REVOLUTIONIZING RICE STRAW MANAGEMENT:

Mechanization in Malaysia

Mohd Shahmihaizan bin Mat Jusoh
Reserarch Officer
MARDI/Malaysia

Dr. Nurazwin binti Zulkifli
Agriculture Officer
DoA/Malaysia

Introduction

Innovative **mechanization** techniques are transforming rice straw management in Malaysia. This presentation explores the impact of modern technology on **sustainable** agriculture practices and the potential for **environmental** conservation.

ESCAP | CSAM
Centre for Sustainable Agricultural Mechanization

Traditional Rice Straw Management

Historically, rice straw in Malaysia has been managed through **manual** labor and **open-field burning**, leading to **environmental** degradation and air pollution. The traditional methods are **inefficient** and **labor-intensive**.

CSAM
Centre for Sustainable Agricultural Mechanization
ESCAP

Challenges in Rice Straw Management

The accumulation of rice straw poses challenges for **sustainable** agricultural practices, including soil **degradation** and methane emissions. Traditional methods also lead to **health hazards** for farmers.

What should we do?

- Reduce waste and minimize the environmental impact of disposal
- Utilize resource that would otherwise been discarded which can lead to a more efficient usage of agricultural byproduct
- create new opportunities for farmers and entrepreneurs.
- contribute to renewable energy sources
- Studying on developing value added product from rice straw represent opportunities for technological innovation and research advancement

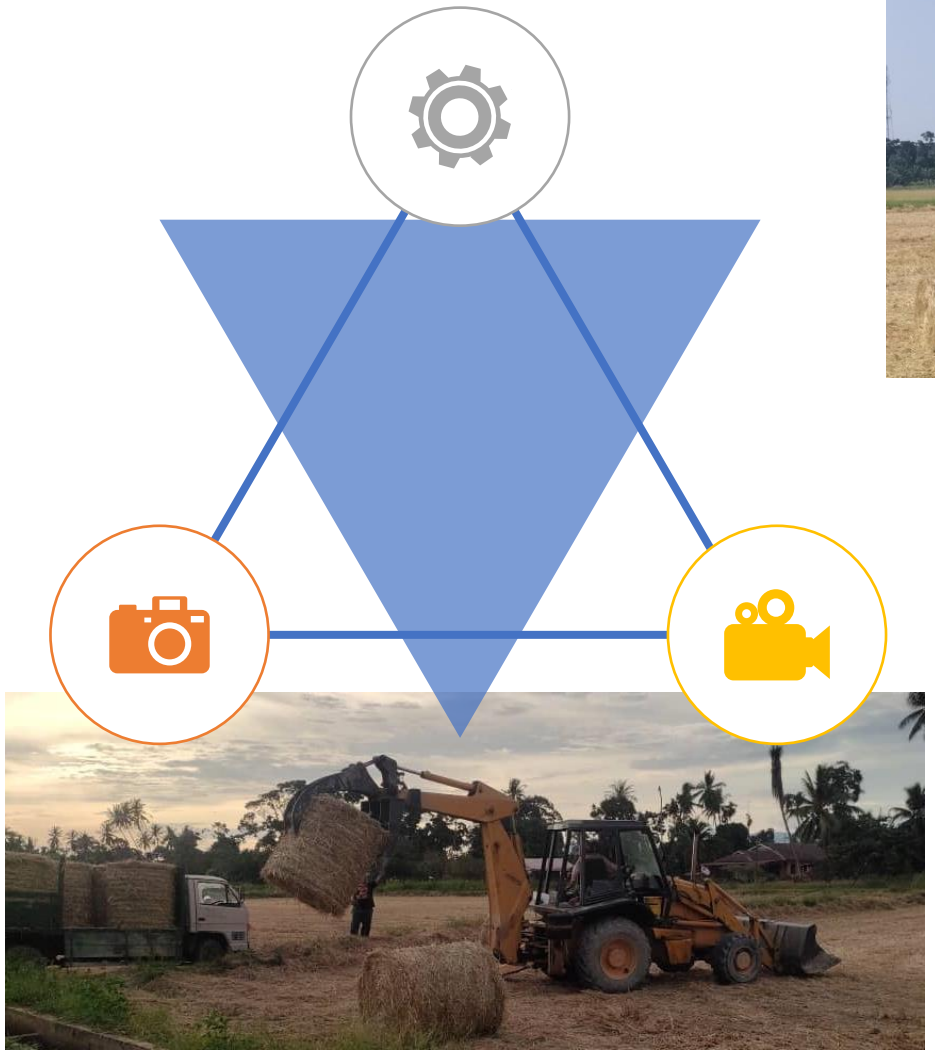
Current issues of rice straw management in Malaysia

Technology has been under utilized

Collection of rice straw cannot be done during wet season

High operational cost

Several machines required to manage the rice straw collection



Limited straw collection period

1.5 months only before upcoming planting season

Current Practices of Mechanized Rice Straw Collection

Work rate: 0.7 ha/hr
[5.6 ha per day - 8 hours working]

Mechanization:
1. Tractor
2. Slasher implement

Work rate: 10 bale/hr
[80 bale per day - 8 hours working]

Mechanization:
1. Tractor
2. Baler

Work rate: 16 bale/hr

[8 bale/lorry - 30 minutes]

Mechanization:
1. Backhoe + Grabber
2. Lorry

Mechanization Suggestion of Rice Straw Collection

Activity	Dry Season	Wet Season
Rice straw collection and bale	Tractor + Baler Implement - High machine cost (More than RM 100K/unit) - Traction type hay baler - Bale size: W-1.2 m, D-1.0m - 1,500kg/hr (10 bale per hour – 1 bale 150 kg) 	Tractor + Baler Implement - Lower machine cost(~ RM 40K/unit) - Compact design - Collect straw on paddy stump - Bale size: W-70cm, D-50cm  

Mechanization Suggestion of Rice Straw Collection

Activity	Dry season	Wet season
Bale collection in field	Using backhoe - 3 operators needed (backhoe operator dan 2 labors including lorry driver) 	trailer + Tractor - 2 operators needed

Comparison of Rice Straw Collection Mechanization

Items	Commercial Baler	Mini Baler	Self-propelled Baler
Manpower	At least 5 (slasher-1, baler -1, bale handling -3)	At least 4 (dry season), 3 (wet season)	At least 2 operators (driver and bale handling)
Machine	Dry season only	Both dry and wet seasons	Both dry and wet seasons
Costing	Purchasing cost > RM 100k	Purchasing cost < RM 100k	Purchasing cost < RM 150k

Machine testing for rice straw collection in field

Baler

- Mini baler can be used during both wet and dry season to increase the production of bale

Parameters	Value
Tractor speed	1.67 km/hr(Gear 1-1)
Engine speed	2,000 RPM
PTO speed	500 RPM

Results	Value
working capacity	0.79 tan/ha
Bale density	98.5 kg/m^3
Bale weight average	13.5 kg

Suggestion of mechanization method

Activity	Existing method (mechanized)	New mechanized suggestion
Collection and bale	Tractor + Baler Implement - High machine cost (More than RM 100K/unit) - Traction type hay baler - Bale size: W-1.2 m, D-1.0m - 1,500kg/hr (10 bale per hour – 1 bale 150 kg)	Tractor + Mini Baler Implement - Lower machine cost(~ RM 40K/unit) - Compact design - Collect straw on paddy stump - Bale size: W-70cm, D-50cm

SELF PROPELLED BALER - OPTIONAL

Mini round-balers for TRACK POWER UNIT

MOUNTAINPRESS 550 CNG

MOUNTAINPRESS 550 CNG is a small round-baler for **small track power units**. One of the advantages of MOUNTAINPRESS 550 CNG is that it runs through a quick coupling flange (bayonet coupling) which allows, once the baler has been removed, to connect other accessories. The MOUNTAINPRESS 550 CNG pressure chamber is housed inside the frame. This provides a very low centre of gravity that results in an overall stability of the baler. The MOUNTAINPRESS 550 CNG baling process is based on the same principle of the other MOUNTAINPRESS small round-balers.

MOUNTAINPRESS 550 CNG

TECHNICAL DATA

Lenght	1.350 mm
Width	1.070 mm
Height	990 mm
Weight	256 kg
Bale output per hour	50 - 80
Pick-up	700 mm
Tyres	3.50.8
Minimum power required	6,6 - 14,8 kW

STANDARD EQUIPMENT

Net wrapping • Bale counter • Automatic chain tensioning

OPTIONAL EQUIPMENT

Gathering wheels • Automatic chain lubrication

RM 75,000.00

RM 125,000.00

Model		FHB 85SP
Pick-up width	cm	220
Engine Power	HP	85
Transmission type		Hydrostatic (HST)
HST size	cc	37
PTO speed	rpm	540
Bale type		Square
Straw cross section	mm	460 x 360
Bale length	mm	350 ~ 1200
Speed	stroke/min	100
Stroke	mm	550
Rope capacity	bundle	06
Strap type		Plastic / Nylon Rope
Safety Protection devise		Safety Bolt
Track size	mm	450 x 90 x 51
Overall dimension	LxWxH, mm	5150 x 2350 x 2200
Overall weight	kg	3,100
Cabin type		Canopy

POTENTIAL USE OF RICE STRAW

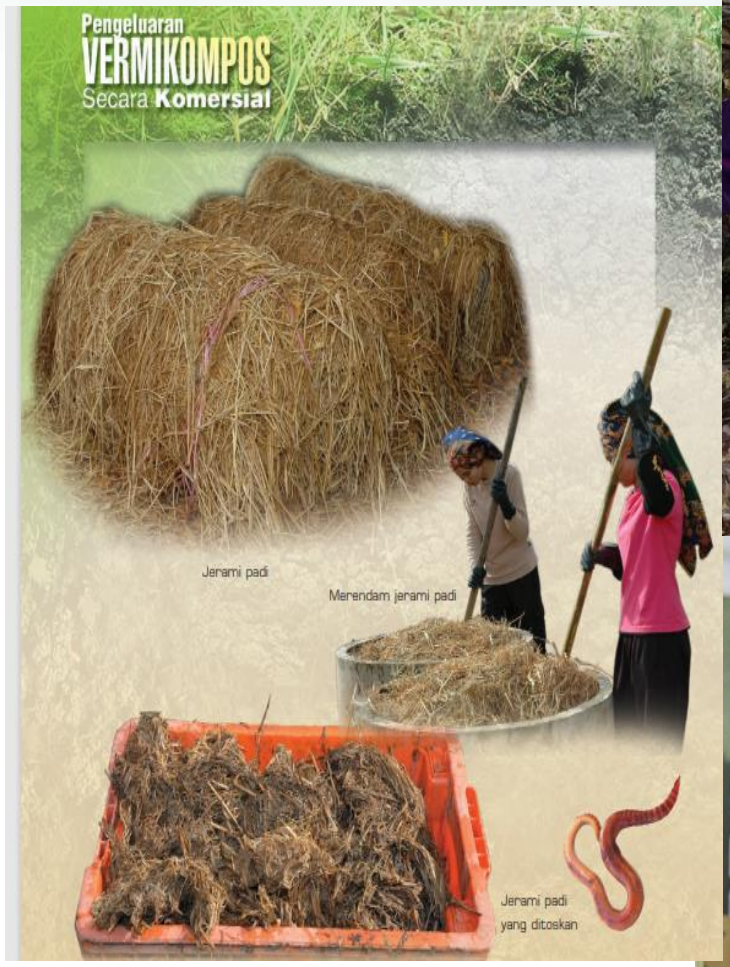
Feedstock/livestock

Composting

Mushroom farming

Bioenergy

Building material (reinforcement composites)



THE WAY FORWARD

- The successful utilization of rice straw requires the development of cost-effective and efficient processing technologies.

- Mechanization plays a crucial role in improving the economics of rice straw management, as it can reduce labor costs, increase the efficiency of collection and transportation, and enable the scaling up of processing operations.

HENCE, by investing in mechanized systems, such as rice straw balers, shredders, and biomass conversion plants, farmers and industry players can unlock the full potential of this agricultural byproduct and contribute to the overall sustainability of the rice production industry in Malaysia.

Conclusion

The revolution of rice straw management through mechanization in Malaysia signifies a significant step towards sustainability, environmental conservation, and economic **progress** in agriculture. Rice straw waste presents a promising opportunity for sustainable resource management. By exploring innovative solutions, we can maximize the potential of this abundant agricultural residue, contributing to a circular and sustainable economy.

Thank you

Follow us:

unescap

unitednationsescap

united-nations-escap

unescap.org

ESCAP

CSAM

Centre for Sustainable Agricultural Mechanization