

# TOWARD A PRACTICE- BASED APPROACH TO PHL

Post-Harvest Investment Tool



ADM Institute for the  
Prevention of Postharvest Loss  
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

 **CENTREC**  
Consulting Group, LLC

## Set-up

- Recall Poverty Incidence and Income Level Analysis
- Application as a practice-based approach with a decision focus
- Understanding the post-harvest supply chain and the practices employed is a starting point for measurement and analysis
- IRRI's chart of losses provides information that can help link loss to practices utilized

What kind of tools could aid decision making?

## Post-Harvest Investment Tool

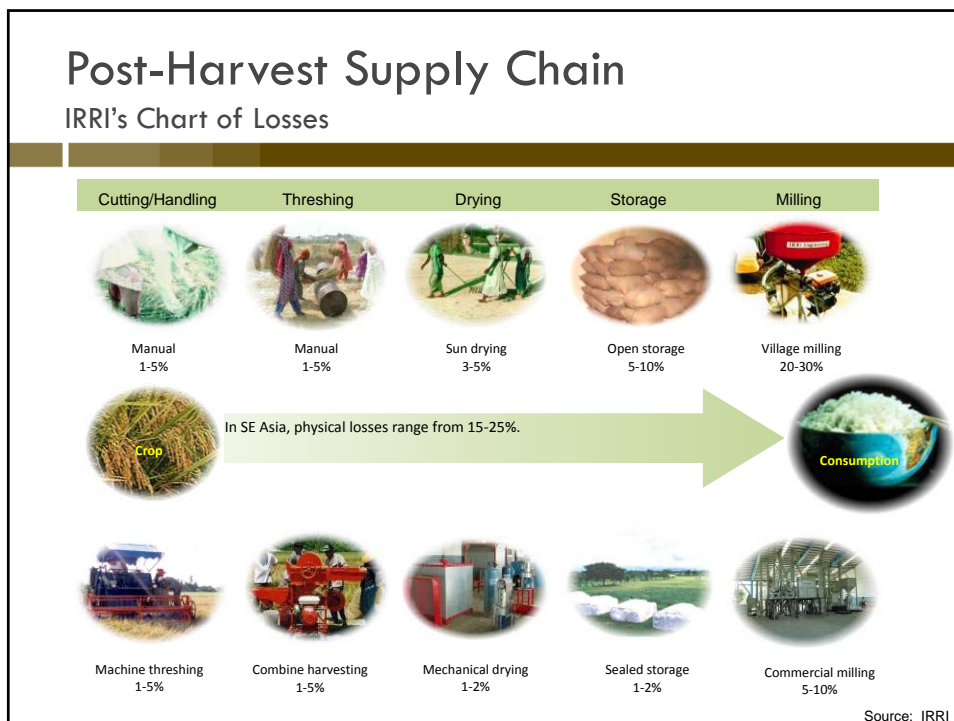
- A tool for systematic mitigation to make justified and informed decisions
- Provide a visual representation of flows and losses by segment of the post-harvest supply chain
- Track both quantity (volume) losses and quality (value) degradation
- Allow comparison scenarios to understand the quantity and quality impact of improving practices

## Post-Harvest Supply Chain

IRRI's Chart of Losses



Source: IRRI



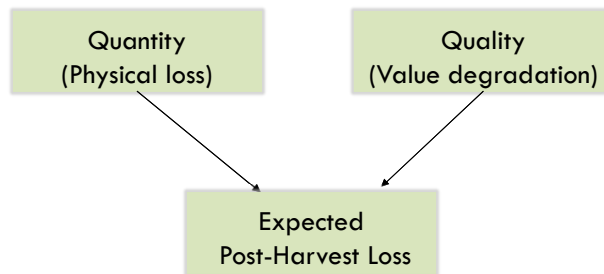


## Practice-based Approach

- Using knowledge of post-harvest practices and their associated range of loss to
  - ▣ calculate expected loss
  - ▣ make decisions on how to invest in improved practices
- Non post-harvest loss example
  - ▣ Given weight, general shape of the body and speed driven for two vehicles, we can get a good idea of relative gas mileage

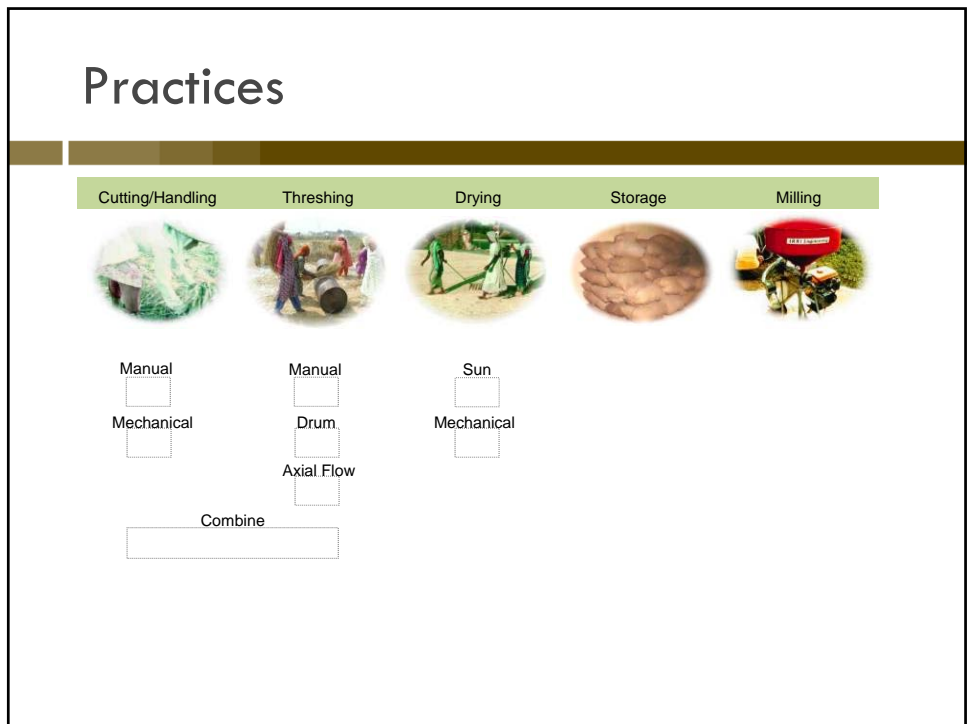
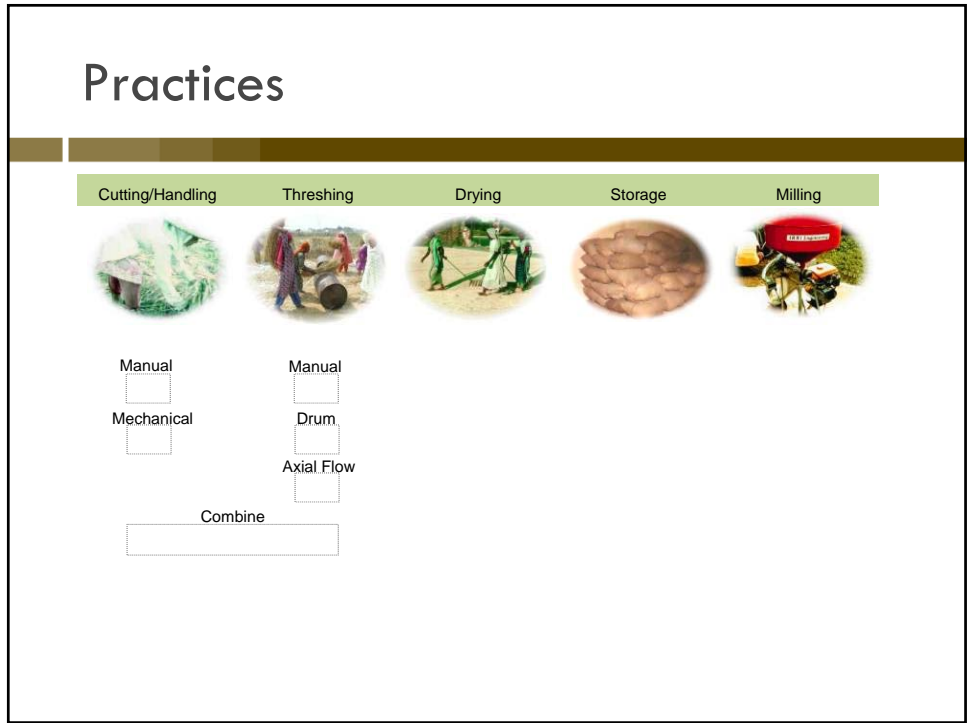
## Practice-based Approach

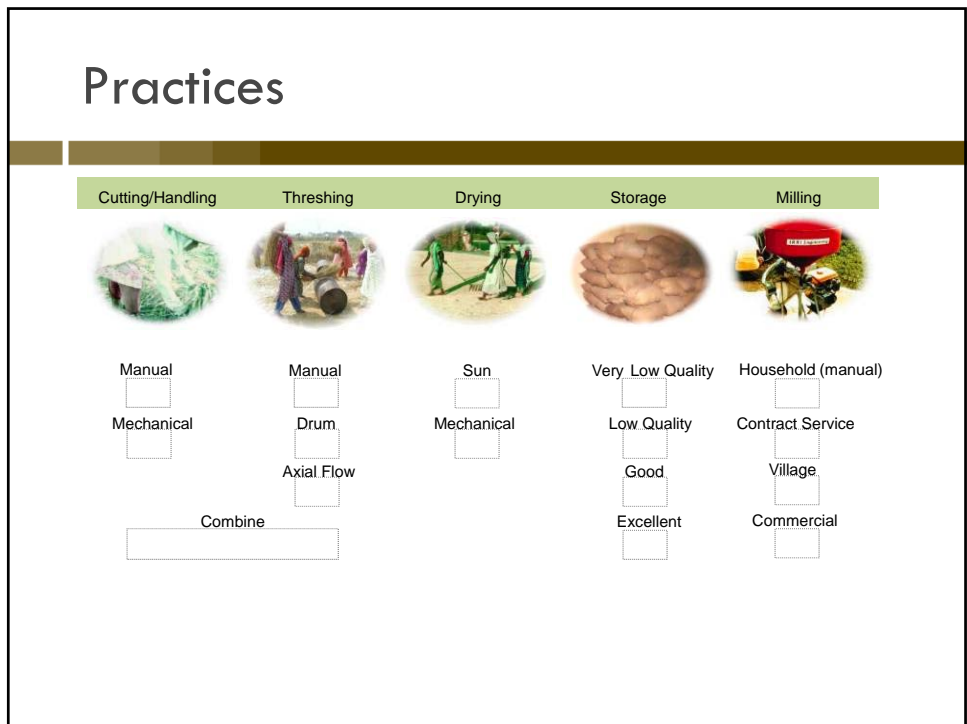
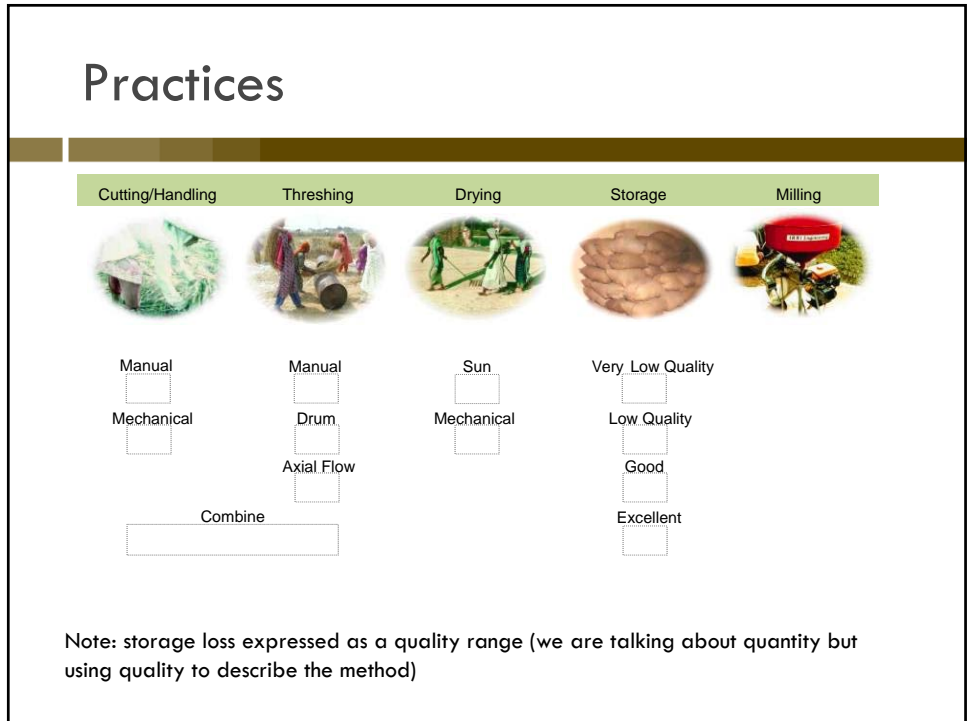
- Identify the practices utilized and their associated loss
- Use best data available to make reasonable estimates of quantity and quality loss

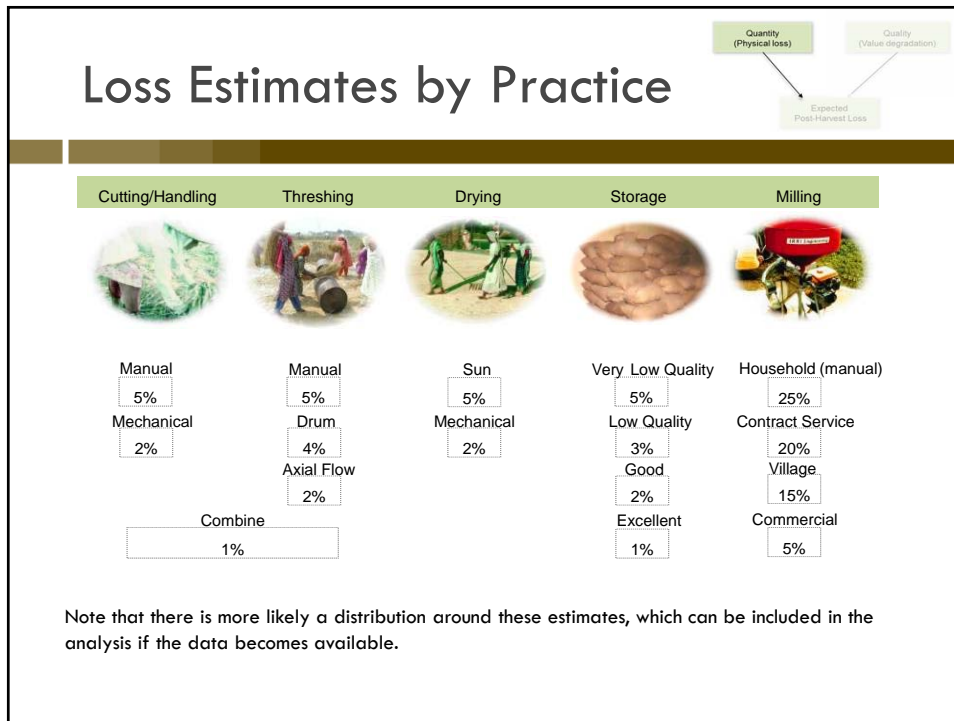


## Practices







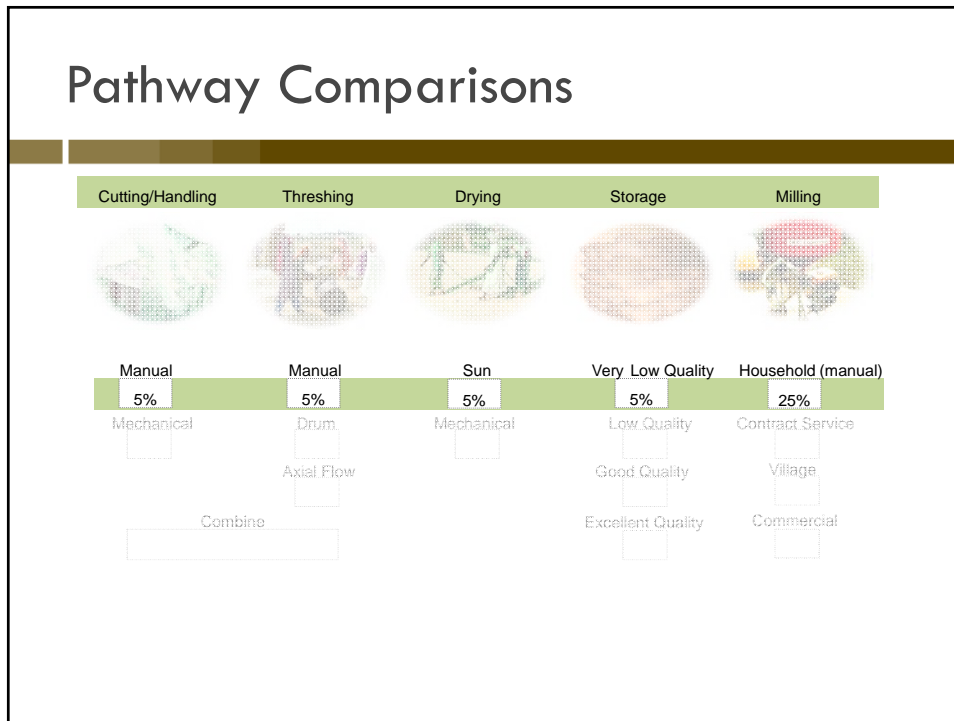


## Quality

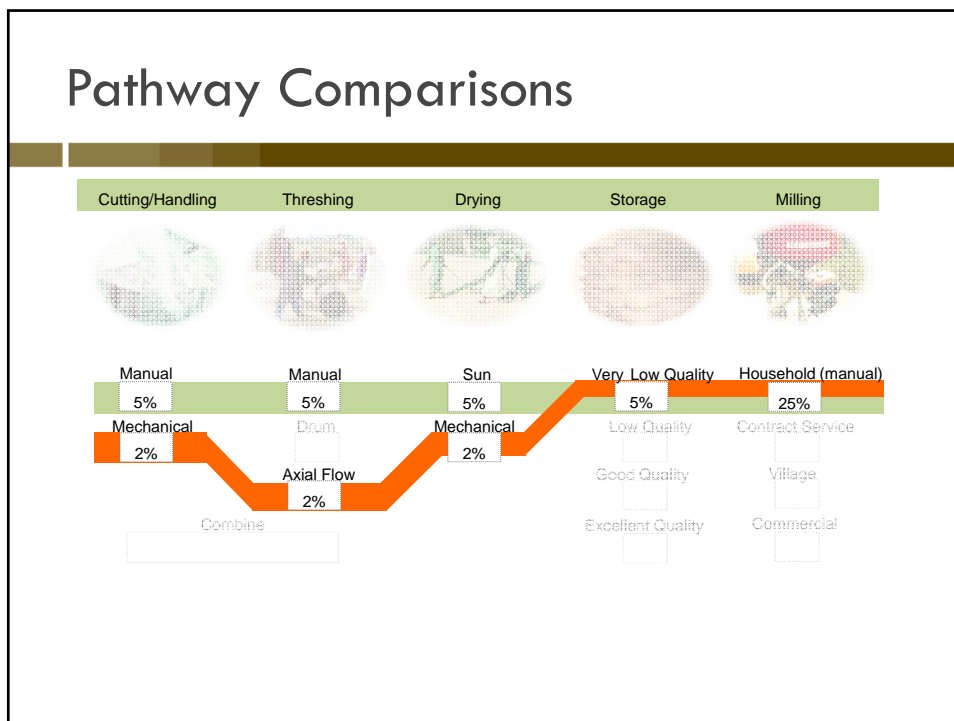
- Quality loss is defined as loss in value
- Loss conditions vary over time (wet/dry seasons) and with technology or practice
- Quality loss is assigned for the entire post-harvest supply chain given the practices utilized throughout the chain



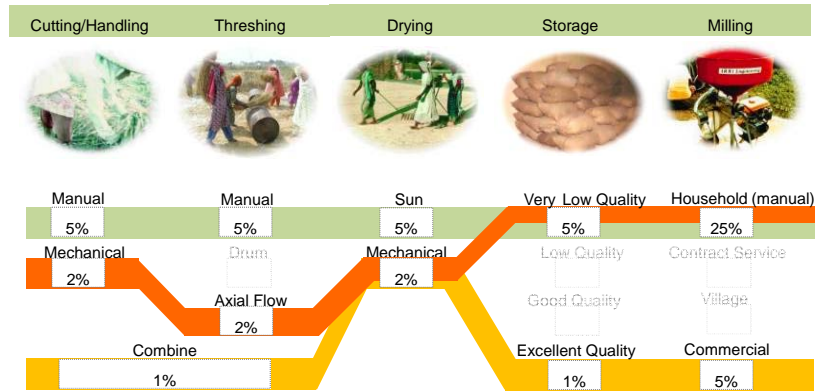
## Pathway Comparisons



## Pathway Comparisons



## Pathway Comparisons



## Vignette

- Take a region similar to Bihar India that is comprised of several districts
- District “A”
  - ▣ 10,000 hectares
  - ▣ 2,500 kg/ha average rice yield (good weather years)
  - ▣ Homogeneous small-scale farming operations
  - ▣ Traditional supply chain
- Market price of 25,000 rupees/MT

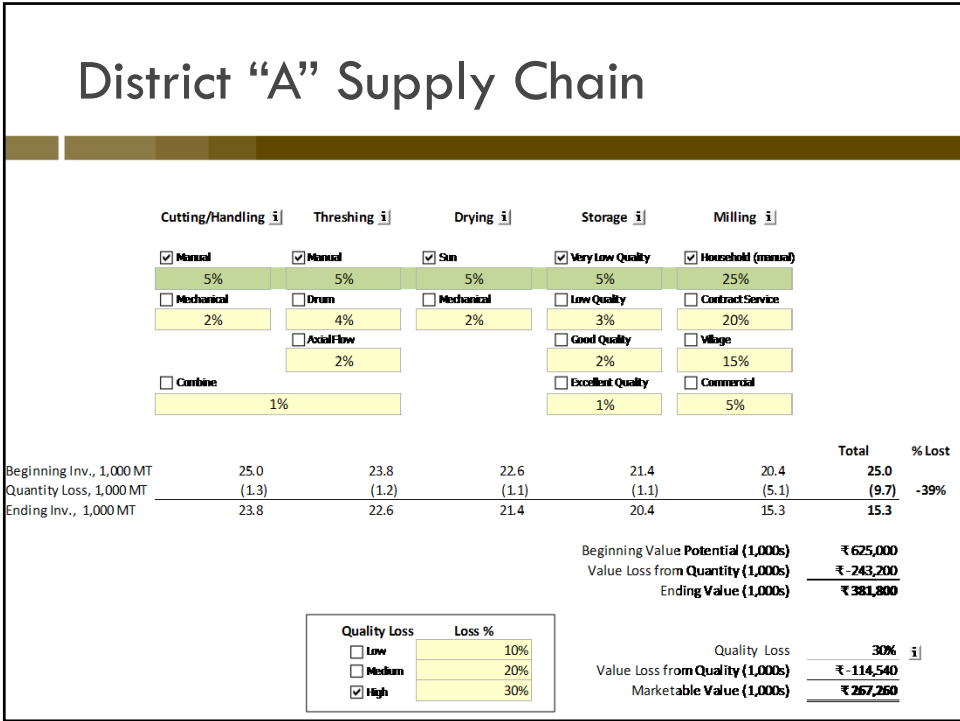
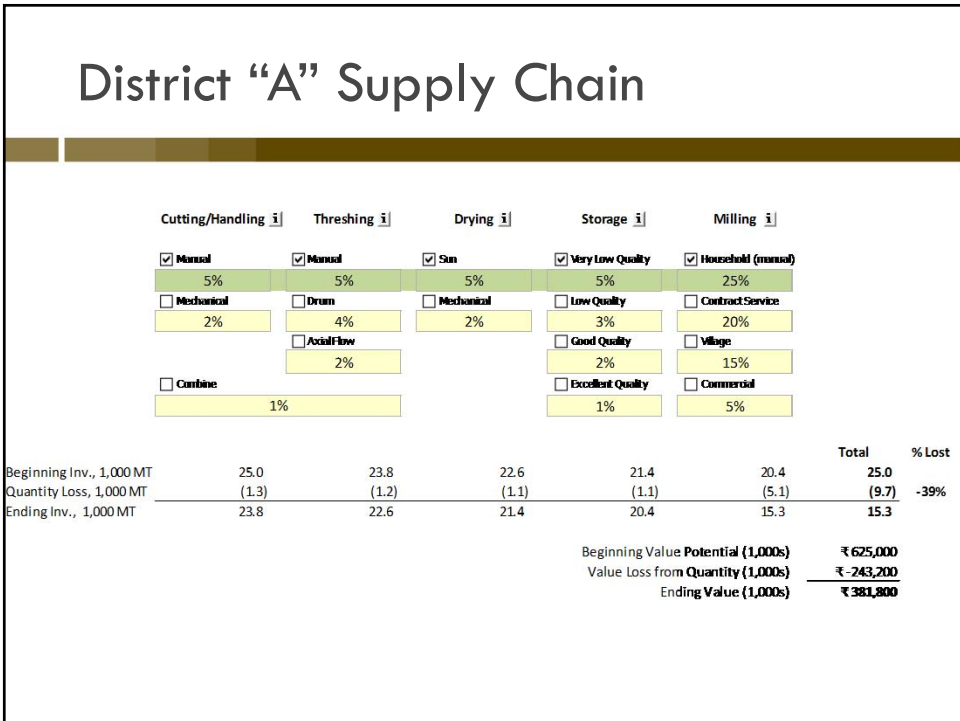
## District "A" Supply Chain

Cutting/Handling <i>i</i>	Threshing <i>i</i>	Drying <i>i</i>	Storage <i>i</i>	Milling <i>i</i>
<input checked="" type="checkbox"/> Manual 5%	<input checked="" type="checkbox"/> Manual 5%	<input checked="" type="checkbox"/> Sun 5%	<input checked="" type="checkbox"/> Very Low Quality 5%	<input checked="" type="checkbox"/> Household (manual) 25%
<input type="checkbox"/> Mechanical 2%	<input type="checkbox"/> Drum 4%	<input type="checkbox"/> Mechanical 2%	<input type="checkbox"/> Low Quality 3%	<input type="checkbox"/> Contract Service 20%
	<input type="checkbox"/> AxialFlow 2%		<input type="checkbox"/> Good Quality 2%	<input type="checkbox"/> Village 15%
<input type="checkbox"/> Combine 1%			<input type="checkbox"/> Excellent Quality 1%	<input type="checkbox"/> Commercial 5%

## District "A" Supply Chain

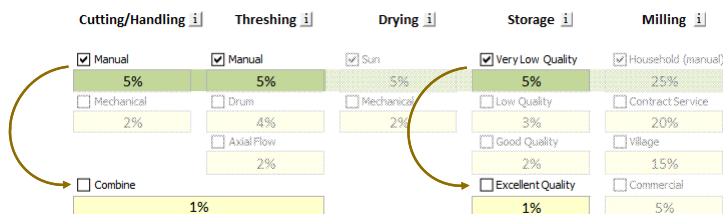
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	<input type="checkbox"/> AxialFlow 2%		<input type="checkbox"/> Good Quality 2%	<input type="checkbox"/> Village 15%
<input type="checkbox"/> Combine 1%			<input type="checkbox"/> Excellent Quality 1%	<input type="checkbox"/> Commercial 5%

						Total	% Lost
Beginning Inv., 1,000 MT	25.0	23.8	22.6	21.4	20.4	25.0	
Quantity Loss, 1,000 MT	(1.3)	(1.2)	(1.1)	(1.1)	(5.1)	(9.7)	-39%
Ending Inv., 1,000 MT	23.8	22.6	21.4	20.4	15.3	15.3	

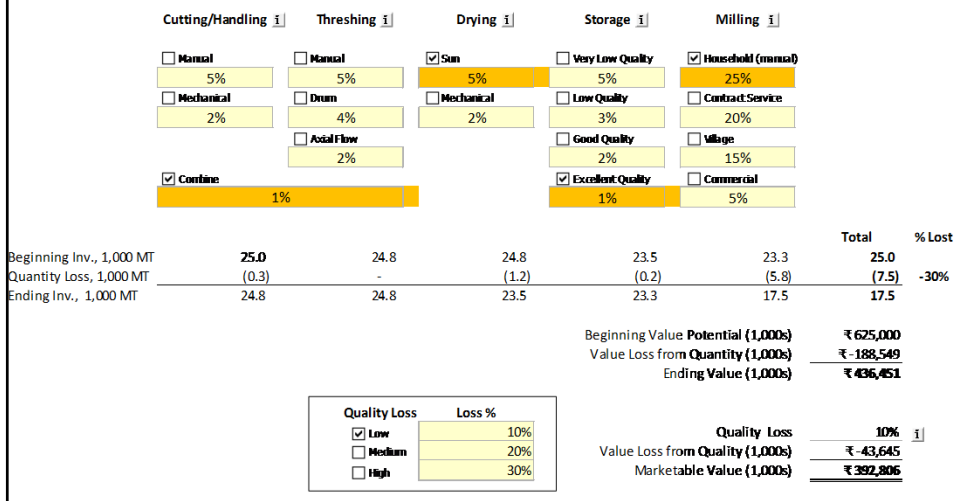


## Alternative Scenario

- What if we invest in more combines and better quality storage?



## District "A" with Improved Practices



## Comparative Results

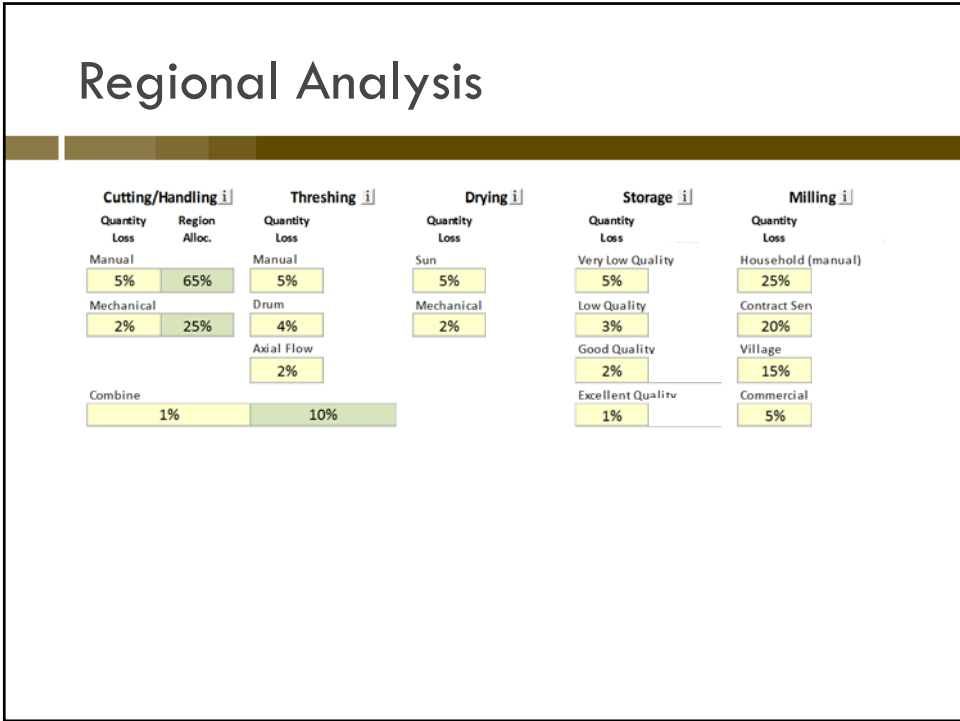
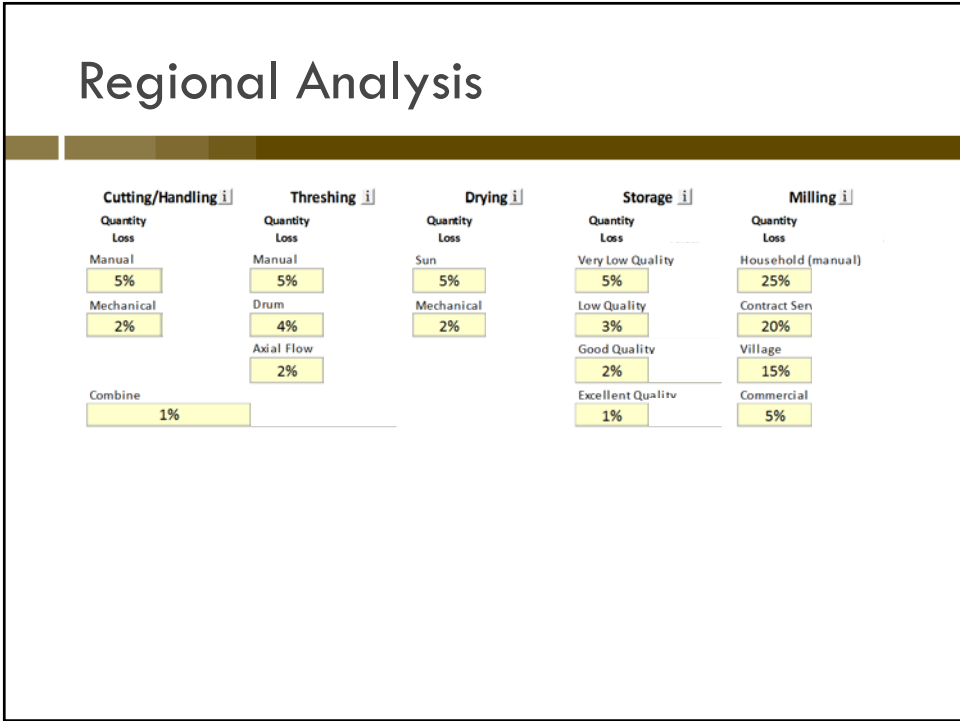
	Volume Loss, 1,000 MT							
	Beginning Inventory	Cutting/ Handling	Threshing	Drying	Storage Loss	Milling Loss	Loss in Quantity	Ending Inventory
Current	25.0	(1.3)	(1.2)	(1.1)	(1.1)	(5.1)	9.7	15.3
Improved Practices	25.0	(0.3)	-	(1.2)	(0.2)	(5.8)	7.5	17.5
Change		1.0	1.2	(0.1)	0.8	(0.7)		2.2

	Value Loss from Quantity Change			Value loss from Quality	Marketable Value (1,000s)
	Beginning Potential	Loss	Ending		
Current	₹ 625,000	₹ -243,200	₹ 381,800	₹ -114,540	₹ 267,260
Improved Practices	₹ 625,000	₹ -188,549	₹ 436,451	₹ -43,645	₹ 392,806
Change			₹ 54,651	₹ 70,895	₹ 125,546

## Regional Analysis

- What if we looked at the portfolio of practices and allocated their use across the entire region?
- Region
  - ▣ 3.2 million hectares
  - ▣ 2,500 kg/ha average rice yield (good weather years)

Note that the regional allocations are for example purposes only and do not reflect an actual region.



## Regional Analysis

Cutting/Handling <sup>i</sup>		Threshing <sup>i</sup>		Drying <sup>i</sup>	Storage <sup>i</sup>	Milling <sup>i</sup>
Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Quantity Loss	Quantity Loss
Manual	5% 65%	Manual	5% 40%	Sun	Very Low Quality	Household (manual)
					5%	25%
Mechanical	2% 25%	Drum	4% 30%	Mechanical	Low Quality	Contract Sen
		Axial Flow	2% 30%		3%	20%
					Good Quality	Village
					2%	15%
Combine	1% 10%				Excellent Quality	Commercial
					1%	5%

## Regional Analysis

Cutting/Handling <sup>i</sup>		Threshing <sup>i</sup>		Drying <sup>i</sup>		Storage <sup>i</sup>		Milling <sup>i</sup>	
Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.
Manual	5% 65%	Manual	5% 40%	Sun	5% 50%	Very Low Quality	5% 40%	Household (manual)	25% 35%
Mechanical	2% 25%	Drum	4% 30%	Mechanical	2% 50%	Low Quality	3% 25%	Contract Service	20% 25%
		Axial Flow	2% 30%			Good Quality	2% 20%	Village	15% 25%
						Excellent Quality	1% 15%	Commercial	5% 15%
Combine	1% 10%								



## New Scenario

- What if we invest in combines and better quality storage?

Cutting/Handling		Threshing		Drying		Storage		Milling	
Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.	Quantity Loss	Region Alloc.
Manual	5% / 65%	Manual	5% / 40%	Sun	5% / 50%	Very Low Quality	5% / 40%	Household (manual)	25% / 35%
Mechanical	2% / 25%	Drum	6% / 30%	Mechanical	2% / 50%	Low Quality	3% / 25%	Contract Service	20% / 25%
		Axial Flow	2% / 30%			Good Quality	2% / 20%	Village	15% / 25%
Combine	1% / 10%					Excellent Quality	1% / 15%	Commercial	5% / 15%

## Comparisons

	Volume Loss, 1,000 MT							
	Beginning Inventory	Cutting/ Handling	Threshing	Drying	Storage Loss	Milling Loss	Loss in Quantity	Ending Inventory
Current	8,000	(308)	(262)	(260)	(237)	(1,265)	2,332	5,668
Improved Practices	8,000	(260)	(202)	(264)	(200)	(1,291)	2,217	5,783
Change		48	61	(4)	37	(26)		116

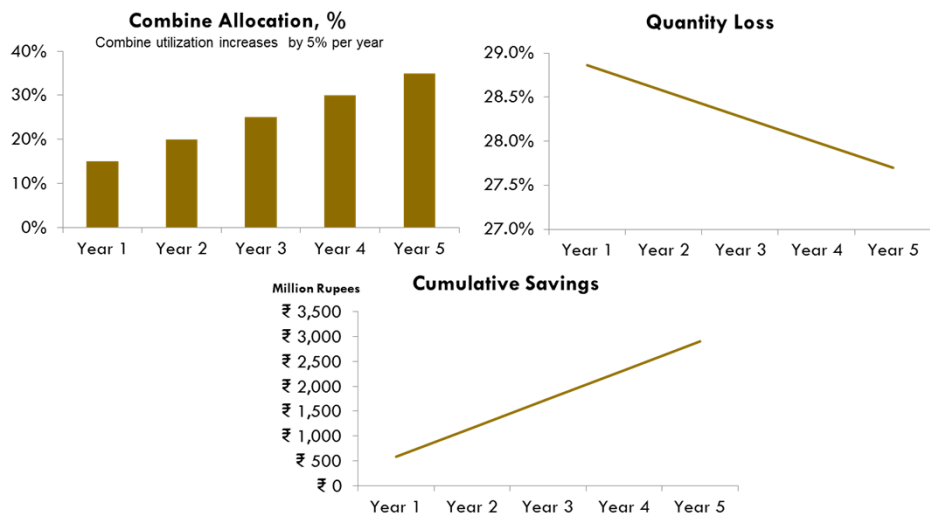
  

	Value Loss from Quantity Change (1,000s)			Value loss from Quality	Marketable Value
	Beginning Potential	Loss	Ending		
Current	₹ 200,000,000	₹ -58,303,644	₹ 141,696,356	₹ -42,508,907	₹ 99,187,449
Improved Practices	₹ 200,000,000	₹ -55,414,790	₹ 144,585,210	₹ -14,458,521	₹ 130,126,689
Change			₹ 2,888,855	₹ 28,050,386	₹ 30,939,240

## Multi-Year Analysis

- Let's look at just the quantity impact of making an investment in combines
- ▣ Five year time horizon with gradual investment in combines

## Multi-Year Analysis



Does not include quality loss and assumes constant yield and prices

## Conclusions

- New approach to thinking about mitigating post-harvest loss
- Understanding practices employed enables reasonable estimation of expected loss
- Tool useful for “what if” analysis and for determining where to invest in improvements
- Can be modified to accommodate other crops and their respective supply chains

QUESTIONS?

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