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Greening Growth and Policies:
Evidence from a Pilot on "Green" Rice Cultivation

by

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Agriculture Sectors under Crisis – Context of Nexus

Unsustainable Development

- Low and Declining Profitability – Largely due to high cost and uncertain outputs prices

(Our productivity growth lacks compared to input growth (fertilizer) based on last 15 years of data)

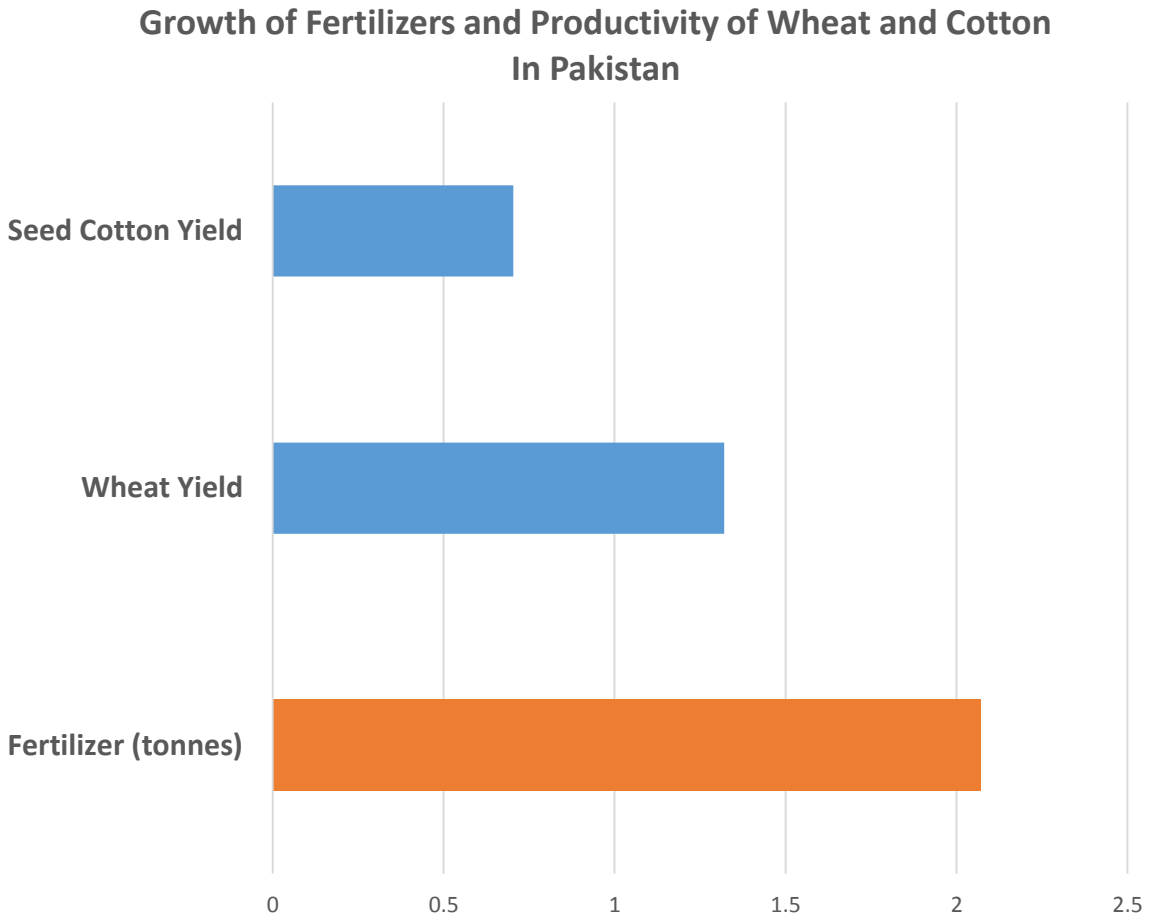
- Heavily dependent on Energy , under utilization of Energy derived from Agriculture (biogas, solid waste, Baggase)
- Adding very low value to water, groundwater depletion
- Climate change and Environmental issues are adding to problems

But REAL CRISIS -- Overtime Mismanaged Practices

- Inundation of soil
- Disturbance/plowing of soil
- Keeping soil naked
- Uni-cropping
- Using old Technology and Practices that results in low land and water productivity

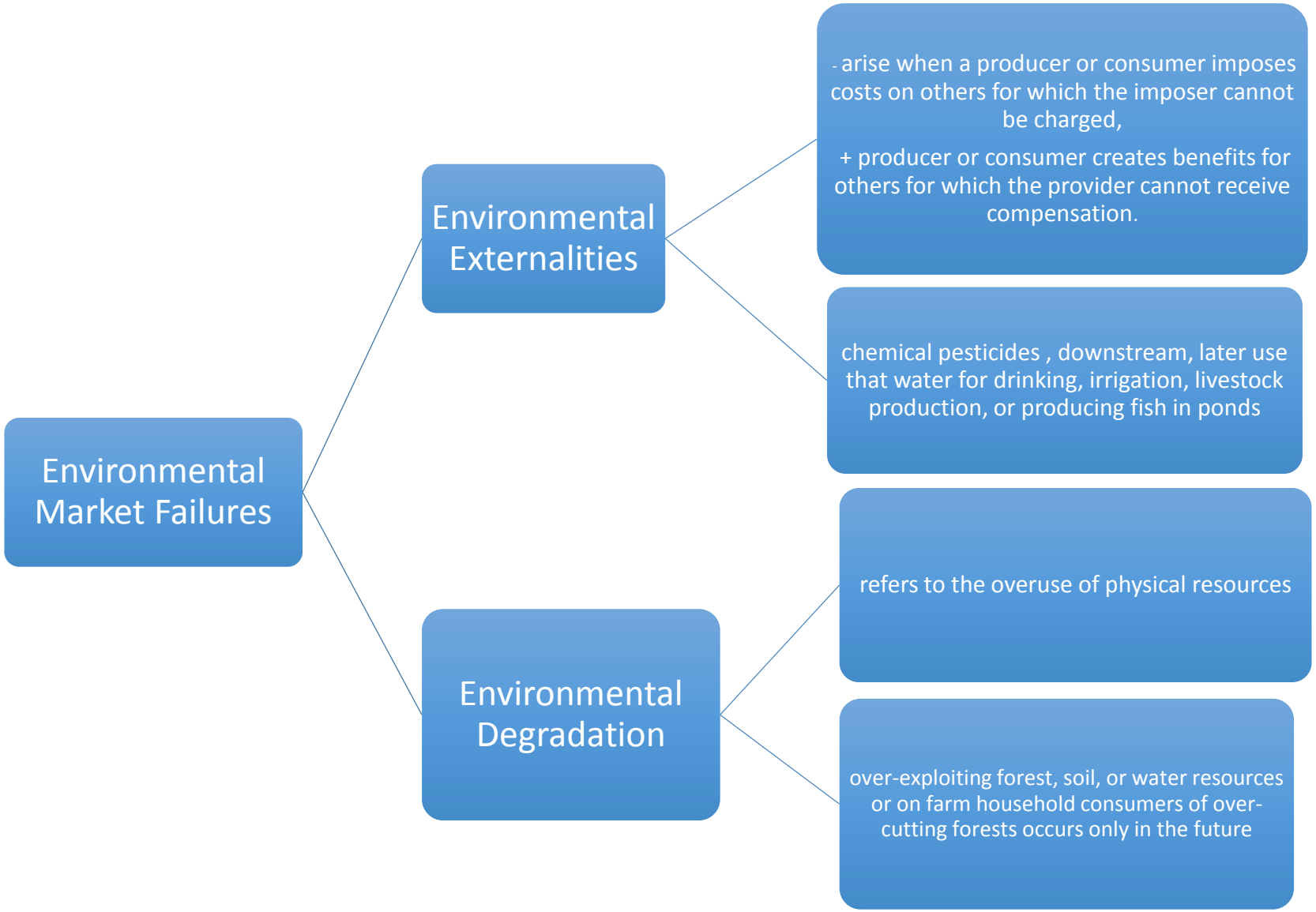
Need to Rehabilitate natural process of soil fertility and vegetation or

MOVING FROM UNSUSTAINABLE (CA) TO SUSTAINABLE ABRICULRURE



Unsustainable Farming is largely due to Environmental Market Failure –

Idea was published 18 years ago in WPJ- waterlogging salinity, GW depletion, sedimentation are not REAL Issues but POLICY, INSTITUTIONAL and MARKET FAILURE are



Conventional Versus Paradoxical Farming

Agriculture Status	Practices	Comments
CONVENTIONAL AGRICULTURE (CA) Present Growth with • *Largely Traditional and subsistent* • *Rising costs* • *Uncertain prices* • *Declining Profitability* • *Polluting Environments* • *Exclusive*	• *Excessive use of plowing and* • *purchased inorganic inputs*	• Resourceful farmers follow it, • Less than 30% resourceful farmers in Pakistan follow it • Urban migration
PARADOXICAL AGRICULTURE (PA) PA complementary - integration of the best practices of each 1. SRI/SCI – System of Rice/Crop Intensification - to *capitalize on natural processes with minimal reliance on purchased inputs*, 2. Conservation Agriculture (CA), *Minimal soil disturbance, Soil Cover and Crop Rotation* 3. Organic Farming (OF). *Not to use any inorganic inputs* Leads to Greening Growth with agriculture as • Profitable • Competitive • Sustainable and	• *Crop production from within the functioning ecosystems* • replica of natural process of vegetation which relies on natural process of soil fertility. • *No or few purchased input is applied*	WIN WIN POLICY OUTCOME : *by modifications in agronomic practice, with lower economic cost, less negative environmental impacts, and with greater contribution to human and ecosystem health.* PLUS • *Growing Demand* – Willingness to Pay is high • *Easy to meet international standards* --while produce is high quality, better than organic, Easy to get certification for Maximum Residue Limit (MRL), GAP, and Traceability • The WP of Wheat is $200, giving Famers $300 and if we adopt PA can be $ 600 • Pakistan can develop export led high value commodities growth in domestic and global value chains • Making most out of possibilities under CPEC

Policy Analysis Matrix (PAM) and
The Extended Model– Environmental PAM

- PAM address *four central issues* of agricultural policy
- Incentive structure a farm or commodity faces(tax or subsidy)
- Competitiveness (private profitability, first row of matrix)
- Efficiency of Resource Use , second row or DRC (second row of matrix)
- Policy transfers , are resources being transfer out of agriculture or put in (third row)
- Pioneer work being initiated at WIT/LUMS to integrate environmental cost (last row)
- By building unsustainable and sustainable PAM

The Basic Model : Policy Analysis Matrix

	Revenues	Cost		Profits
		Traded	Domestic	
Financial Prices	A	B	C	D
Economic Prices	E	F	G	H
Divergence	I	J	K	L
Divergence Environmental Cost	?	?	?	?

Environmental PAM : Unsustainable PAM (Rs per hectre)

	Revenues	Costs			Profits
		Tradable	Capital	Laboor	
Private	7230000	966000	1680000	402500	4181500
Social	5784000	1021000	1680000	462500	2620500
Divergence	1446000	-55000	0	-60000	1561000

Environmental PAM : Sustainable PAM – Pesticide Free (Rs per hectre)

	Revenues	Costs			Profits
		Tradeable	Capital	Labor	
Private	6627500	771000	1680000	402500	3774000
Social	5302000	771000	1680000	462500	2388500
Divergence	1325500	0	0	-60000	1385500

Source: Scott Pearson Carl Gotsch Sjaiful Bahri, 2003 , Applications of the Policy Analysis Matrix in Indonesian Agriculture

Environmental PAM
The Case of Rice- The Results

The Adopted Technology

- System of Rice Intensification (SRI) *water-efficient good agriculture practices, on-farm water management, integrated pest and disease management and integrated plant soil nutrient management.*
- *Direct Seeded Rice (DSR) method can be used to directly sow rice in the fields*. The DSR method helped farmers reduce 30% of water usage, reduce labor requirements and costs, and earn additional income through selling the extra seedlings to his neighboring famers.

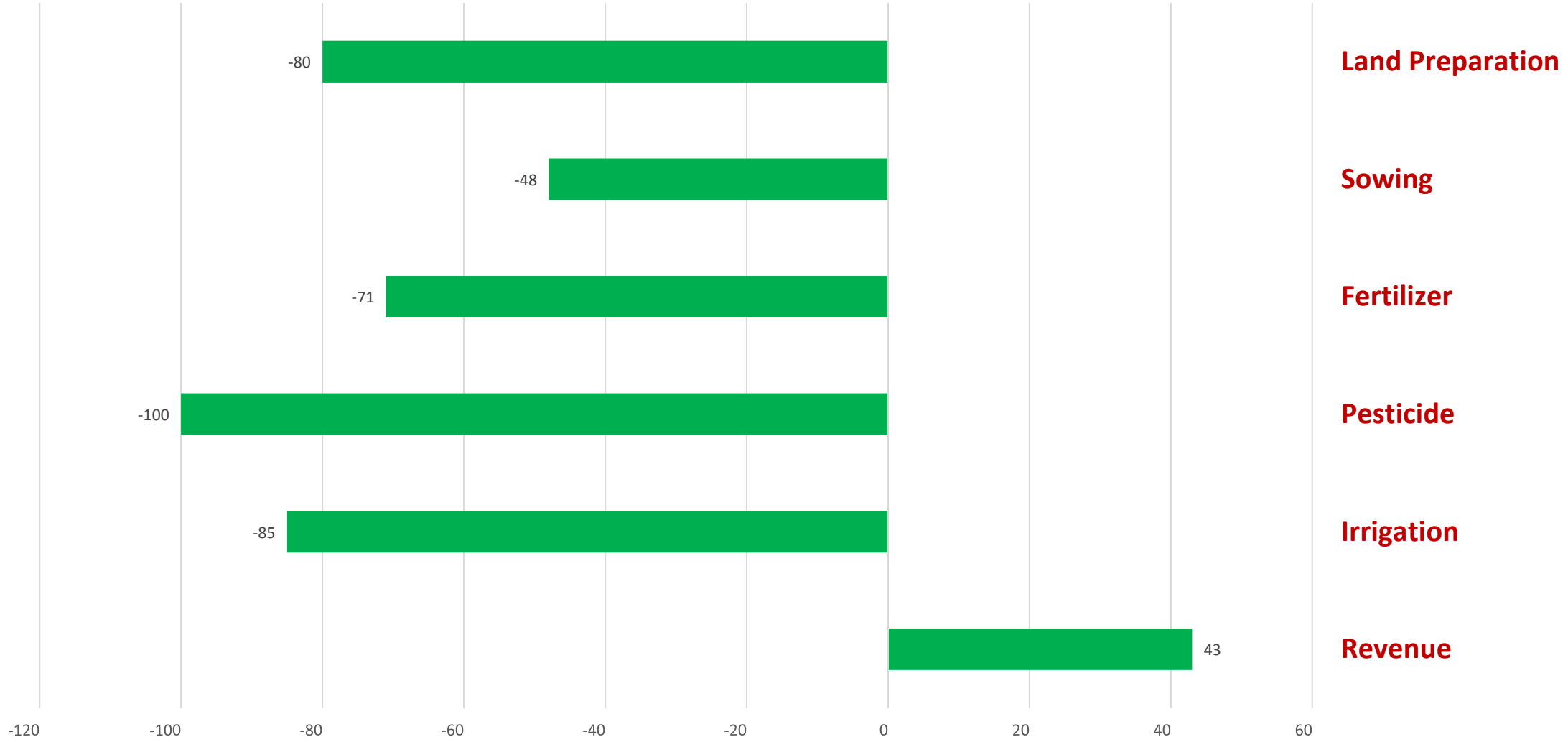
- Based on data provided by PEDVAR, the WIT/LUMS team built
- unsustainable rice model (Conventional agriculture)
- sustainable rice model (Paradoxical agriculture)
- Results are presented in next slides

Traditional Versus Green Rice Budget

Operation/Input	Unit	Cost/Unit (Rs)	Conventional Hybrid Irri 6		Unit	Cost/Unit (Rs)	Paradoxical Hybrid Irri 6
Sowing/Planting - Time			Jun-Jul				Jun-Jul
Harvesting - Time			Sep-Nov				Sep-Nov
Plowing							
Leveling							
Land Preparation			**5000**				**1000**
Seed Kg.	5	50	250		2	50	100
Seed Treatment	1	300	300				
Nursery Planting and Transplanting	1	3500	3500				2000
Sowing			**4050**				**2100**
Urea	3	1800	5400		0.5	1800	900
DAP	1	3900	3900		0.25	3900	975
Potash/Zinc	1	3850	3850		0.5	3850	1925
Transportation			0				0
Fertilizer Application	Man Days		350				100
Fertilizer			**13500**				**3900**
Interculture - Weeding/ Weedicides	**2**	**800**	**1600**				**1000**
Plant Protection - Fundicide/Pesticidies	**4**	**880**	**3520**				**0**
Canal Water	1	150	150		1	150	150
Tube well Water (3 hours @ Rs. 400/hr)	8	800	6400		1	800	800
Irrigation			**6550**				**950**
W/Course Cleaning	Man Days		200		Man Days		200
Labor Charges for Irrigation	Man Days		300		Man Days		200
Labor for Irrigation			**500**				**400**
Green Manure			**0**				**0**
Total 1 to 8			**34720**				**9350**
Markup on Investment - except Canal Water Rates		**15%**	**2454**			**15%**	**551.25**
Harvesting			3000				3000
Transporting			1000				1000
Harvesting			**4000**				**4000**
Land Rent (6 Months) @ Rs. 40,000/- per year		**40000**	**20000**			**40000**	**20000**
Mangement / Other Charges			**2000**				**2000**
Agriculture Income Tax			**150**				**150**
Total Cultivation Cost 1 to 13			**63324**				**36051**
Yield per Acre (40 Kg.)			**35**				**50**
Cost of Production/40 kg. at Farm			**1809**				**721**
Marketing Expenses (Rs./40 kg.)			**20**				**20**
Cost/40 Kg. at Market Gate			**1829**				**741**
Average Market Price/40 Kg.			**2000**				**2000**
Net Income from Produce (Rs./40 Kg.)	**Unit**	**Cost/Unit (Rs)**	**Conventional Hybrid Irri 7**				**1259**
Net Income from Produce (Rs./Acre)			Jun-Jul				**62949**
Value of Bhoosa/Fodder/Burnable			Sep-Nov				**2000**
Total Net Income per Acre							**64949**

Greening Rice Policy - Adopting Paradoxical Agriculture

Percentage Change in Input Costs and Revenue (Rs per Acre)



Unsustainable Budget and Policy Analysis Matrix (PAM) Rice

		Share		Financial Value		Parity Price	CF	Economic Value		
	Financial	Traded	Domestic	Traded	Domestic			Traded	Domestic	Econmic
Seed	4050	0.3	0.7	1215	2835		0.8	972	2268	3240
Urea	5400	0.8	0.2	4320	1080	3795	0	3036	759	3795
DAP	3900	0.8	0.2	3120	780	2212	0	1770	442	2212
Potash	3850	0.8	0.2	3080	770	1472	0	1178	294	1472
Land Preparation	5000	0.7	0.3	3500	1500		0.9	3150	1350	4500
Pesticide	3520	0.8	0.2	2816	704		0.9	2534.4	633.6	3168
Transportation	1000	0.6	0.4	600	400		1.3	780	520	1300
Water	6550	0	1	0	6550		3	0	19650	19650
Labour for Irrigation and Interculture	2100	0	1	0	2100		1.5	0	3150	3150
Harvesting	3000	0	1	0	3000		2	0	6000	6000
Land Rent and Agriculture Tax	20150	0	1	0	20150		1.3	0	26195	26195
Management and Markup	4454	0	1	0	4454		1	0	4454	4454
Total Cost	62974			18651	44323			13420.37	65716.59	79137

	Unsustainable			
Price	Revenue	Traded	Domestic	Profit
Financial (Private)	70000.00	18651.00	44323.00	7026.00
Economic (Social)	81950.43	13420.37	65716.59	2813.46
Divergence	-11950.43	5230.63	-21393.59	4212.54
Policy Indicators				
NPC	0.85			
Effective protection	0.75			
Domestic Resource Cost	0.96			

Sustainable Budget and Policy Analysis Matrix (PAM) Rice
(Greening the Policy)

		Shar		Financial Value		Parity Price	CF	Economic Value		
	Financial	Traded	Domestic	Traded	Domestic			Traded	Domestic	Total
Seed	2100	0	1	630	1470		1	504	1176	1680
Urea	900	1	0	720	180	633	0	506	127	633
DAP	975	1	0	780	195	553	0	442	111	553
Potash	1925	1	0	1540	385	736	0	589	147	736
Land Preparation	1000	1	0	700	300		1	630	270	900
Pesticide	0	1	0	0	0		1	0	0	0
Transportation	1000	1	0	600	400		1	780	520	1300
Water	950	0	1	0	950		3	0	2850	2850
Labour for Irrigation and Interculture	1400	0	1	0	1400		2	0	2100	2100
Harvesting	3000	0	1	0	3000		2	0	6000	6000
Land Rent and Agriculture Tax	20150	0	1	0	20150		1	0	26195	26195
Management and Markup	2551	0	1	0	2551		1	0	2551	2551
	35951			4970	30981			3451	42047	45498

	Sustainable			
Price	Revenue	Traded	Domestic	Profit
Financial (Private)	100000.00	4970.00	30981.25	64048.75
Economic (Social)	117072.04	3451.43	42046.61	71574.01
Divergence	-17072.04	1518.57	-11065.36	-7525.26
Policy Indicators				
NPC	0.85			
Effective protection	0.84			
Domestic Resource Cost	0.37			

Preliminary Policy Findings

- Significant Improvement in Comparative Advantage : high returns on investment - the conventional approach returns Rs. 100 for every Rs. 96 invested, while the paradoxical approach fetches the same returns with only Rs. 37.
- Reduced input costs - significantly lower cost of land preparation (80%), sowing (48%), fertiliser (71.1%), pesticides (100%), and tubewell irrigation (85% reduction), - and increase in revenues (43%), reveals itself to be a more viable system for Basmati rice cultivation
- Improving Competitiveness: Good Financial Profitability in both cases – can create export lead growth under options of selling either organic or semi-organic products that can fetch better values.
- Sustainable Farm Practices: mulching, and other good agricultural practices including drawing upon proven SRI / SCI methods, hold promise of allowing Pakistan to develop a profitable, competitive, and self-sufficient agricultural system.
- Providing absolute win-win outcome – less environmental degradation and much needed profitability in agriculture

Future Work at WIT/LUMS

- WIT/LUMS to expand pilot research domain : to include Wheat , Sugarcane, Corn and Potatoes which using paradoxical agriculture - addressing present agriculture policy dilemma of rising input costs and declining profitability
- From Pilot to upscaling : Farmers showing interest in PA (Pedaver Has 50,000 Farmers WHATAPP followers) and donors are listening
- Involving MOA and other related institutions: With Support of Punjab Planning Department (Urban Unit), Multan Division has been selected to suggest cropping pattern that not only will look at comparative and competitive advantage but also at sectors sustainability (Environmental PAM)
- Cotton versus Sugarcane: Much needed policy work would taken up

- FAO Interest: The pilot work at LUMS can be of interest to FAO, especially in implementation of new FAO climate change resilience project in Pakistan funded by Green Climate Fund (GCF).
- ICCIA/FAO/LUMS workshop from 2 to 4 December in Karachi : also provide opportunity for obtaining greater details, where Dr. Asif Sheriff, CEO of PEDAVAR would hold a session on paradoxical agriculture
- To be followed by stand alone national workshop on PA at LUMS early next year