DESIGN-OPTIMISATION AND DEVELOPMENT OF ROBUST
MULTI PURPOSE CUTTING MACHINE FOR
AGRICULTURAL USAGE

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COLLEGE : V.S.M. INSTITUTE OF TECHNOLOGY, NIPPANI
BRANCH : DEPARTMENT OF MECHANICAL ENGINEERING
GUIDE : Prof. MAHADEV N. HARKUDE
STUDENTS : Mr. AKASH A. DESHPANDE
            Mr. AKSHAY R. KAMATE
            Mr. BALAGOUDA B. MALAGOUDANAVAR
            Mr. ABDULBASIT M. BAGBAN

Keywords:
Straw cutter, Groundnut Stripper, Paddy Stripper, Sugarcane Seed Cutting.

Introduction:
Agriculture is one of the most significant sectors of the Indian Economy. Agriculture is the only means of living for almost two thirds of the workers in India. The agriculture sector of India has occupied 43% of India’s geographical area, and is contributing 16.1% of India’s GDP. In India agriculture has been facing serious challenges like scarcity of agricultural labour, not only in peak working seasons but also in normal time. This is mainly for increased non-farm job opportunities having higher wage, migration of labour force to cities and low status of agricultural labours in the society. On the other hand cultivable land is decreasing due to urbanization. Agricultural mechanization is one way to overcome this problem. Fortunately, there are many opportunities to move forward with agricultural mechanization.

Sugarcane:
India is one of the largest sugarcane producers in the world, producing around 300 million tons of cane per annum. For plantation of sugarcane, the sugarcane seed has to be planted in wet soil. This sugarcane seed is nothing but part of sugarcane. Sugarcane has approximately 15-18 seeds. In traditional way farmers use to cut whole sugarcane in 5-6 parts, in such a way that each part having 2-3 seeds. Then those cut parts are planted in soil. About 4 million sugarcane farmers and a large number of agricultural labours are involved in sugarcane cultivation and auxiliary activities, constituting 7.5% of the rural labour force.

Straw:
Straw is remaining part of Jowar and Maize plant, after removal of corn part. Farmer use to cut this straw and use this cut parts as a food for pet animals like buffalos, ox, cows etc. Initially this straw is of around 150-200 cm. This should be cut into small pieces.

GROUNDNUT:
Groundnut is one of the important agriculture products in India. Farmer use to separate groundnuts from its plants by manually. This require more man power as 20-30 labours per acre, and also this is time consuming operation. A single groundnut plant contains 20 to 30 groundnuts.
Paddy:

Rice is one of the favorite foods of India. Paddy is the initial stage of it. Farmers removing this paddy from paddy plant called as paddy stripping, and this is done by several methods. Most of the time farmers use to remove paddy from its plant by manually. Also there are several machines available for paddy stripping.

A. Sugarcane Seed  
B. Straw of Maize Plant  
C. Groundnut Plant  
D. Paddy of wheat plant

Objective:

1) Semi automated machine.  
2) To perform more than one operation at a time.  
3) To achieve high volume mass production of agriculture products.  
4) To reduce most of processing time.  
5) To reduce labour cost.  
6) To overcome the problem of labour crises.

Methodology:

Modification Of The Identified Problem  
↓  
Literature Survey  
↓  
Selection Of New Mechanism And Materials  
↓  
Design And Calculations  
↓  
Fabrication Process  
↓  
Assembly Of Unit  
↓  
Finalizing The Project

Fig. 10.1 Methodology Chart
Conclusion:
In robust multipurpose cutting machine, four individual operations are combined. By using this machine the problem of labour crises can be reduced, because it makes the process faster and labour required for operate the machine is also less. The top concentration of our design is the cost and operational easy in case of small farm units.

It performs more than one operation, so processing time can be saved. In the sugarcane seed cutting operation wastage of sugarcane can be controlled easily and cut seeds are easy to sowing. In the groundnut stripping operation instead of 10-20 labours per Acre only two labours can separate the groundnuts from plant by using this machine. In the paddy stripping operation while separating paddy from plant wastage will be more in traditional methods. By using this machine wastage will be less and instead of 5-6 labours only 2 labours can do the same operations in minimum time. If this machine is used by maximum number of farmers definitely farmer can overcome the labour crises problem, which reduces the labours cost and process become faster and easy. By providing a balanced mechanism for various objectives in a single machine signifies the technological improvement in agricultural sector. Single equipment performing more objectives with flexibility in changing the operation will motivate the farmers.

Future Scope:
In future we can make this machine more human comfort by using advance sensors and microcontroller device and automatic with less cost. The future of this machine is very wide. In market separate machines are available for individual operation and also these machines are very costlier. Some more number of operations can be combined with same machine. And some of the operations can be done by manually handling. By using worm gears automatic feeding of straw can be done in straw cutting operation. And along with groundnut stripping we can make the groundnuts into Nuts with less cost and less time.