



PADDY THRESHER FOR SMALL SCALE FARMERS IN RURAL AREAS



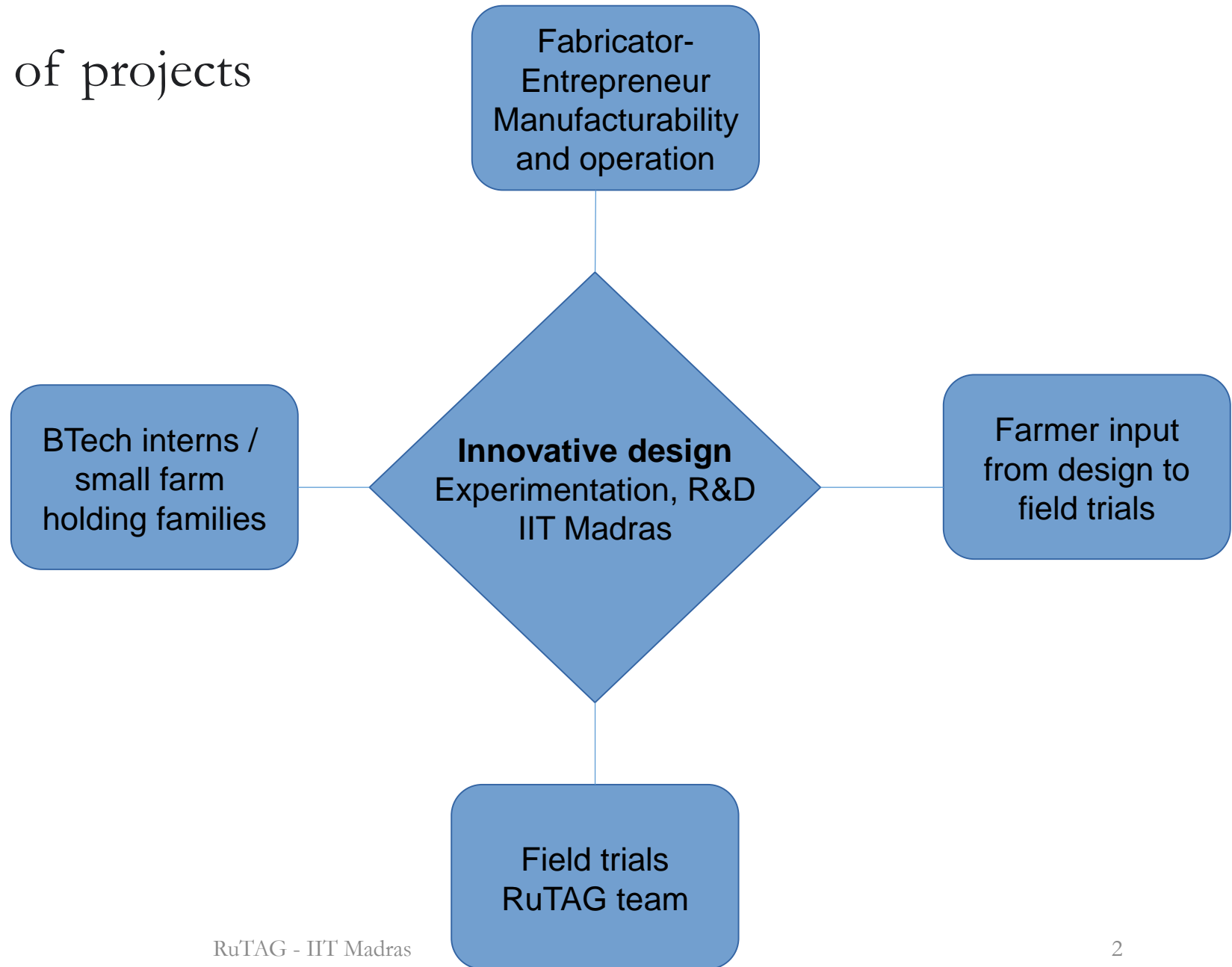
Prof. Shankar Krishnapillai, Department of Mechanical Engineering

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Rural Technology Action Group (RuTAG)

Indian Institute of Technology (IIT) Madras

RuTAG model of execution of projects



Main problem being addressed



- *Threshing is the process of separating the grains from the paddy stalks*
- Labour supply-demand gap for paddy threshing
 - Labour demand exceeding the labour supply for farming operations during the harvest and post-harvest season in rural areas
 - Farm mechanization as a coping mechanism to labour shortage
- Reducing labour intensity of the paddy threshing and threshing losses
 - 30-40 man-hr/tonne of threshed paddy; **1.5-8.5 % paddy remain un-threshed in manual methods** (Zaman et.al., 2006)
 - Alleviating pressure on marginal and small scale paddy farmers caused by labour shortage
- Use of large scale threshers is expensive and result in more grain wastage for marginal and small scale farmers
 - Medium and large scale farmers also grow in smaller scale due to short fall of labour and water

How big is the problem?

Who has this problem?

How many people are affected?



Total food grains production (2017-18): ~ 285 million tonnes (~128 million ha)
Rice production (2017-18): ~ 113 million tonnes (~50 million ha)

Source: Department of Agriculture, Cooperation & Farmers Welfare (Agriculture Statistics 2017-18)

Farmer classification	Land holding range (in ha)	Total area (in million ha)	Number of holdings (in million)
Marginal	< 1 ha	17.4	45.77
Small	1-2 ha	11.64	8.24
Semi-medium	2-4 ha	10.6	3.93
Medium	4-10 ha	7.37	1.29
Large	>10 ha	2.63	0.15

Estimated annual un-threshed paddy losses due to manual threshing (2017-18):
1.5 - 10 million tonnes
 amounting to
Rs. 2700-18000 crore
 @ MSP of Rs. 1800/ quintal

Source: Department of Agriculture, Cooperation & Farmers Welfare (Agriculture Census 2015-16, Phase-I)

How is the problem currently being solved?

- Threshing by feet
- Beating pods with sticks
- Hand beating against hard surface
- Animal treading
- Trampling by tractor/power tiller
- Pedal thresher (hold on type)

Manual Threshing

Done in small farms and villages, where acreage is small.

Crops are laid in the sun to dry for a day, and tied in bundles. The workers beat it against stones to separate the grains from the stalks. (90% efficiency). Nowadays women find it difficult to do this.

Later it is stamped under the hooves of the cattle to separate the remaining paddy. Stalks should be lightly crushed under the hooves, to be edible for cattle.

(The whole process takes 3-4 days, and 15 workers for a small farm)



Problems with the current method

- Threshing output per man-hr reduces, if the labourer/farmer works for longer time to thresh a lot of bundles
- It also depends on the size of the bundle and the amount of paddy in each bundle
- Time and labour required depends on the skill, attention and sincerity of the labourers
- Manual threshing is a tedious job causing painful physical stress to the labourer/farmer
- Declining cattle population in rural areas leading to unavailability of cattle for animal treading

Our Solution

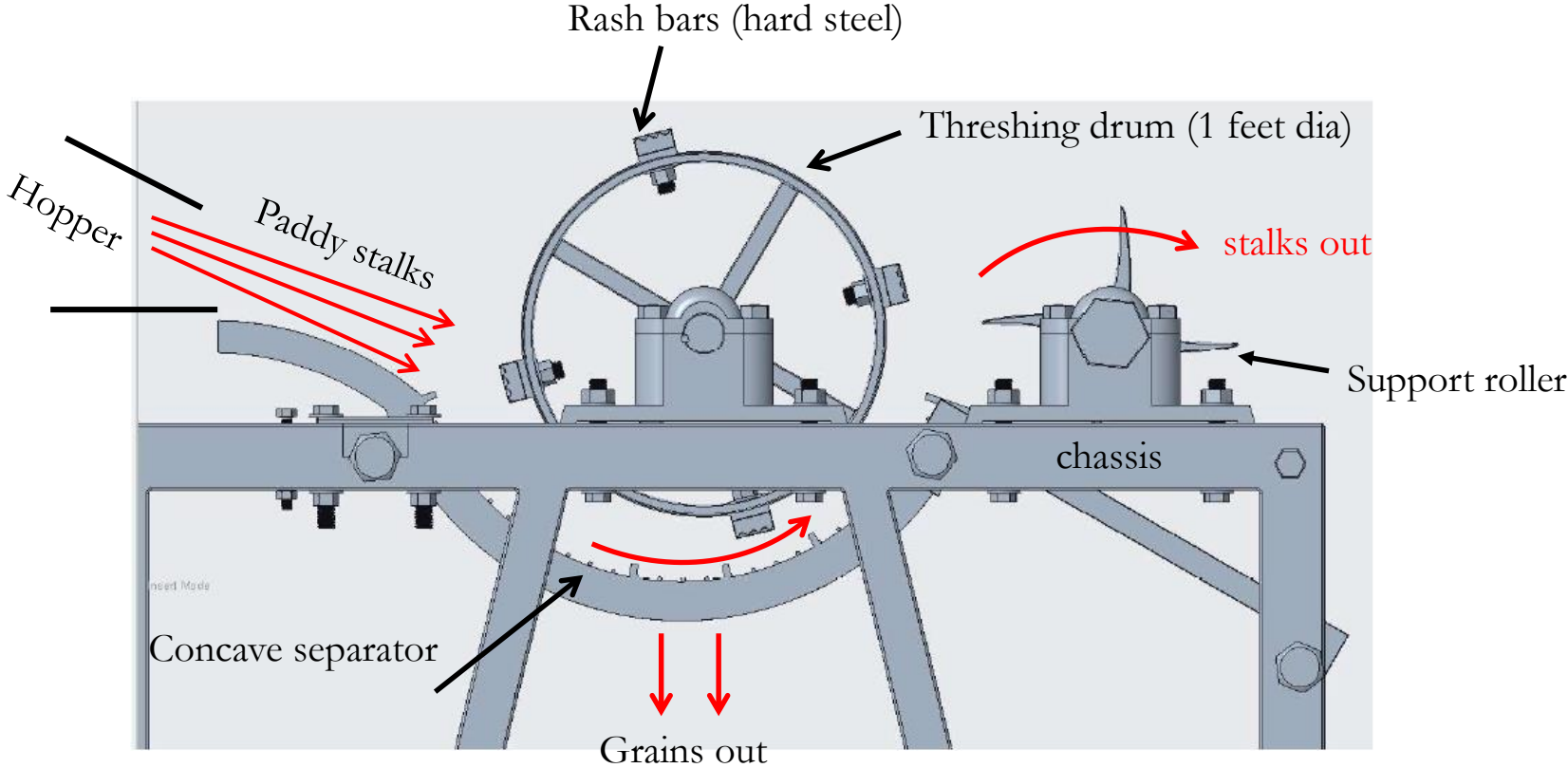


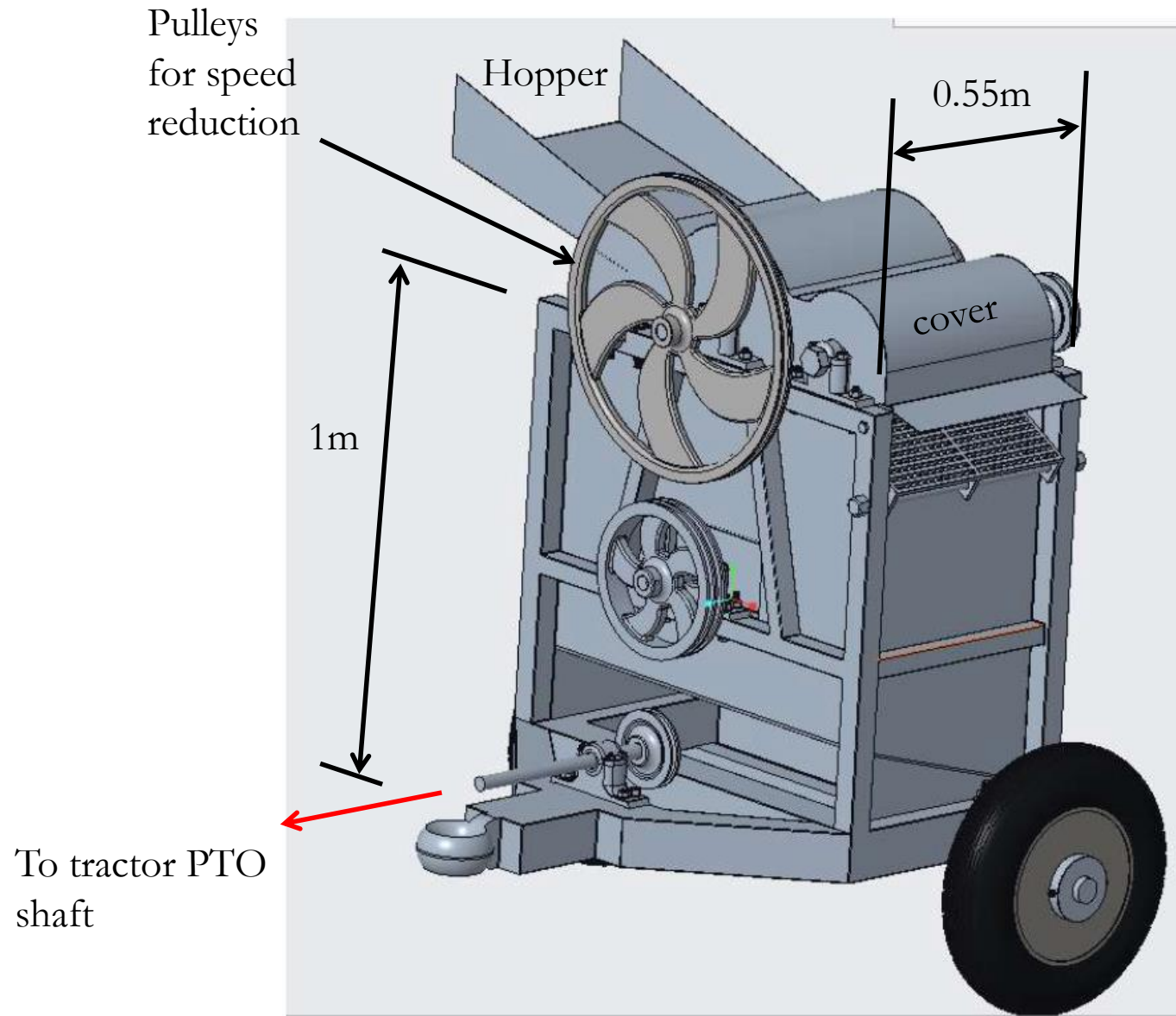
Specifications

- Type: Feed-in threshing machine
- Capacity : 150-200 kg output/hour
- Threshing drum Speed : ~ 1000 rpm
- Power: 1 HP
- Threshing efficiency : 95-98%
- Thresher weight: ~ 200 kg
- Power source: Tractor PTO/electric motor
- Paddy varieties tested: Indian traditional varieties with premium market value (Poongar, Kichili Samba, Jeeraga Samba, Vaikunta, Palakkad Matta, Ponni, etc.)
- Key Competitive Advantages
 - It can thresh paddy without chopping the straw of the moist crop
 - The straw, chaff, grains are separated and thrown separately thus reducing drudgery.
 - The device is easy to install and maintain.
 - It does not chop the straw and hence we get it in full length.
 - Portable and easy maintenance
 - Adjustable blade; suitable for different paddy varieties with variable stalk lengths



Essential working principle of Paddy thresher





To tractor PTO shaft

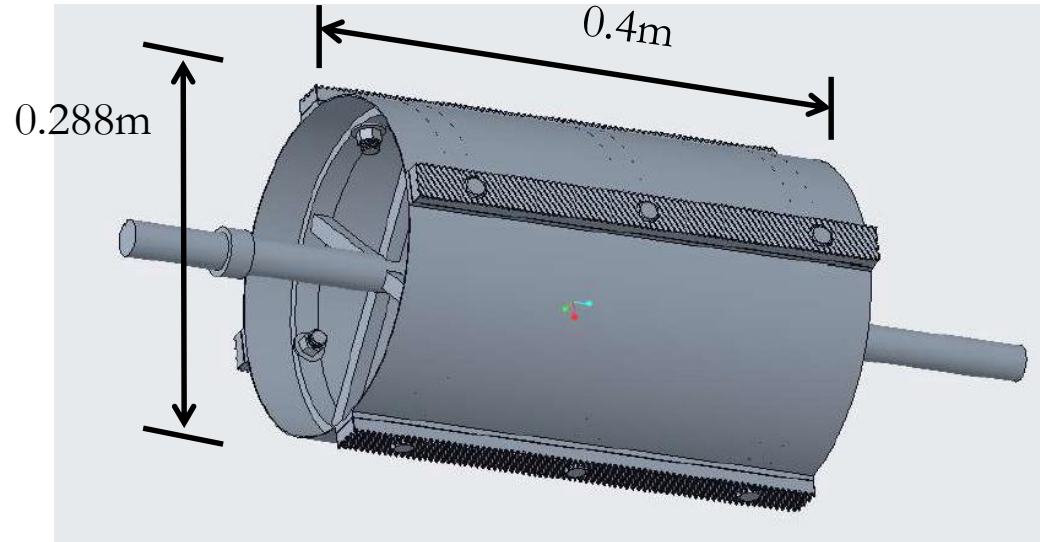
(Weight of Machine – 200kg)

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Important parts:



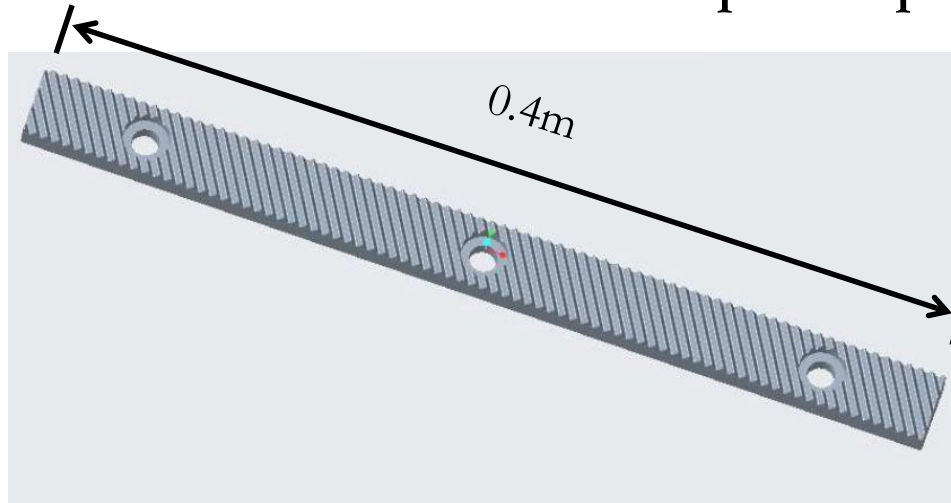
Chassis 1m x 0.55m
Made of welded box sections
for stiffness



Threshing drum

Sheet metal welded over frame of
box sections.
Solid shaft.

Important parts:



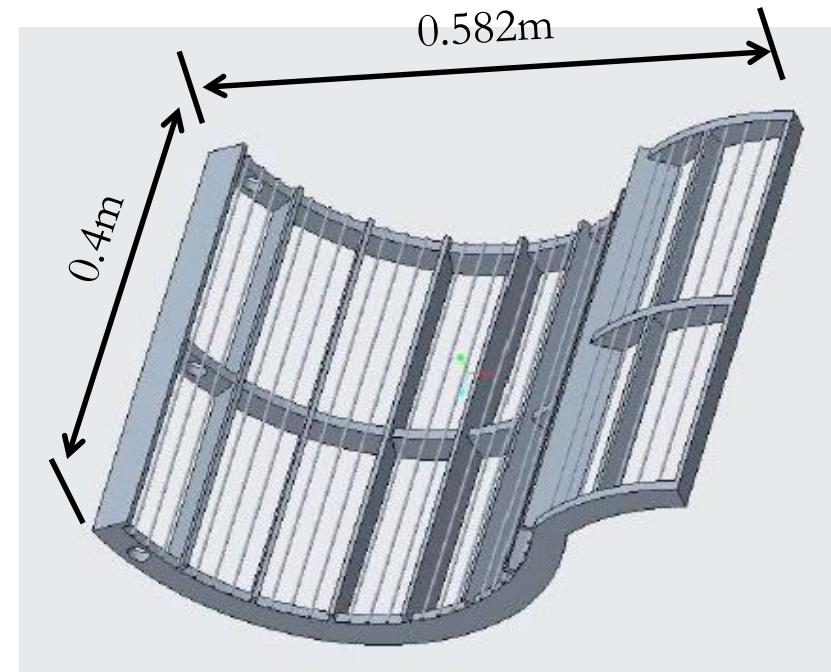
Rash bar

Hard steel bar with teeth (grooves).
This bolted to the drum.
Available in market in 0.7m length.

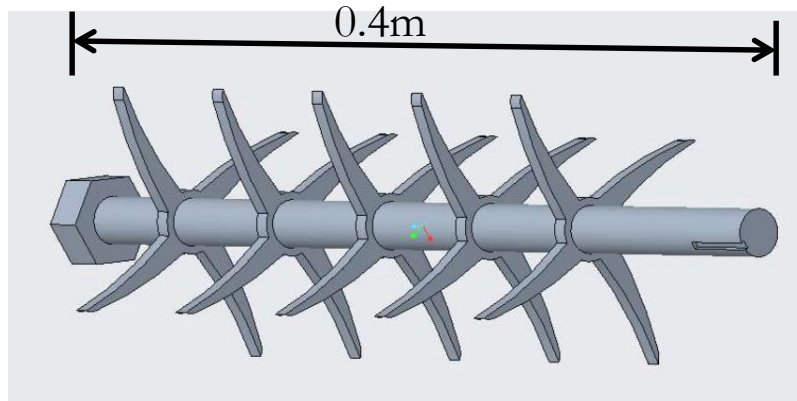
Concave separator

The paddy stalks are crushed
between the drum and separator.

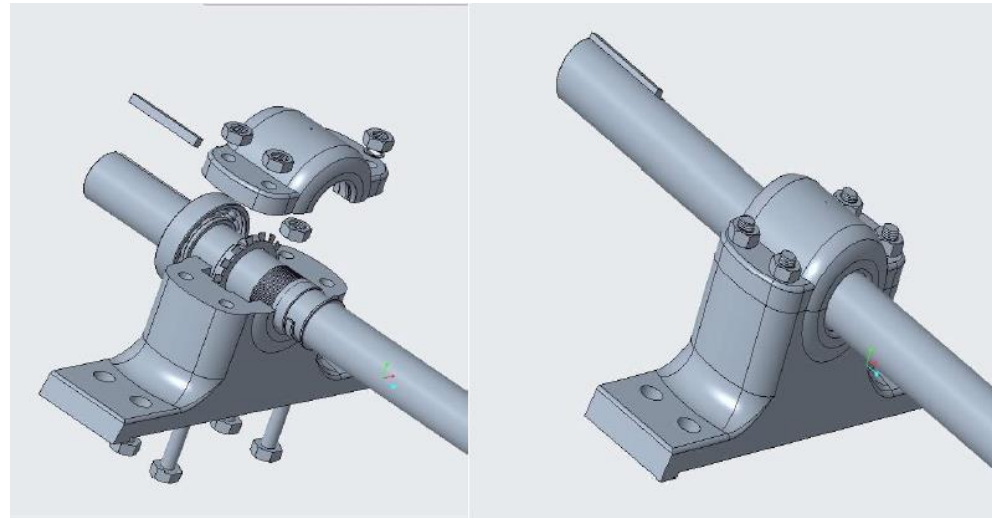
It is a built up structure with slender
members welded over a frame.



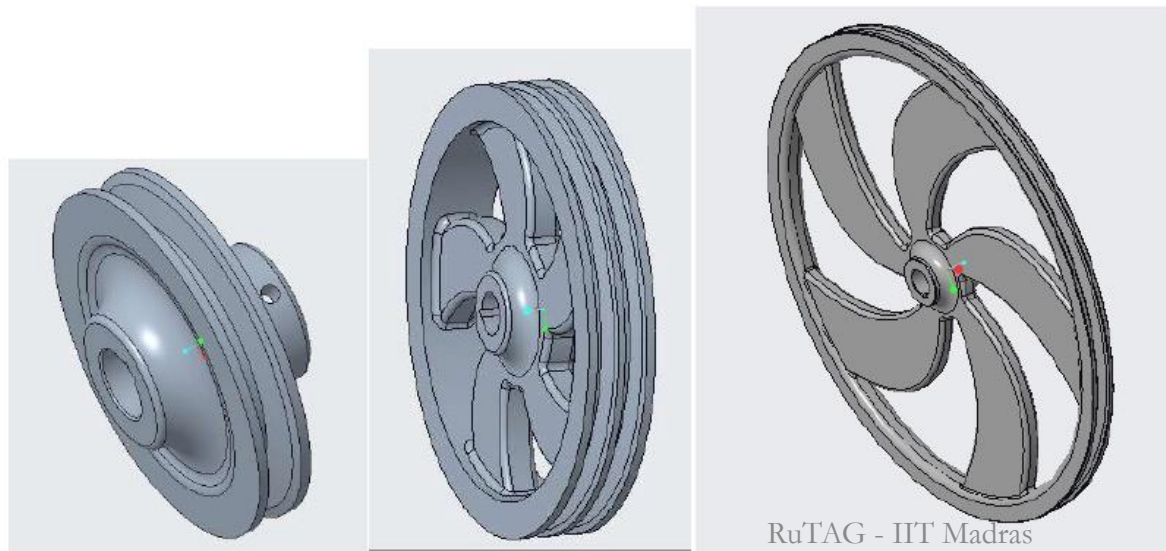
Other miscellaneous parts:



Support roller
(draws out the paddy stalks)



Deep groove ball bearings for supporting the shafts.



Pulleys for speed reduction

Estimate of cost of prototype unit

PADDY THRESHER BREAK UP DETAILS

<u>S.NO</u>	<u>DESCRIPTION</u>	<u>RATE/EACH</u>
1	Square Pipe for Chease MS	Rs.3,450.00
2	30mm Round Shaft MS	Rs.2,000.00
3	Cam Shaft (with machining Cost approx.)	Rs.4,870.00
4	Square Shaft MS 50 X 50mm	Rs.3,508.00
5	Threshing Drum (with welding sheet metal labour)	Rs.8,580.00
6	Rash Bar (available in market) CAST IRON	Rs.2,250.00
7	Concave Separator (with metal and maching work)	Rs.10,377.00
8	Support Roller (with welding and labour work)	Rs.4,230.00
9	Pulleys(6inch, 12inch, 24inch)	Rs.4,706.00
10	Belts	Rs.750.00
11	Propeller Shaft	Rs.7,513.00
12	Plummer Block	Rs.4,250.00
13	Bearings	Rs.3,265.00
14	Additional Sieve	Rs.5,000.00
15	Nut, Bolt, Washer and U Bolt	Rs.980.00
16	Wheels	Rs.8,314.00
17	Sheet metal 1mm for casing without labour	Rs.1,750.00
18	Labour(including welding, drilling and sheet metal works)	Rs.10,000.00
	Total	Rs.85,793.00

Paddy thresher prototype (built in Coimbatore by Ganesh Engg. Works)



- Trials conducted at:**
1. Coimbatore, TN
 2. Palakkad, Kerala
 3. Madurantakam, TN

Machine was iteratively improved over successive trials to improve efficiency of threshing to 98%.

Field trials were done at small field in Zamin Endathur (Madurantakam), Tamilnadu on 29-1-2020



Observations:

Power Source	: Tractor PTO (VST Mitsubishi Sakthi VT 224-1D)
Duration of Trials	: 90 minutes
Thresher cylinder Speed	: 950 rpm
Paddy variety used	: Jeeraga Samba (Indian traditional variety, Rs. 120/kg)
Length of Paddy Stalks	: 1.5 ft (approx)
Quantity used	: Produce from 5 cents of land(approx)
Time of Harvest	: 2 days before trials
Thresher efficiency	: 98% approx
Productivity	: 200-250kg grain per hour.



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Thank you!

For more details, please contact:

Rural Technology Action Group (RuTAG),
2nd Floor, Centre for Industrial Consultancy and Sponsored Research,
Indian Institute of Technology Madras, Chennai- 600036.

Office: +91-44-2257 8380 / 8381

Email: rutag@iitm.ac.in / rutagpo@iitm.ac.in / iitmruTAG@gmail.com

Website: <https://rutag.iitm.ac.in>