PROJECT PRESENTATION

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Manual Drawn Engine Operated Soybean Harvester

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INTRODUCTION

Soybean production in World

As you can see, Brazil is the leading producer of soybeans in the world, followed by the United States, Argentina, China, and India. These five countries account for over 80% of global soybean production.

Year	US	Brazil	Argentina	China	India
2021-2022	119.884	144	52	19	11.2
2020-2021	112.549	137	47	19.6	10.45
2019-2020	96.667	128.5	48.8	18.1	9.3
2018-2019	120.515	119.7	55.3	15.967	10.93
2017-2018	120.065	123.4	37.8	15.283	8.35

Soybean production in India

The major soybean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, Gujarat and Telangana. Madhya Pradesh accounts for about 45% of the total soybean production in India.

Soybean production for the year 2022-23

State	Production (in lakh tonnes)
Madhya Pradesh	55.84
Maharashtra	46.01
Rajasthan	10.62
Karnataka	3.82
Gujarat	2.24
Telangana	1.51

Importance and Need of Study

Labor shortage during harvesting in regions experiencing rapid industrialization and urban migration.

Intercropping soybean with pigeon pea for crop security in the dryland region of Vidarbha.

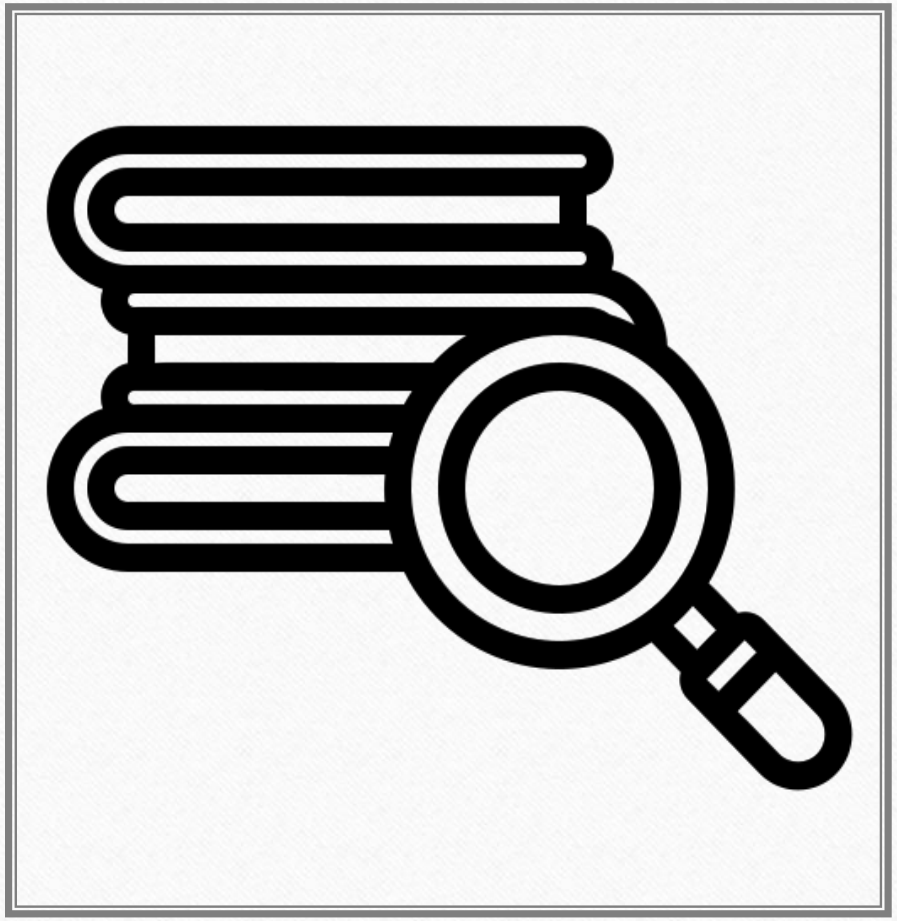
Limitations of using combine harvesters in small soybean fields and intercropping regions.

Dependence on manual labor for harvesting intercrop soybean, leading to crop losses and damage during peak seasons and untimely rainfall.

Need for a smaller, more efficient, and cost-effective soybean harvester suitable for intercropping.

Objective:

REVIEW OF LITERATURE



Patel *et al.,* (2018) evaluated the performance of the reaper binder for Wheat crop with respect to field capacity, field efficiency, fuel consumption, harvesting losses, labour requirement and cost of operation and compared with manual harvesting method. The effective field capacity and field efficiency of the machine was found to be 0.17 ha h^{-1} and 78.49 per cent at an average operating speed of 2.55 km h^{-1}. The cost of harvesting with reaper binder and manual harvesting was found to be Rs. 3235.11 and Rs. 5550 per hectare respectively. The losses were found to be 25.42 kg ha^{-1}. The observed fuel consumption was 1.12 L ha^{-1} and the cost of harvesting was low as compared to manual harvesting. The feedback of machine operation was collected by some farmer's at the time of harvesting and the performance of the reaper binder at the farm was satisfactory.

Materials and Method

- Study of crop parameter
- Performance evaluation
- Cost estimation

Study of crop parameter:	Height of plant, cm
	Row to row spacing, cm
	Plant to plant spacing, cm
	Minimum pod height from ground surface, cm
	Stem diameter, cm
	Plant population, per m^2
	Crop (grain and stem) moisture content, %
	Stubble height, cm

The crop parameters are necessary to study before the performance evaluation of any machine.

Performance evaluation of manual drawn engine operated soybean harvester

The performance of manual drawn engine operated soybean harvester was evaluated by taking the following test

- Laboratory test
- Field test

Laboratory test

The manual drawn engine operated soybean harvester was parked on the firm horizontal ground surface and various dimension of machine were measured.

Field test

- Speed of operation
- Effective field capacity
- Theoretical field capacity
- Field efficiency
- Cutting efficiency
- Fuel consumption
- Harvesting losses
- Shattering losses
- Uncut losses

Field before testing of manual drawn engine operated soybean harvester

Cost of operation

The total cost of operation per hour consists of fixed & variable operating cost

A. Fixed cost includes

- Depreciation
- Interest on the capital

B. Variable operating cost includes

- Fuel cost
- Lubrication cost
- Repair and maintenance cost
- Wages of operator per hour

C. Total cost = A+B

Results and Discussion

- Soybean crop specification
- Filed Performance Result
- Cost estimation

Soybean crop specification

Sr. No.	Parameters	Details
1	Height of plant, cm	56.62
2	Row to row spacing, cm	45
3	Plant to plant spacing, cm	3.9
4	Minimum pod height from ground surface, cm	3.6
5	Stem diameter, cm	0.59
6	Plant population, per m^2	40
7	Grain moisture content, %	9.8
8	Stem moisture content, %	29.61
9	Stubble height, cm	9.4

Filed Performance Result

Field trials were carried out on total area of 0.005 hectare at the field of Highway Block, Central Research Station, Dr. PDKV, Akola.

Sr. No	Parameters	Result
1	Area covered, ha	0.005
2	Time required to cover area, hr	6.7
3	Effective working width, cm	90
4	Forward speed, km/hr	1.92
5	Theoretical field capacity, ha/hr	0.172
6	Effective field capacity, ha/hr	0.149
7	Field efficiency, %	86.6
8	Fuel consumption, lit/hr	0.460
9	Cutting efficiency (%)	97.83

Measuring stem

diameter and height of cut

Harvesting Losses

Sr. no	Parameters	Avg
1	Yield from $1m^2$, gm	130.08
2	Shattering losses, gm	7.65
3	Uncut losses, gm	16.69
4	Harvesting losses, g/m^2	24.34
5	Shattering losses, %	5.88
6	Uncut losses, %	12.83
7	Harvesting losses, %	18.71

Field after testing of manual drawn engine operated soybean harvester

Cost Economics of manual drawn engine operated soybean harvester

The total cost of operation for harvesting soybean crop with manual drawn engine operated soybean harvester was observed that

Parameters	Manual drawn engine operated soybean harvester	Manual harvesting
Cost of operation Rs/hr	158	540
Cost of operation Rs/ha	888	3000

Summary and Conclusion

After conducting the field test of manual drawn engine operated soybean harvester following conclusion are drawn.

1) It harvests the soybean crop minimum uncut losses.
2) It windrowed the cut crop in the adjacent empty space between the crop row which makes it easy for collection.
3) In case of harvest losses, it was found that the uncut losses were more as the height of pod are more close to ground. This was due to found that plant population is more.
4) There is 70% saving inn cost of harvesting over manual harvesting method. However to collect the harvested soybean, manual labor is required.

Thank You…