (www.mnre.gov.in, 2018). Telangana generates about 28.89 million tones of agriculture waste. After meeting the requirements surplus residue available was 6.96 million tonnes, out of which 2.73 million tonnes were burnt. Ministry of Renewable and Energy Resources, estimates that agri-waste can generate more than 18000 million tones of power every year apart from generating green fertilizers to farms (www.mnre.gov.in, 2018).

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Impact of agri waste burning

Burning of agri waste leads to release of soot particles and smoke causing human and animal health problems. It also leads to emission of greenhouse gases namely carbon dioxide, methane and nitrous oxide, causing global warming and loss of plant nutrients from the soil like N, P, K and S. The burning of crop residues is wastage of valuable resources which could be a source of carbon, bio-active compounds, feed and energy for rural households and small industries. Heat generated from the burning of crop residues enhances soil temperature causing death of active beneficial microbial population, though the effect is temporary, as the microbes regenerate after a few days. Repeated burnings in a field, however, diminishes the microbial population permanently resulting in soil hardening & erosion of soil.

Agri waste material from agriculture and allied sectors

Rice generates straw and husk, straw used for compost, mulching material and *insitu* incorporation and animal feed. Husk is used as animal feed and poultry manure. Maize generates stover and green leaves, stover is used for mulching material, compost and animal feed. Green leaves is used for silage making and animal feed. Sorghum generates stubbles used as animal feed. Sugarcane generates trash used as mulching material and compost. Redgram generates stubbles, which is used for compost and fuel. Cotton stalks are used as fuel.

Horticulture and vegetables crop generates stubbles and leaves, which are used for compost and animal feed. Livestock generates dung and urine used for bio-gas, bio-insecticide, compost and dung cake.

Agri waste management advantages

Agri waste management practices integrate principles of crop production, sustainability of soil and environment quality. Agri waste management helps framers to reduce cost on fertilizers and increasing yield of crops. It creates low-skill jobs at local level (vermi-compost). Agri waste conversion reduces waste flow into air and water. It reduces greenhouse gas emissions such as carbon dioxide and nitrous oxide.

Incorporation of agri waste into soil or retention on the surface increases hydraulic conductivity improves water holding capacity and reduce bulk density of soil by modifying soil structure and aggregate stability. It reduces evaporation from the upper strata of soil and helps in increasing crop yield in different cropping systems and climatic situations.

The agri waste act as a reservoir for plant nutrients, prevent leaching of nutrients and reduce the weed infestation. It provides congenial environment for biological N_2 fixation, increase microbial biomass and enhance activities of enzymes such as dehydrogenase and alkaline phosphatase. Increased microbial biomass can enhance nutrient availability in soil.

Agri waste is a serious economic, environmental and social problem and there is a need to analyze different types of waste produced in production, processing and management practices for better utilization of agri waste materials. The use of agriculture waste materials in agricultural operations can reduce waste management problems. Keeping this in view this

study is proposed to establish the level of awareness about agri waste management practices and their utilization in agriculture and allied sectors by the farmers.

METHODOLOGY

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An *Ex-post* facto research design was adopted for the study. The State of Telangana was chosen since the researcher was familiar with local language and culture. Medak (Erstwhile) district of Telangana state was selected purposively for the study as it is

The data from the respondents was collected with the help of an interview schedule. The data collected was analysed and interpretations were drawn based on results. The statistical techniques frequency, percentage, exclusive and inclusive class interval were adopted for analyzing data.

Rogers (1995) defined adoption as a decision to make full use of an innovation as the best course of action available. In this study, extent of adoption operationally defined as 'extent to which the agri waste management practices and agri waste uses were accepted and practically adopted in the field by the respondents.

A schedule was developed with 23 statements comprising various agri waste management practices and agri waste uses. For quantifying the data, each statement was given score of one (1) for non-adoption, two (2) for adoption. The score of all the statements summed up to arrive at a total score of each respondent. The maximum and minimum possible scores to be obtained by the respondents were 80 and 40 respectively. The maximum and minimum obtained scores were 67 and 37. Accordingly the respondents were classified into three groups by using exclusive class interval technique.

S.No.	Category	Class interval
1	Low extent of adoption	37-47
2	Medium extent of adoption	47-57
3	High extent of adoption	57-67

RESULTS AND DISCUSSION

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1. Extent of adoption of agri waste management practices

The data was collected from the respondents on the selected profile characteristics were analysed, interpreted, and accordingly the following results and conclusion were drawn.

The results in the table 1. indicated that majority of the farmers (45.80%) fall under the category of medium adoption, followed by low (27.50%) and high (26.70%) adoption categories with regards to the adoption of agri waste management practices.

Table 1. Distribution of farmers according to their extent of adoption of agri waste management practices. (n=120)

S.No.	Category	Frequency	Percentage
1	Low	33	27.50

2	Medium	55	45.80
3	High	32	26.70
Total		**120**	**100.00**

The medium trend of extent of adoption of agri waste management practices might be due to the fact that majority of the respondents were small farmers with low infrastructure facilities and low level of training received. Other reasons might be waste management practices include additional work and investment, scarcity of labour for the waste management activities and huge volume of crop residue and low returns from the investment on agri waste management.

The government needs to take measures to inculcate team spirit in forming the groups among the farmers to take up community based agri waste management practices. The findings were in line with the results of Mali (2015) and Ansue (2016). In their studies on trash management practices they reported that, majority of the farmers (72.50%) had medium adoption, followed by low (16.67%) and high (10.83%). In a study on impact of integrated sugarcane trash management technology (ISTM) on sugarcane growers revealed that majority (43.33%) of them had not adopted decomposition by application of urea, single super phosphate and cellulolytic microbial culture while (36.67%) of them adopted partially followed by full adoption (20.00%) about trash management after harvest of ratoon crop.

2. Extent of adoption of crop wise agri waste management practices

In addition to the above, an attempt was made to document and assess the crop wise waste maangament practices adopted by the respondents and the details of the study were furnished here under.

2.1 Distribution of farmers according to their extent of adoption of rice crop waste management practices (n=80)

Crop	Waste	Practices /uses	Frequency	Percentage
Rice	Straw	Vermi-compost/compost	06	7.50
		Manure preparation	02	2.50
		Straw board and card board	00	0.00
		Animal feed and bedding material	60	75.00
		Mulching material	04	5.00
		Nursery bedding material	05	6.25
		Insitu incorporation	20	25.00
	Husk and Bran	Poultry litter	01	1.25
		Energy source for brick klin	00	0.00
		Packing material	01	1.25
		Animal feed	50	62.50

It could be observed from the table 2.1 that among different practices of rice straw management 75.00 per cent of farmers adopted animal feed and bedding material, followed by *insitu* incororporation (25.00%), nursery bedding material (6.25%), comopost/vermicompost (7.50%) mulching material (5.00%) and manure preparation (2.50%). The same results were reported by Sindhu (2012) in her study on agriculture waste

utilization in diversified agriculture revealed that among different ways of utilizing paddy straw, the most popular way which was practiced by 55.83 percent of farmers was to use it as animal feed, making animal shed/bedding and storing it for future use. The second most popular way was to sell it which was practiced by 45.83 percent of farmers. Using it for mulching was practiced by 43.33 percent of farmers followed by composting and vermicomposting which was practiced by 31.67 percent of farmers.

It was also observed from the table 2.1 that among different practices of rice husk management 62.50 per cent of farmers adopted animal feed followed by packing material (1.25%) and poultry litter (1.25%).

Table 2.2 Distribution of farmers according to their extent of adoption of sugarcane crop waste management practices (n=80)

Crop	Crop waste	Practices /uses	Frequency	Percentage
Sugarcane	Trash	Compost	08	10.00
		Animal feed (Tops)	06	7.50
		Mulching material	07	8.75

It could be observed from the table 2.2 among different practices sugarcane trash 10.00 per cent farmers adopted compost, followed by mulching material (8.75%) and animal feed (7.50%). The findings were in line with that of Sindhu (2012) in her study on agriculture waste utilization in diversified agriculture revealed that 35.83 percent of farmers feed sugarcane trash to their animals, 16.67 percent of farmers turned it into compost, 5.83 percent of farmers sold it to other farmers for animal feed purpose and only 1.67 percent of farmers used sugarcane trash for mulching purposes.

Table 2.3 Distribution of farmers according to their extent of adoption of maize crop waste management practices (n=60)

Crop? Maize	Crop waste	Practices /uses	Frequency	Percentage
Maize?	Stover	Vermi-compost	08	20.00
		Manure preparation	03	07.50
		Mulching material	02	05.00
		Insitu incorporation	12	30.00
		Animal feed	28	70.00
	Green leaves (sweet corn)	Silage making	01	02.50
		Animal feed	18	45.00

The results in the table 2.3 showed that among different practices of maize stover management 70.00 per cent of the farmers adopted animal feed followed by insitu incorporation (30.00%), vermi compost/compost (20.00%), and mulching material (5.00%) and manure preparation (7.50%). It was also observed from the table 2.3 that, among different practices of maize green leaves management, 45.00 per cent of the farmers adopted animal feed and 2.50 per cent adopted silage making.

Table 2.4 Distribution of farmers according to their extent of adoption of redgram crop waste management practices. (n=30)

Crop	Crop Waste	Practices /uses	Frequency	Percentage
Redgram	Stubbles and husk	Compost	00	0.00
		Animal shelter	02	6.66
		Animal feed (husk)	12	15.96
		Fuel	16	21.28

The results in the table 2.4 revealed that among different ways of managing redgram stubbles 21.28 per cent of farmers used it as fuel followed by animal feed (15.96%), and animal shelter (6.66%).

Table 2.5 Distribution of farmers according to their extent of adoption of cotton crop waste management practices. (n=50)

Crop	Crop waste	Practices /uses	Frequency	Percentage
Cotton	Stalks	Compost	00	0.00
		Fuel	26	52.00
		Mulching material	03	6.00

Rresults of the table 2.5 indicated that among different practices of managing cotton stalks majority of the farmers used it as fuel (52.00) and mulching material (6.00%). Savitha and Ravi (2020) in their study on Extent of Adoption of Recommended Practices of Cotton Cultivation by the Farmers revealed that, only 35.83 per cent of the farmers were aware about the in-situ incorporation of cotton stalks in to the soil and whereas only meagre percent of the farmers (10.00%) were aware about the use of the cotton stalks as boiler fuels by preparing briquette and pellets. It is also evident from the table that, cent percent of the farmers were aware of using the stalks as fuel/fire wood for cooking purpose and use of stalks for preparation of bio enriched compost (20.83%). Further, Sindhu (2012) also reported that, in case of cotton crop 62.50 percent of farmers stored cotton sticks and used for burning in chulha and spoiled fruits and vegetables were turned into compost/vermicompost or fed to animals by 37.5 percent of farmers. Animal dung and urine was used by 7.50 percent of farmers to produce biogas, prepare manure, compost/vermicompost and dung cakes and only 1.67 percent of farmers used urine to prepare bio pesticide.

Table 2.6 Distribution of farmers according to their extent of adoption of vegetable and fruit crops waste management practices. (n=40)

Crop	Crop waste	Practices /uses	Frequency	Percentage
Vegetabl	Damaged fruits	Compost	08	20.00

e and fruit crops	and vegetables	Animal feed	20	50.00
		Nursery bedding material	04	10.00

From the table 2.6 it was revealed that among different practices of managing damaged fruits and vegetables, majority of the farmers adopted it as animal feed (50.00%) followed by compost (20.00%), and nursery bedding material (10.00%). Sindhu (2012) in a study on agriculture waste utilization in diversified agriculture, reported that, in case of spoiled fruits and vegetables were turned into compost/vermicompost or fed to animals by 37.5 percent of farmers. Animal dung and urine was used by 7.50 percent of farmers to produce biogas, prepare manure, compost/vermicompost and dung cakes and only 1.67 percent of farmers used urine to prepare bio pesticide.

Table 2.7 Distribution of farmers according to their extent of adoption of livestock waste management practices. (n=40)

Crop	Waste	Practices /uses	Frequency	Percentage
Live stock	Dung and urine	Biogas	00	0.00
		Vermi composting	06	15.00
		Manure preparation (FYM)	38	95.00
		Bio insecticide	04	10.00
		Dung cake	01	2.50

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The results in the table 2.7 indicated that manure preparation (95.50%) followed by vermi compost (15.00%), bio-insecticide (10.00%) and dung cake (2.50%), were the livestock waste management practices adopted by the farmers. Sindhu (2012) in a study on agriculture waste utilization in diversified agriculture, reported that, animal dung and urine was used by 7.50 percent of farmers to produce biogas, prepare manure, compost/vermicompost and dung cakes and only 1.67 percent of farmers used urine to prepare bio pesticide.

3. Relationship between selected profile characters of the respondents with their extent of adoption

In order to study the relationship between the profile characteristics and extent of adoption of agri waste management practices by the respondents the Coefficient of correlation (r) values were computed and findings were furnished in table 3.1

Table 3.1. Relationship between selected profile characters of the respondents with their extent of adoption (n=120)

S. No.	Profile characteristics	Calculated (r) Value
1.	Age	-0.069NS

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2.	Education	**0.229***
3.	Farm size	**0.172NS**
4.	Farming experience	**-0.229***
5.	Cropping Intensity	**-0.064NS**
6.	Cropping pattern	**0.221***
7.	Infrastructure facilities	**0.190***
8.	Level of aspiration	**0.060 NS**
9.	Innovativeness	**0.182***
10.	Achievement of motivation	**0.188***
11.	Information seeking behaviour	**0.253****
12.	Training undergone	**0.234***

- Significance at 0.01 level;**

*** Significant ant 0.05 level;**

NS Non significant

Age Vs Adoption

From the findings it was evident that age had negative and non significant relationship with adoption of agri waste management. The reason might be as majority of the famers were with middle to old age group and fall under medium adoption of agri waste management practices. The results were in line with that of Onumadu and Osahon (2014) who reported that, age had negative and significant correlation with extent of adoption.

, **Education Vs Adoption**

From the findings it was found that there was a positive and significant relationship between education and dependent variable adoption. It indicates that formal education increases awareness and knowledge about agri waste management and thereby adoption. The results were in line with that of Onumadu and Osahon (2014) who reported that, education had a positive and significant correlation with adoption of improved rice technology. Shashank (2015) and Bhatia (2015) also reported that, education was having highly significant correlation with the extent of adoption practices by the farmers.

Farm size Vs Adoption

From the findings it was found that farm size was positively and non significantly correlated with adoption of agri waste management, which may be attributed to the fact that, majority of respondents were spread under marginal, small and small medium

categories with medium extent of adoption (86.00%). Same results were also reported by Ashok *et al.* (2014) in their study on evaluation of profile characteristics of SRI cultivation farmers in relation to their extent of adoption concluded that non- significant relationship between farm size of paddy farmers and their extent of adoption of SRI technology.

Farming experience Vs Adoption

Farming experience was found to be negatively and significantly correlated with adoption of agri waste management. The reason might be that majority of the farmers were middle aged with higher farming experience. Whereas in a study conducted by Maraddi and Shivakumar (2008) on extent of adoption of sustainable cultivation practices with respect to ratoon management by sugarcane growers revealed that thre was a positive significant relationship between farming experience and adoption of sustainable sugarcane cultivation practices.

Cropping intensity Vs Adoption

Cropping intensity was found to be negatively and non significantly correlated with, adoption of agri waste management. The reason might be most of the farmers in the area were rainfed farmers. The results were in line with Savitha (2009).

Cropping pattern Vs Adoption

Cropping pattern was found to be positively and significantly correlated with, adoption of agri waste management. The reason might be attributed to the fact that more diversification in farming may help farmers to gain more awareness and adoption of agri waste management.

Infrastructure facilities Vs Adoption

Infrastructure facilities was found to be positively and significantly correlated with adoption of agri waste management. The reason might be infrastructure facilities helps the farmers to adopt agri waste management.

Level of aspiration Vs Adoption

Level of aspiration was found to be positively and non significantly correlated with adoption of agri waste management. The reason might be low preference of the farmers to do agri waste management. Uttej (2019) in his study on participation of youth in agriculture and allied sectors found a positive and significant relationship between level of aspiration and adoption. The probable reason might be that high level of aspiration aimed for better goal achievement.

Innovativeness Vs Adoption

Innovativeness was found to be positively and significantly correlated with adoption on agri waste management. The reason might be that innovative farmers are always ready to accept and adopt agri waste management practices. Veenitha (2015) in her research

on critical study on the adoption of homestead technologies revealed that innovativeness had positive and non significant relation with adoption level of respondents

Achievement motivation Vs Adoption

Achievement motivation was found to be positively and significantly correlated with adoption of agri waste management. The reason might be that, achievement motivation encourages the farmer to adopt the waste management practices for excellence in farming. The results were in support of the findings of Taman Kohistani (2018), in his study on adoption of production recommendations of maize observed positive and significant relation between achievement motivation and extent of adoption of recommended practices by the maize farmers.

Information seeking behavior Vs Adoption

Information seeking behavior was found to be positively and significantly correlated with, adoption of agri waste management. The reason behind this was that the exposure to different information sources helps to gain more knowledge and understanding about agri waste management practices which results in adoption of agri waste management. Veenitha (2015) in her research on critical study on the adoption of homestead technologies revealed that information source utilization was positively significant and relation with adoption level of respondents

Training undergone Vs Adoption

Training undergone was found to be positively and significantly correlated with adoption of agri waste management. The reason might be that, training imparts knowledge and skills required for taking up agri waste management. The results were in consent with that of Murali *et al.* (2015), who revealed in their study on adoption and impact of eco-friendly conservation practices that training undergone by the farmers was found to have positively contributed to the adoption of eco-friendly conservation practices. The findings of the study were also supported by Sikandar (2015) whose study on influence of socio-demographic factors in adopting organic farming practices reported that training seems to be more influential factor in adopting organic farming.

Conclusion:

The medium trend of extent of adoption of agri waste management practices might be due to the fact that majority of the respondents were small farmers with low infrastructure facilities and low level of training received. Other reasons might be waste management practices include additional work and investment, scarcity of labour for the waste management activities and huge volume of crop residue and low returns from the investment on agri waste management. Among the profile characteristics, information seeking behavior had positive and significant relationship with adoption at one percent level of significance. The variables education, cropping pattern, infrastructure facilities, innovativeness, achievement motivation, training undergone had positive and farming experience had negative significant relationship with adoption at five per cent level of

significance. The remaining variables, age, cropping intensity were negatively and farm size, level of aspiration had positively non-significant relationship with extent of adoption of agri waste management practices.

The government needs to take measures to inculcate team spirit in forming the groups among the farmers to take up community based agri waste management practices.

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