Opportunities and limitations of by product based feeding systems to increase efficiencies of livestock production

Blümmel M, Wright IA and Herrero M

ILRI

International Livestock Research Institute

Closing the Efficiency Gap in Natural Resource Use: FAO, Rome April 2nd to 4th

Topics

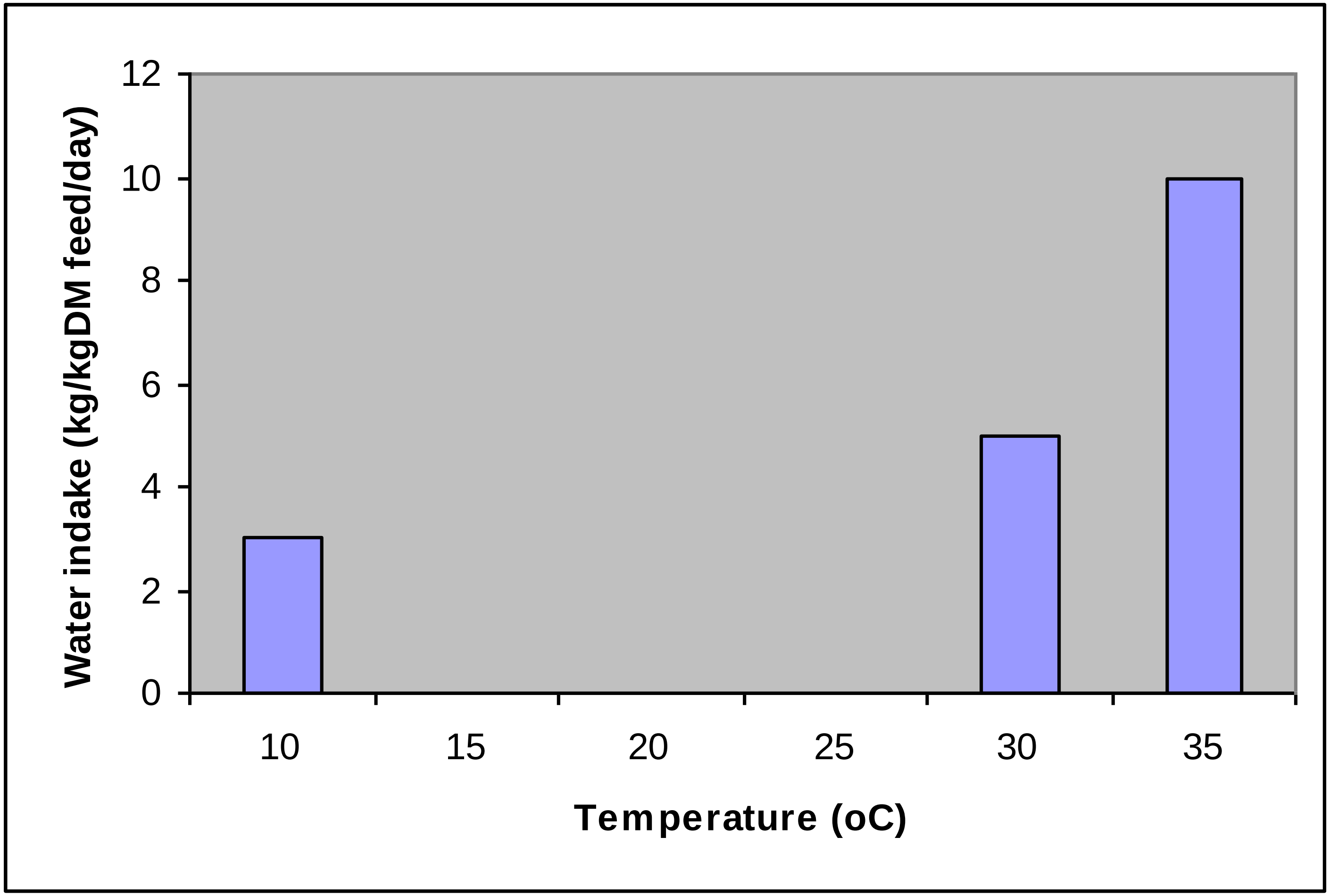
- Why focus on by-products as feed resources
- Improvement of by-product based feeds at source engaging diverse key players
- Opportunities and limitation of improved by-product based feeds for intensification of livestock production

Key feed sources in India: 2003 and 2020

Feed Resource	%	
	2003	2020
Crop Residues	44.2	69.0
Planted fodder crops	34.1	n. diff
Greens (F/F/CPR/WL)	17.8	n. diff
Concentrates	3.9	7.3

(summarized from NIANP, 2005 and Ramachandra et al., 2007)

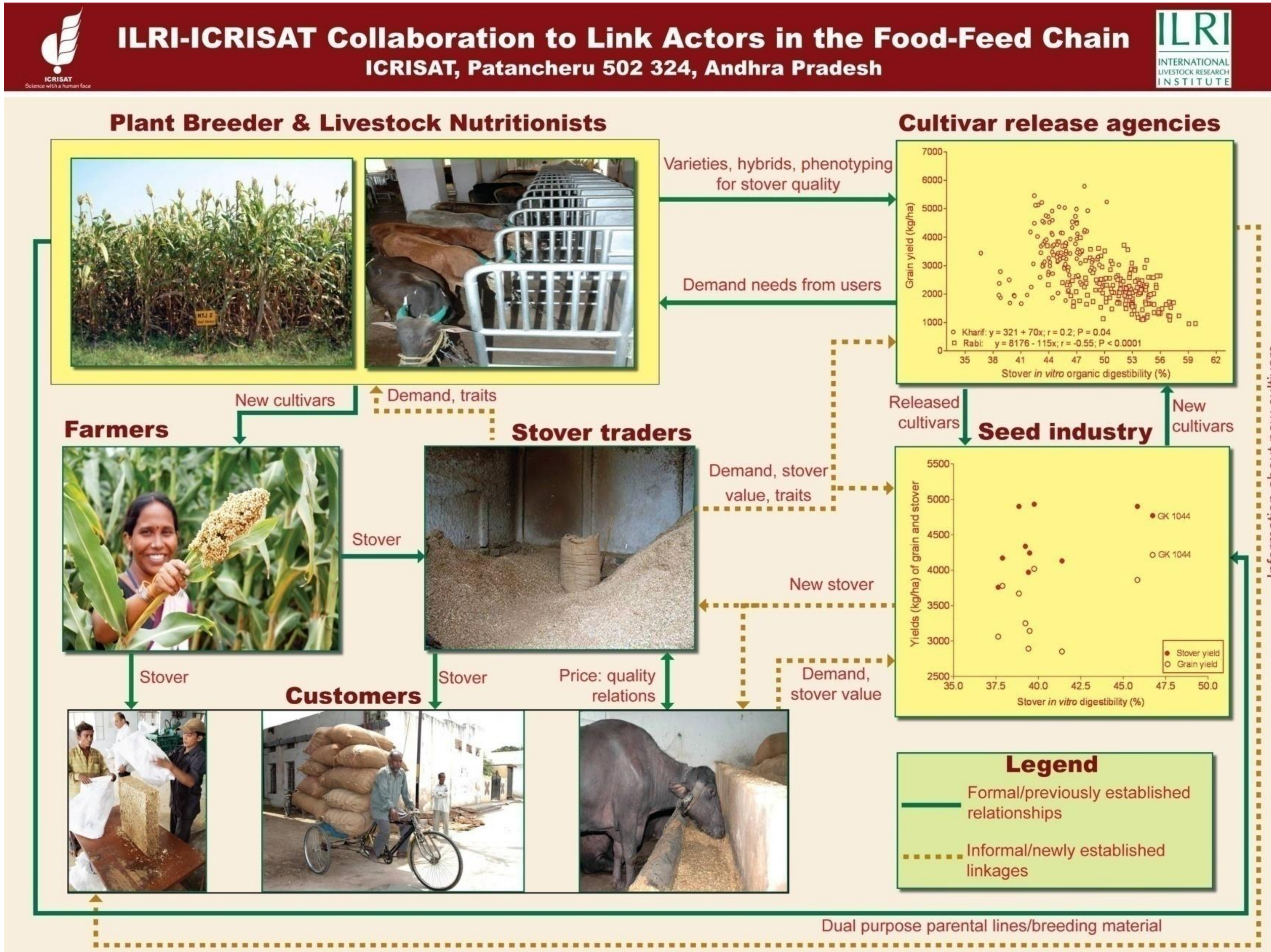
Water: where does it go?



Water for milk and fodder

Gujerat	3 400 l of water per kg of milk
	10 000 l of water for fodder/animal/day
Gobal	900 l of water per kg of milk

Source: Singh, Sharma, Singh, Shah (2004)


ILRI-ICRISAT Collaboration to Link Actors in the Food-Feed Chain
ICRISAT, Patancheru 502 324, Andhra Pradesh
ICRISAT
Science with a human face
ILRI
INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE
Plant Breeder & Livestock Nutritionists
Cultivar release agencies
Varieties, hybrids, phenotyping for stover quality
Demand needs from users
Grain yield (kg/ha)
Kharif: y = 321 + 70x; r = 0.2; P = 0.04
Rabi: y = 8176 - 115x; r = -0.55; P < 0.0001
Stover in vitro organic digestibility (%)
New cultivars
Demand, traits
Farmers
Stover traders
Released cultivars
Seed industry
New cultivars
Information about new cultivars
Demand, stover value, traits
Stover
New stover
Yields (kg/ha) of grain and stover
GK 1044
GK 1044
Stover yield
Grain yield
Stover in vitro digestibility (%)
Stover
Stover
Customers
Price: quality relations
Demand, stover value
Legend
Formal/previously established relationships
Informal/newly established linkages
Dual purpose parental lines/breeding material

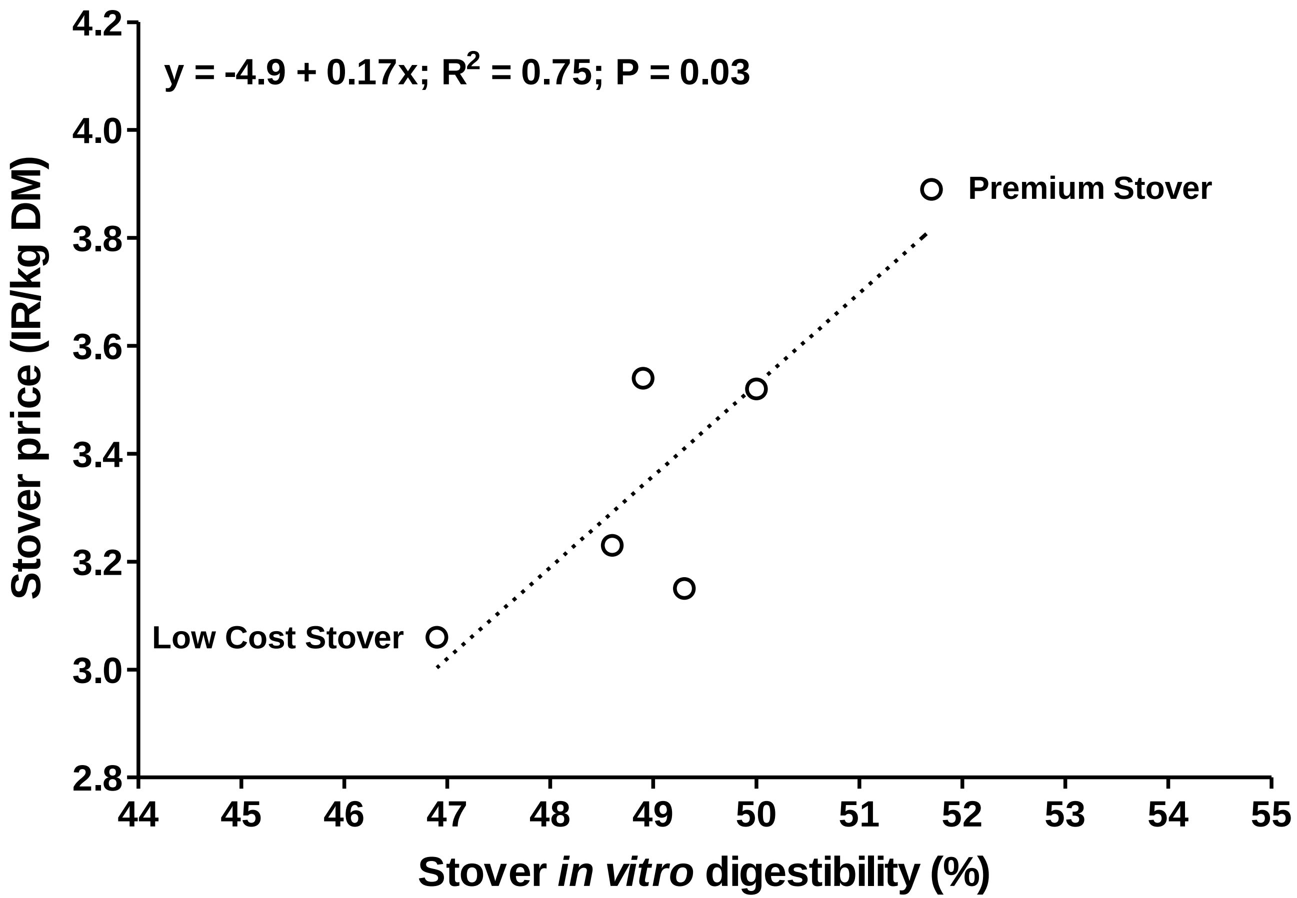
Sorghum stover trading in Hyderabad

Type and cost of sorghum stover traded 2004-2005

Stover type	Price IR / kg DM
Andhra	3.52[b]
Andhra Hybrid	3.15[cd]
Ballary Hybrid	3.54[b]
Raichur	3.89[a]
Rayalaseema	3.23[c]
Telangana (Local Y)	3.06[d]

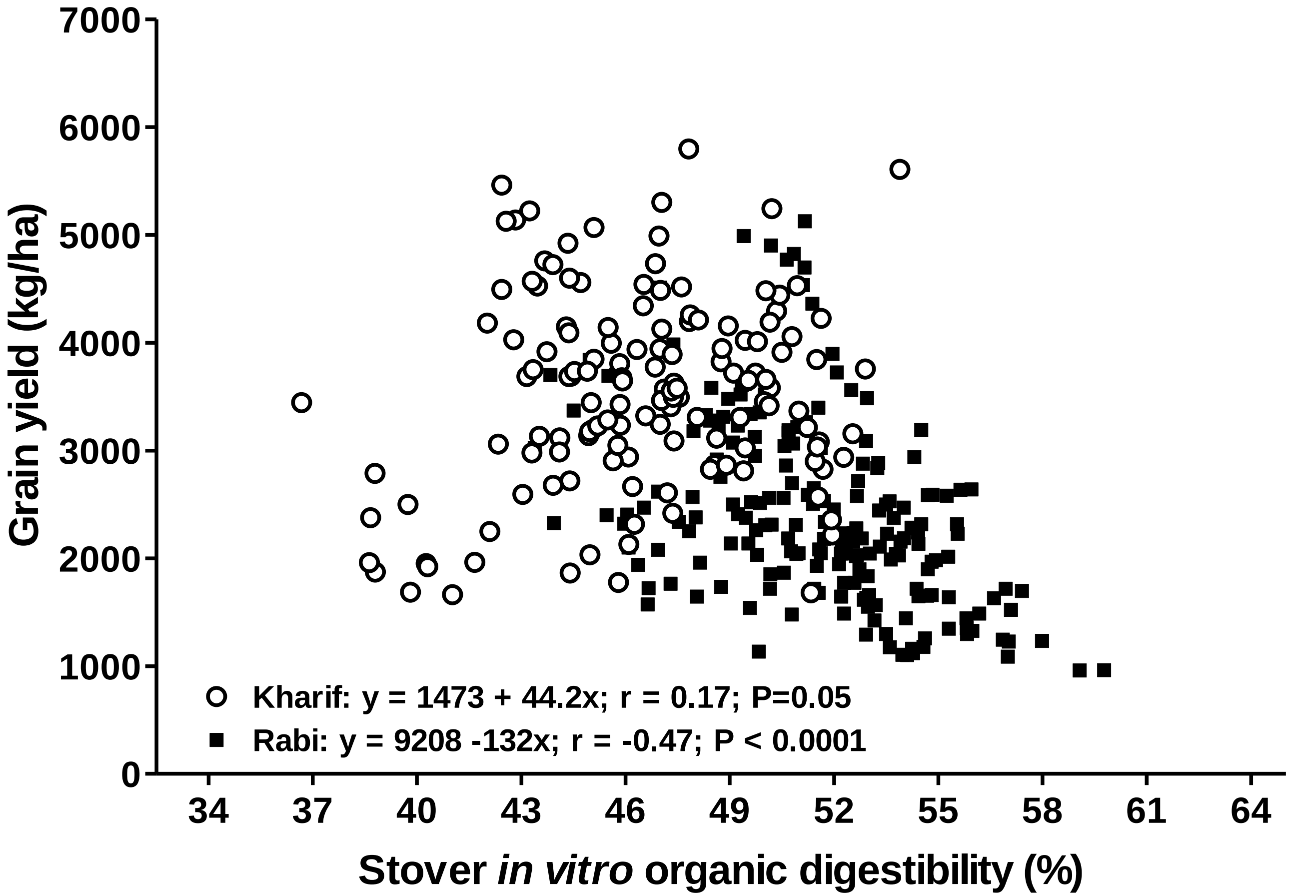
Blümmel and Parthasarathy, 2006

Relation between price of sorghum stover and *in vitro* digestibility



Blümmel and Parthasarathy, 2006

Stover digestibility and grain yield in sorghum cultivars release-tested between 2002 and 2008



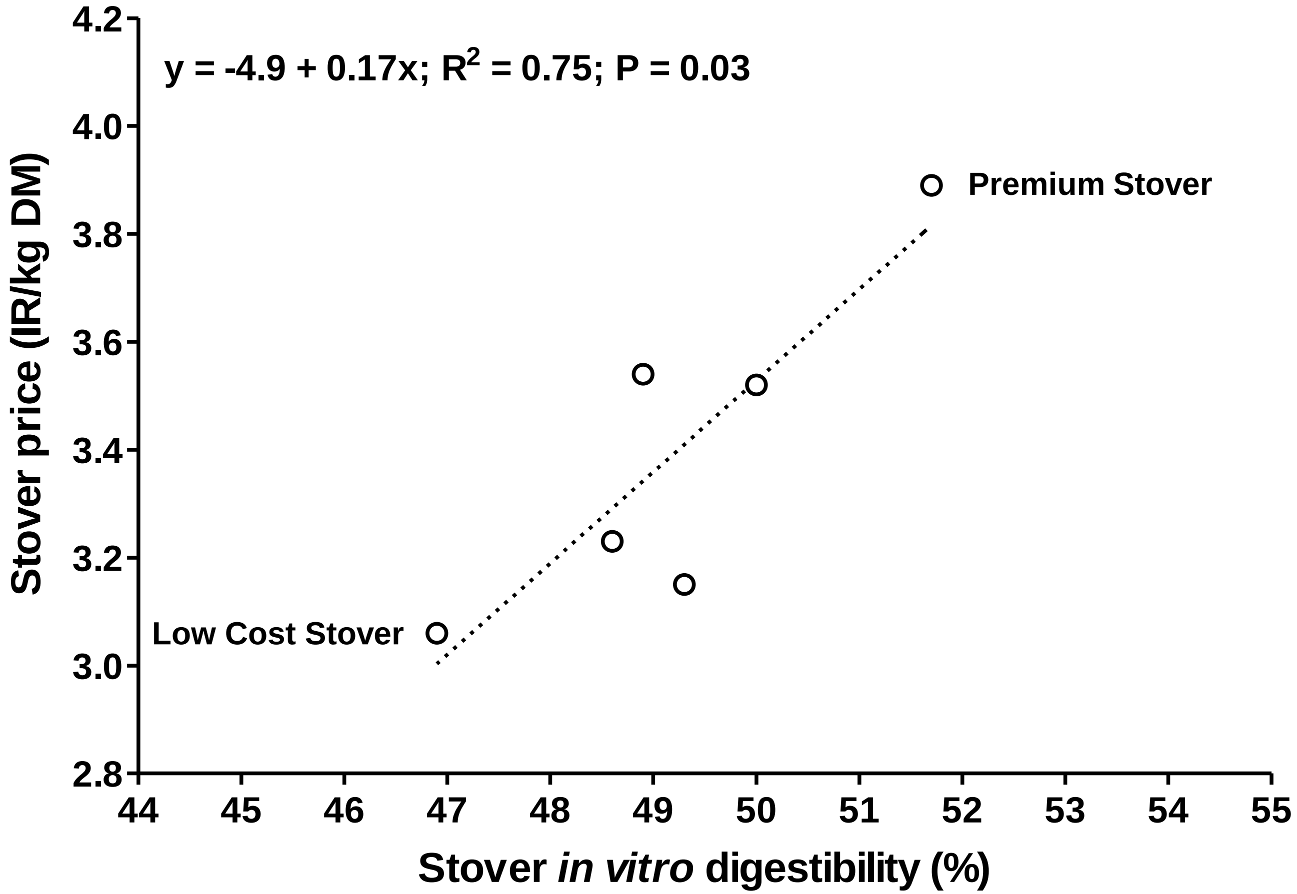
Blümmel et al. 2010

Feed block manufacturing: supplementation, densification

Ingredients	%
Sorghum stover	50
Bran/husks/hulls	18
Oilcakes	18
Molasses	8
Grains	4
Minerals, vitamins, urea	2

Courtesy: Miracle Fodder and Feeds PVT LTD

Relation between price of sorghum stover and *in vitro* digestibility



Blümmel and Parthasarathy, 2006

Comparisons of premium and low cost sorghum stover based complete feed blocks in dairy buffalo

	Block Premium	Block Low Cost
CP	17.2 %	17.1%
ME (MJ/kg)	8.46 MJ/kg	7.37 MJ/kg
DMI	19.7 kg/d	18.0 kg/d
DMI per kg LW	3.6 %	3.3 %
Milk Potential	16.6 kg/d	11.8 kg/d

Anandan et al. (2009a)

Feed allocation, methane production and natural resource utilization

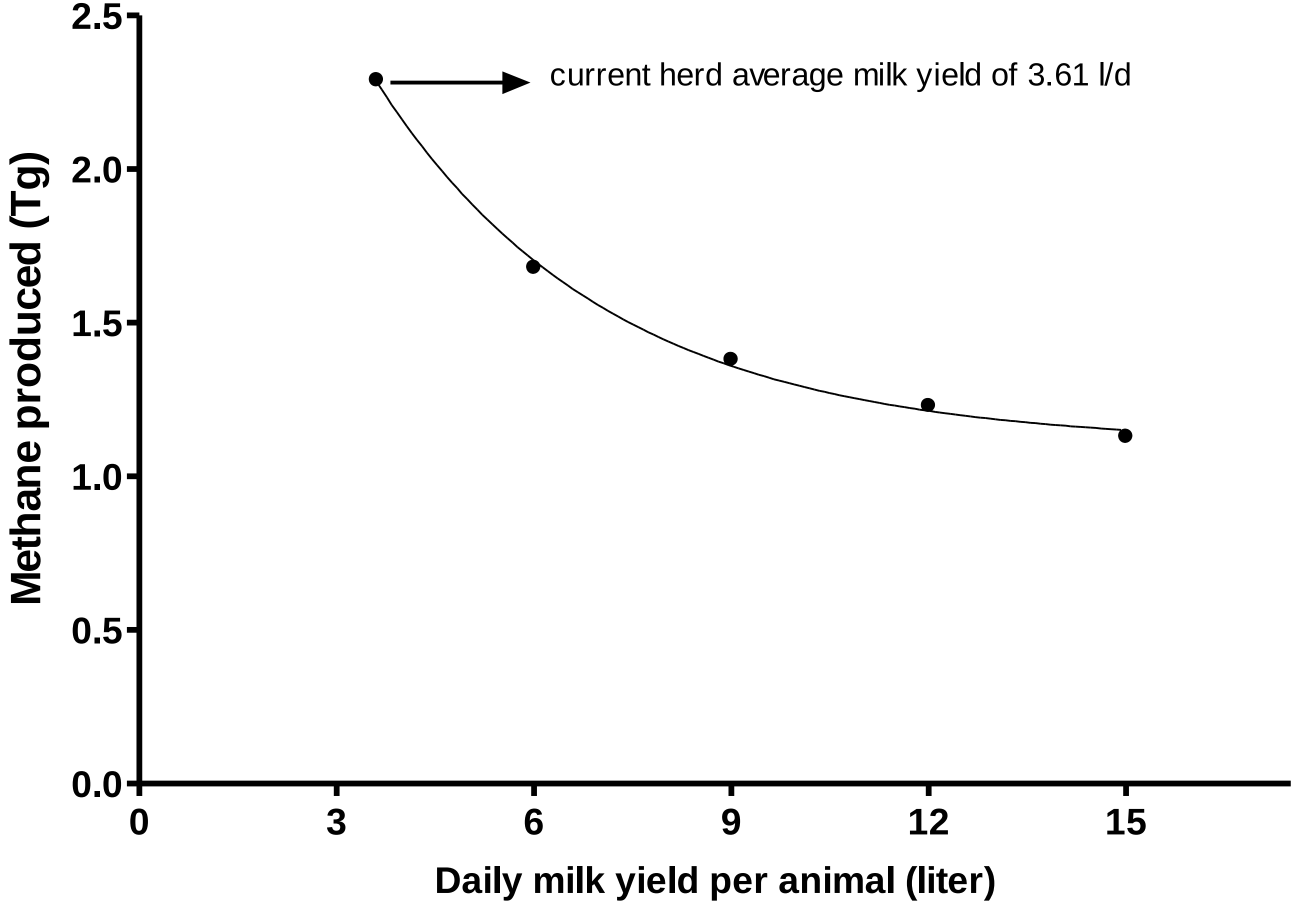
India: Livestock and milk in 2005-06			
	Milch animals	Total animals	Milk yield
	$x\ 10^3$		kg/d
Cross Bred	8 216	28 391	6.44
Local	28 370	155 805	1.97
Buffalo	33 137	101 253	4.40

Overall herd mean 3.61 l/d

Feed energy needs of milch animals in dependence of average daily milk yields

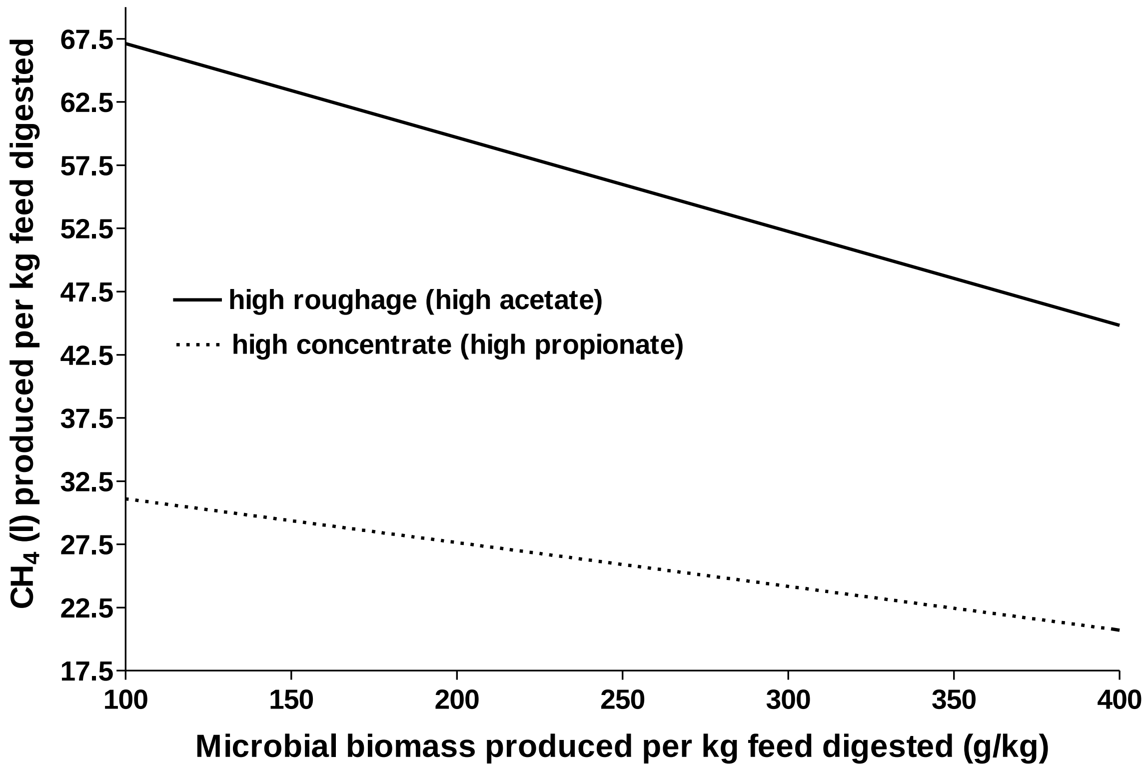
	ME required (MJ x 10^9)		
Milk (kg/d)	Maintenance	Production	Total
3.61 (05/06)	1247.6	573.9	1821.5
6 (Scenario 1)	749.9	573.9	1323.8
9 (Scenario 2)	499.9	573.9	1073.8
12 (Scenario 3)	374.9	573.9	948.8
15 (Scenario 4)	299.9	573.9	873.9

Effect of increasing average daily milk yields on overall methane emissions from dairy in India



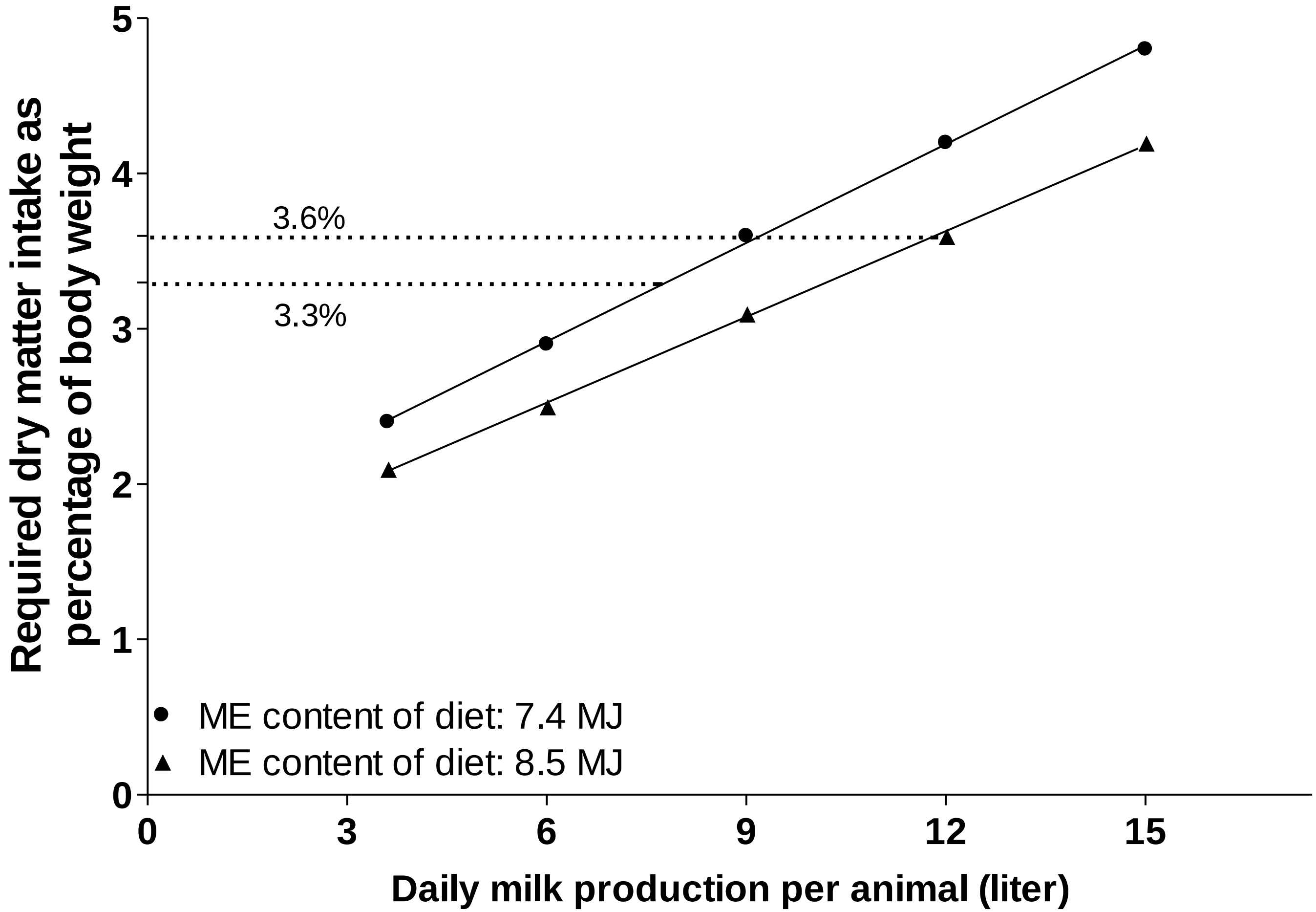
Blummel et al 2009

Feed quality and methane production



Blümmel and Krishna 2003

Relations between average daily milk production, diet quality and required dry matter intake



Livestock revolution: Impact on energy and feed requirements

	(2005-06)	2020	2020 (fixed LP
Milk (million tons)	91.8	172	172
yield/day (kg)	3.6	5.24	6.76
Numbers (000)	69759	89920 *	69759
Metabolizable energy requirements (MJ x 10^9)			
Maintenance	1247.64	1608.22	1247.6
Production	573.94	1075.00	1075.00
total	1821.58	2683.22	2326.66
Feed Req.(m tons)	247.50	364.57	315.6

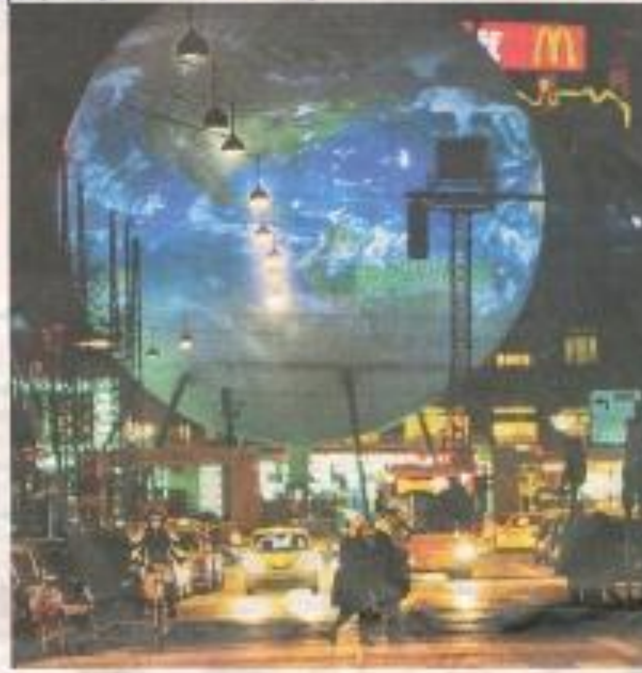
* Calculated based on Component Annual Growth Rate (CAGR)

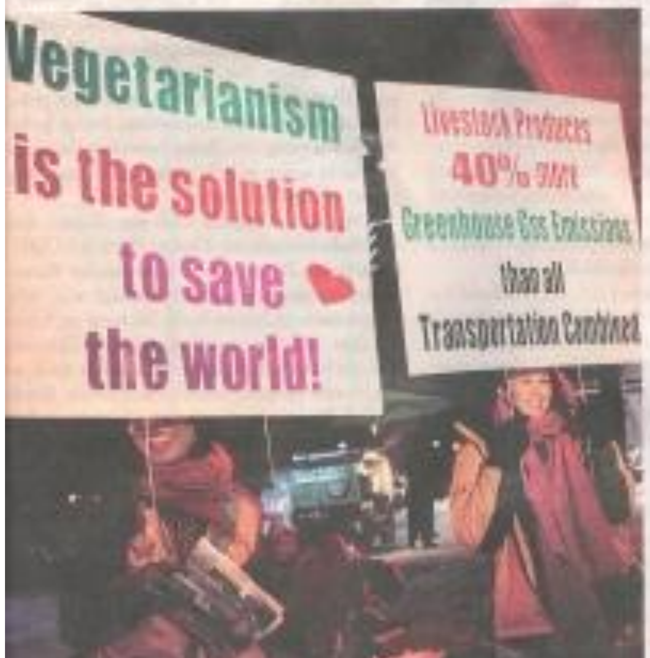
Conclusions

- Intuitively “small “differences matter and can have substantial accumulating advantages
- With changing allocation of feed resources probably 10 to 12 liter milk (dairy buffalo) feasible
- Feed processing optimizing approach no solution fits all (blocks *vs* mash *vs* supplementation)
- Decentralized business models required

Thank you for your attention!

Die ZEIT 10/12/2009 Nr 51





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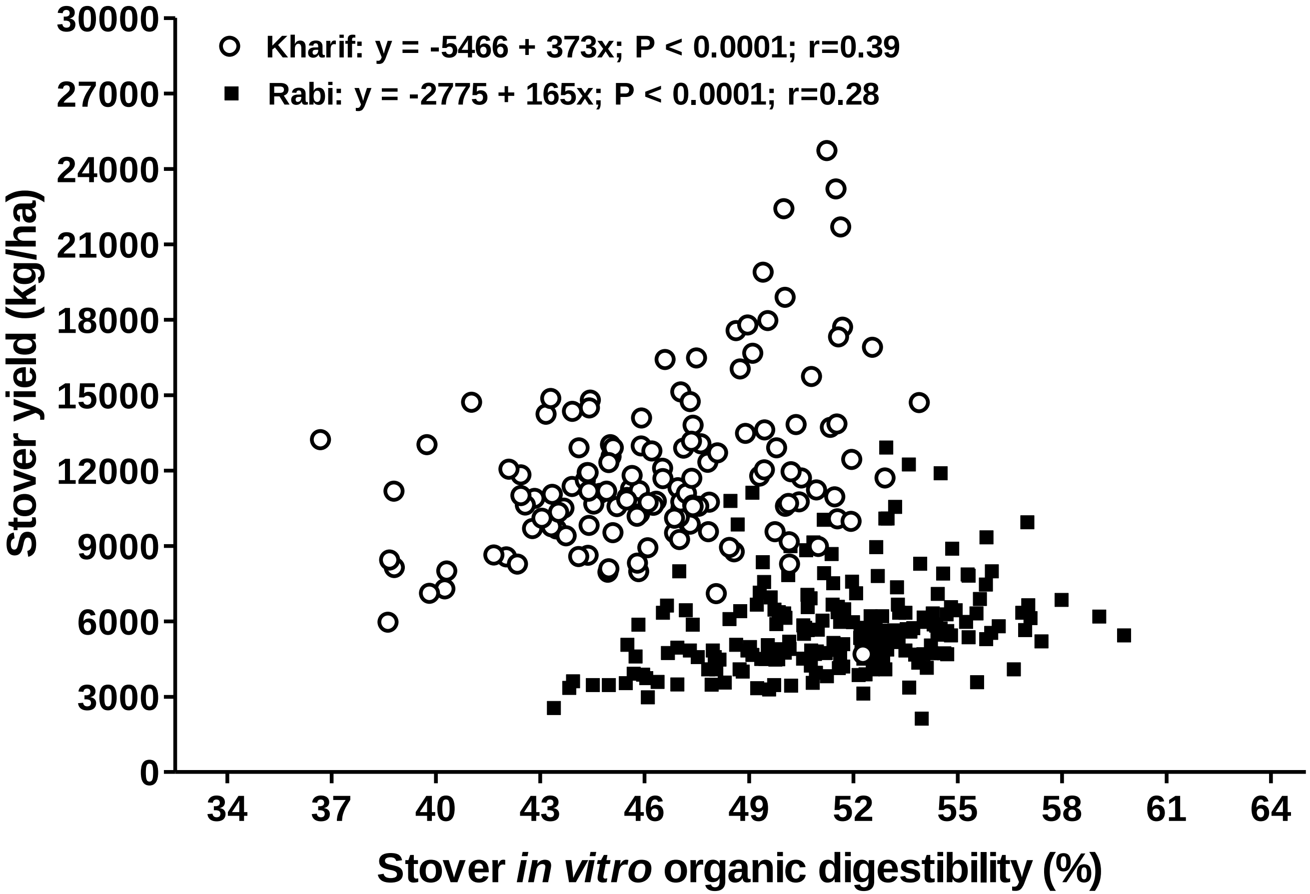

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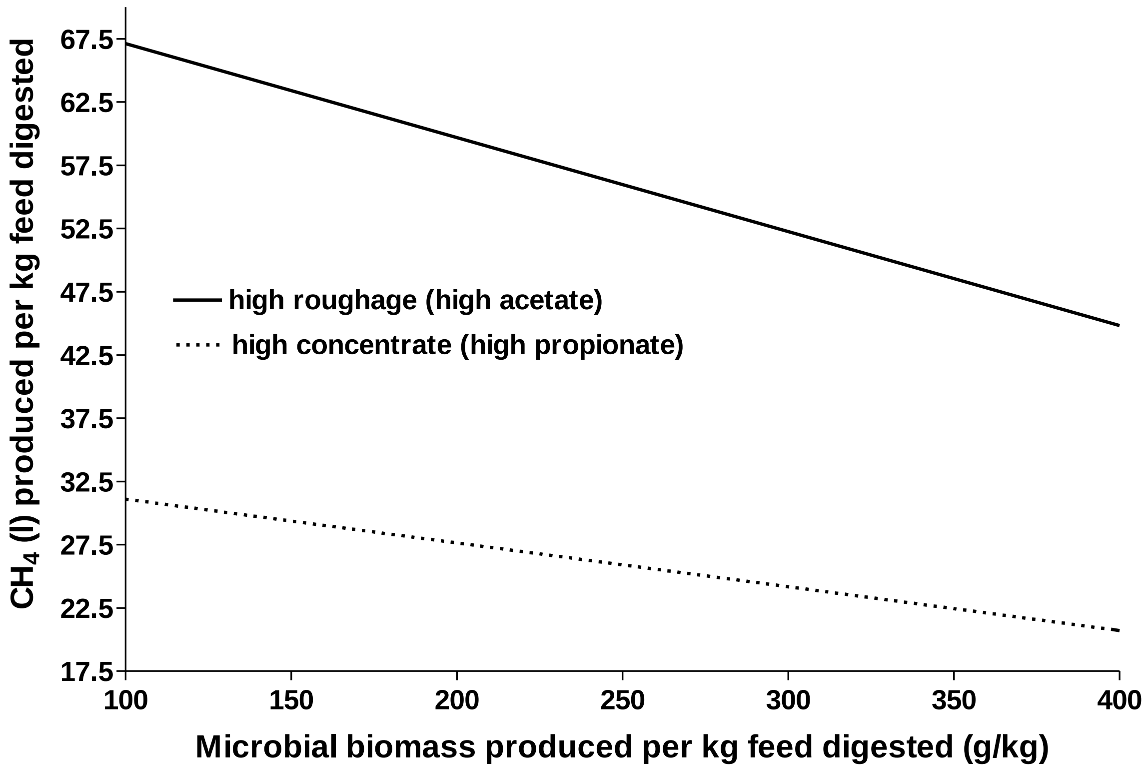

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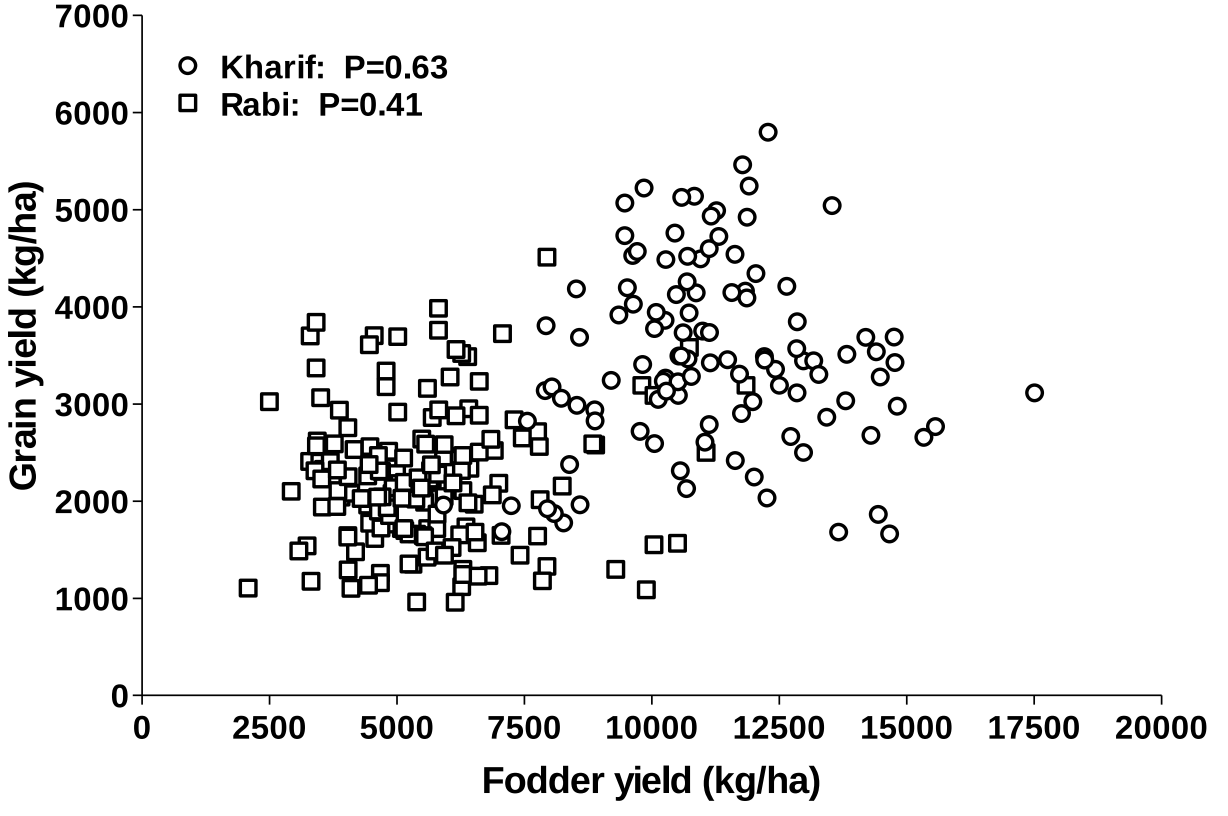

BAIF success with cross bred cow performance in rural WM 1997-2001

Land use	Milk (kg/d)
Irrigated areas	8.5
Non-irrigated areas	7.7

Data from Ghokale et al 2007 calculated for 365 day lactations

Conclusions

- Complex decisions about trade-offs and strategies for balancing positive and negative effects of livestock required
- Potential win-win situations associated with intensification
- Inverse associations between productivity and natural resource use and GHG emissions
- Other than technical support required (markets, insurance schemes etc)