

CARD General Meeting Seminar

Session 1: Increasing rice production in sub Sahara Africa through mechanization.



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CARD Challenge

“Double rice production in sub-Saharan Africa within the next 10 years”

What does this really mean?

- Increase rice production by 14 million tons
- This means 7.2% increase per year for next 10 years

At the moment

- Average yields: 1.5t/ha (stagnant)
- Present production increase: 3% per year mainly due to area expansion



How can this be done?

1. Increase productivity per unit area
2. Decrease losses after harvest
3. Increase the area growing rice



1. Increase productivity per unit area

1. Plant on time
 - *potential 1 ton per month late*
2. Level land and bunded fields
 - *increase water use 20%, decrease yields 15-20%*
3. Poor land preparation
 - *double seeding rate (80-160kg/ha)*
4. Weed early
 - *1kg weeds = 1kg grain*
5. Harvest on time
 - *22% moisture*

2. Reduce Post harvest losses

1. Field Drying

- *1 Month drop from 22% to 14% (rats, birds, grain quality)*

2. Storage losses and contamination:

- *20-30% loss*

3. Milling losses: -10-15%

4. Market variability: *1month = 10%*



3. Increase the growing area

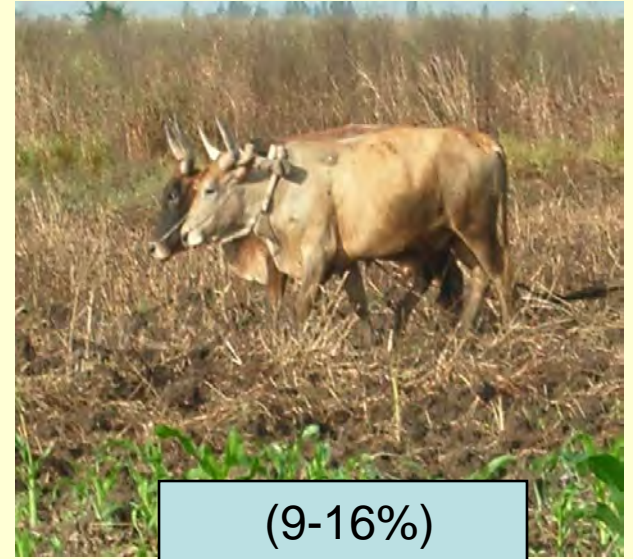
- Most likely option-presently 3%
- Land and water are available
- Needs a lot more energy/power
- Need Capital investment



Present systems for rice production in SSA



+
99%



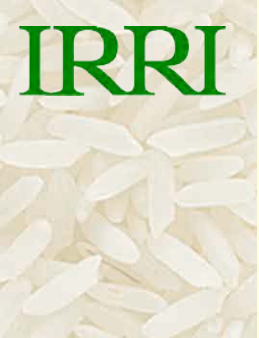
+
less 1%





Comparison of different systems for plowing 1ha

	Human	2 Animals	2-wheel tractor	4-wheel tractor
Power		1kW	12 kW	40kW
Distance	750 m-3 (100 truck loads)	50km	20km	5km
Time (days)	120-140	10-12	1	2hr
Hours/day	5-6	5-6	8-10	10-12
Energy (hour)	2MJ	22MJ	170MJ	775MJ
Work (MJ /ha)	1560	1584	1530	1550



Human system of farming- 80-90%, (Farm size 0.5-1 ha)





Animal +human based system (9-16% area, 1-2ha)





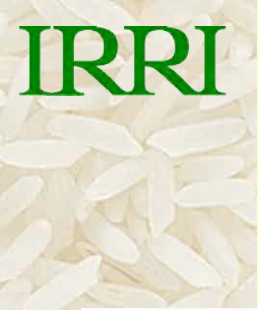
Small equipment (less 1%, 20-25 ha)





Small equipment for milling and transport





Commercial System (less 1%, 2-300ha)





Mechanization Systems Comparison

Based on

- *Energy*
- *Cost*
- *Time*
- *Capital investment*



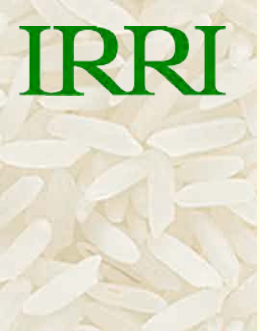
Total System Comparison Energy (MJ/ha)

	Human	Animal	Small-equip	Commercial equip
Land preparation	3120	3168	3060	3100
Planting	1228	2382	1228	1951
Weeding	2400	2880	960	2700
Harvesting	640	640	664	1525
Transport	128	172	340	386
Total	7516	9242	6252	9662



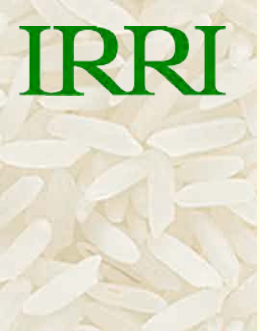
Total Operating and Fixed Cost (\$/ha)

	Human	Animal	Small-equip	Commercial equip
Land preparation	520	88	93	89
Planting	92	56	92	62
Weeding	150	180	60	149
Harvesting	80	80	33	42
Transport	16	8	10	5
Total	858	412	288	347



Time (days/ha)

	Human	Animal	Small-equip	Commercial equip
Land preparation	260	22	2	0.5
Planting	40	12	40	0.2
Weeding	75	90	30	0.6
Harvesting	40	40	11	0.3
Transport	8	4	0.2	0.1
Total	423	168	83	1.7



Capital Cost (\$/ha)

	Human	Animal	Small-equip	Commercial equip
Power source		330	160	100
Plow and harrows	20	16	15	24
Trailer		50	23	6
Cone weeders			13	
Boom Sprayer				42
Thresher /combine			20	100
Total	20	396	231	272



Results from comparative study

- Similar amount of energy needed
 - *especially for land preparation and weed control*
- Large differences in time required
- Small equipment “appears best bet”
 - less energy, less capital investment and less operating costs, reasonable time*
 - power source for transport, pumping, threshing, electricity*



To double production in 10 years

In perspective

- Extra 3million kW of farm power needed
- This is equivalent to 400,000 2wheel tractors or 40,000 4wheel tractors
- 100,000 threshers or 40,000 combine harvesters
- Rice Mills-15,000 single pass or 5000 (1.5t/hr mills)



Capital cost to double yield (\$million)

	Small Equipment	Larger equipment	Average cost
Tractors	1600m	1000m	1300m
Threshers	250m	1600m	925m
Rice mills	53m	1250m	66m
Total cost	1903m	3850m	2,875m
Average cost \$/ha	190	385	287



Other support is also needed

- Government support
- Private sector support
- International and national manufacturers
- Training institutes
- Technology champion
- Credit



Conclusion

African transition into mechanization

1. Learn from Asian experience
2. Small equipment initially
 1. *2-wheel tractor (transport, plow, pump)*
 2. *Mechanical weeder-line planting*
 3. *Mechanical threshers-engine and pedal*
 4. *Hermetic storage systems-local materials*
 5. *Single pass rice mills-local ownership*
3. Private sector driven and Government supported