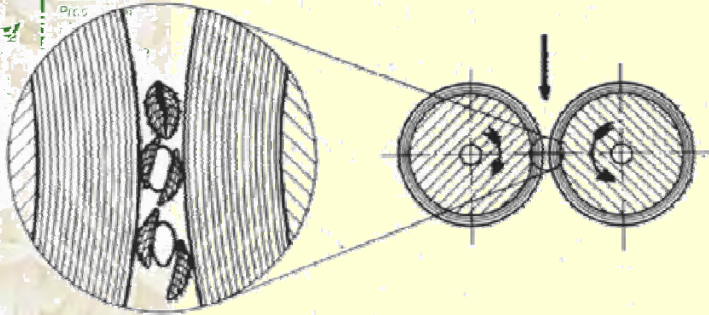


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Rice Milling

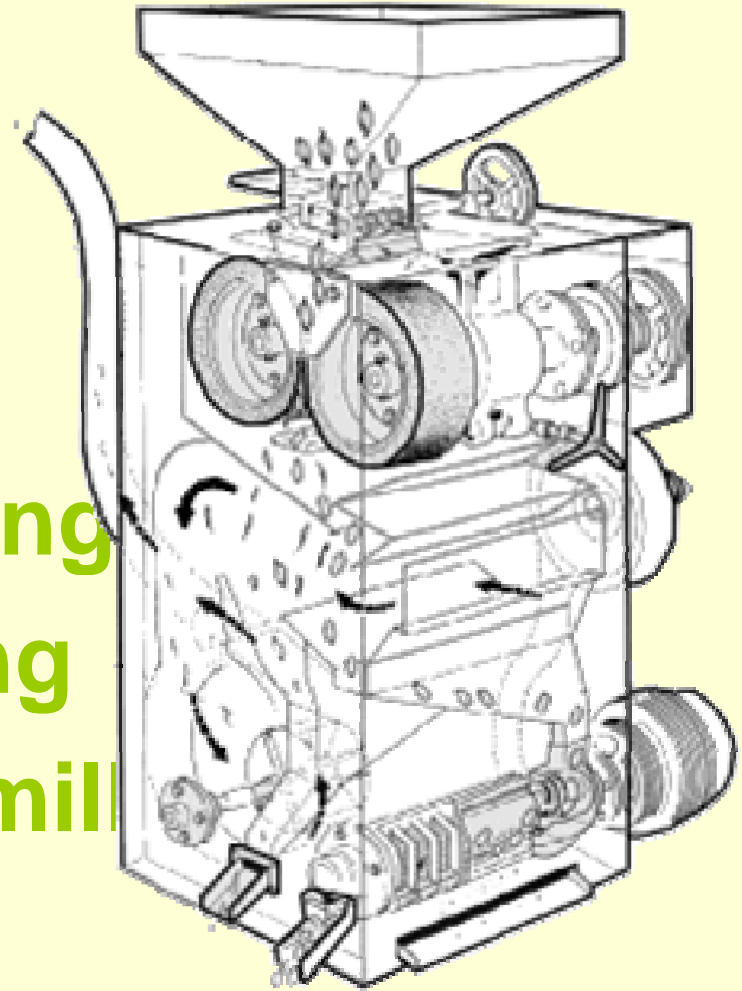
M.Gummert

postharvest@irri.org

Rice
Science
for a Better
World

Topics

- **What is milling**
- **Characteristics of paddy**
- **Options for milling**
- **Multistage milling**
- **By products of mill**

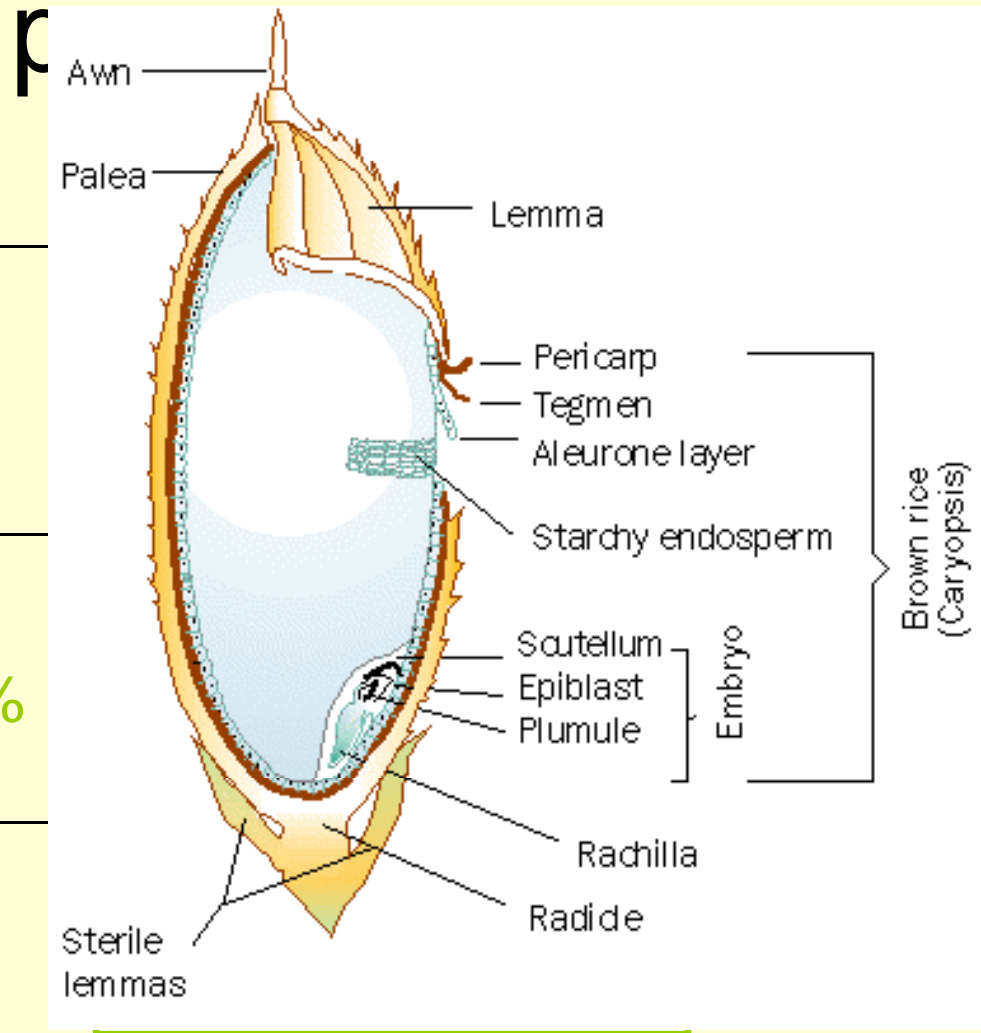
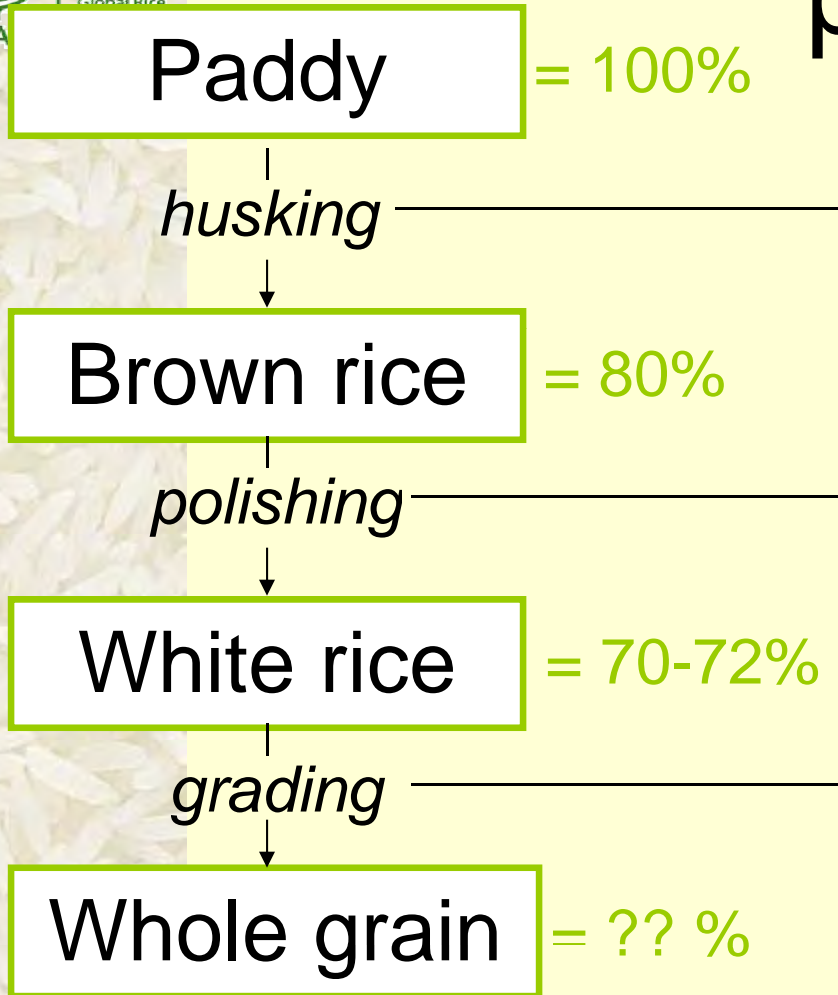


Objective of Milling



- Remove the husk
- Remove the bran
- Produce white rice kernels
 - sufficiently milled
 - free of impurities
 - minimum number of broken kernels

Fractions in the milling



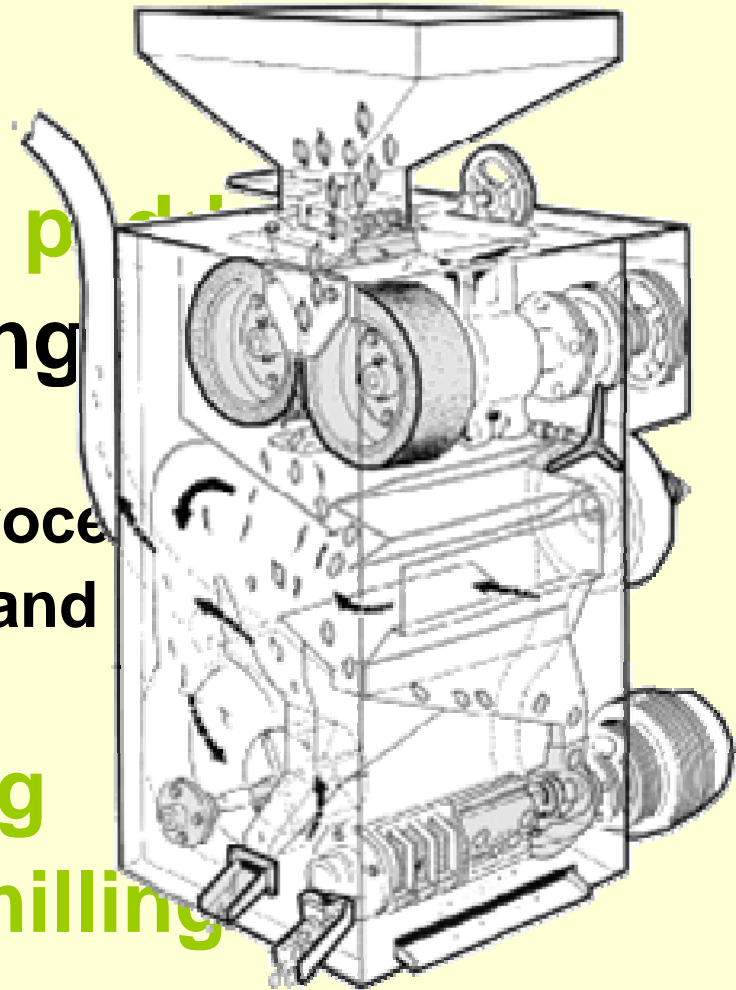
Depends on rice mill AND raw material

Chemical Characteristics

	Brown rice	White rice	Bran
Moisture content (%)	13-14	13-14	13-14
Starch (%)	68-70	80	9
<i>Amylose</i>	28-30	33	6
Protein (%)	6-8	6-7	14
Fat	3	1	20
Fiber	2-3	0.5	25
Crude ash	1-1.5	0.5	9-10

Topics

- **What is milling**
- **Characteristic of products**
- **Options for milling**
 1. Hand milling
 2. One step milling process
 3. Two-step process and
 4. Multistage process
- **Multistage milling**
- **By products of milling**



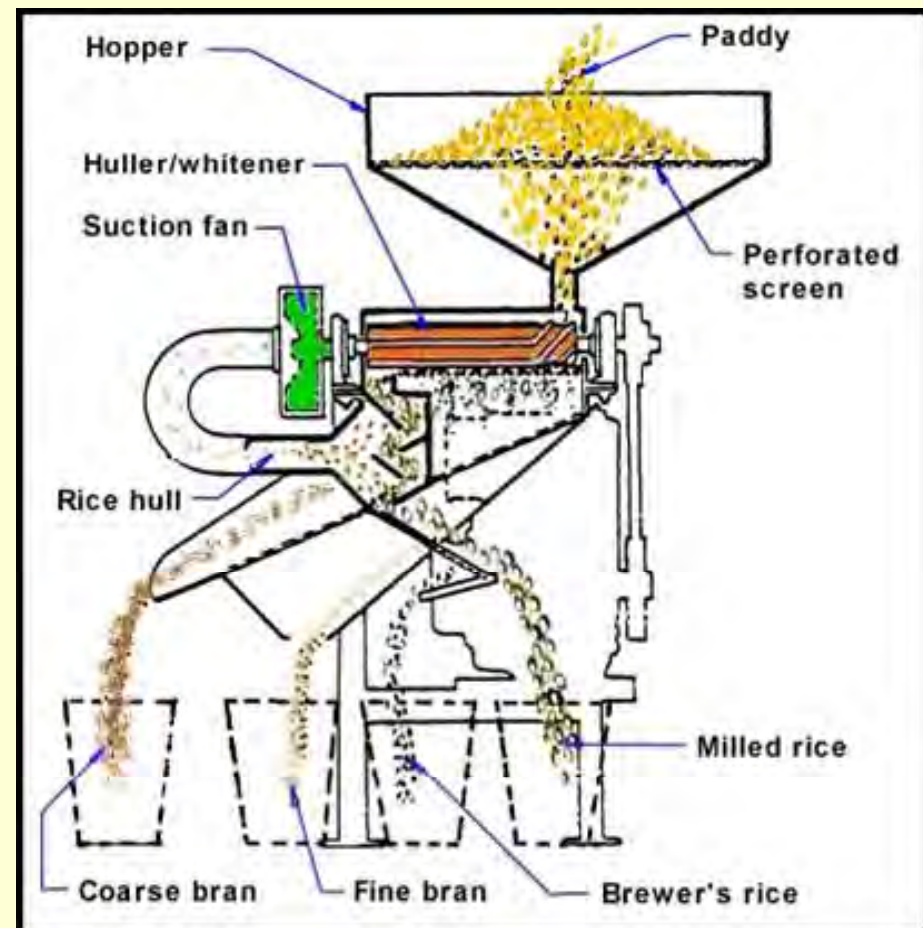
Pestle and mortar

- Friction based - kernel against kernel
- High breakage
- Final cleaning: hand winnowing and gravity



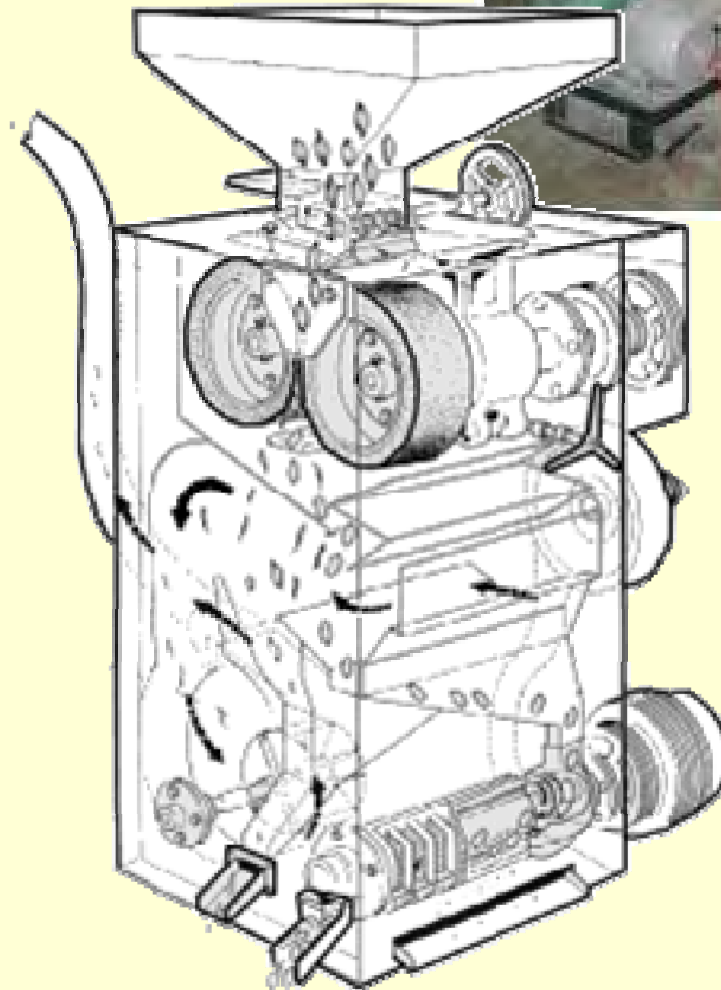
Single-stage Steel Mill

- Steel friction mill
- Originated from coffee grinder (Engleberg mill)
- Very high pressure
- Low white rice recovery (50-55%)
- Head rice less than 30%
- Often used for parboiled rice



Two Stage M

- Super seeded Engleberg (steel) mill
- Separate hulling and whitening
- Rubber roller huller
- Steel friction polisher
- Capacity 0.5-1t/hr
- Milling recovery - 60%



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Vietnamese 2 stage mill



Research
Program on
Rice
Global Rice
Science
Partnership



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Multi-stage Mill

- Pre-cleaning the paddy
- Removing the husk
- Polishing or whitening the brown rice
- Separating the broken grains
- Bagging the milled rice
- Managing the by-products



Compact rice mill in Vietnam

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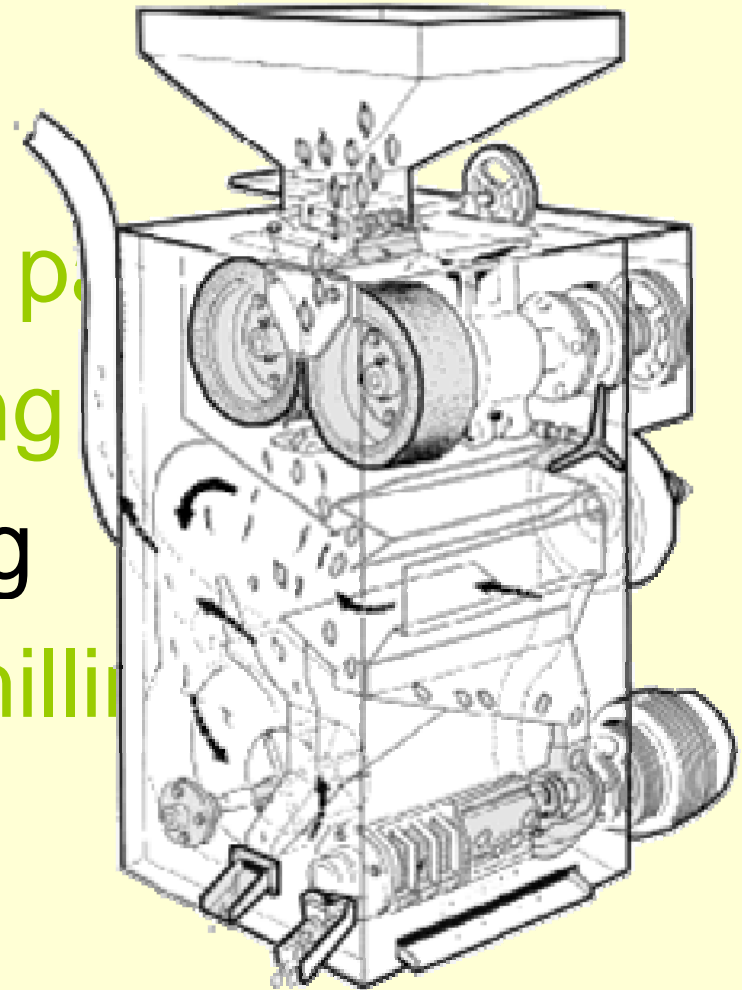
Multi-stage mill



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Topics

- What is milling
- Characteristic of p
- Options for milling
- Multistage milling
- By products of millin



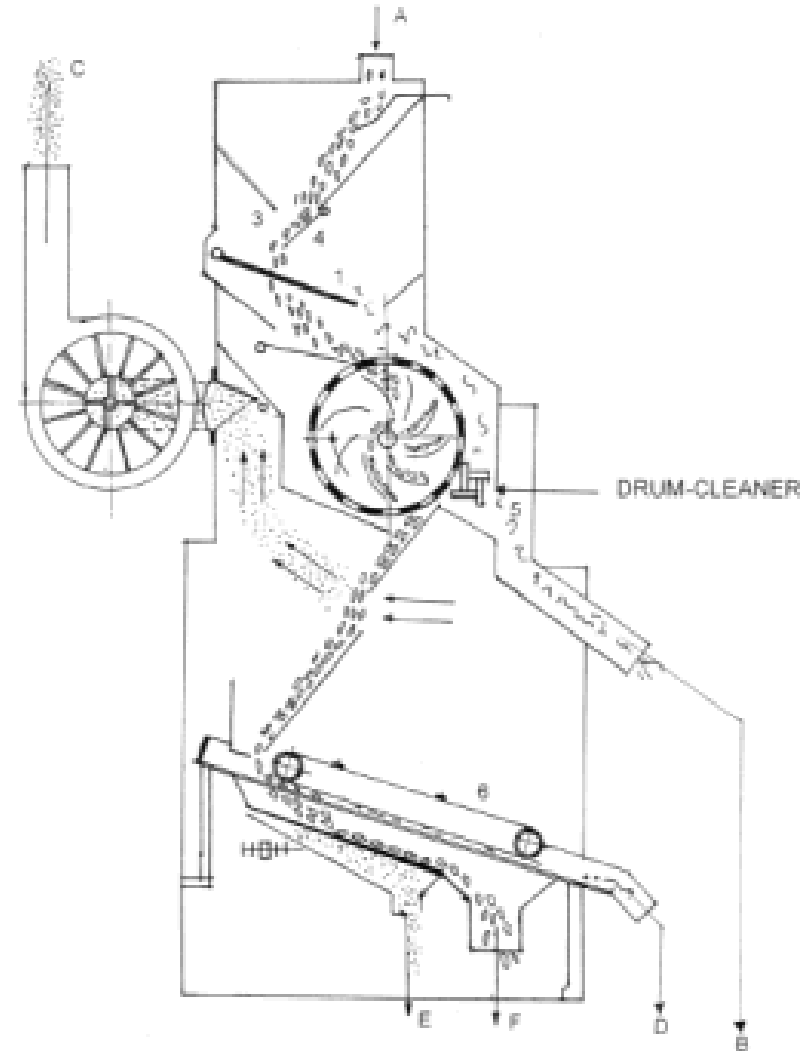
Pre-cleaning

- **Equipment**
- Oscillating Sieve type
- Aspiration cum Oscillation Type
- Rotary Cleaner



Process of separation

- **Process**
- Scalp larger objects
- Retain desired size/weight
- Removes small size or lighter weight material



- Gravity separator
- Separates on weight

De-stoner



Dehusker / Huller

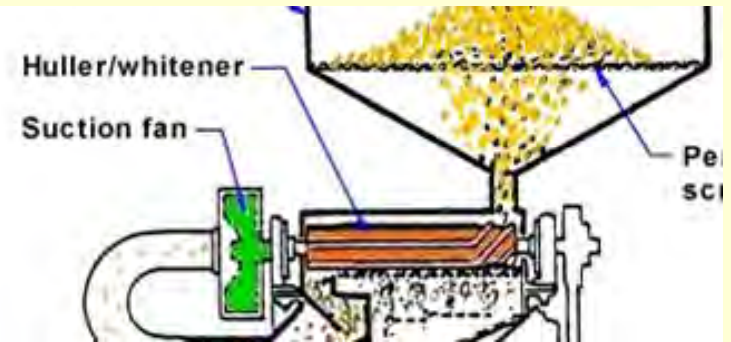
1

Three basic types

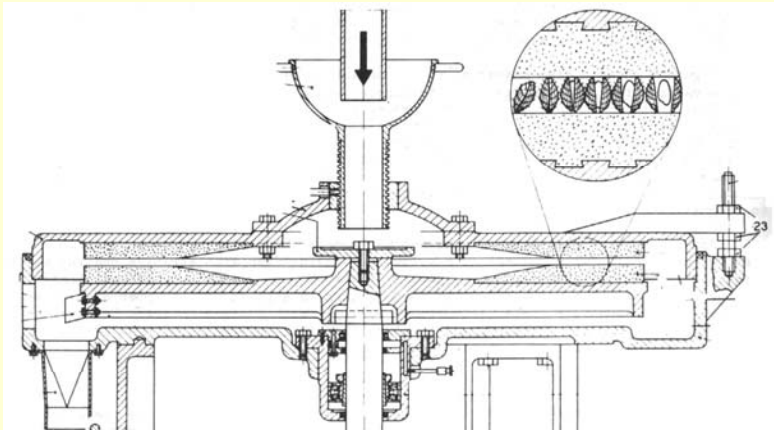
1. Steel huller
2. Under runner disc sheller
3. Rubber rollers

- Operation principles

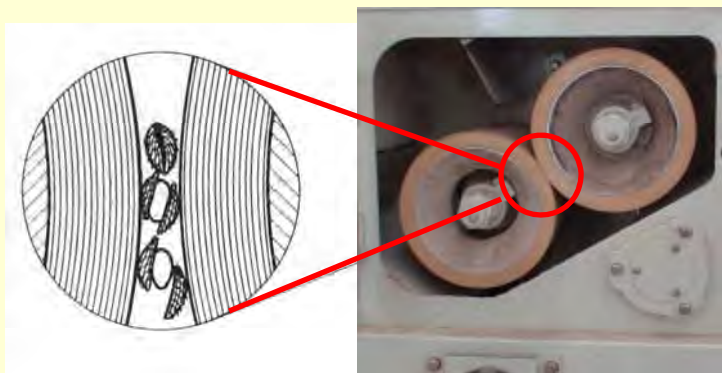
- Friction between surfaces
- Speed differentials
- Abrasion



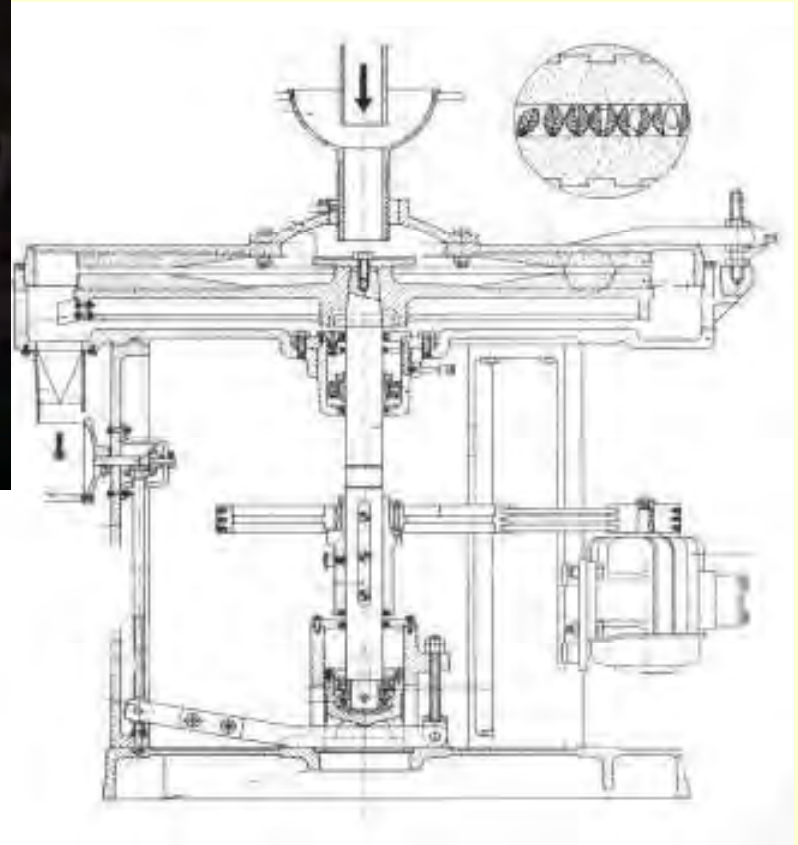
2



3



Under runner disc Sheller



Paddy separator

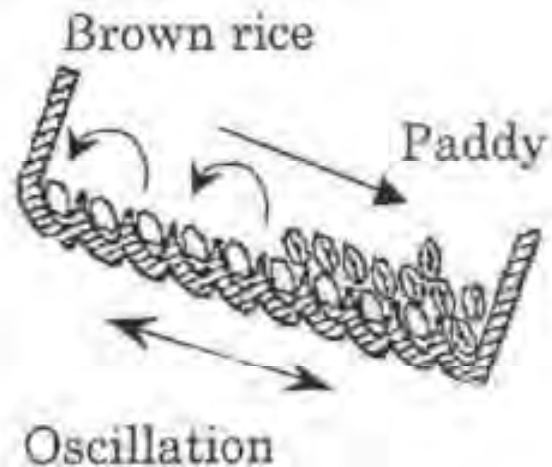
- **Compartment Separator**
- Paddy and brown rice move at different speeds
- Brown rice moves faster
- Specific gravity/buoyancy
- 45 compartments/2 ton



Gravity separator

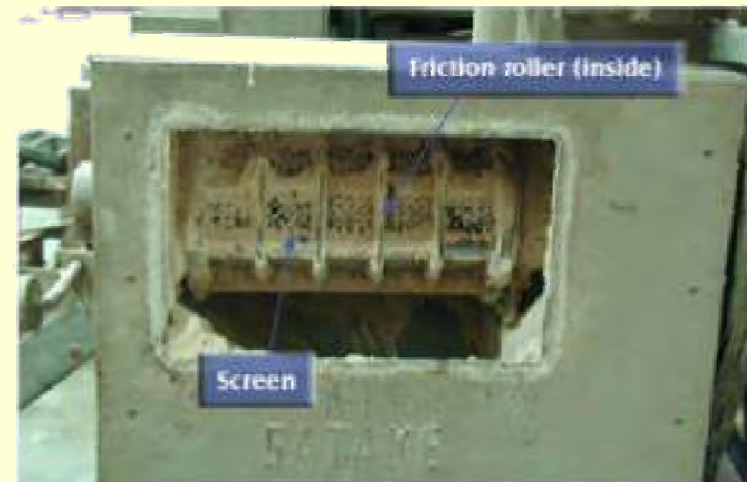
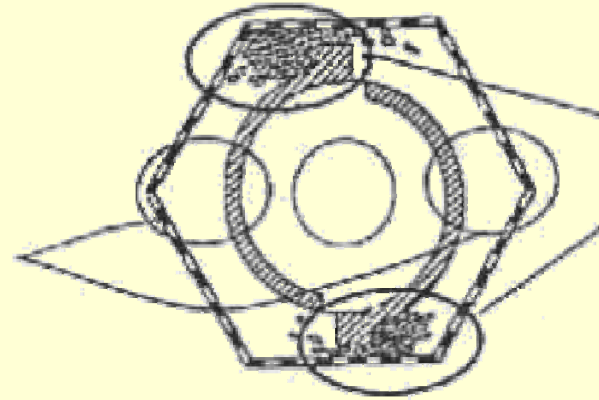
• Tray Separator

- Brown rice up slope, paddy down
- Specific gravity, grain length, coefficient of friction

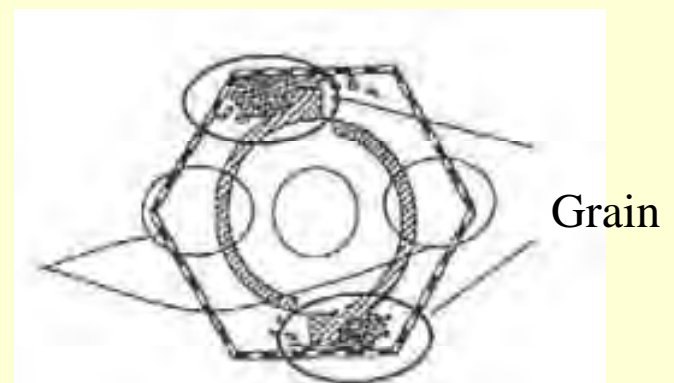
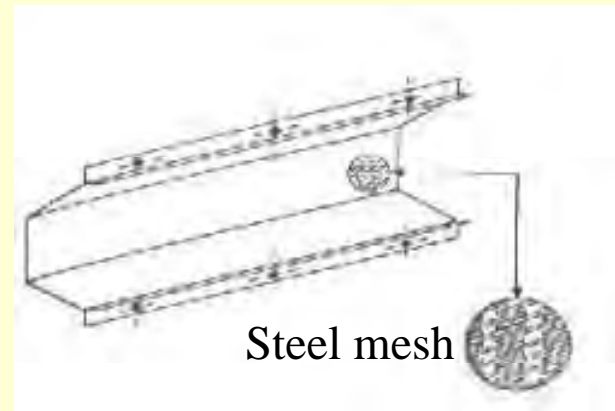
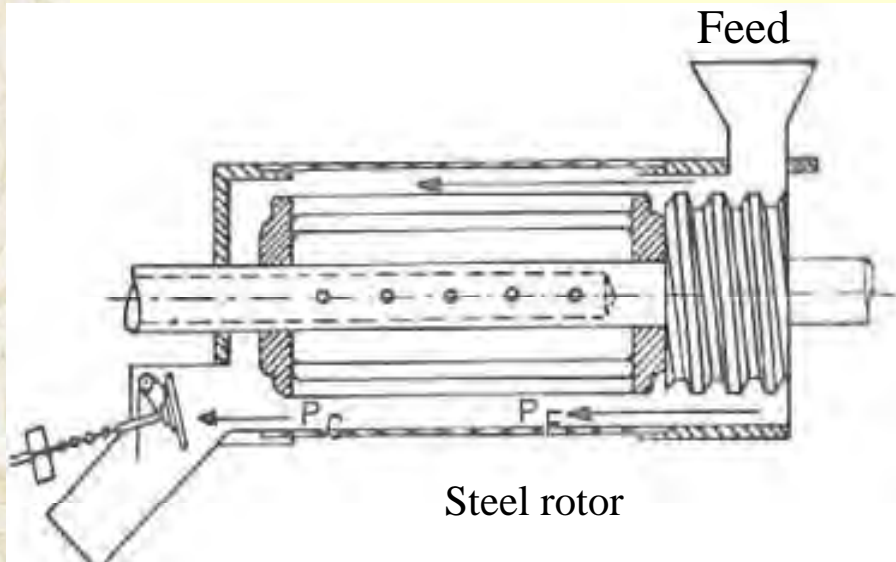


Friction polisher

- Grain kernels forced against each other and a metal screen by a steel ribbed cylinder
- Always horizontal
- High pressure, higher temperature than abrasive
- Suitable japonica types

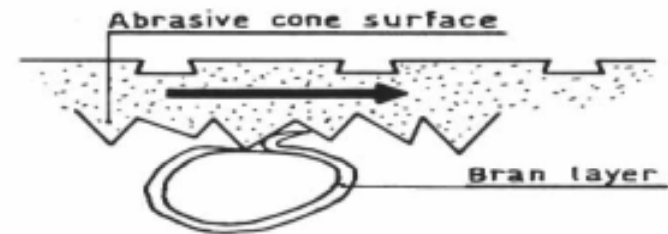


Steel Polisher-horizontal friction (Engelberg Type)

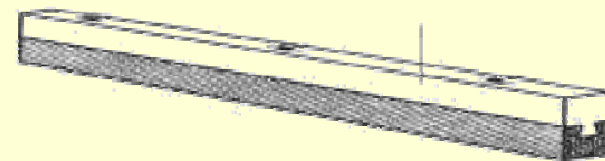
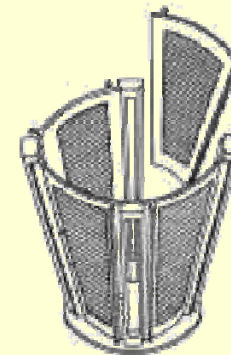
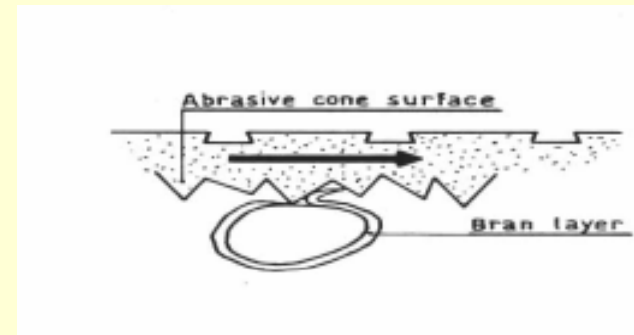
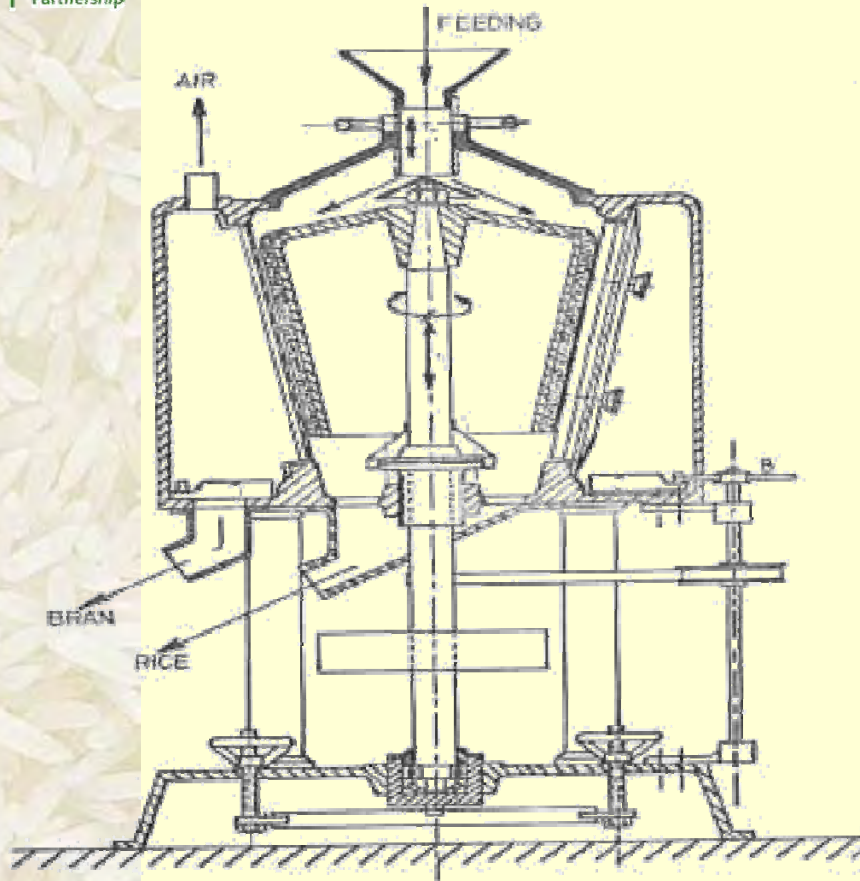


Abrasive polisher

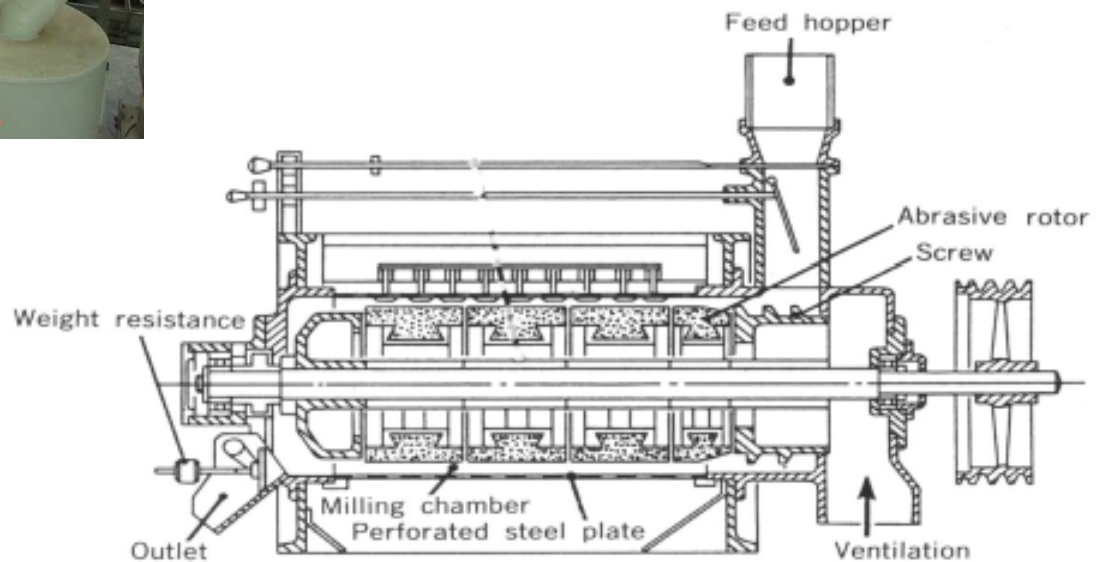
- Vertical or horizontal
- Abrasive surface and screen
- Less pressure on kernel
- Better for Indica types



Polishing- Conical Stone



Polisher-horizontal Abrasive



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Oscillating Screen Separator

- Separates out brewers
- Large and small brokens
- Oscillating screen



Length Grader

- Length grader works by matching screen indentation with whole grain length
- Small/broken rice fall into indents while whole grain pass to end
- Sometime set up with 2 different indent sizes



Separating bins

- Separates into head rice, large broken and small broken
- Mix any combination on belt by variable speed delivery motors in each outlet



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Mist Polisher

- Improves luster on rice
- Small amount dust and water



Color sorter

- Has to be calibrated for desired color
- Works on separation discolored grain by using air stream
- Expensive



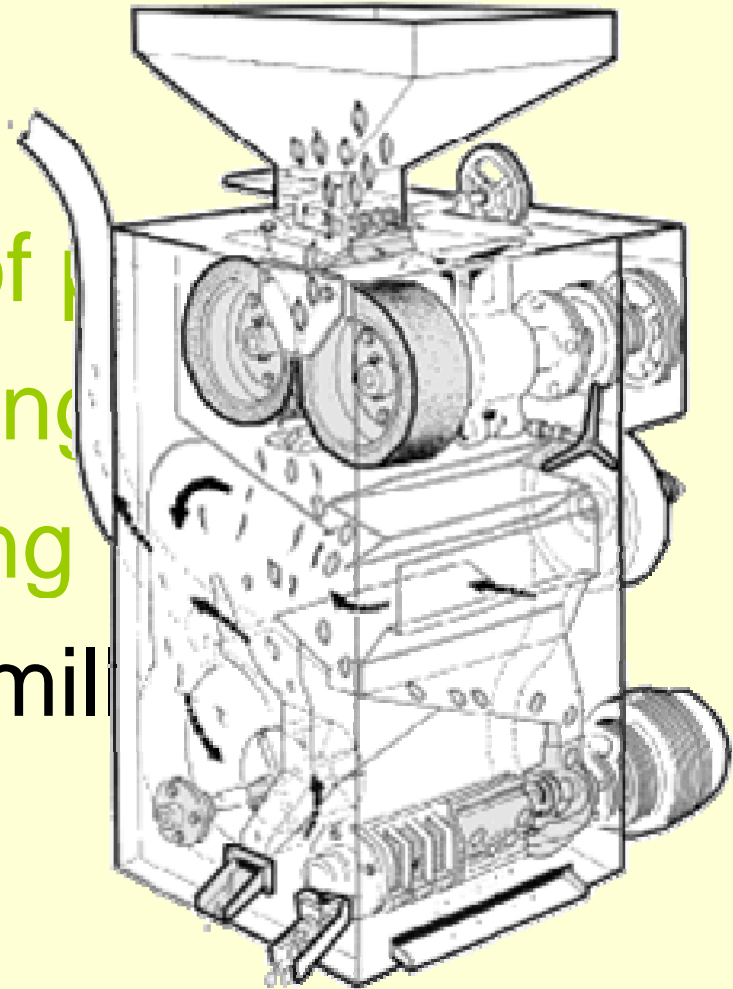
Bagging Station

- Rice normally sold in 50kg bags
- Accurately weighed



Topics

- What is milling
- Characteristic of p
- Options for milling
- Multistage milling
- By products of mill



- Husk
- Coarse meal
- Fine meal
- Brewers grain

Mill by products



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