TRANSPORTATION AND STORAGE PROBLEMS OF RICE AND WHEAT STRAW OF INDIAN FARMERS

Dr. Ali Hasan

Abstract-In this article, author suggests a technique to solve the transportation, storage and increased pollution problem after burning the rice and wheat straw by Indian farmers. Using these technique farmers can store their rice and wheat straw in about one tenth space of the store using this mechanism and can sale it at proper times. In this way the transportation problem of wheat straw, which is a national problem can be solved. Also for getting higher prices, farmers would not burn it in their fields. The crops waste can be converted to wealth thereby giving jobs for many unemployed youths.

Keywords - wheat straw, transportation, storage and pollution.

I. INTRODUCTION

Wheat producing crop is the main crop in India. We are second in world rank after China in wheat production. There are multiple uses of these crop residues in India like cattle feed, fuel for residential cooking and industry, power generation, paper mills, wine production, etc. Farmers need a small amount this wheat and rice straw for feeding their animals as the animals used for cropping purpose is the thing of the past. Very good machinery facilities are available to them. So they have to sell it in very cheap due to shortage of space for storing purpose, to the intermediaries, who in turn sell it at higher prices to industries at proper time. There are many productive methods for straw management such as composting [1], recycling in soil [2], etc. But it takes time and farmers need vacant fields for the next crop. There are machines to convert this waste into briquettes by compressing it. The inventor Oladeji [3] demonstrated briquettes production from rice husk and corncob. Sengar [4] used cashew nut, grass and rice husk as biomass. Olorunnisola [5] showed the fuel wood, twigs and charcoal as the major source of renewable energy. Amith et. al[6] worked on the low cost briquetting machine. Paolo et. al[7] presented their work related to transportation processes and environmental pollution. Marco [8] worked for modeling and mapping of environment pollution. Meroni et. al [9] showed the stress induced due to environmental pollution. Laini et. al. [10] presented the contamination and dispersion pattern of pollution. Pérez et. al[11] described the influence of climatic factors while Bläsing et. al[12] seen reduced soil black carbon deposition in river valleys. Rajtor et. al[13] presented his paper on Prospects for arbuscular mycorrhizal fungi and Bläsing et. al[14] studied fingerprint of inland navigation vessels. Cai et. al.[15] studied Improved source apportionment and Barbafieri et.al.[16] investigated arsenic and lead combined mobilization and their removal. Yan et. al. [17] studied a combined process coupling phytoremediation and in situ flushing for removal of arsenic in contaminated soil. Lasko et. al.[18] worked on improved rice residue burning emissions estimates. Wang et. al. [19] studied the greenhouse gases emission from biomass burning while Johnston et. al. [20] worked on arsenic mobilization. Pathak et. al. carried out a project related to inventory of green house gas emission from agriculture.

II. OPEN FIELD BURNING

Due to shortage of storing space and transportation problems in terms of higher costs, road blockages and no entry in cities, farmers are compelled to burn it in the fields itself as shown in Figure-1. This is a national problem. In the present, especially in the winter season, it becomes the
international problem. Burning of straw is pollutes the atmosphere which is harmful to human, soil as well as environmental health. The main reason for open field burning is greater mechanization in crop harvesting and insufficient learning of its economic usage. Farmers get hardly 15 -20 days gap between the two crops. Farmers have the urgency to clear the fields in this short duration of time for next crop. Also there is a higher labour cost in what straw collection, so open field burning is an easy way for them to clear the fields.

III. ADVERSE EFFECT OF BURNING OF OPEN FIELD BURNING

As a result of open fields burning, we get harmful gases like methane and nitrous oxide, carbon monoxide, carbon dioxide, hydrocarbons and atmospheric pollutants like particulates, oxides of sulphur and nitrogen as shown in Figure-2. One tonne of wheat straw on burning releases 60 kg CO, 1460 kg CO2, 199 kg ash and 2 kg SO2 [21]. Wheat paddy burning creates smoke which in turn gives several health related issues. Sometimes, fire may spread dangerously and may become out of control giving the huge damages. Also there are accidents on roads and road blockages due to poor visibility. The soil health adversely affected by this process of straw burning.

IV. TRANSPORTATION AND STORAGE OF WHEAT STRAW

It is a well-known national problem that all of us face on the roads due to the overturning of vehicles carrying wheat straw and road jam/ block (see Figure-3). The farmers cannot store it due to lack of space as it has less mass but large volume and as a result, they have to sell dispose off it on at very cheap price (see Figure-4). If we design such a mechanism that can reduce the straw volume by
1/10 then the farmers will be able to store it in small space and can sale it in the market during its demand. By reducing the straw volume, we will be able to transport it using less number of vehicles and vehicle overturning / roads jams/ road blockage problems will not be there.

V. REMEDIES

We should design and fabricate such a mechanism which can compress the wheat straw/ rich husk up to 1/10 to 1/20 to its original volume. The main condition is that the mechanism/ machine must be available at comparatively at cheaper cost to every farmer. This mechanism will work with the wheat grain cleaning machine itself. Although, wheat straw /rice husk has binding strength in itself but additional binders may be used to compress the original volume. The binder may be selected carefully and the wheat straw should not lose its value upon compression. In this way the farmers can store their product in a small space and can sell at a higher rate at proper time. Now the transportation cost will also be reduced in the ratio of reduced volume of straw. The wheat straw can be converted into briquettes to be used in house or industries. Compacted Straw pellets have a lesser volume and higher density as compared to straw. These pellets easily stored and transported at a very cheap cost. In a study, we used UTM (Universal Testing Machine) to apply a compressive load with the help of a designed plunger. The wheat straw filled in a cylinder of the plunger diameter and applied a compressive load of 10 tonne and observed that the original volume can be reduced by 1/8th
to its original volume without using any binder. After mixing a small amount of binder (molasses), the same volume may be reduced to 1/10th to its original volume. Further study needs to be done to reach on final concluding remarks. It means that after compressing we can save 10 times store space/transportation facility and as a result 10 times saving in transportation/storage cost. At the end use of the product (wheat straw) would give its original value for that particular application. The whole process may be mechanized having a cylinder and a piston. After complete filling of the cylinder with straw, the sliding plunger is moved to compress it and then back to its initial position. After opening the cylinder, we get a compacted straw pallet of the desired shape and size as shown in Figure-5.

VI. CONCLUSION

Briquetting of paddy straw is a good option to manage crops residues at a cheaper cost so that every farmer/villager can use this technique. If the crops residue leftover the roads/ in the fields for decomposition, it will create health issues. It will be a source of income of the middle class farmer. We has to design the device mechanically for the application in agriculture filed at the lowest price to reduce the volume of wheat straw/rice husk to a considerable value. This will be better solution of environment pollution otherwise the days are not far when every human will use an oxygen cylinder with him/her for breathing purpose. We can use different binders to reduce the wheat straw volume further. By using this compacting machine, farmers can get fair price of his effort. They can store the wheat straw in a smaller space and can sell it at higher prices at the time of demand. As a result, the back bone of India will become strong and society will get healthier pollution free environment

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