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Cost Economics of Cotton Uprooter cum Shredder

K. Raju Yadav[1]*, A. Ashok Kumar[1], K. Madhusudhana Reddy[2], J. Gitanjali[3] and Yallappa D.[3]

[1]*Department of Farm Machinery and Power Engineering, ANGRAU University, Bapatla, Andhra Pradesh 522101, India
[2]Department of Agricultural Engineering, ANGRAU University, Guntur District, Bapatla, Andhra Pradesh 522 101, India
[3]Department of Farm Machinery and Power Engineering, AEC & RI, TNAU, Coimbatore 641 003, T.N., India

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ABSTRACT

Cotton is the most important fibre and cash crop and it plays a significant part in the country's industrial and agricultural economy. One of the most difficult for cotton producers is the need to clear the ground and stalk odd cotton plants after final harvesting. In India, manual uprooting or cutting of the plant stalks is followed, which is highly labour intensive, time consuming and costly and needs about 50-65-man hr. ha^{-1}. Cotton uprooter cum shredder performs both shredding and uprooting operations in two different rows simultaneously in a single operation. The developed machine's performance was evaluated in a cotton crop. The cost has been estimated using standard procedures, and an assessment of labour savings has been made to govern the economic feasibility of the machines. The break-even point (BEP) for cotton stalk uprooter cum shredder was evaluated on a time and area basis and was found to be 480 h and 158.4 ha, respectively. The cotton stalk uprooter cum shredder has a payback period of one year when calculated on a time basis. When compared to the united cost of existing uprooting and shredding methods, the cotton stalk uprooter cum shredder can save up to 49.1% in uprooting and shredding costs.

***Key words** : Economy, Intensive, Break-Even point, Payback Period.*

Introduction

In India, the farmers are still using manual power operations like planting, sowing, weeding, picking and uprooting. The Machinery or the implements used for the purpose are efficient and time-consuming. The adaption of machinery in farm operations islagging because of various factors, i.e., non-availability of highly efficient machinery, high cost of machinery small landholding of farmers and lack of technical knowledge and skills to operate complex farm machinery.

One of the most difficult in cotton producers is the need to clear the ground to draw odd cotton plants after final harvesting. At present, only manual uprooting or cutting of the plant stalks is followed, which is highly labour continuous, time-consuming and costly. In some area's farmers used repeated heavily disking to cut the cotton stalks and cover in soil. The incorporation of stalks into soil ensures napped decomposition. The all-clear protection occurs of the stalks occurs napped when they are placed 10 cm below the soil. Moreover, making the cotton stalks into small pieces also increases the note of all compositions. The cotton stalks uprooting is done to favour the tillage, sowing and intercultural operations easy for the next crop. If the stalks remain in the soil, it will obstruct the operations like sowing,

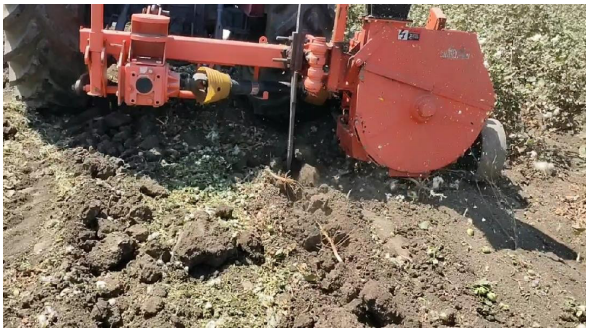
weeding, and irrigation during the next season. They will deduct the influence of the crop yields.

The various methods being procured to uproot cotton plant stalks are hand pulling, manually pull-

ing tools, tractor pulling of stalks. The problem associated with manual pulling is time-consuming, laborious and involves high cost. In India, hand pulling and manual hand pulling tools are labour intensive and need about 50-65-man hr. ha^{-1}. High demand of labour during peak renods. Manually pulling high labour-intensive, time-consuming and involves high cost. These can be abridged only through the outlawing of mechanical cotton uprooter cvm shredding. The objective of this study was to condense human drudgery as well as the cost to the farmers.

Materials and Methods

Cotton stalk uprooter was designed and developed to reduce human interventions in the removal of stalks by hand, which involves more force and takes more time to eradicate stalks in an odd posture for both men and women. As a result, the human bending posture requires more time and is tedious, requiring more labour and time, which leads to a complete lack of labour availability. The stalks in the field were cut and shredded with a shredder while the residual stalks in the soil were removed with an uprooter. Both were operating in two different rows



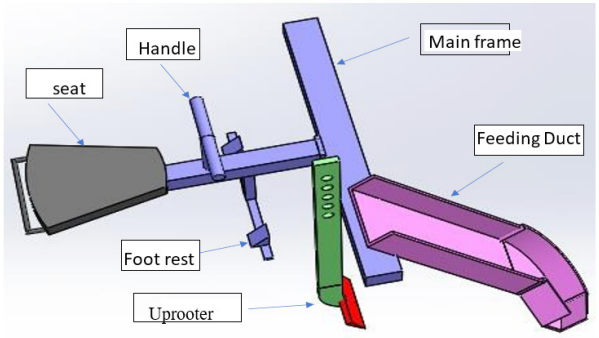


Fig. 1. Cotton uprooter cum shredder

at the same time. The uprooter's uprooting efficiency, draught force, and wheel slip were all measured.

Cost Economics

The total cost of a field operation includes charges for the implement, the tractor power utilized and wages for labour. Costs of Implement and tractor are divided into two types as fixed cost and operating cost or variable cost. The total cost of operation of tractor-operated cotton stalk uprooter cum shredder was determined by adding fixed cost and variablecost.

Fixed cost

Fixed cost is the total cost of depreciation, interest on the investment, tax, insurance and housing. The straight-line method was used for calculating the depreciation of the machine.

Depreciation

Depreciation is the lessening of the value of a machine with time. Among the various systems employed in calculating depreciation, the straight-line method is the most practical and most common. It is the simplest method and gives a constant annual charge for depreciation throughout the life of the machine. The following equation is used for the calculation of the depreciation. The salvage value in the below equation is assumed to equal10% of the initial cost.

$$\text{Depreciation } (D.h^{-1}) = \frac{C-S}{L \times H}$$

Where(1)

D = Depreciation cost. $Year^{-1}$, Rs/-

C = Purchase price of the machine, Rs/-

S = Salvage value of the machine, Rs/-

L = Useful life of the machine, years

H = Working hours per year

Interest on investment

Interest in the investment in a farm machine is a legitimate cost since money spent in buying a machine cannot be used for other productive enterprises. The following equation is used for calculating the interest.

$$\text{Interest} = \frac{C+S}{2} \times \frac{i}{H} \quad .. (2)$$

Where

I = Interest per hour, Rs.h^{-1}

i = rate of Interest, %

Insurance, taxes and housing costs

These are minor items in the total fixed costs but should be included. There are wide variations among states with respect to property taxes. This amount was paid at the time of purchase and this may be distributed over the life of the developed machine. It depends on the type of machine/implement. Generally, each one was taken 1% of the initial cost of the implement.

Variable cost

Variable costs are directly related to the utilized amount and include repairs and maintenance, fuel and lubricants and wages for manpower. The various costs are calculated as discussed below.

Repairs and maintenance

The repairing and maintenance costs were taken as 10% of the procurement price of the tractor.

Fuel cost

Tractor- operated cotton stalk uprooter cum shredder with 45 hp. For calculating the cost of fuel per hour, F.C to operate and present the cost of the fuel per litre were considered.

Lubrication costs

The cost of lubricants and engine oils was estimated as 30 % of fuel consumption cost.

Wages and labour charges

The existing rates for tractor driver was taken to calculate wages. The 8 working hours per day was considered.

The total cost of operation of the implement per hour was calculated by using the above-mentioned procedure is summarized below.

Fixed cost = Depreciation + Interest + Insurance + Taxes + Housing

Variable cost = Fuel + Lubricant + Repair and maintenance + wages

Total cost of operation = Fixed Cost + Variable Cost.

Determination of Breakeven point

Breakeven analysis, also renowned as a point of no profit loss, has been used to determine the amount of time necessary to meet all costs or expenditures at a given price. The breakeven point is the point at which the lines of total cost and custom hiring cost intersect. The farmer benefited from owning a machine if the breakeven point value is less than the annual utility time of the machinery. If the breakeven point value is greater than the annual utility time of machinery, owning machinery might indeed lead to a loss to the farmer; in this particular circumstance, custom hiring is the better option for him.

Payback period

It is the time required for an investment to generate sufficient cash to cover its initial cost. The payback period was calculated by using the formula below. For farm machinery, it is normally expressed in years.

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Aveage net annual benefit}} \quad .. (3)$$

Where,

Average net annual benefit, = (CHC – TOP) × Annual utility

CHC = Custom hiring charge, Rs. h^{-1} = (25% over total cost of operation Rs. h^{-1})

TOP = Total operating cost, Rs. h^{-1}

Results and Discussion

The cost economics of the developed cotton stalk uprooter cum shredder was done taking the cost of the prime mover and considering an annual use of cotton stalk uprooter cum shredder 480 h. $year^{-1}$ the cost of operation per ha is Rs. 2550 Rs. ha^{-1}. The cost of operation was comparatively very less when compared with the traditional cotton stalk uprooting cum shredding.

As far as the operational cost is concerned the developed machine requires less cost than the traditional method. This was considered mainly because

the developed machine reduced labour considerably during uprooting and shredding. While manual uprooting requires 10 to 15 labour per ha. Therefore, manual application method the cost of operation is 5000 Rs. ha^{-1}.

Cost economics of tractor

Life and annual utility of the tractor were considered as 10 years and 1000 hours per year respectively. Fixed cost and variable costs of a tractor were 135Rs.h^{-1} and 461.5 Rs.h^{-1}. The operating cost of tractor obtained was 716.5 Rs. h^{-1}.

Cost economics of cotton stalk uprooter cum shredder

Life and annual utility of the machine were taken as 10 years and 480 hours per year respectively. Fixed cost and variable costs of the machine were calculated as 58.1 Rs. h^{-1} and 68.9 Rs. h^{-1}. The operating cost of the machine obtained was 125Rs. h^{-1}.

The combined cost of tractor and machinery

Total fixed cost is the summation of fixed costs of tractor and machinery which is obtained as 91,728 Rs. Year^{-1}. The total variable cost of the combination was calculated as 531.4 Rs. h^{-1}. The total operating cost of tractor and machinery combined was calculated as 841.5 Rs. h^{-1}. But in existing manual methods it requires 5000 Rs. ha^{-1} for completion of shredding and Uprooting, with that of tractor-drawn uprooter cum Shredder it requires 2550 Rs.ha^{-1}.

Cost operation of cotton stalk uprooter cumsh redder

$$= \frac{\text{Operation Cost of the machine per hour}}{\text{Field capacity of the machine}} \quad .. \quad (4)$$

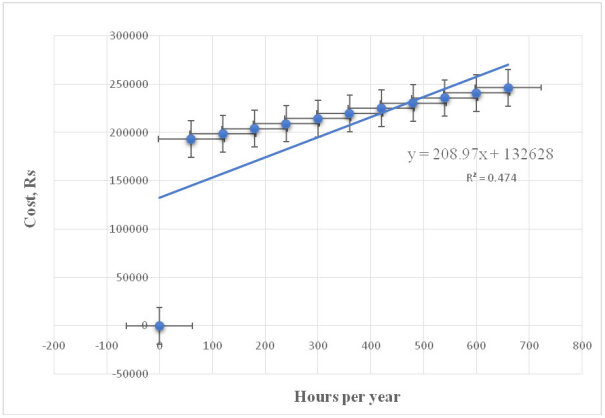


Fig. 2. Break-Even Point for tractor and machine

$$= \frac{841.5}{0.33} = 2550 \text{ Rs. ha}^{-1}.$$

Breakeven point Calculation

The Break-even point was determined by plotting the total cost (annual operating cost) and custom hiring cost against the usage of the machine. The location of the intersecting point finished by the two cost lines gives the number of hours of work essential for break even. Below the picture "y = 208.97x + 132628" is the line of the total operating cost and "y = 208.97x" is the line of total custom hiring cost (existing manual cost). In both, the line "x" indicates the number of effective hours of machinery. From the below, graphical illustrationthe breakeven point of the machine was calculated as 480 hours per year. Break-even point of owning the machine Fixed, variable and operating costs of the tractor.

Conclusion

Two operations of shredding and uprooting were

Table 1. Cost operation of tractor-operated cotton stalk uprooter cum shredder

SI.No	Tractor and cotton uprooter cum shredder	Tractor	Uprooter
1.	Depreciation (D.h^{-1})	67.5	35.6
2.	Interest (R.h^{-1})	49.5	17.4
3.	Insurance, taxes and housing (Rs)	18	3.1
4.	**(A)Total fixed cost**	**135**	**56.1**
5.	Repair and maintenance (Rs)	1.5	6.4
6.	Fuel consumption lit. h^{-1}	6	62.5
7.	Fuel cost per hour = fuel consumption lit. h^{-1} × cost of fuel Rs. h^{-1}	480	
8.	Driver cost per hour	100	68.9
9.	**(B) Variable cost per hour**	**461.5**	125
10.	i. Cost of operation of tractor per hour = fixed cost per hour (A) + variable cost per hour (B)	**716.5**	841.5

done simultaneously in different rows improving the uprooting efficiency which reduces the drudgery, time and cost to the farmers The cost economics of cotton stalk uprooter cum shredder was found to be 2550 Rs. ha^{-1} is less when compared with traditional cotton stalk uprooting was 5000 Rs. ha^{-1}. The cost savings for the farmers was found to be 49.1% which is very beneficial for the farmer, saving time and reducing the drudgery of the farmers.

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