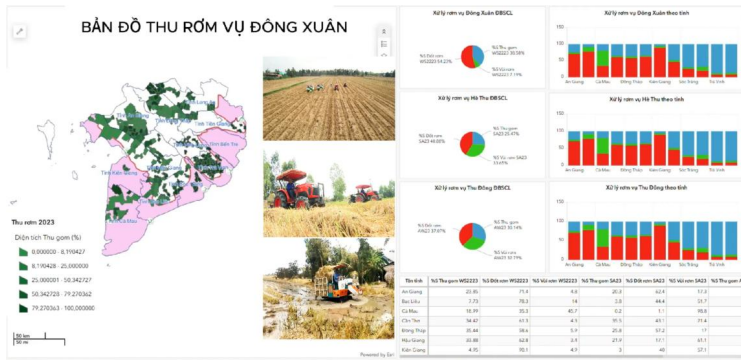


Innovations and Interventions On Rice straw management in Vietnam



easy Farm APP FOR Farmer

Easy Farm is an agricultural management application developed by IRRI, empowering farmers to seamlessly place and oversee orders for essential agricultural supplies and services.

- Equipment Rental Scheduling**: Schedule harvesters, tractors, and other equipment for your field.
- Order Management**: Manage your orders for agricultural supplies and services.
- Fertilizer Purchase**: Purchase fertilizers by scanning QR codes or your field.
- Field Management**: Manage your field information and track your crop progress.

DOWNLOAD NOW!
Available on Google Play store

IRRI



S4I



RiceEco



Fertilize Right

TAIWAN



CABIN

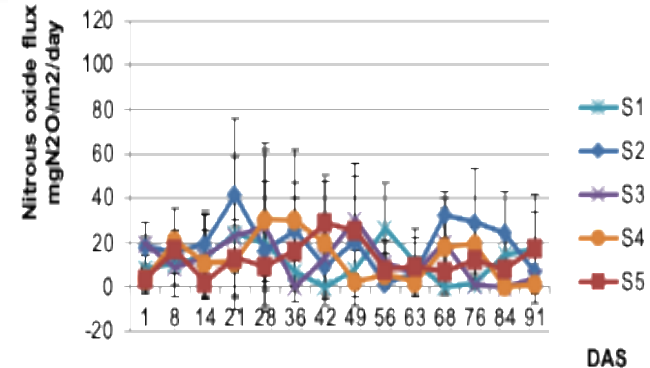
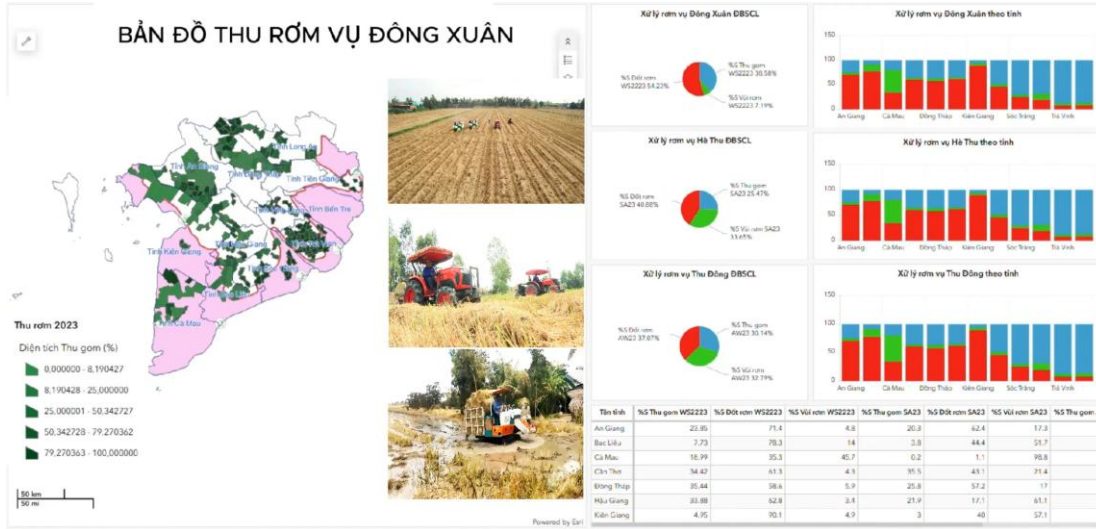
IRRI team and related partners



Key points

- Current rice straw management status -opportunities for rice straw management
- In-field rice straw management
- Off-field rice straw management
- EasyFarm: match-making among farmers, service providers, and markets
- Recommendations and collaborative opportunities

Rice straw-based circular agriculture: from R&D to Scaling

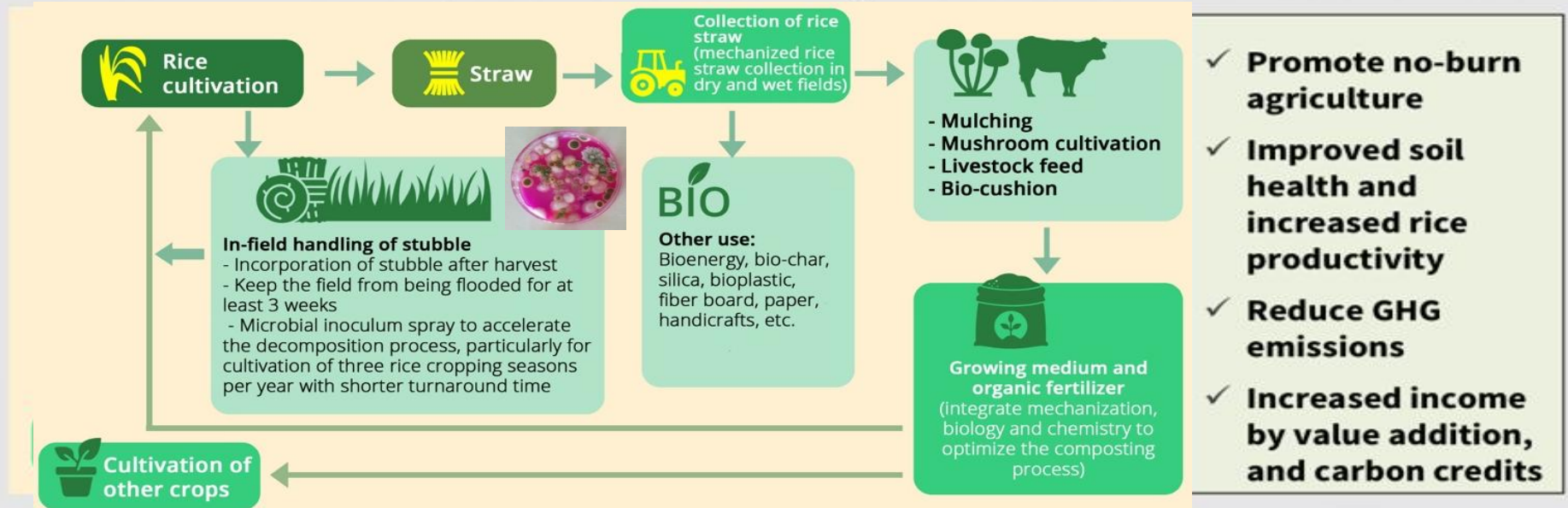


Mapping to develop a strategy for rice straw management in MRD

Potential GHGe reduction from rice straw in MRD Vietnam up to 40%

Rice & rice straw – based circular economy

Solution: IRRI developed Circular economy model to convert waste to wealth

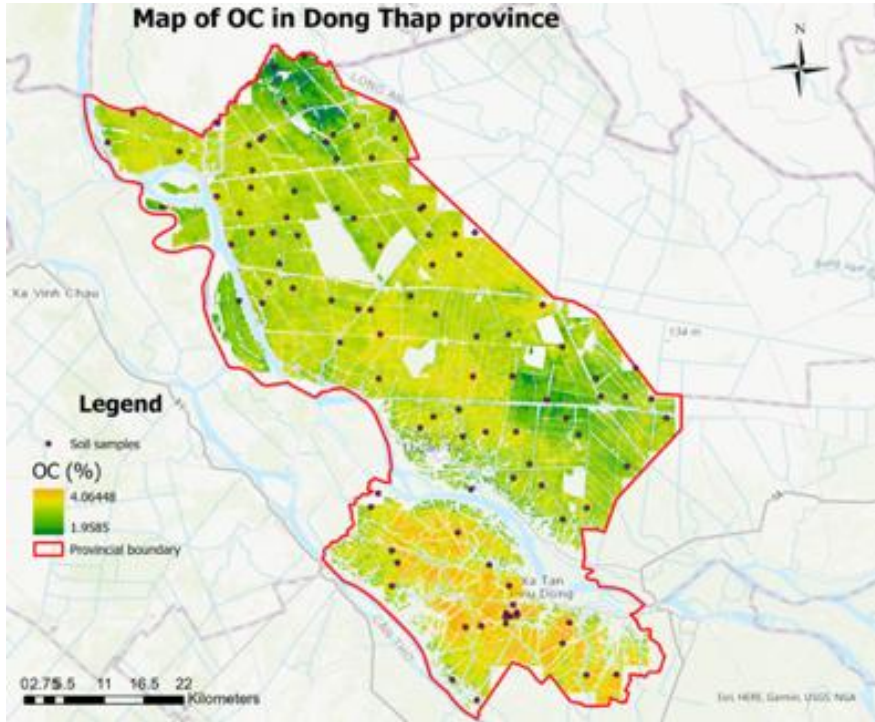


- ✓ **Promote no-burn agriculture**
- ✓ **Improved soil health and increased rice productivity**
- ✓ **Reduce GHG emissions**
- ✓ **Increased income by value addition, and carbon credits**

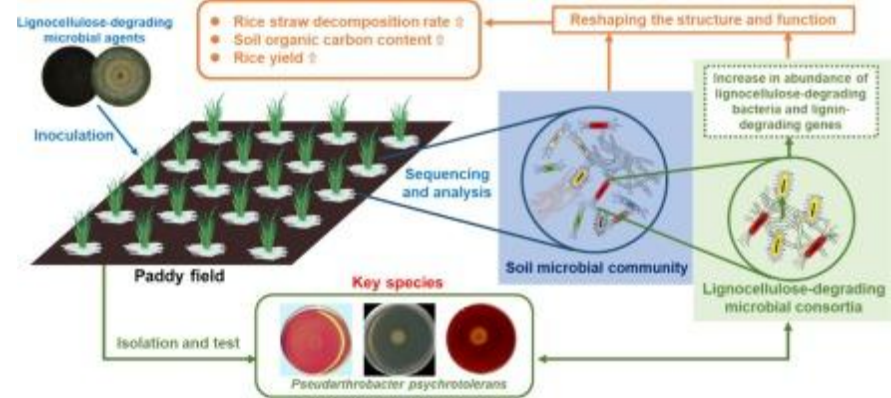


Innovations: Mechanized collection, composting, biochar production, animal feed, and alternate use for mushroom production, biogas, and products such as bioplastic/pots

Infield rice straw management



Soil organic mapping for optimized rice straw management



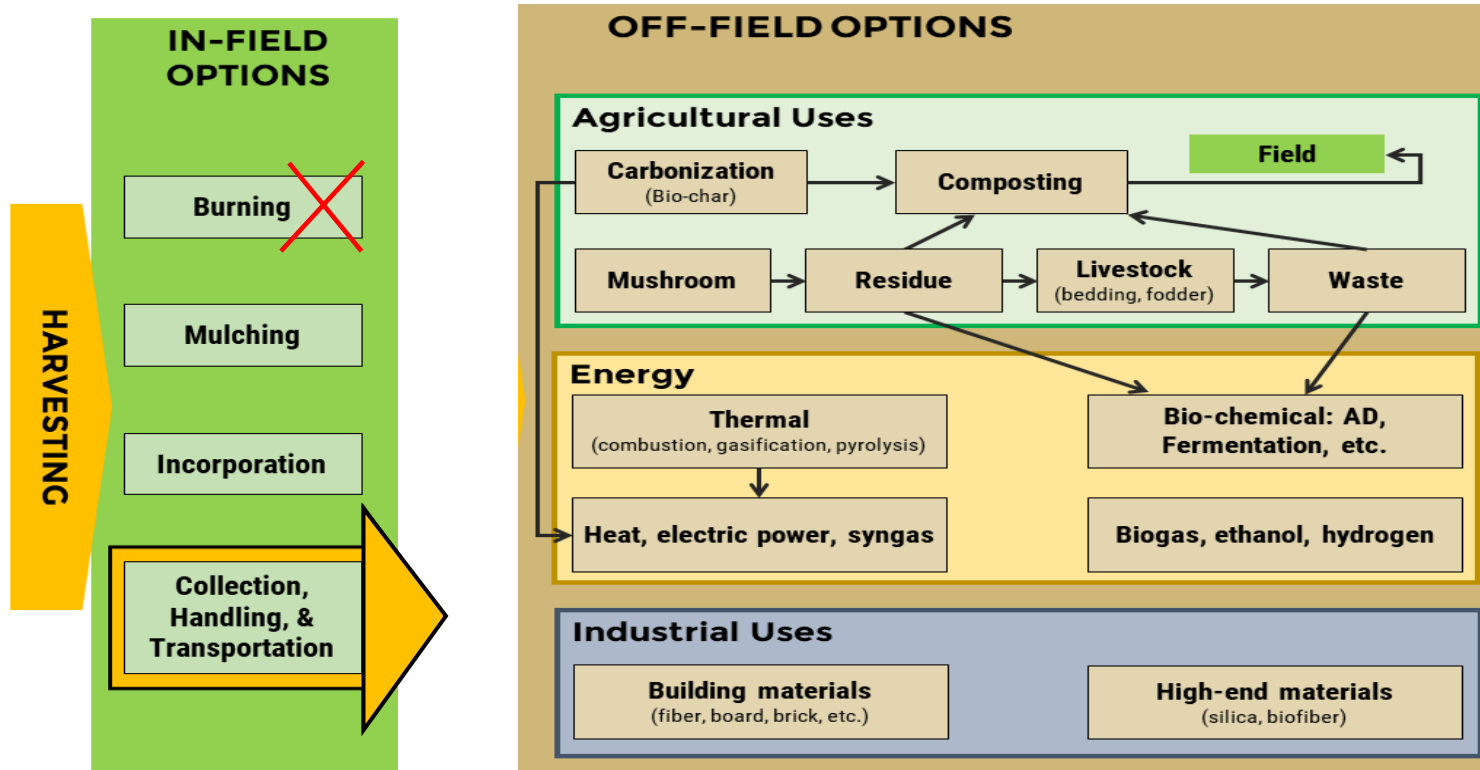
Developing microbial technologies and inoculants for rapid rice straw decomposition

Mechanization combined with microbial technology for rapid rice straw decomposition

- Avoid burning
- Mechanized rice straw incorporation + microorganisms can speed up the decomposition of rice straw and increase soil health
- Rice straw decomposed before new crop establishment → reduce CH₄



Off-field options



It is important to note that not all of these possible options are economically viable.

Rice straw based mushroom production



Yield: 80kg mushroom/ton of straw



Yield: 150-200 kg mushroom/ton of straw

Higher investment and production cost



Vertical mushroom farming



Mechanized rice straw composting

Combines physical and bio-chemical processes for optimizing rice straw decomposition efficiency and organic fertilizer quality.

*technology transfer/
capacity development
in Cambodia, India,
Philippines, Thailand,
and Vietnam*



After-mushroom,
low quality, or wet straw



Animal manure



Organic fertilizer



Compost pellets

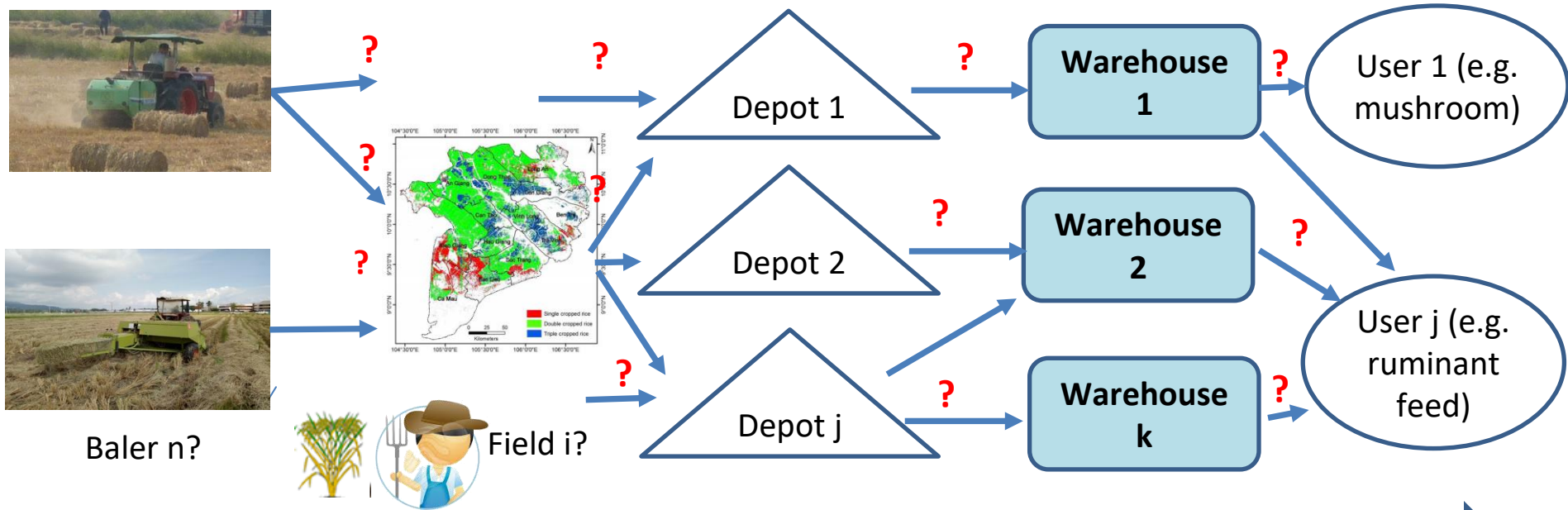


Composting

Biodegradable plant pots



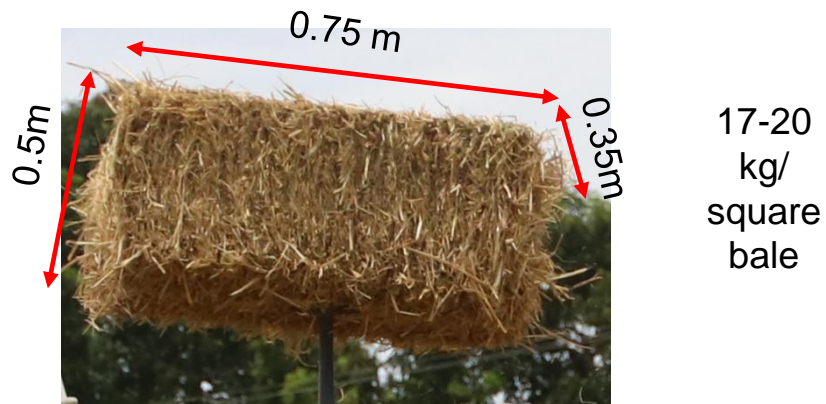
Optimize rice straw logistics





Supply chain direction

Research direction (existing, potential markets → feedstock demand → supply chain (collection, handling, transportation, aggregation))

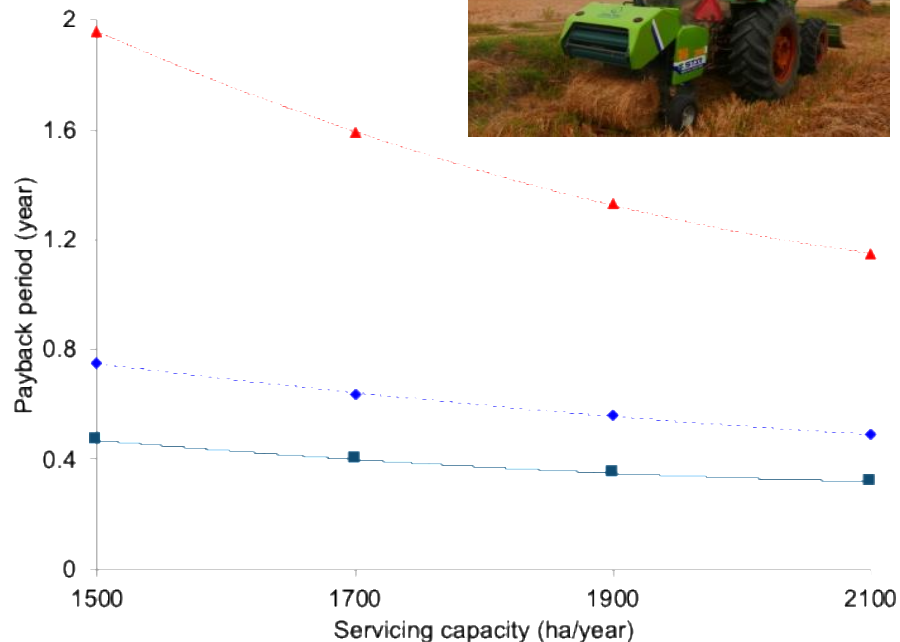
Mechanized collection and compaction



Main parameters of two types of straw balers commonly used in MRD

Parameter	Tractor driven round baler	Self-propelled baler
		
Field conditions for operation	Dry field	Both dry and wet fields
Type of bale	Cylindrical (round)	Cylindrical (round)
Bale size (length x diameter), m	0.7 x 0.45	0.7 x 0.45
Bale Weight at 14% RH (kg/roll)	18- 20	18 – 20 (wet bale 30 kg)
Working Capacity (ton/h)	1. 6 - 1.8	1-1.3
Investment cost (machine price)_ 2023 (million VND)	70 - 120	350
Engine/tractor power (HP)	30 - 60	70 - 100
Consumption level (liter/ton)	2 .8 - 3	4 - 5

Role of rice straw collection business models



STT	Investment	\$US	Total baling and transport cost	\$US/ton	%
1/	Investment cost	5,455	Depreciation	1.68	14.4
1	Equipment	5,000	Interest	0.21	1.8
	Baler	5,000	Fuel	2.13	18.2
2	Workshop for parking and maintenance	455	Labor	3.53	30.2
2/	Depreciation	2	Tractor rental	3.10	26.5
1	Life span of equipment (year)	5.0	Equip. transport	1.06	9.1
2	Life span of workshop (year)	7.0	Total	11.71	100
3	Working time a day (hour/day)	8.0			
4	Maintenance coefficient	1.5			
5	Capacity (hour/ton)	0.45			
6	Working days each year (days/year)	90			
7	Capacity per year (tons/year)	1,584			
8	Depreciation of equipment per year	1,000			
9	Depreciation of workshop per year	65			
10	Depreciation cost of equipment (\$US/tons)	0.63			
11	Depreciation cost of workshop (\$US/ton)	0.04			
12	Total depreciation cost (\$US/ton)	0.67			
13	Total depreciation and maintenance cost (\$US/ton)	1.01			
3/	Interest, (\$US/ton)	0.21			
1	Bank interest, (%/year)	12.00			
2	Annually interest (\$US/year)	327			
3	Interest cost (\$US/ton)	0.21			
4/	Labor (\$US/ton)	3.53			
1	Baler driver (hour/ton)	0.45			
2	Baler driver (\$US/day)	13.64			
3	Handling bales to the bund (hour/ton)	2.20			
4	Labor for handling (\$US/day)	9.09			
5	Management (\$US/day)	4.55			
5/	Fuel consumption (\$US/ton)	2.13			
1	Diesel price (\$US/liter)	0.82			
2	Fuel consumption for tractor 25-30 Hp, (lit/ton) - hauling baler	2.60			
6/	Tractor rent cost (\$US/ton)	3.10			
1	Tractor renting price, (\$US/h)	6.82			
2	Tractor renting cost, (\$US/ton)	3.10			
7/	Transportation of tractor and baler, 10% of baling cost (\$US/ton)	1.06			
8/	Total cost before tax, (\$US/ton)	11.82			
1	Total cost before tax, (\$US/ton)	11.71			
2	Tax 10%, (\$US)	0.11			
9/	Straw baling service fee (\$US/ton)	15.00			
10/	Net Profit, (\$US/ton)	3.18			

Equip. transport	9%
Depreciation	14%
Interest	2%
Fuel	18%
Labor	30%
Tractor rental	27%

9/ Capital return		
Income (\$US/year)	23 760	
Total cost (\$US/year)	18 720	
Net Profit (\$US/year)	5 040	
Time of capital return (year)	1.08	

10/ IRR		
End (year)	\$US	Note
0	- 5 455	Invest
1	5 040	Profit
2	5 040	
3	5 040	
4	5 040	
5	5 040	
IRR	88.5	

\$US	End (year)
6000	
4000	
2000	
0	
-2000	
-4000	
-6000	

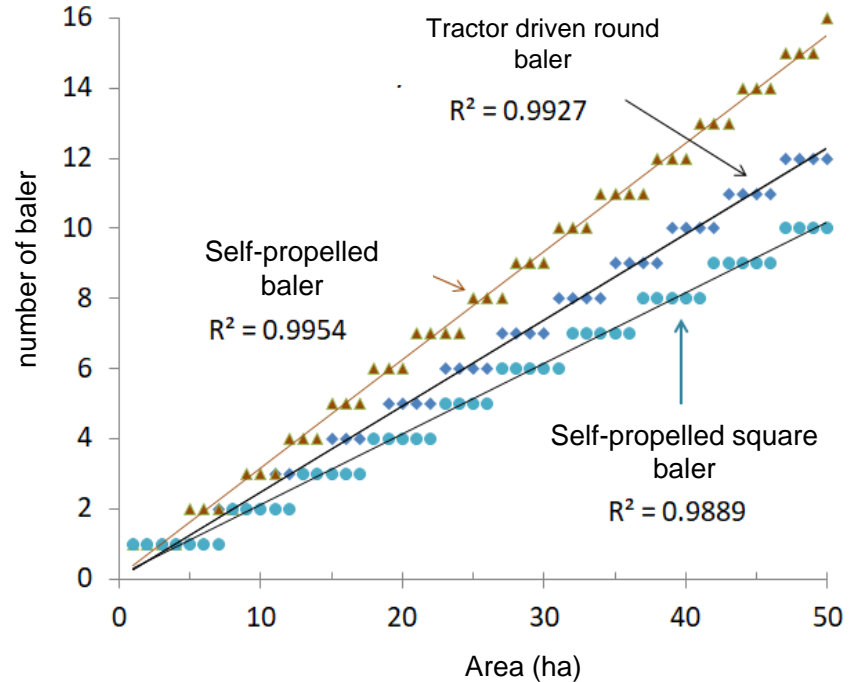
Number of straw baler required for the Mekong Delta

Parameter	Dried straw (WS + 50% Summer-Autumn and Autumn-Winter)	Wet straw
Annual cultivated area in the Mekong Delta (million ha)	2.73	1.37
Working capacity of baler (ha/h)	1	0.6
Working time per day (hours/day)	8	8
Number of working days in a year, (days/year)	50	30
Number of baler needed	6825	9514

Assumption: invest all self-propelled balers, sufficient for wet straw collection → can use for dry straw collection

Total rice straw balers needed (-30% existing) = 70%*9514 = around 7000 balers

Total required budget for subsidy: 30%*7000*350 mil = around 700 billion VND ~ 26.7 million USD



Model for calculating the number of straw baler (Hung et al., 2020)

- Working capacity
- Area
- Travel schedules and seasons

Capacity per trip for each sample vehicle type

Square Bales			
Vehicle Type	volume cap (m ³)	Number of bales	total weight (t/trip)
small vehicle	5.64	43	0.75
small truck	34.55	264	4.62
large truck	55.23	421	7.37
Round Bales			
Vehicle Type	Volume cap (m ³)	Number of bales	total weight (t/trip)
small vehicle	5.64	51	0.71
small truck	34.55	311	4.35
large truck	55.23	497	6.96



High density compaction to reduce transportation cost



Further high density compacting (130 kg/bale)

→ reduce transportation (1000-2000 km) cost (\approx 6 times)

Depot and storage for rice straw



Bag-stacks covered in a plastic film-container in the Philippines



Bag-stacks covered by canvas in Vietnam



Straw warehouse (with conveying system)

EasyFarm – match-making between farmers and other stakeholders along 1mha value chain

App for Farmers



Equipment Rental Scheduling
Enables farmers to rent tailored combine harvesters and straw balers for their fields.

Field Management
Empowers farmers to optimize rice field management

Order Management
Provides a comprehensive list of orders and their statuses, allowing farmers to track and manage them efficiently

Fertilizer Purchase
Facilitates farmers in sourcing and ordering the best fertilizers for their crops

Agriculture product for sale
Making it easy to sell paddy grain, straw, and other agricultural products to buyers

DOWNLOAD NOW!

Android iOS

App for Service provider and buyer



Statistics
Aggregates daily and monthly data.

Equipment Management
Enables providers to track their equipment inventory and detailed status.

Fertilizer Management
Lists owned fertilizers, enabling providers to efficiently track and manage their products.

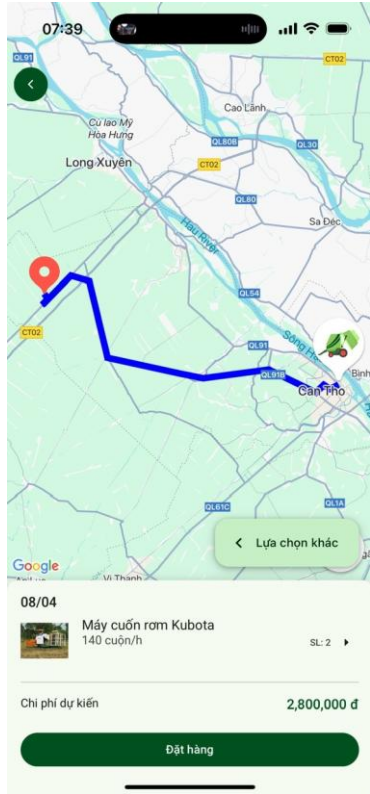
Buy agricultural products
Buyers are able to find and buy paddy grain, straw and other agriculture products.

Order Management
Facilitates providers in managing all equipment rental and fertilizer sales orders in one platform.

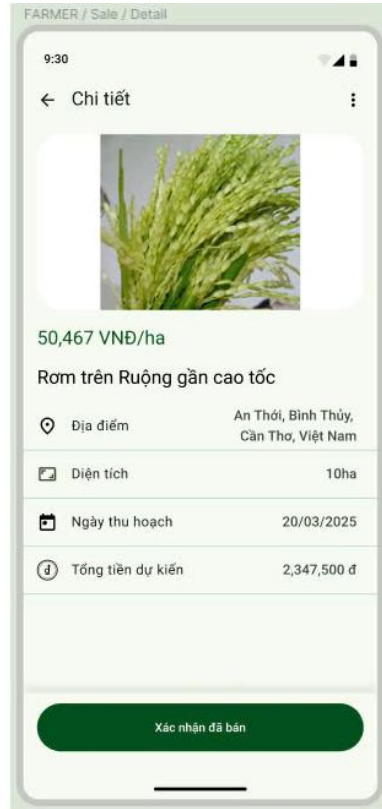
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Android iOS

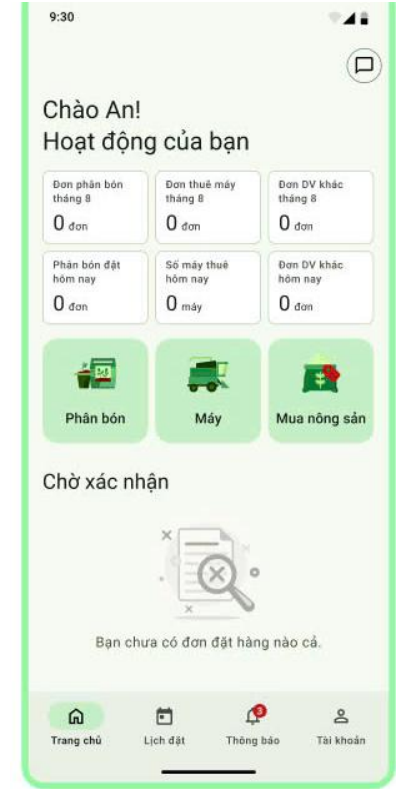
EasyFarm – match-making between farmers and other stakeholders along rice value chain



Book rice straw balers



Farmers can sell paddy grains, rice straw and other products on the App



App service providers/dealers/ buyers

Recommendations and collaboration opportunities

- Scalable and sustainable solutions for rice straw decomposition, handling and processing
- Deploy new technologies, e.g. biochar, biofertilizer, bioplastics, ect.
- Improved rice straw logistics and value chains (comprehensive study, site-specific assessment, mapping, etc.)
- Capacity building for rice straw management and business models
- Digital tools/ Apps for improving value chain – e.g. EasyFarm: match-making between farmers, service providers, buyers, etc.



Thank you

**For the contributions and collaborations of all partners
and IRRI's colleagues in the Region and Countries**

The team from IRRI Vietnam:

Nguyen Thanh Tuyen (Data Science), CABIN project manager

Tran Thi Cam Nhung (Plant protection + biotechnology), RiceEco project coordinator

Nguyen Thi Nhu Hien (Economist, Finance)

Nguyen Van Hung (Agricultural engineering)



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