

Quality characteristics of wheat and rice straw traded in Indian urban centres

ICDD, Faisalabad, Pakistan
20/10/2011



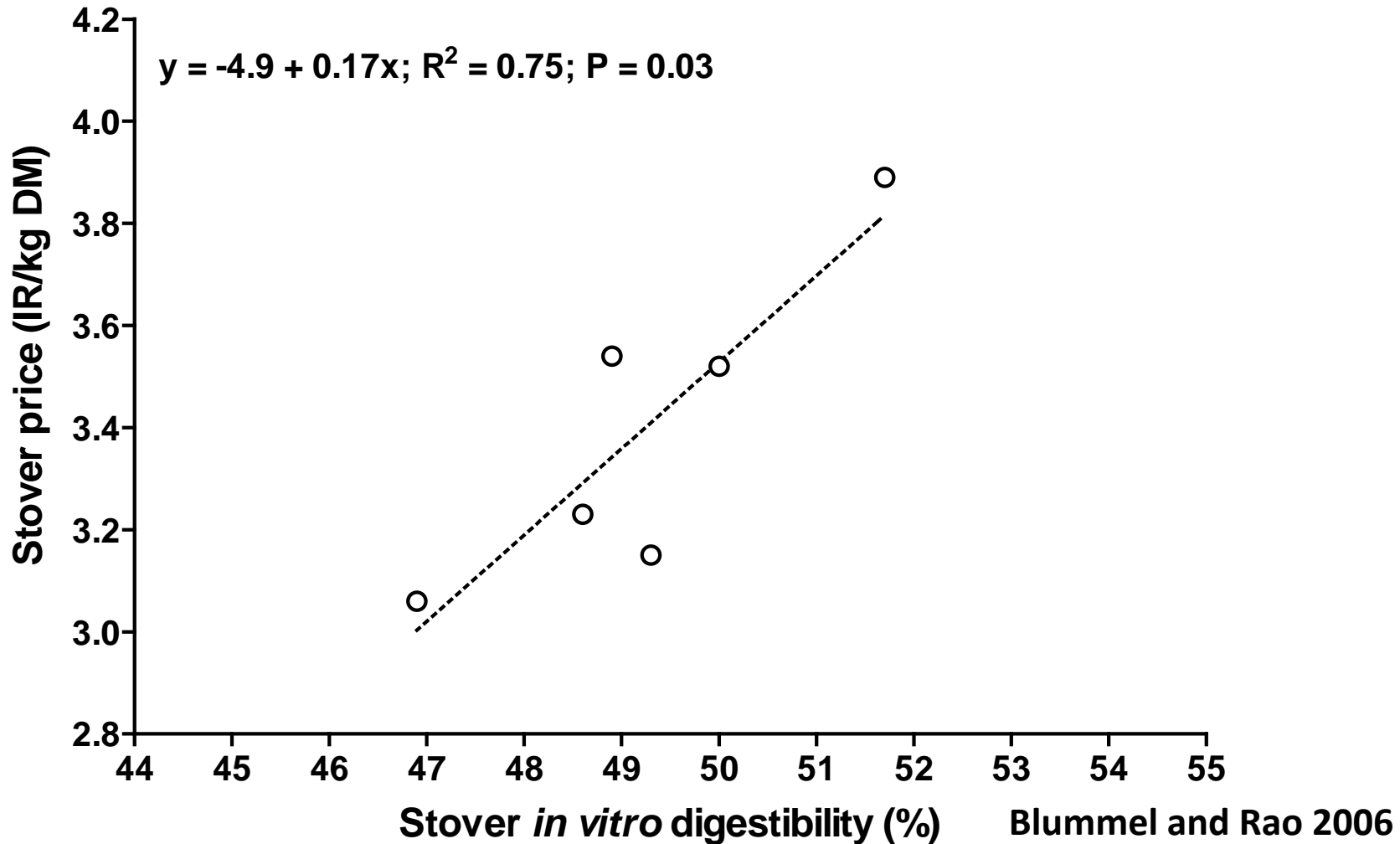
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Why straw quality?

- Straw is most important feed in South Asia
- Weak link: nutritional quality – grain yield
- Small improvements in nutritional quality can generate considerable gains
- Genetically determined quality (in varieties) can be efficiently distributed through seeds
- But: How is straw quality perceived?

Relation between digestibility and price of sorghum stover



Research questions

- How do traders perceive quality?
- What is the nutritional quality and its variation
 - in wheat and paddy straw?
 - in northern and eastern Indian urban markets?
- Are perceived and nutritional qualities linked?
- How do markets value quality characteristics?
- What are major price determinants?

Methodology / approach

- Monthly sampling during 06/2008 - 06/2009 (13 months)
- In three urban centres
 - Delhi (wheat)
 - Patna (wheat & paddy)
 - Kolkata (paddy)
- 12 samples per site and type each month from 43 traders (some traders had several qualities)

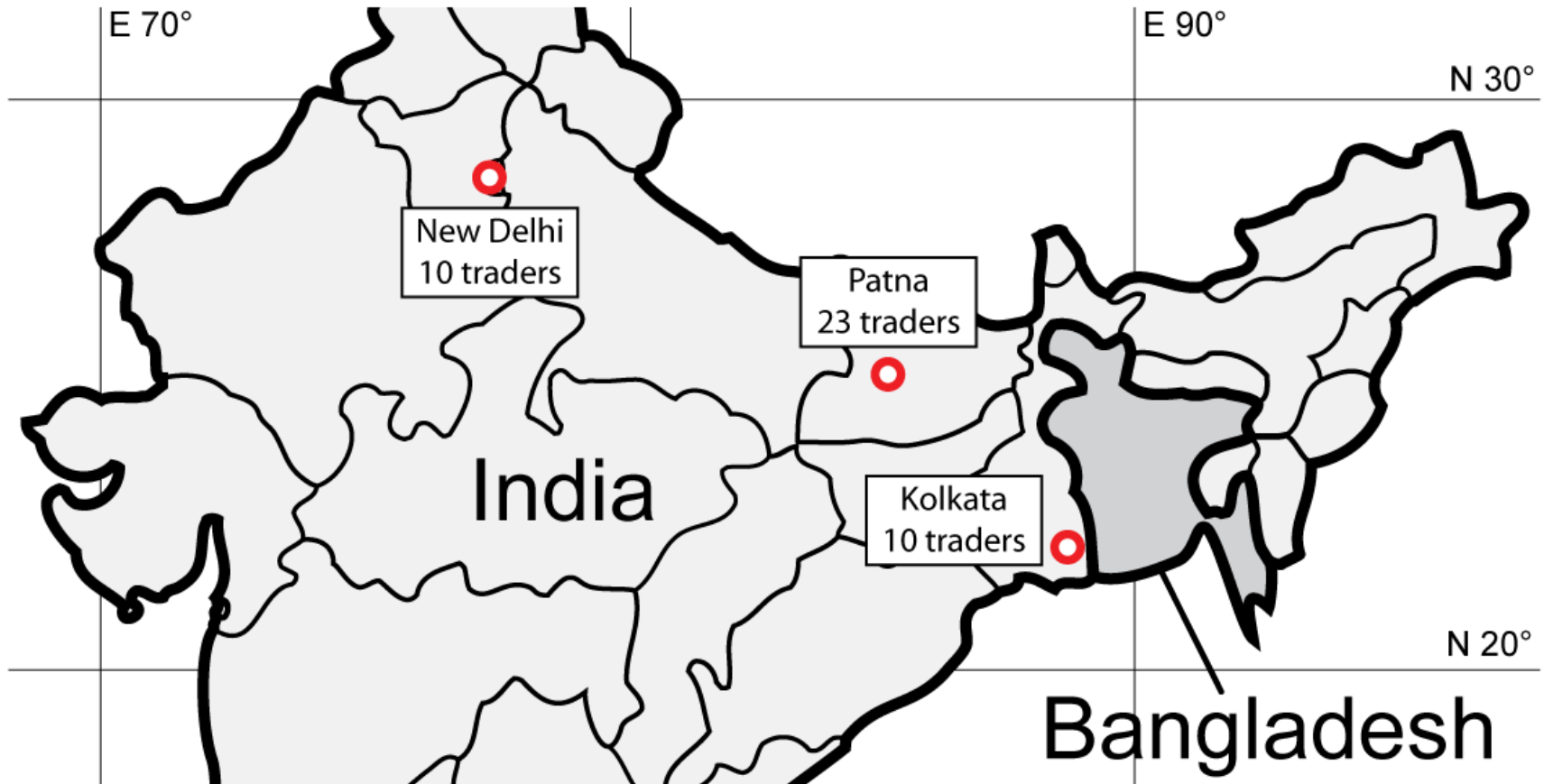
Data – collected at sampling

- Quality perception by traders
- Numerical evaluation (scale 1-5) of main traits
 - chopped (wheat & paddy)
short, soft, pure, bright, dry, tasty
 - whole (only paddy):
long, thin, base bright
 - overall quality
- Current price of sample
- Variety & origin information is **not** available
- Collection of 4 reps /sample for lab analysis

Data - laboratory analysis

- ILRI office Hyderabad, Michael Bluemmel
- Near InfraRed Spectroscopy (NIRS)
 - 1mm ground feed
 - exposed to near infrared light ray
 - analysis of absorption/reflection spectrum
- Calibration with traditional lab methods
- Regression models on NIRS data
- Variables generated for this study
 - nitrogen %, *in vitro* digest., metabol. energy
 - ash, silica, ndf, adf, adl , gas24

Study locations



Urban trader in Patna



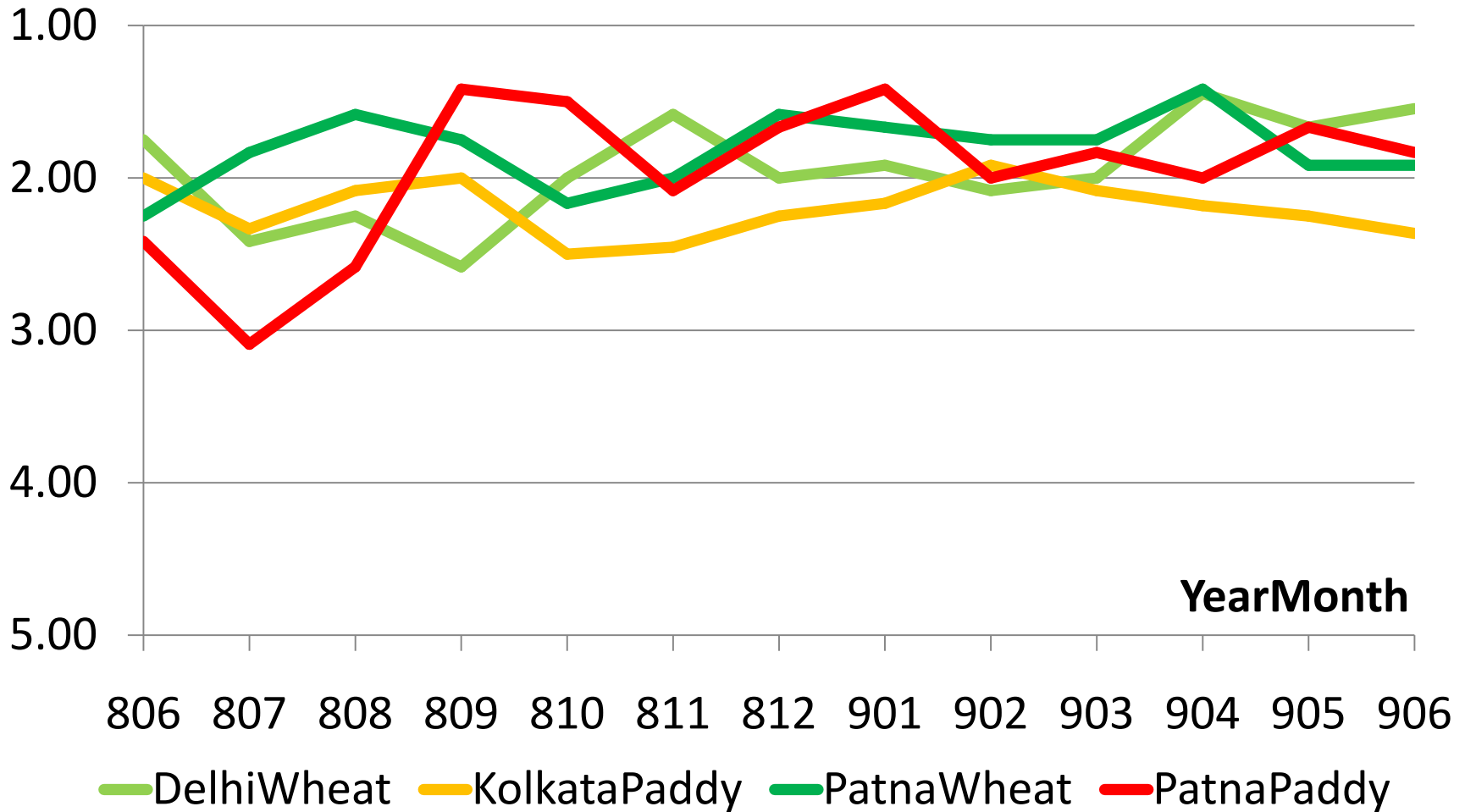
Sampling interview



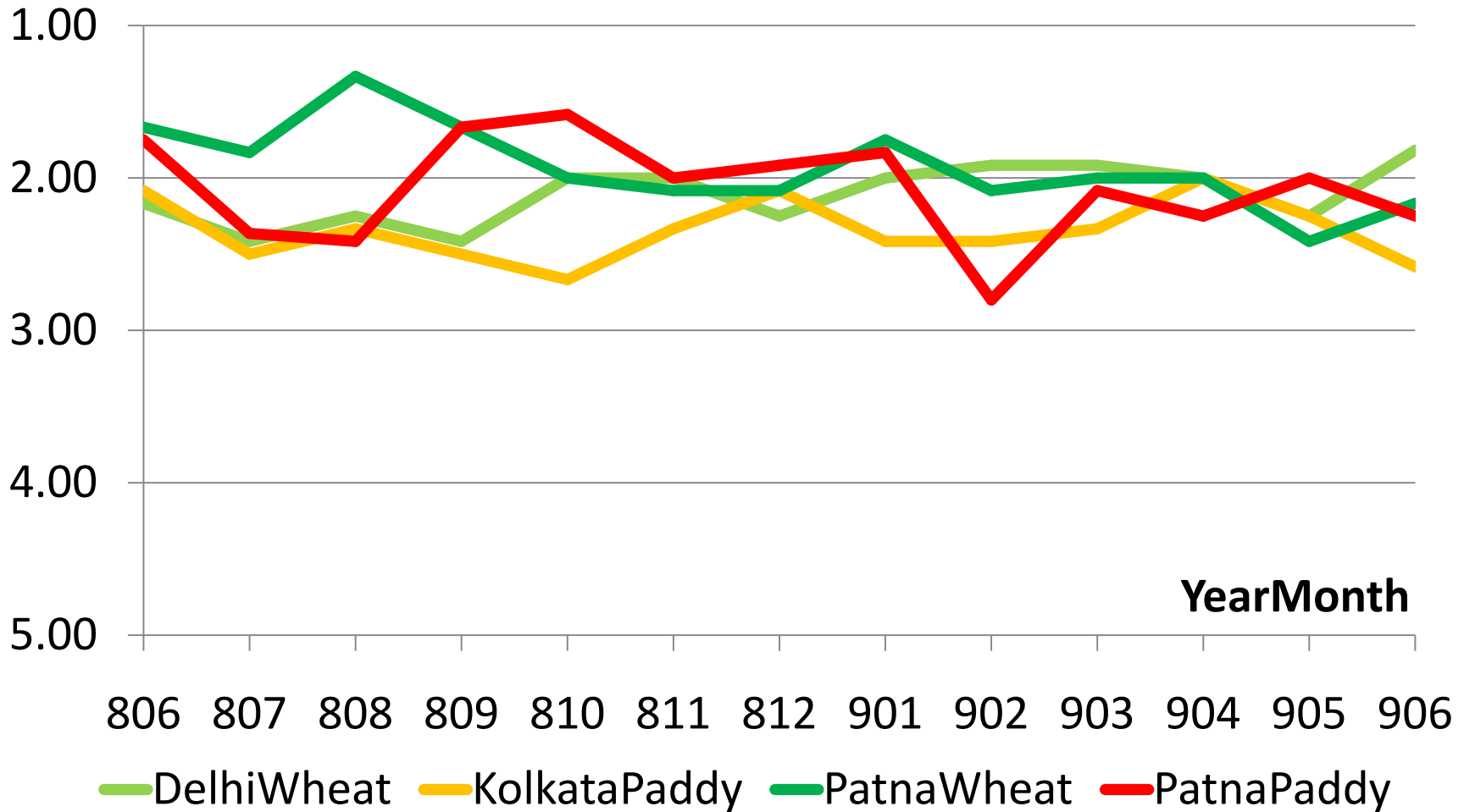
Large paddy straw bundles



Results – quality, bright



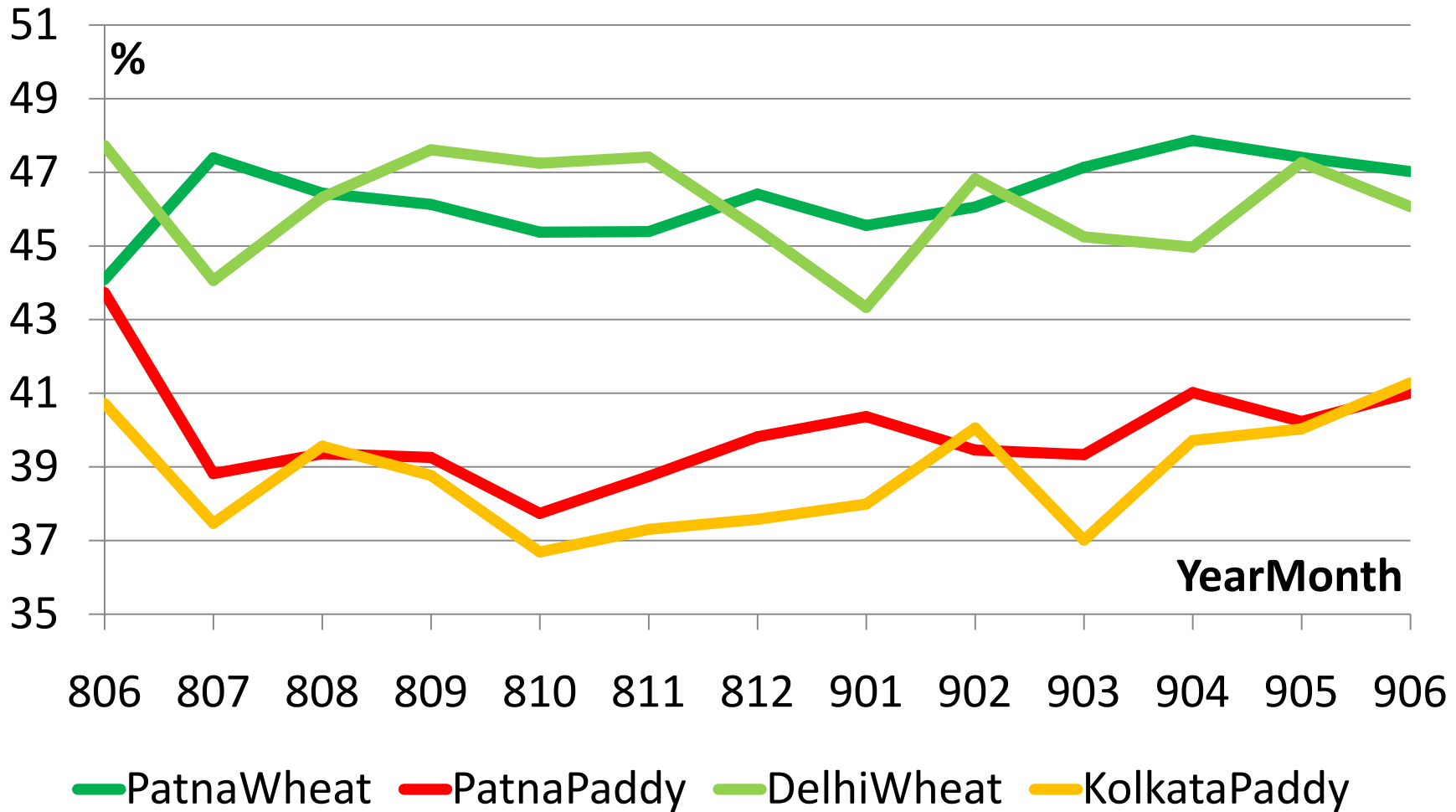
Results – quality perception, all



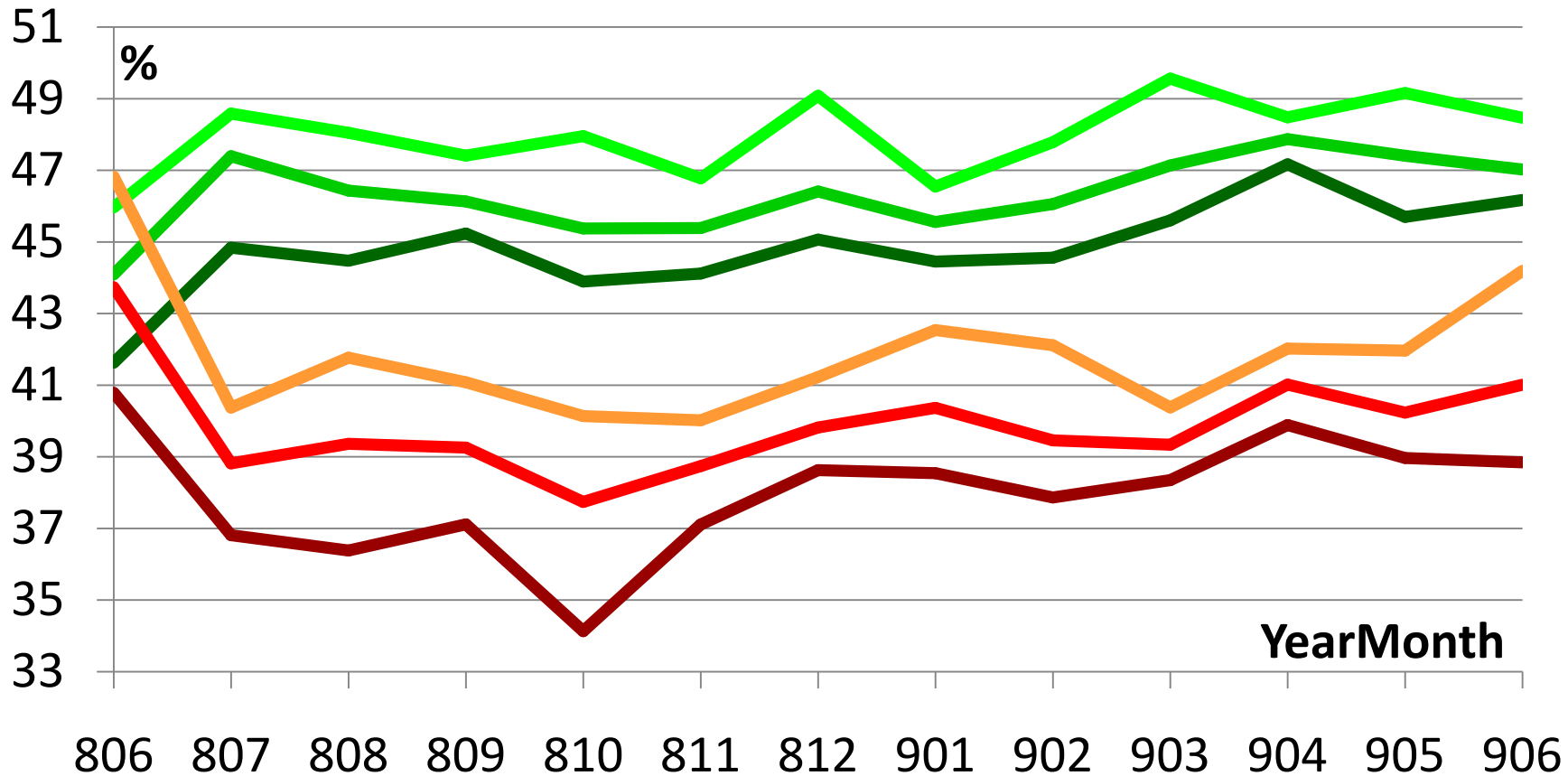
Trait effects on overall quality

Dep. Variable:	Wheat		Paddy	
Overall Quality	(n=294, adj R ² : 0.659)		(n=274, adj R ² : 0.536)	
	Stand. Beta	Sig.	Stand. Beta	Sig.
(Constant)	-	.888	-	.515
Short	.387	.000	.105	.019
Soft	.182	.000	.135	.004
Pure	.077	.069	-.129	.016
Bright	.241	.000	.276	.000
Dry	.001	.976	-.067	.163
Tasty	.197	.000	.341	.000
Long (whole)	-	-	.090	.033
Thin (whole)	-	-	.157	.001
BaseBright (whole)	-	-	.193	.000

Results – digestibility, means



Results – digestibility, range (Patna)



PatnaWheatMax PatnaWheatMean PatnaWheatMin
PatnaPaddyMax PatnaPaddyMean PatnaPaddyMin

Traits effects on digestibility

Dep. Variable:	Wheat		Paddy	
InVitro Digest.	(n=294, mod. sig: 0.248)		(n=274, adj R ² : 0.030)	
	Stand. Beta	Sig.	Stand. Beta	Sig.
(Constant)				.000
Short			-.213	.001
Soft			.021	.749
Pure			.017	.823
Bright			.022	.788
Dry			-.123	.079
Tasty			-.038	.632
Long (whole)			.010	.872
Thin (whole)			.071	.290
BaseBright (whole)			-.061	.390

Traits effects on metabol. energy

Dep. Variable:

Wheat

Paddy

ME [MJ/kg]

(n=294, mod. sig: **0.572**)

(n=274, adj R²: **0.140**)

Stand. Beta

Sig.

Stand. Beta

Sig.

(Constant)

-

.000

Short

-.097

.112

Soft

-.109

.084

Pure

.037

.606

Bright

.074

.335

Dry

-.280

.000

Tasty

-.116

.122

Long (whole)

.053

.362

Thin (whole)

-.046

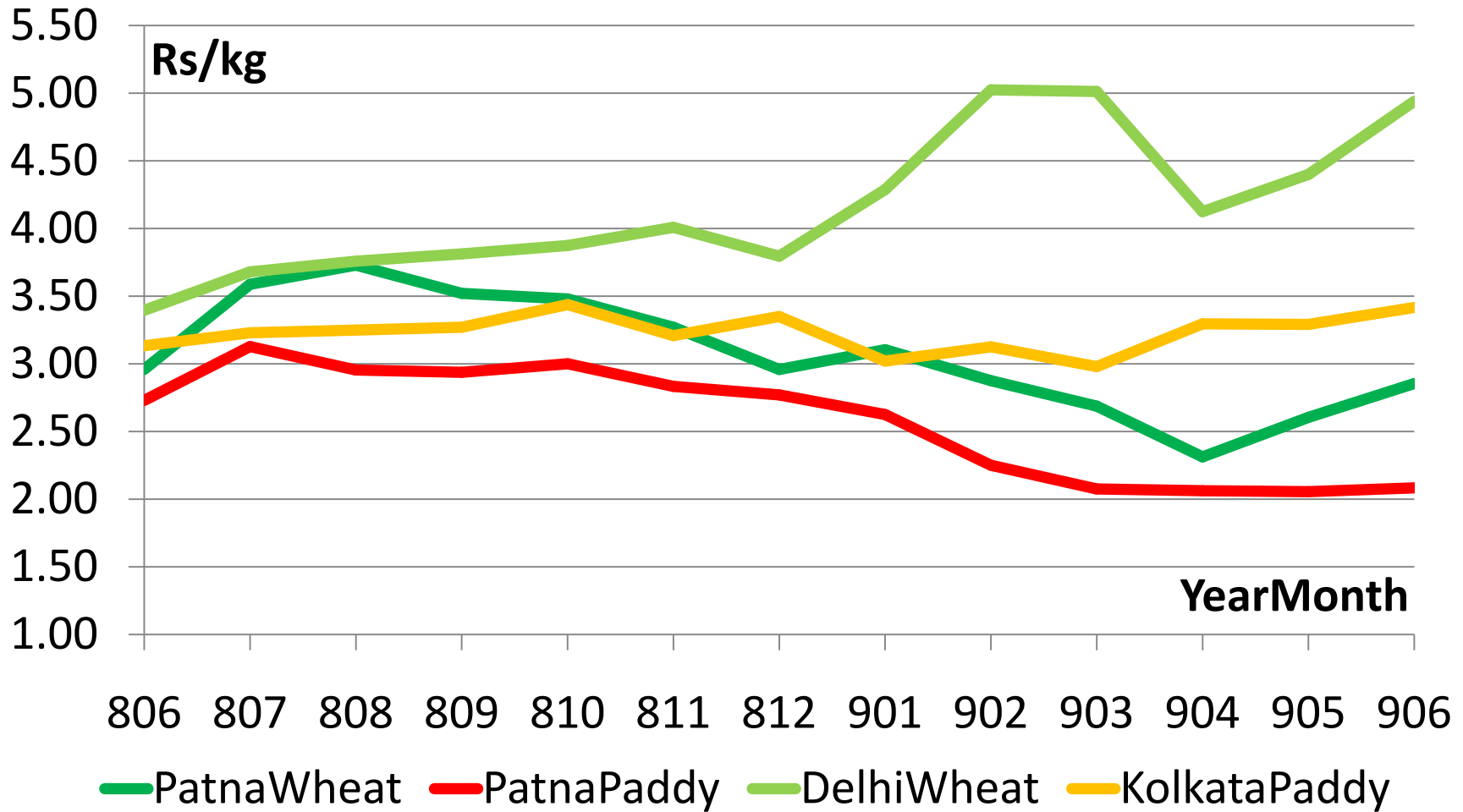
.469

BaseBright
(whole)

-.099

.136

Results – price, means



Price determinants – 1

Dep. Variable: (after box cox)	Delhi - Wheat Price Rs/kg (n=147, adj R ² : 0.598)		Kolkata - Paddy inv (Price Rs/kg) (n=126, adj R ² : 0.982)	
	Stand. Beta	Sig.	Stand. Beta	Sig.
(Constant)		.000		
Trend	.644	.000		
PaddyHarvest	-.214	.000		
WheatHarvest	-.334	.000		
Digestibility			-.161	.085
MetabEnergy			.357	.000
NitrogenCont	.151	.006		
Short	.131	.034	.175	.026
Soft			.188	.015
Pure	.144	.048		
Bright	.130	.047	-.171	.043
Dry	.129	.089		
Tasty	.162	.050	.617	.000

Price determinants - 2

Dep. Variable: (after box cox)	Patna - Wheat		Patna - Paddy	
	Stand. Beta	Sig.	Stand. Beta	Sig.
	In(Price Rs/kg) (n=156, adj R ² : 0.471)		Price Rs/kg (n=146, adj R ² : 0.738)	
(Constant)		.000		.000
Trend	-.442	.000	-.773	.000
PaddyHarvest	.125	.038	.147	.002
WheatHarvest	-.310	.000		
MetabEnergy			-.092	.062
Soft			-.162	.002
Tasty			-.096	.083
WholeThin			-.108	.031
WholeBase			.137	.008
Bright				

Price determinants - 3

Patna - Wheat & Paddy

Dep. Variable: $\ln(\text{Price Rs/kg})$
(after box cox) (n=306, adj R²: 0.676)

	Stand. Beta	Sig.
(Constant)		.000
PaddyDummy	-.436	.000
Trend	-.526	.000
PaddyHarvest	.116	.001
WheatHarvest	-.151	.000
Soft	-.153	.000

Conclusions - 1

- Quality differences are recognised in wheat & paddy straw
- Traders & consumers evaluate by appearance
 - traits are often related to (post)-harvest processes
 - variety & origin information is not carried forward
- Lab analysis shows
 - superior nutritional quality of wheat straw
 - paddy straw digestibility below expectations (avg of variety tests > 40%)

Conclusions - 2

- Perceived and nutritional quality are poorly linked
- Price variations are mainly temporal & regional
 - separate analysis of individual markets
 - wheat & rice straw are substitutes in Patna
 - 1 year too short to capture inter-year effects

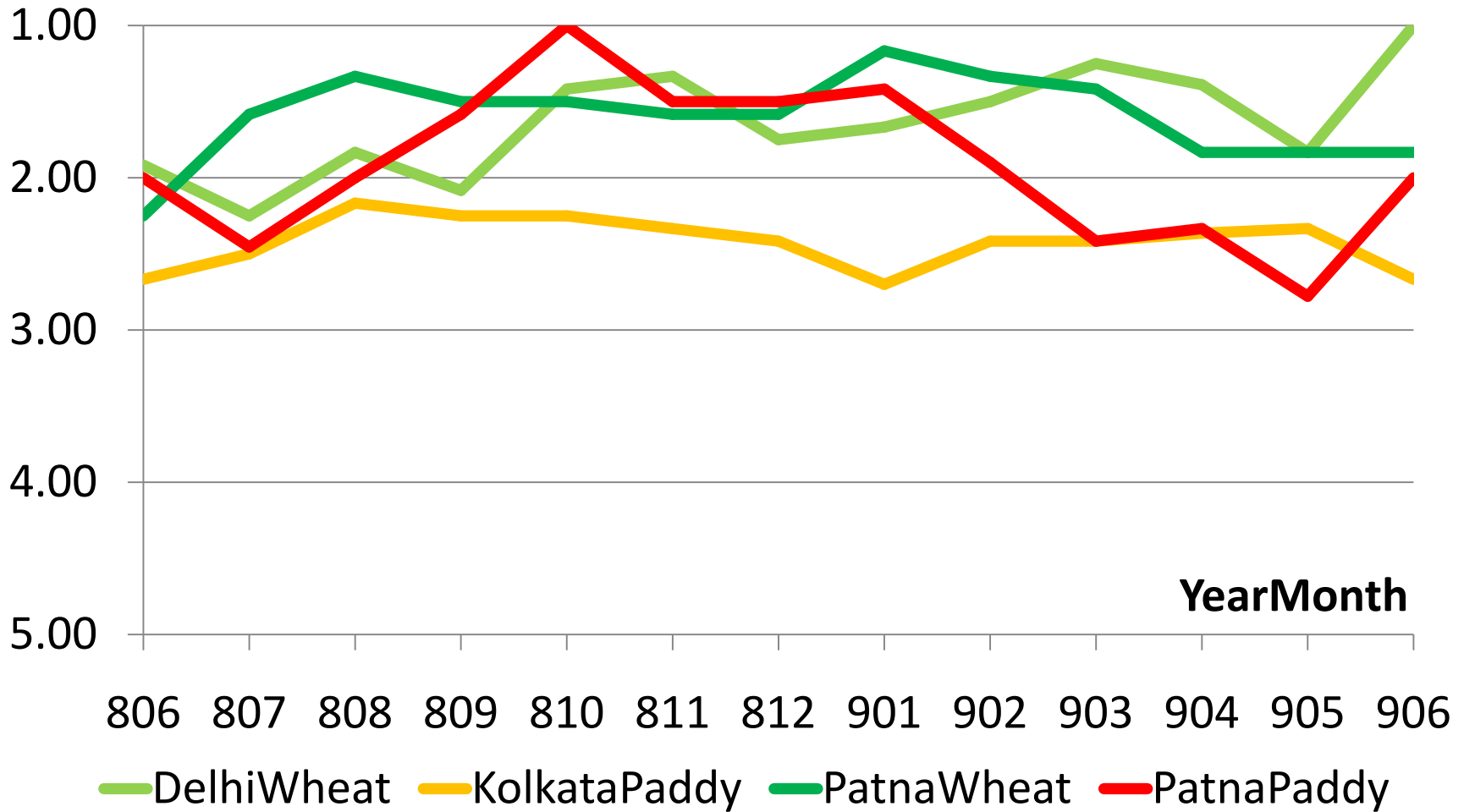
Outlook

- What are the underlying characteristics and effects of the perceived quality traits?
- How do effects of improved nutritional quality compare to other improvements (e.g. in harvest & storage processes)?
- Can the benefits of various quality improvements be quantified & who gains?
- What are the effects of the price volatility and could it be reduced?

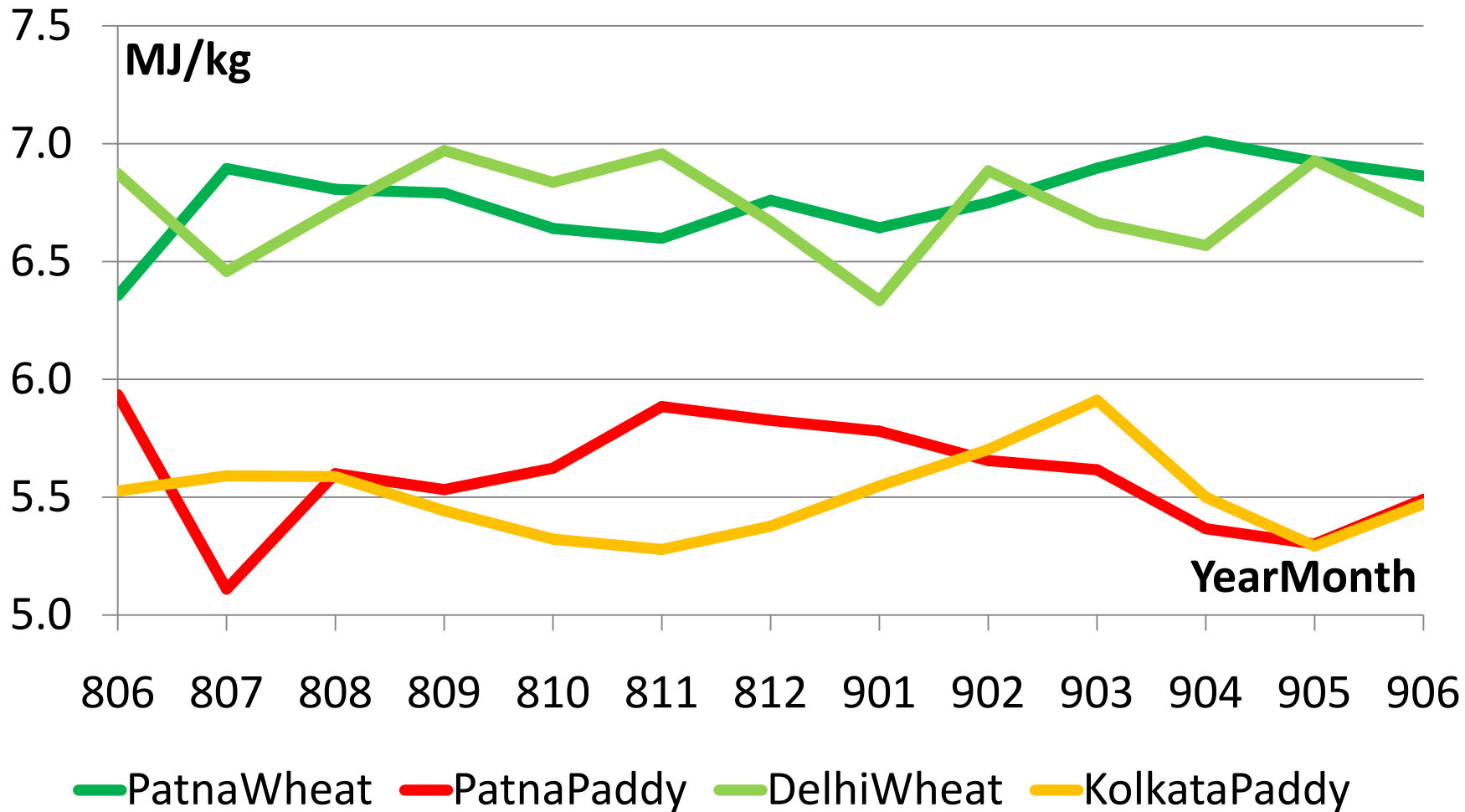
Thank you



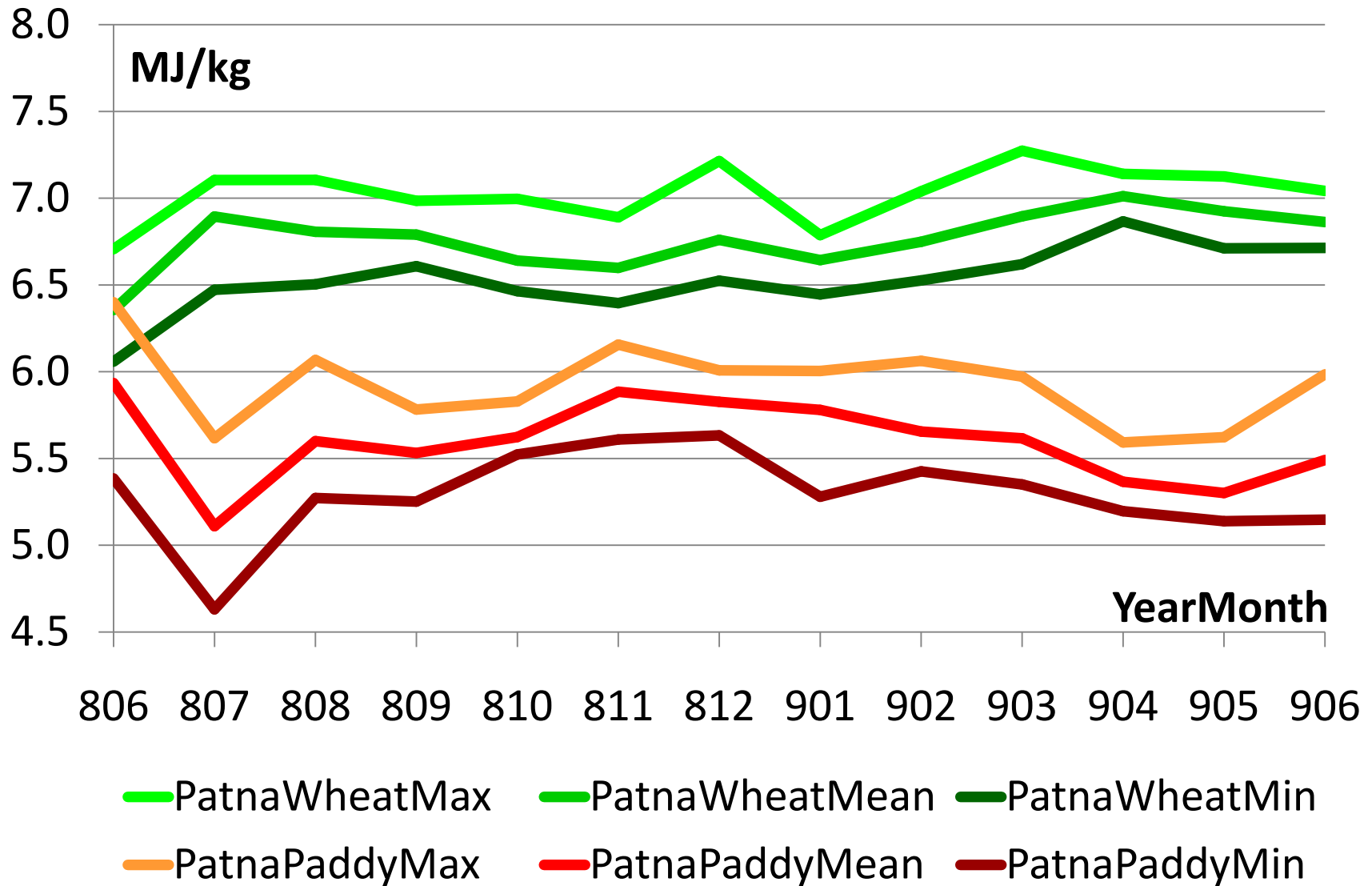
Results – quality, soft



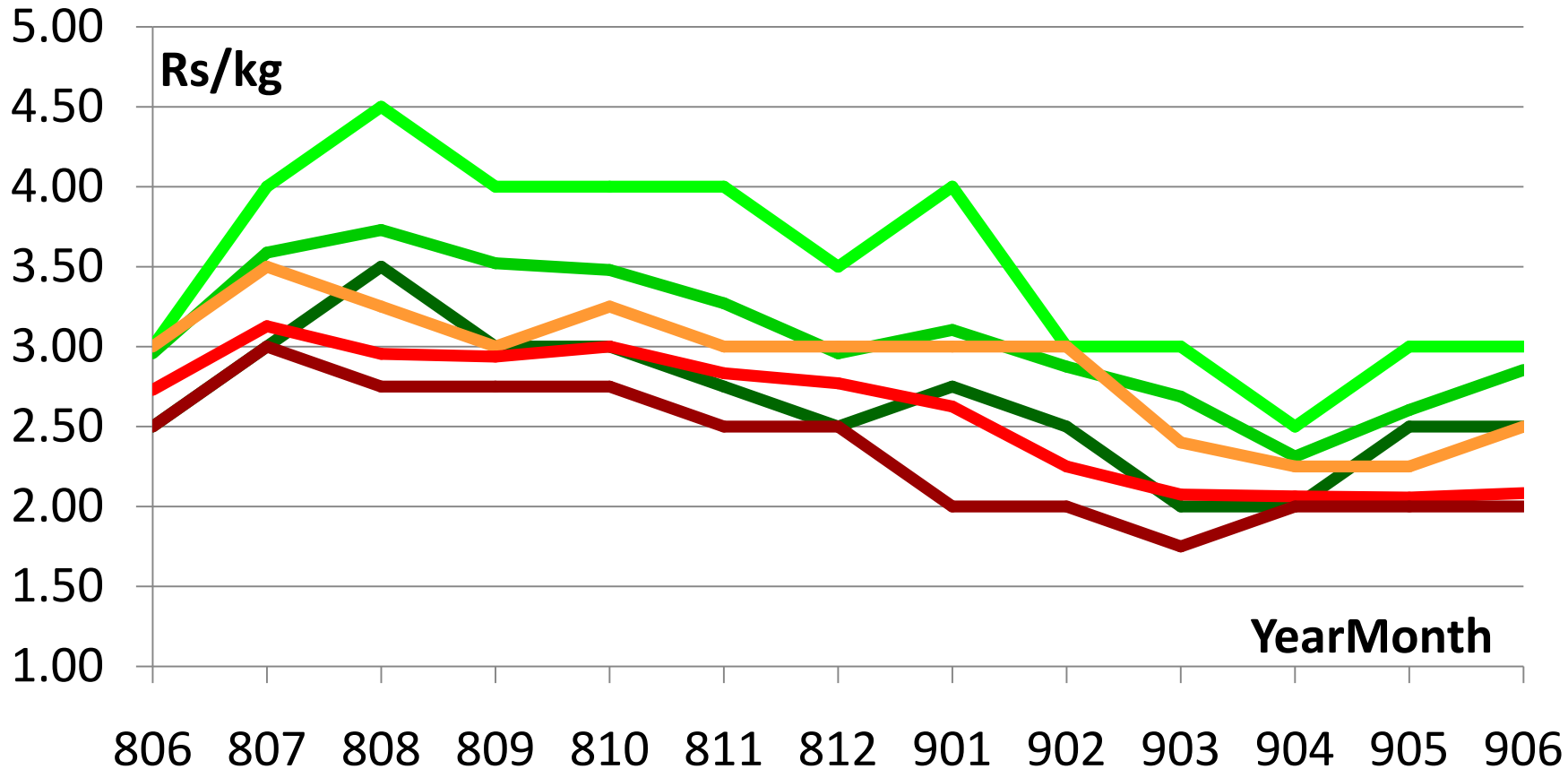
Results – metabol. energy, means



Results – metabol. energy, range



Results – price, range



PatnaWheatMax PatnaWheatMeans PatnaWheatMin
PatnaPaddyMax PatnaPaddyMeans PatnaPaddyMin

Trait effects on price

Dep. Variable:	Wheat		Paddy	
Price Rs/kg	(n=294, adj R ² : 0.093)		(n=272, adj R ² : 0.288)	
	Stand. Beta	Signfc.	Stand. Beta	Signfc.
(Constant)	-	.000	-	.000
Short	-.012	.856	-.057	.306
Soft	-.156	.026	-.030	.599
Pure	-.301	.000	-.176	.008
Bright	.159	.022	.245	.001
Dry	-.064	.293	.278	.000
Tasty	.094	.227	-.178	.010
Long (whole)	-	-	-.050	.339
Thin (whole)	-	-	-.429	.000
BaseBright (whole)	-	-	.016	.787