

Amal S. Owis

Prof. of Biochemistry, Cotton Chemistry and Textile Fibers Dep.,  
Cotton Research Institute, Agricultural Research Center, Giza,  
Egypt

## Introduction

Cotton is the most important strategic crops in Egypt and plays a major role in the Egyptian national economy, because it is an important source of raw material in cotton textile industry as well as being a source for the production of cottonseed oil and used in animal feeding.

# I consider cotton as a magic plant

# So we should not thinking only for the cotton linter (white gold) .

# But cotton has magic economic parts , such as **cotton stalks** , I called it the "yellow gold".

# Cotton stalks provide additional outcome for the cotton farmer for supply of raw materials to more than 1000 industrial products.



### Some facts :

Cotton stalks produced as a byproduct of post-harvest with large quantities of thousands of tons annually, causing many **problems** such as:

1. Farmer storing it on the roofs of them houses, **causing fires** when the wind coming,

2. or burning it which causing significant **environmental problems**, which lead to spread of many human diseases,

3. on the other hand, cotton **stalks contain eggs and larvae of pink boll worm**, which stay until cultivating of the next crop, causing serious damage on the cotton crop



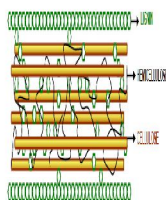
## Cotton stalks Utilization

# The yield of biomass from cotton crop varies from variety to other.

# However, on an average about 3 tones of cotton stalks are obtained from one Acer of land.

# The cotton plant stalk contains about 68% holocellulose, 45-46 % Cellulose , 26 % lignin and 4-6 % ash and other biomass.

• ( this is new source of the money for the farmer and national income as I will explain later)



So this presentation will show us how nowadays I am thinking regarding :

- \* How by indirect ways encourage the cotton famers to cultivate cotton under the big challenges for unstable price of the cotton linter .
- \* Serve for the environment
- \* Increase the national income.

All of that will done by transforming the cotton stalks to some useful and economical products such as:

- # Organic fertilizer (compost) ,
- # Animal feed (silage) ,
- # Wood ,
- # Cellulose derivatives
- # and Charcoal, ....etc,



# CONVERTING COTTON STALKS TO COMPOST

## Advantage of recycle cotton stalks to organic fertilizer (compost):

1. Giving new area in marketing process of cotton products.
2. Reducing import of mineral fertilizer to about 50 % (saving foreign currency).
3. In terms of environmental benefits; prevent the burn of cotton stalks emission more than two million ton CO<sub>2</sub> annually.
4. Solving the problem of unemployment, especially for non-qualified persons. Because converting cotton stalks to compost provide approximately 20 jobs does not require high efficiency for most of them.



Success story

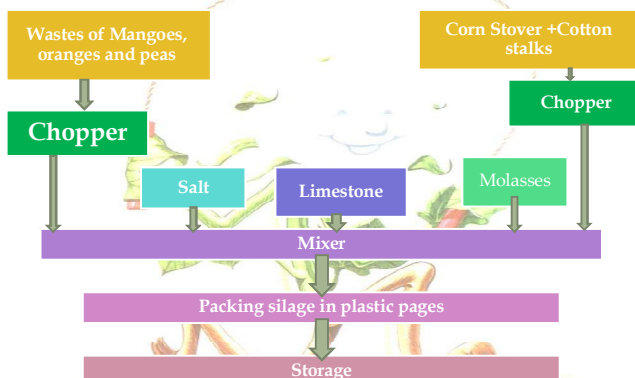
# CONVERTING COTTON STALKS TO SILAGE ( ANIMAL FEED)

## Advantage of recycle cotton stalks to silage:

1. Reducing import from meat and animal feed for shortage of agricultural area and green animal feed.
2. Giving new area in marketing process of cotton products.
3. Friendly for the environment.
4. Solving the problem of unemployment, especially for non-qualified persons.



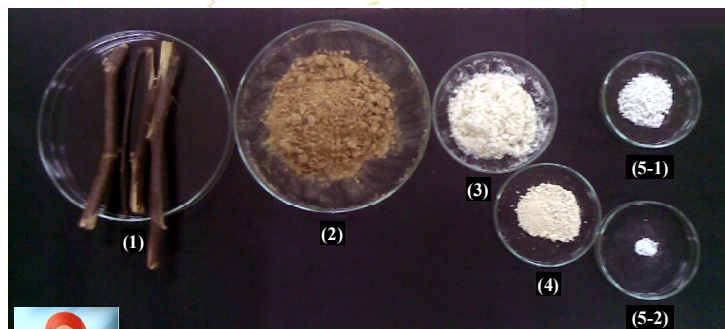
## Stages of silage Production



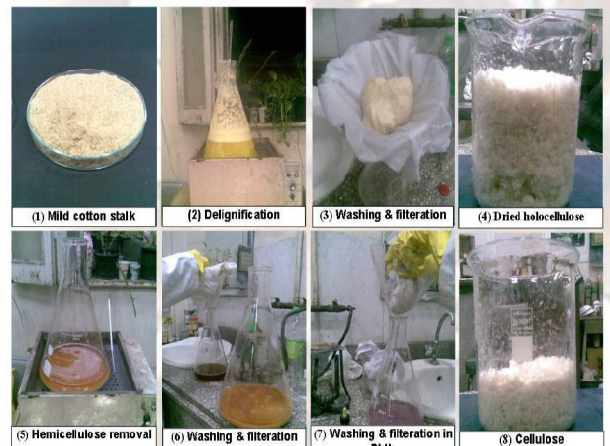
# CONVERTING OF COTTON STALKS TO CELLULOSE AND CELLULOSE DERIVATIVES



## CONVERTING OF COTTON STALKS TO CELLULOSE AND CELLULOSE DERIVATIVES



## II. Cellulose extraction from cotton stalk:



## CONVERTING OF COTTON STALKS TO 5-Hydroxymethylfurfural and its Derivatives



Recycling of cotton stalks to 5-hydroxymethylfurfural and its Derivatives to economic products such as:

1. Biofuel, and green solvent.

2. manufacturing of polyurethanes and polyesters.

3. antifungal agent, and an intermediate of pharmaceuticals

4. producing Corrosion inhibition products .

5. Removal of kidney stones products .



## CONVERTING COTTON STALKS TO WOOD



### Recycling the cotton stalks to wood (particle board):

• Depending upon the variety and the crop condition the stalks are from 1 to 1.30 m long and their diameter just above the ground may vary from 1 to 2.5 cm.

• The properties of the particle board are comparable to those made from wood particles .

• Recycling the cotton stalks for particle board manufacture will provide additional outcome for the cotton farmer for supply of raw material to the particle board industry.

• And in addition help in mitigation of the green house gas emission from burning them in open air and indirectly by reducing the demand on forest resources .

## Stages of Wood Production

- **Chopping** cotton stalks with chopper
- **Mixing** chopped cotton stalks with glue ( mechanical mixer) • Glue
- **Compressing** ( Using hydraulic piston to form the panels)
- Panels stacked vertically to **dry** and leaving spaces for ventilation
- End product
- Storage

## Converting cotton stalks to Charcoal or activated carbon



## Properties of charcoal compared with the animal Charcoal

1. Charcoal has a better ability to remove colors.
2. Re-activate it is very easy .
3. After refining sugar the consumer can be used charcoal as fuel on the contrary of animal charcoal .



## Uses of cotton stalks charcoal :

1. Food industries use it for refining sugar cane and soft drinks....etc .
2. Masks industries use it for its role in catching poisonous gases.
3. Purifying water for drinking.
4. As well as purification of air pollution at some factories.



Sugar refinery

### ▣ Using charcoal from cotton stalks in refining sugar cane in Egypt

- Sugar factories in Egypt and in most developing countries still use animal charcoal in purifying sugar from the colors ,
- But now we test using the stalks charcoal for that, because the price of imported charcoal is so high, the price of one ton is more than 10 thousand dollars.

## Conclusion

# Creation of an effective supply chain system for provision of the cotton stalks as a raw material usable for more than 1000 industry will enable the industrial utilization of cotton stalks.

# The development of entrepreneurship in the supply chain of the cotton stalks as industrially usable raw material will play a crucial role in nurturing this venture.

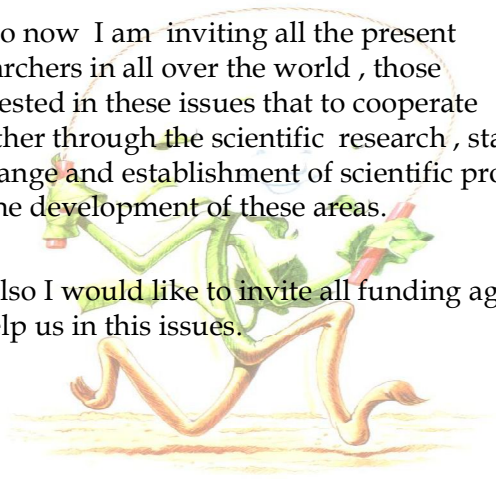
# Use of cotton stalks for industrial proposes instead of burning may help in obtain carbon credits also and would thus help the farmer in obtaining additional income.

# Serve of the environment as a general.



▣ # So now I am inviting all the present researchers in all over the world , those interested in these issues that to cooperate together through the scientific research , staff exchange and establishment of scientific projects for the development of these areas.

▣ # Also I would like to invite all funding agents to help us in this issues.



# Thank you for all



Prof. Dr. Amal Saber Owis  
Former director for CRI  
[amalsaber@yahoo.com](mailto:amalsaber@yahoo.com)

