



ISSN: 0975-833X

## RESEARCH ARTICLE

### STRATEGIES OF AGRICULTURAL WASTE MANAGEMENT FOR BETTER EMPLOYMENT AND ENVIRONMENT

\*Nitu Sindhu, P. Seharawat, S. and Malik, J. S.

Department of Extension Education, CCS Haryana Agricultural University, Hisar-125001, India

#### ARTICLE INFO

##### Article History:

Received 05<sup>th</sup> September, 2015  
Received in revised form  
18<sup>th</sup> October, 2015  
Accepted 07<sup>th</sup> November, 2015  
Published online 30<sup>th</sup> December, 2015

##### Key words:

Crop Wastes,  
Waste management strategies  
Environment.

#### ABSTRACT

There are requirements for the application and management of agricultural waste on farms. However, the primary reason behind managing agricultural waste is to make good sense both environmentally and economically. This paper will highlight strategies that can be adopted in the agricultural waste management so that the farmers become aware and take full advantage of the various possibilities of plant waste recycling and further utilization for increasing economic. This paper includes wastes generated from crops like paddy, wheat, sugarcane, mustard and cotton. It is very important to fully exploit various methods of utilizing agricultural wastes. The result shows that majority of the farmers had very high level of awareness regarding the management of waste of crops like paddy, wheat, mustard, cotton and sugarcane. It was noticed that farmers knew about almost all the applications of crop wastes. It was also noticed that in spite of high percentage of awareness the farmers failed to take full advantage of the wastes on their farm. Thus there was need to suggest some waste management strategies for all the important crops grown in Haryana. After analyzing what all different ways the crop wastes can be used waste management strategies for paddy, wheat, cotton, mustard and sugarcane were developed. These strategies should be implemented on the farms so that farmers can take full advantage of various possibilities of managing the waste generated on their farm and earn more money. Systematic utilization of agricultural waste also helps to improve environmental conditions by reducing pollution caused by disposal of astronomic agricultural waste.

Copyright © 2015 Nitu Sindhu et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Citation:** Nitu Sindhu, P. Seharawat, S. and Malik, J. S. 2015. "Strategies of Agricultural waste Management for better employment and Environment", *International Journal of Current Research*, 7, (12), 24604-24608.

#### INTRODUCTION

In the 21st century, most of agricultural operations today use the same basic waste treatment processes that have been used since the beginning of farming was to let it drain to a septic pond, live upwind, and forget about it. The agricultural wastes are simply dumped on ground or burned. The emissions from wheat crop residues in Punjab are relatively low compared to paddy crop. It is inferred that incorporation of agricultural residues into the soil in rice-wheat systems is highly sustainable and eco-friendly, rather than burning the crop residues as discussed by Badrinath (Badarinath *et al.*, 2006). There are requirements for the application and management of agricultural waste on farms. However, the primary reason behind managing agricultural waste is to make good sense both environmentally and economically. This paper will highlight strategies that could be adopted in the agricultural waste management so that the farmers become aware and take full advantage of the various possibilities of plant waste recycling and further utilization for economic purpose.

This paper includes wastes generated from crops like paddy, wheat, sugarcane, mustard and cotton. It is very important to fully exploit various methods of utilizing agricultural wastes. The most common crop of our country is paddy and paddy plant provides paddy grains and straw. We can get whole rice, broken rice, rice bran, rice husk, rice flour, puffed rice, rice wine, starch, papad etc from rice. Rice bran is used to make rice bran oil, deoiled cake, cattle feed, wax, tar and other things. Rice husk is used to make rice husk cement, husk board, furfural, silica and black ash for bricks. From the paddy straw we can make straw board, straw paper, straw bags, handicraft products, shampoo, packing material etc.

In the same way whole banana plant is useful in feed, food, pharmaceutical, packaging and many other industrial application. Whole plant is used in some social and religious ceremonies; the peel is used as animal feed, for extraction of pectin and lignin, and also as base material for alcohol production. Fibre from pseudo stem can be used for making biodegradable ropes. Pith can be used as color absorber and even for food. Its leaves can be used for feed, wrapping material and thatching material. Apart from this the plant has many pharmaceutical uses as concluded by Mohapatra

\*Corresponding author: Nitu Sindhu, P.

Department of Extension Education, CCS Haryana Agricultural University, Hisar-125001, India

(Mohapatra *et al.*, 2010). Similarly we can have wheat utilization system, sugarcane utilization system, cotton utilization system, pigeon pea utilization system etc. In other words we can have immense possibilities of agricultural waste management systems and technologies. One such strategy of waste management can be noted in the study conducted by Hosseini. To reduce the waste and increase production of wheat. Ministry of Agriculture started a program to hire university graduated students in field of agriculture to work as advisors to train farmers. This methods led to an increase in production and reduction of wastes in the Wheat self Sufficiency Plan (WSP). Keeping in mind how important agricultural waste management can be for farmers, our country, environment and economy this study highlights the awareness among farmers and try to develop suitable strategies of agricultural waste management by studying the awareness of farmers regarding waste management of different crops and developing suitable strategies of waste management for wheat, paddy, sugarcane, cotton and mustard.

## MATERIAL AND METHODS

### Locale of the study

The present study was conducted in Haryana state. Two districts Hisar and Sonapat were selected, purposively, because multiple cropping systems are practiced in these districts. From each district, two blocks were selected randomly. Thus four blocks were selected and three villages were selected from each block and from each village, ten farmers were selected. Therefore a total of one hundred twenty farmers were interviewed for the study

### Construction of interview schedule

Considering the scope, objectives and variables under the study, a detailed and simple structured interview schedule was constructed. The most relevant, unambiguous and practical questions were included in order to gather adequate and precise information. Wheat, paddy, mustard, sugarcane, cotton were the crops taken under the study.

### Collection of data

For assessing the awareness about waste management data was collected by conducting personal interview with the respondents at their farm/home.

### Analysis of data and interpretation of results

The information collected through the responses of the respondents, were suitably coded, tabulated and analyzed to draw meaningful inferences by using statistical tools such as frequency distribution, percentages, weighted mean scores and rank order.

## RESULTS AND DISCUSSION

### Awareness regarding the management of paddy waste

100 percent of farmers were aware that wheat and paddy straw can be used as animal feed and fuel, 97.50 percent of farmers

were aware that wheat and paddy straw can be used to make compost, vermicompost, manure and packing material. Awareness about its use for making poultry litter and animal bedding was 96.67 percent followed by 85.00 percent awareness regarding its use as mulching material, 81.67 percent about making straw board, 75.83 percent about making paper, cardboard and disposable food containers, 58.33 percent about making dry flowers, 52.50 for making briquettes, 51.67 percent for making planting bed, 45.83 percent for making baskets, equal percentage of awareness was observed regarding its use for making carpets and foot mats. Awareness about making hats and bags was least i.e. 29.17 percent.

### Rice husk

All the farmers were aware that rice husk can be used as animal feed and soil conditioner, followed by 97.50 percent as poultry litter, 92.50 percent as a source of energy and 85.00 percent of farmers as mulching material. Awareness about making briquettes was 52.50 percent, activated carbon was 29.17 percent, fungicide was 25.00 percent, bioplastics was 24.17 percent and alcohol was 19.17 percent. None of the farmers were aware of its use for making tar and using it in biogas plant for generating biogas.

### Rice bran

About 80.00 percent of farmers were aware that edible oil can be extracted from rice bran. Awareness about extraction of wax was comparatively very less i.e. 22.5 percent. (Kornkanok *et al.*, 2011) conducted a study on the separation and determination of wax content using 100-phenogel column and stated that rice bran wax is a byproduct of rice bran refinery which can be used for various other purposes.

### Awareness regarding the management of wheat waste

100 percent of farmers were aware that wheat and paddy straw can be used as animal feed and fuel, 97.50 percent of farmers were aware that wheat and paddy straw can be used to make compost, vermicompost, manure and packing material. Awareness about its use for making poultry litter and animal bedding was 96.67 percent followed by 85.00 percent awareness regarding its use as mulching material, 81.67 percent about making straw board, 75.83 percent about making paper, cardboard and disposable food containers, 58.33 percent about making dry flowers, 52.50 for making briquettes, 51.67 percent for making planting bed, 45.83 percent for making baskets, equal percentage of awareness was observed regarding its use for making carpets and foot mats.

Awareness about making hats and bags was least i.e. 29.17 percent. Rekha *et al.*, 2012 reported that wheat straw and mustard cake were the major indigenous feed mixture given to all cows. Wheat straw, paddy straw and weeds were the major dry fodders, where as bamboo leaves were used as due green leaves by majority of respondents. Yadav *et al.*, 2002 reported that animals were fed unnecessarily by the respondents. According to the scientists' wheat bran, cotton seeds or churi may meet the concentrate requirements. Wheat straw can alone meet the bulk requirement of the animals and under the green fodder grass only can serve the purpose.

## Awareness regarding the management of sugarcane waste Sugarcane bagasse

Hundred percent farmers were aware that bagasse can be used for making animal feed, alcohol and fuel. Awareness about making vinegar and beverages was 82.50 percent followed by 75.83 percent awareness about making paper, cardboard and particle board. Awareness about making briquettes was 52.50 percent, using it for planting bed was 31.67 percent, about making wax was 14.00 percent, about making table ware was 00.83 percent and no awareness was seen about generation of biogas from sugarcane bagasse. Awareness about growing green fodder on bagasse was 31.66 percent, making wax was 21.67 percent, extracting cellulose was 14.17 percent, and for making tableware were 00.83 percent and no one aware about generation of biogas from bagasse.

**Sugarcane trash:** 100 percent farmers were aware that trash can be used as animal feed, fuel and for mulching purpose (85.00 percent), making paper, cardboard, and particle board (75.83), and making briquettes (52.50 percent).

## Awareness regarding the management of cotton waste

**Cotton sticks:** all the farmers were aware about the use of cotton sticks as fuel, 95.83 percent of farmers were aware that decorative items like dry flowers can be made from it. Awareness about chipping of cotton sticks was 81.67, particle board making, paper and cardboard making was 75.83 percent, followed by 52.50 percent awareness about briquetting, 50.00 percent was about composting of sticks, 5.83 percent about growing mushroom on composted cotton sticks and no one was aware about the use of cotton sticks for generating biogas.

## Awareness regarding the management of mustard waste

**Mustard sticks and husk:** all the farmers were aware about the use of mustard sticks as a source of energy in brick making and electricity generation process. Awareness about making compost and vermicompost was 97.50 percent, making paper, cardboard and particle board was 75.83 percent, briquettes was 52.50 percent, mulching was 13.33 and its use as animal feed was 12.50 percent

## Strategies for Waste Management

### Strategies for paddy and wheat waste management

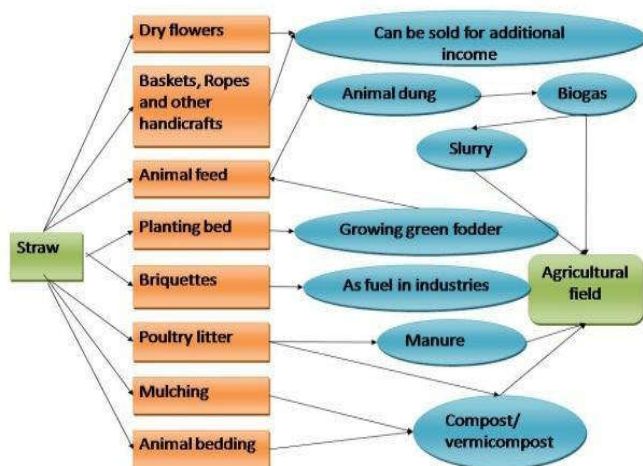


Figure1 explains the various possible methods of using paddy

and wheat straw. It is a chain process starting with its use as animal, animal waste like dung can be used for generating biogas and biogas slurry which comes out of biogas plant can be used as manure. Straw can also be used to make planting bed to grow green fodder; the straw along with green fodder can be chopped and fed to animals. Wheat straw can be used as poultry litter which can further be used as manure or converted into compost. If wheat straw is used as animal bedding, after its use it can be composted and turned into manure. Another important use of straw is to make briquettes, which is an excellent fuel. It can be used either for domestic purpose or for industrial purpose. This waste management system is completely sustainable as every waste material is fully utilized without creating any environmental pollution. Garay, 2009 reported that Particle board can be made with crop residues mixed with wood from *pinus radit*, all the crop residues like wheat straw, corn and rice straw are suitable for making particle boards but best results were with wheat straw and corn stubbles.

## Sugarcane waste management system

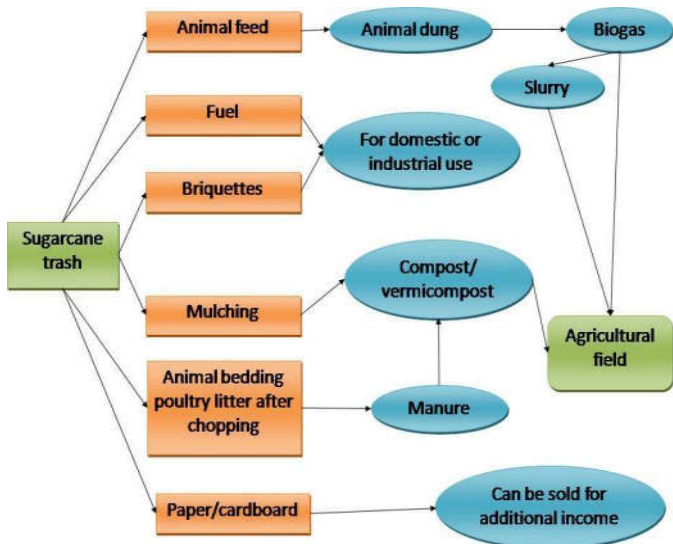
Following are the sugarcane crop wastes management modalities suggested.

### Sugarcane bagasse

Sugarcane bagasse management system. It is also a chain process starting from its use as planting bed to grow vegetables like chilli, capsicum, tomato, okra, etc. fruits like strawberry can also be grown on it. Beside this green fodder can be grown on it, chopped along with bagasse and then fed to milch animals this will help to increase the milk yield. It can be used to make alcohol for fuel purpose. Making briquettes is another important use of bagasse and it can also be used in making vinegar and other beverages that are useful products and fetch high prices in market. Bagasse is an excellent mulching material which can further be used for composting and making manure, its use as animal bedding and poultry litter is also possible, this litter can be used for composting, manure or fed to biogas plant for generation of biogas, which is an excellent fuel. Use of bagasse in making paper is quite common. Handmade paper industry can be developed on village level which will not only utilize waste but also provide employment to rural population.

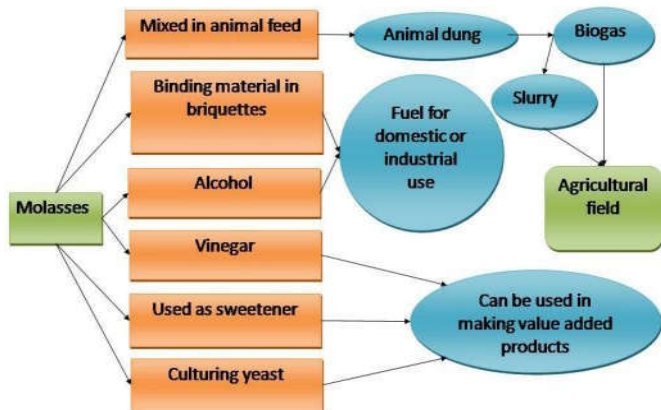
### Sugarcane trash

Sugarcane trash is usually fed to animals by all the farmers. Figure 3 shows other possible ways of utilizing sugarcane trash. Sugarcane trash can be used as source of energy in sugar industries or any other industry. It can also be used to make briquettes, which can further be used as fuel. Sugarcane trash has been used as mulching material since ages, after it has been used for mulching it can be converted into compost and mushrooms can be grown on it. Another possible use is using it for animal bedding and poultry litter. The animal bedding and poultry can again be used as manure or fed to biogas plant in order to generate biogas. It is also advisable to use it in making cardboard and paper.



**Molasses**

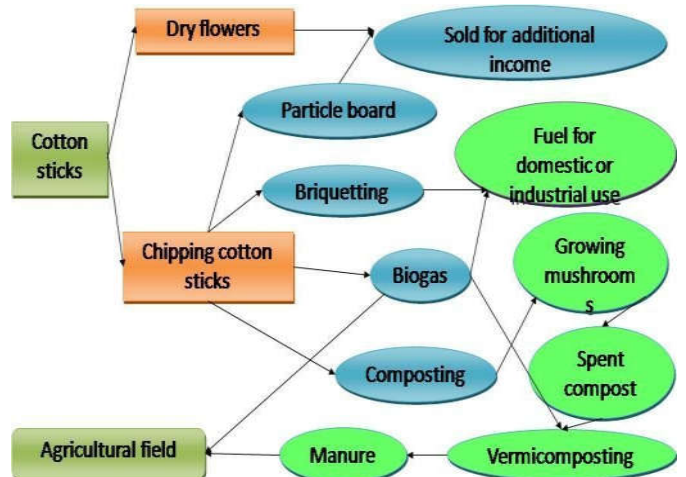
Molasses is a great sweetener and a good source of calcium and iron. Figure 4 shows the waste management system of molasses. It can be mixed in animal feed as a nutrient supplement. Alcohol, vinegar and other beverages can also be made by using molasses. It can also be used in culturing yeast. Most important use of molasses is its use as binding material to make briquettes. Anastassiadis *et al.*, 2008 conducted a study on the production of citric acids and stated that many inexpensive by-products and residues of the agro-industry (e.g. molasses, glycerin etc.) can be economically utilized as substrates in the production of citric acid. There are also health beneficial effects of apple vinegar such as anti-bacterial and antioxidant, blood pressure reducing activity, prevention from cardiovascular diseases (Ozturk *et al.*, 2009).



**Cotton waste management system**

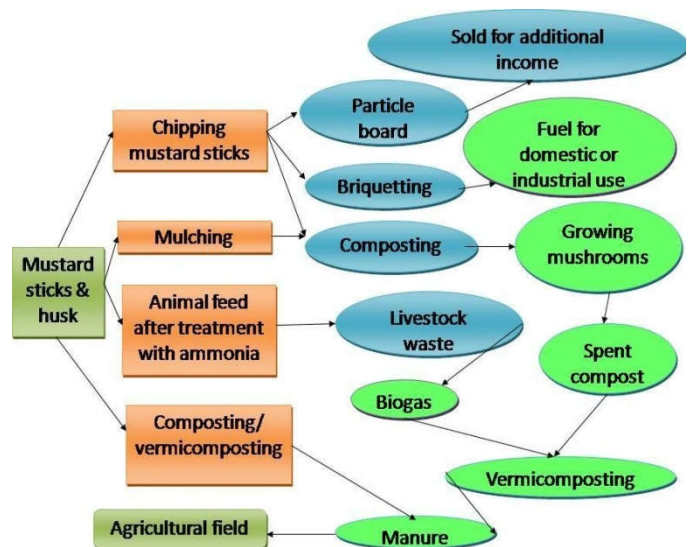
Other possible ways of cotton waste utilization is described in figure 5. Cotton sticks can be used to make decorative items like dry flowers that can fetch high prices in market. Cotton sticks can be chipped and then used to make particle board which is further used for making furniture. Chipped cotton sticks can also be used to make briquettes and to make compost. Compost made from cotton sticks is best for mushroom cultivation. (Mehta *et al.*, 2008) reported that all the respondents in hisar and fathabad district were using cotton

sticks and cow dung cake as a working fuel in traditional chulha. All the respondents were making the cow dung cake daily which is not healthy for human as well as environment. Researchers have shown that biogas can be generated from waste cotton sticks thus it can be fed to biogas plant. Isci and Demirer [6] conducted an experiment on biogas production potential from cotton wastes and reported that cotton waste can be treated anaerobically and are a good source of biogas. Approximately 65, 86 and 78 ml CH<sub>4</sub> were produced in 23 days from 1 g of cotton stalks, cotton seed hull and cotton oil cake in the presence of basal medium (BM), respectively.



**Mustard waste management system**

Figure 6 shows other possible ways of utilizing mustard sticks. Mustard sticks can be easily chipped and used for making briquettes and particleboard. It can also be used to make animal feed after physical, chemical or biological treatment. By treating chemically with ammonia its digestibility can be increased and mixed with green fodder and fed to animals. Mustard sticks can also be converted into compost for growing mushrooms or can be used as planting bed.



Butnar *et al.*, 2010 reported that the overall assessment includes the cultivation and collection of biomass, its transport and the processes of its energy transformation. The results showed that,

the transportation of biomass from the field to the power plant is an important stage that has to be carefully planned in order to get the maximum amount of electricity with a minimum environmental impact. Compared to electricity from natural gas or the Spanish electricity mix, the electricity obtained from biomass is more impacting

### Conclusion

The study revealed that there was very high percentage of awareness among the farmers regarding the management of wheat, paddy, cotton, mustard and sugarcane waste but it was also noticed that the farmers did not utilize the waste fully. After analyzing what all different ways the crop wastes can be used, waste management strategies for paddy, wheat, cotton, mustard and sugarcane were developed. These strategies should be implemented on the farms so that farmers can take full advantage of various possibilities of managing the waste generated on their farm and earn more money and create better employment opportunities for the rural youth. Systematic utilization of agricultural waste also helps to improve environmental conditions by reducing pollution caused by disposal of astronomic agricultural waste.

### REFERENCES

- Anastassiadis, S., Morgunov, I.G., Kamzolova S.V and Finogenova T.V. 2008. A study on the citric acid production. *Recent Patents on Biotechnology* 2 (2):107-123.
- Badarinath, K.V.S., Kiran, R. K. and Prasad, Krishan, 2006. A study on Agriculture crop residue burning in the Indo - Gangetic Plains – A study using IRS-P6 AWiFS satellite data. *CURRENT SCIENCE*, VOL. 91(8)
- Butnar, Isabela, Rodrigo, J., Carles, M., and Castells, F. 2010. A study on the Life-cycle assessment of electricity from biomass: Case studies of two biocrops in Spain. *Biomass and Bioenergy*, 34(12):1780-1788.
- Garay, Rose, Marie, MacDonald, Francisco; Acevedo, Maria, Luisa; Calderon, Beatriz and Araya, J. E. 2009. A study on particleboard making with crop residues mixed with wood from *pinus radiata*. *BioResource*, 4(4):1396-1408
- Hosseini, S.J.F., Birjandi, V. and Mirdamadi, S.M. 2010. A study on the perception of farm advisors about the role of wheat self sufficiency plan (WSP) in reducing wheat waste in Iran. *Research Journal of Biological Sciences*, 5(6):435-438.
- Isci, A. and Demirer, 2006. A study on biogas production potential from cotton wastes. *Renewable Energy*, 32(5):750-757.
- Kornkanok, Arysusk, Chumsantea, Salisa, Sombatsuwan, piraporn, Lilitchan, supatra, and Krisnangkura, Kanit. 2011. A study on the Separation and Determination of Wax Content Using 100-Phenogel Column. *Journal of the American Oil Chemist's Society*, 88(10):1497-1501.
- Mehta, M, Sangwan, V. and Malaviya, A. 2002. A study on fuel use pattern in rural Haryana. *Journal of Family Ecology*, 4(1&2):54-59
- Mohapatra, Debandya; Mishra, Sabyasachi, Sutar, Namrata, 2010. Banana and its by-product utilisation: an overview. *Journal of Scientific and Industrial Research*, Vol.69(05):323-329
- Ozturk, A., Ozdemir, Y., Goksel, Z. 2009. A study on Apple vinegar and its therapeutic effects. *Tarim Bilimleri Arastirma Dergisi.*, 2(1):155-158.
- Rekha, Anju, Dogra, S and Verma, S.K. 2002. Indegenous technological knowledge of rural women for cow feeding practices. *Journal of Family Ecology*, 4(1&2):216-219.
- Yadav, Monika and Rani, Seema. 2001. A study on Acceptance of scientifically validated indigenous animal husbandry feeding practice by rural women. *Journal of Family Ecology*, 3(2):31-35.

\*\*\*\*\*