

MANUALLY OPERATED SUNFLOWER THRESHER



A SUCCESS STORY



ALL INDIA COORDINATED RESEARCH PROJECT ON
FARM IMPLEMENTS AND MACHINERY
CENTRAL INSTITUTE OF AGRICULTURAL ENGINEERING
Nabi Bagh, Berasia Road, Bhopal - 462 038, India

Extension Bulletin No. CIAE/FIM/2000/9

**MANUALLY OPERATED
SUNFLOWER THRESHER**

| | | |
|---|---|---|
| Year | : | 2000 |
| Published by | : | COORDINATING CELL AICRP ON FARM IMPLEMENTS AND MACHINERY CENTRAL INSTITUTE OF AGRICULTURAL ENGINEERING Nabi Bagh, Berasia Road Bhopal-462 038, India |
| Design & Development: | | RV Jadhav JS Deshpande MPKV, Pune |
| Compilation & Editing : | | KL Majumdar MM Pandey CIAE, Bhopal |
| Art, Cartography & Proof Reading : | | Yashwant Bhokardankar SS Mandvikar CIAE, Bhopal |
| Word Processing : | | Zackaria V John CIAE, Bhopal |
| Reprography : | | Radheyshyam Kushwaha CIAE, Bhopal |

Introduction

Sunflower is an important oilseed crop mainly grown in Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Uttar Pradesh and Madhya Pradesh, covering an area of one million ha. Out of this, Maharashtra alone accounts for 0.5 million ha. Sunflower seed contains 45 to 50% oil which has a good flavour and high nutritive value. Nearly 80% of the sunflower growers in Maharashtra are medium and small farmers. They need a small size sunflower thresher. The traditional manual sunflower threshing methods are expensive besides being tedious and time consuming. The small farmers cannot afford to buy costly high capacity machine only for sunflower threshing. A low cost, efficient machine for sunflower threshing will therefore have a wide scope in Maharashtra. Considering these, a manually operated sunflower thresher was developed at Mahatma Phule Krishi Vidyapeeth, Rahuri during 1987-90.

Traditional Sunflower Threshing Practices

The traditional practice followed by small farmers for sunflower threshing are:

- i) Beating sun-dried heads with stick,
- ii) Rubbing the heads face to face against each other,
- iii) Rubbing the heads on bricks, stones, wire mesh, coir cots etc.
- iv) Trampling the heads under bullock-feet or tractor
- v) Using conventional wheat threshers where grain damage is high and cleaning is a problem.

These practices are tedious, cumbersome and expensive.

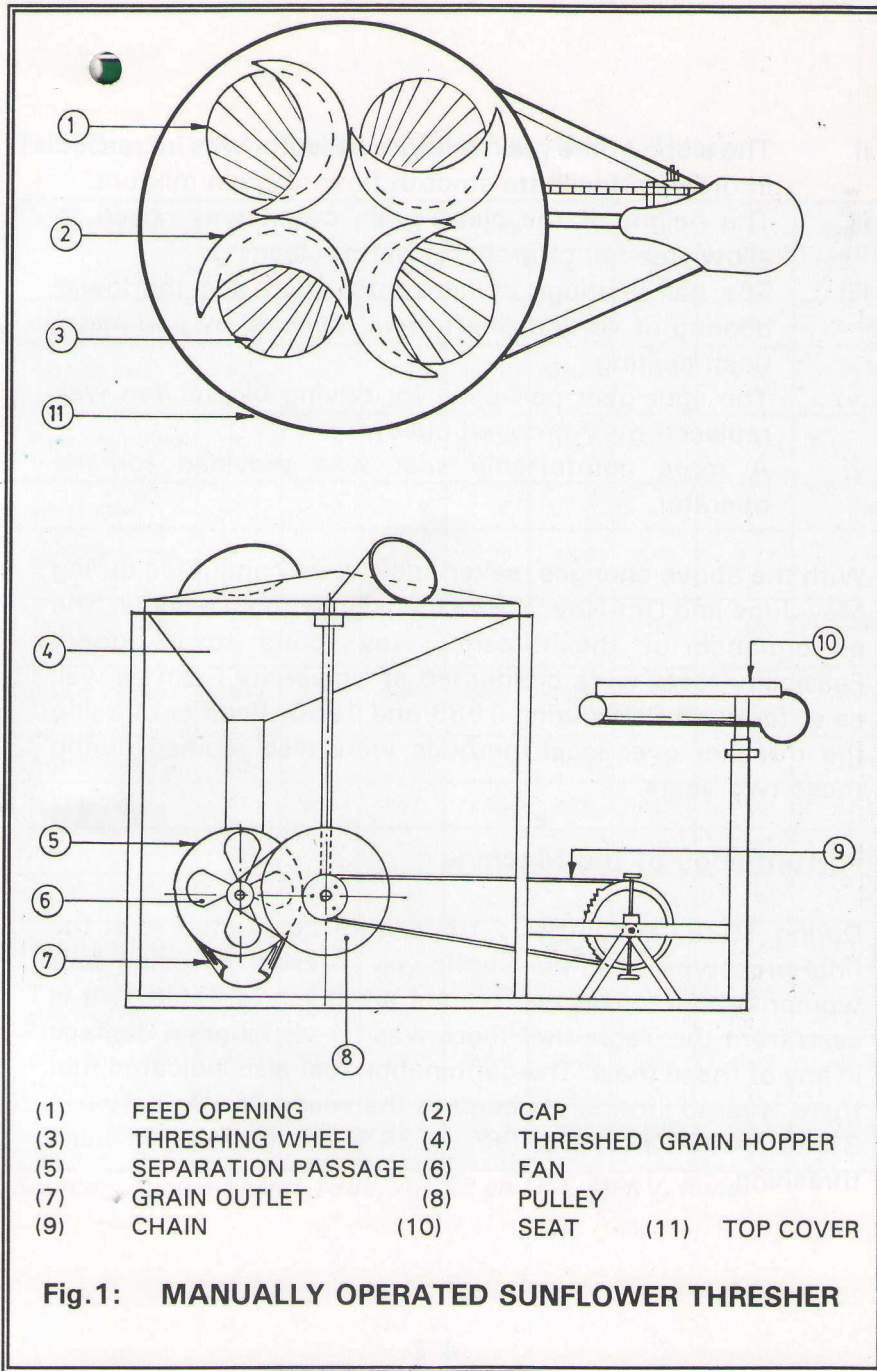
Salient Features of the Machine developed

The Phule Sunflower thresher consists of a top cover, threshing wheel, threshed matter collector and blower fan. It is provided with a saddle for the operator. The threshing wheel and the blower fan are operated by foot pedal through chain-sprockets and v-grooved pulleys. The rim of the threshing wheel is made out of conduit and MS spokes. Four holes are provided on the top cover of the threshing wheel for holding sunflower heads on the threshing wheel. Four persons including operator are required to feed the sunflower heads. The threshing wheel rotates on a vertical axis.

A sunflower head is held with its seed-face gently on the revolving wheel till the seeds are detached. At times the head is required to be tilted and rotated to remove the seeds from the periphery of the head. The unbroken seedless heads are thrown aside and new heads are taken for feeding. A funnel shaped seed mixture collector is provided beneath the threshing wheel to guide seeds mixture towards blower fan for cleaning. Clean seeds are received through the main seeds outlet.

Development Process

The first prototype was developed on the basis of studies of local threshing methods during Sept. 1987. Four trials were conducted at different moisture contents and at varying head sizes. The output capacity observed was from 25 to 37 kg/h. The maximum blown grain and spilled grain losses were 3% and 1.8% respectively. However, there was no broken grain loss. Trials indicated the need of certain modifications. Accordingly, a second prototype (Fig.1) was fabricated during 1988 with the following modifications :



- | | | | |
|-----|--------------------|------|-----------------------|
| (1) | FEED OPENING | (2) | CAP |
| (3) | THRESHING WHEEL | (4) | THRESHED GRAIN HOPPER |
| (5) | SEPARATION PASSAGE | (6) | FAN |
| (7) | GRAIN OUTLET | (8) | PULLEY |
| (9) | CHAIN | (10) | SEAT |
| | | (11) | TOP COVER |

Fig.1: MANUALLY OPERATED SUNFLOWER THRESHER

- i) The slope of the grain mixture collector was increased in order to facilitate smooth flow of grain mixture.
- ii) The height of the clean grain outlet was raised to allow free fall of grain for better cleaning.
- iii) The ball bearings of horizontal shaft and the lower bearing of vertical shaft were replaced by gun metal bush bearing.
- iv) The spur gear pair used for driving blower fan was replaced by V-grooved pulleys.
- v) A more comfortable seat was provided for the operator.

With the above changes, seven trials were conducted during May-June and Oct-Nov., 1988 by using women labours. The performance of the thresher was found to be good. Feasibility tests were conducted at University Farm as well as at farmer's field during 1989 and 1990. Benefits of using the thresher over local methods were also studied during these two years.

Performance of the Machine

During 1988, altogether 7 trials were conducted with the final prototype of Phule Sunflower Thresher by using four women labours. The test results are given in Table-1. It is seen from the Table that there was no visual grain damage in any of these trials. The germination test also indicated that there was no internal damage to the seeds. It was between 33 to 34% as compared to 34% for grain from hand threshing.

Table-1: Test Results of Phule Sunflower Thresher

| Particulars | Tests | | | | | | | Average |
|-----------------------------|-------|---------|-------|-------|-------|-------|--------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| Grain straw ratio | 0.55 | 0.52 | 0.52 | 0.37 | 0.35 | 0.34 | 0.39 | 0.43 |
| Head dia (cm) | 10-20 | 10 - 20 | 10-20 | 10-20 | 20-30 | 10-20 | 7.5-15 | 15.9 |
| Seed moisture {wb}, (%) | 6 | 6 | 6 | 15.1 | 13.2 | 12.9 | 12 | 6-15.1 |
| Labour used | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Duration of test (h) | 2.42 | 3.22 | 2.68 | 2.08 | 1.08 | 1.47 | 3.17 | 2.3 |
| Threshing wheel speed (rpm) | 166 | 166 | 160 | 166 | 166 | 166 | 166 | 166 |
| Blower speed (rpm) | 2360 | 2360 | 2360 | 2360 | 2360 | 2360 | 2360 | 2360 |
| Air velocity (m/S) | 3.33 | 3.33 | 3.33 | 3.33 | 3.33 | 3.33 | 3.33 | 3.33 |
| Feed rate (kg/h) | 56.2 | 62.1 | 56.0 | 48.1 | 63.9 | 68.0 | 45.7 | 57.1 |
| Broken grain (%) | Nil | Nil | Nil | Nil | Nil | Nil | Nil | Nil |
| Blown grain (%) | 2.49 | 3.62 | 3.85 | 0.04 | Nil | Nil | 0.38 | 1.48 |
| Spilled grain(%) | 3.43 | 3.80 | 2.75 | 1.43 | 3.97 | 2.00 | 3.00 | 2.91 |
| Threshing efficiency (%) | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Cleaning efficiency (%) | 97.0 | 95.6 | 98.0 | 88.4 | 89.0 | 89.7 | 92.9 | 92.9 |
| Output capacity (kg/h) | 31.2 | 31.7 | 28.6 | 18.0 | 23.6 | 25.9 | 17.7 | 25.2 |

Source: Annual Report-1988, AICRP on FIM, MPKV, Pune

The average blown grain percentage was 1.48 and it was more in trial No. 2 and 3 due to presence of more immature grains. The average spilled grain loss was 2.91%. This could be reduced by extra care while holding the head against threshing wheel. The threshing efficiency was 100% in all cases. The cleaning efficiency was observed to be between 88 and 98%. In the *Kharif* crop the grain filling was not proper and hence the cleaning unit was over loaded reducing the efficiency to as low as 88%. The output capacity was observed to be higher in summer trials ranging from 28 to 32 kg/h as compared to 18 to 25 kg/h in *Kharif* crops. This difference is again due to variation in grain crop ratio. Low grain crop ratio resulted in reduced output due to high straw handling.

Feasibility trials were conducted on farmer's field and also on University Farm during 1989 and the performance was compared with local method of threshing. In both cases women labourers were used. In local method, threshing was done by beating 3 to 4 kg sunflower heads in batches using bamboo sticks. Larger pieces were separated manually and final cleaning was done by winnowing in natural wind. The comparative study revealed that the average output capacity per labour using pedal operated thresher was 11.7 kg/h as against 6.3 kg/h with the local beating method.

Feasibility trials were also conducted on farmer's field during 1990. The output capacity per labour by using pedal operated thresher was 10.3 kg/h as against 3.0 kg/h with local method. The cost of operation per quintal using the thresher was Rs 40/q against Rs 60/q for the local method. Thus, there was saving of Rs 20/q by use of this thresher over the local method. The test results of two years are shown in Table 2 and 3.

Table-2: Feasibility Test Results of Phule Sunflower Thresher

| Sl. No. | Description | Average of 3 trials during 1989 | Average of 8 trials during 1990 |
|---------|-----------------------------|---------------------------------|---------------------------------|
| 1 | Crop variety | MSFH-18 | Morden / SS-.56 |
| 2 | Dia of head (cm) | 16-27 | 10-32 |
| 3 | Grain moisture (wb), % | 13.2 | 6.5-23 |
| 4 | Straw moisture (wb), % | 80.7 | 43-66 |
| 5 | Grain straw ratio | 0.30 | 0.34-0.70 |
| 6 | Threshing wheel speed (rpm) | 156 | 156 |
| 7 | Duration of test (h) | 0.46-1.07 | 2.4-5.78 |
| 8 | Feed rate (kg/h) | 194 | 152 |
| 9 | Broken grain (%) | Nil | Nil |
| 10 | Blown grain (%) | 0.03 | 0.01 |
| 11 | Threshing efficiency (%) | 100 | 100 |
| 12 | Cleaning efficiency (%) | 93.67 | 93 |
| 13 | Output capacity (kg/h) | 46.9 | 41.3 |

Table-3: Test Results of Threshing Sunflower by Local Method

| Sl. No. | Particulars | Average of 3 trials during 1989 | Average of 6 trials during 1990 |
|---------|---|---------------------------------|---------------------------------|
| 1. | Variety of crop | Morden | Morden SS-56 |
| 2. | M.C. of seed (wb), (%) M.C. of straw (wb), (%) | 5.7 9.2 | 6.3 6.9 |
| 3. | Dia of head (cm) | 6-17 | 10-32 |
| 4. | Grain straw ratio | 0.78 | 0.59 |
| 5. | Number of labour used | 1 | 1 |
| 6. | Weight of flowers (kg) | 30 | 23.3 |
| 7. | Time for beating, h | 1.30 | 1.65 |
| 8. | First cleaning (h) | 0.48 | 0.27 |
| 9. | Second cleaning (h) | 0.27 | 0.21 |
| 10. | Total time (h) | 2.05 | 2.13 |
| 11. | Weight of seed obtained (kg) | 12.90 | 7.6 |
| 12. | Weight of seed (kg/h) | 6.32 | 3.8 |

Source: Annual Report 1989 & 1990 of AICRP on Farm Implements and Machinery, MPKV, Pune

Benefits over traditional technology

| | | |
|---------------------------------|---|----|
| Saving in labour (%) | : | 50 |
| Saving in time (%) | : | 50 |
| Saving in cost of operation (%) | : | 33 |

Status of Technology

| | | |
|---|---|--|
| Design and development | : | Completed |
| Feasibility test in field | : | Completed |
| Demonstration | : | The machine was demonstrated in farmer's field, farmer's fairs, and Research organizations. It was exhibited in National Agricultural Fair at New Delhi during 1989. |
| Manufacturing drawings | : | Available |
| No. of prototype fabricated | : | 75 Nos. |
| No. of manufacturers who adopted technology | : | 1 |
| Whether technology released: | : | Yes, Government of Maharashtra has granted 50% subsidy to this thresher. |

Specification of Manually Operated Sunflower Thresher

| | | |
|--------------------------|---|---|
| Type | : | Manual hold-on type |
| Overall dimensions | | |
| Length (mm) | : | 1170 |
| Width (mm) | : | 660 |
| Height (mm) | : | 1050 |
| Weight (kg) | : | 42 |
| Threshing wheel dia (mm) | : | 635 |
| No. of spokes | : | 50 |
| Type of blower | : | Centrifugal |
| No. of blower | : | One |
| Power transmission | : | Operated by foot pedal through chain-sprocket and pulleys |
| Power source | : | One person for drive |

Source of availability

- i) Principal Investigator
Agril. Engg. Research Centre
College of Agril., Mahatma Phule Krishi Vidyapeeth
Pune-411005
- ii) M/S Chintamanai Enterprises
50, Wireless Colony, Aundh,
Pune-411 007