NUTRITIONAL PROPERTIES OF COCOA PODS AS RUMINANT FEEDSTUFF

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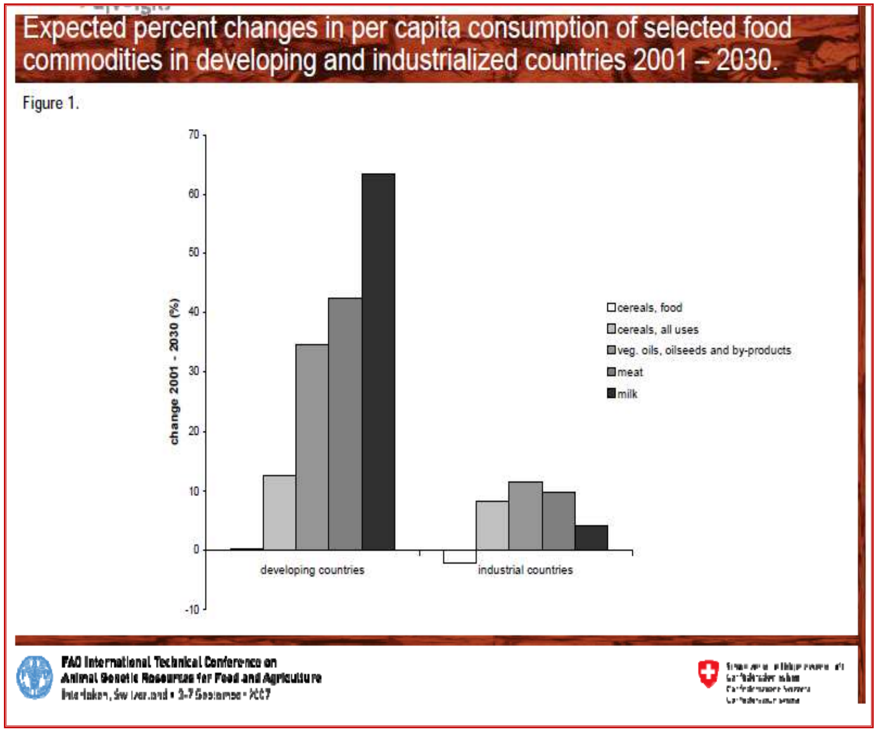
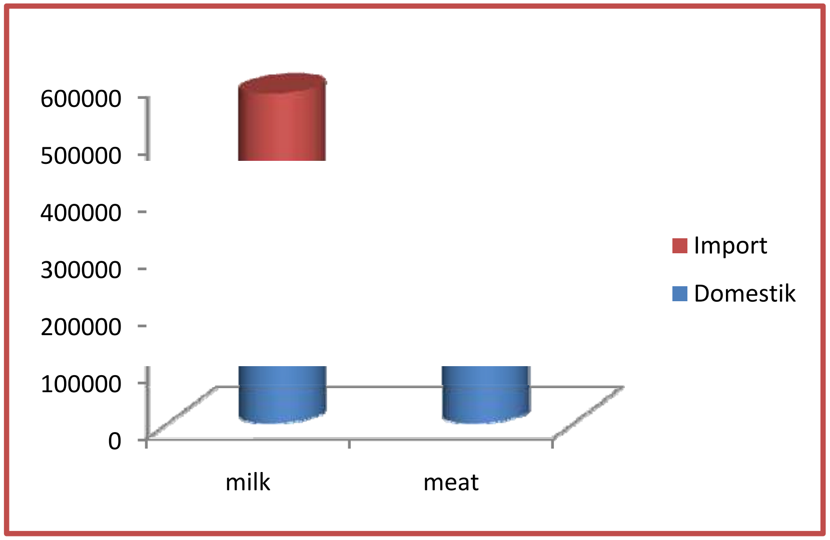
Ruminant Figure



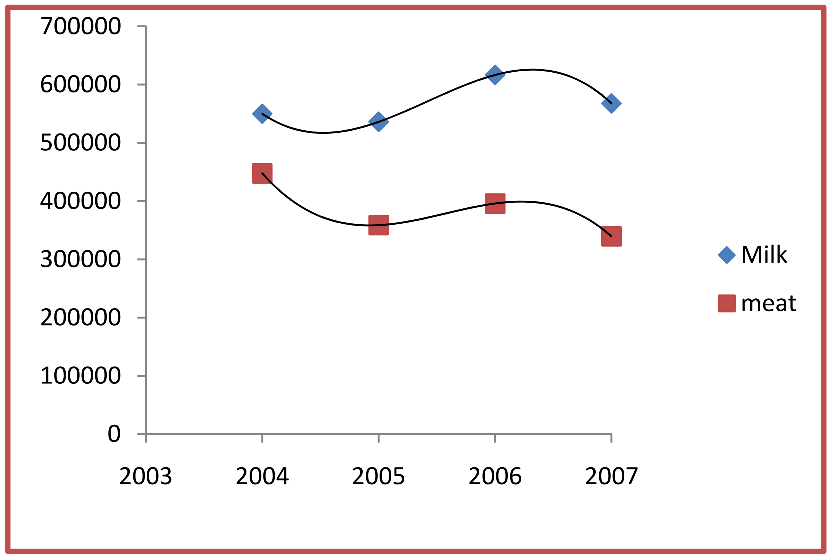
Milk consumption

COUNTRY	CONSUMPTION (liter/capita/year)
China	5
Indonesia	7
Cambodia	13
Philippines	20
Malaysia	20
Singapore	21
Thailand	20
India	30
Bangladesh	31
Japan	40

Ruminant Figure



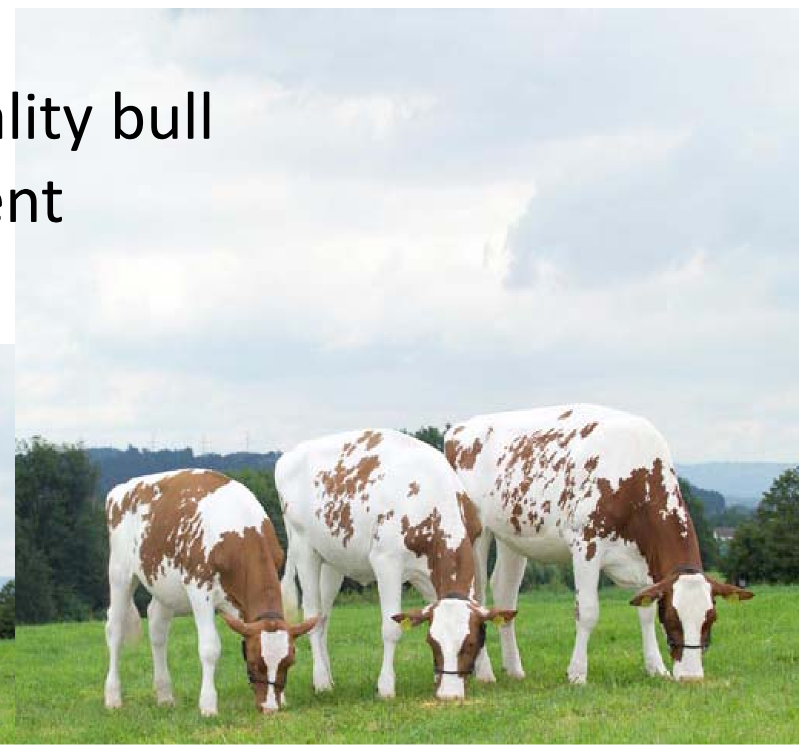
Demand of ruminant product and the ability of domestic production 2006 (ton)



Rate of milk and meat production (ton)

Problem of ruminant development in Indonesia

- Feeding Problem:
  - Lack of good quality feed resources
  - suboptimum of byproduct utilization
- Breeding problem
  - Breeding stock uneconomic
  - Limited availability of high quality bull
  - slow breed quality improvement
  - Low reproduction efficiency
- Disease problem
- Socio-economic problem



Feeding Problem

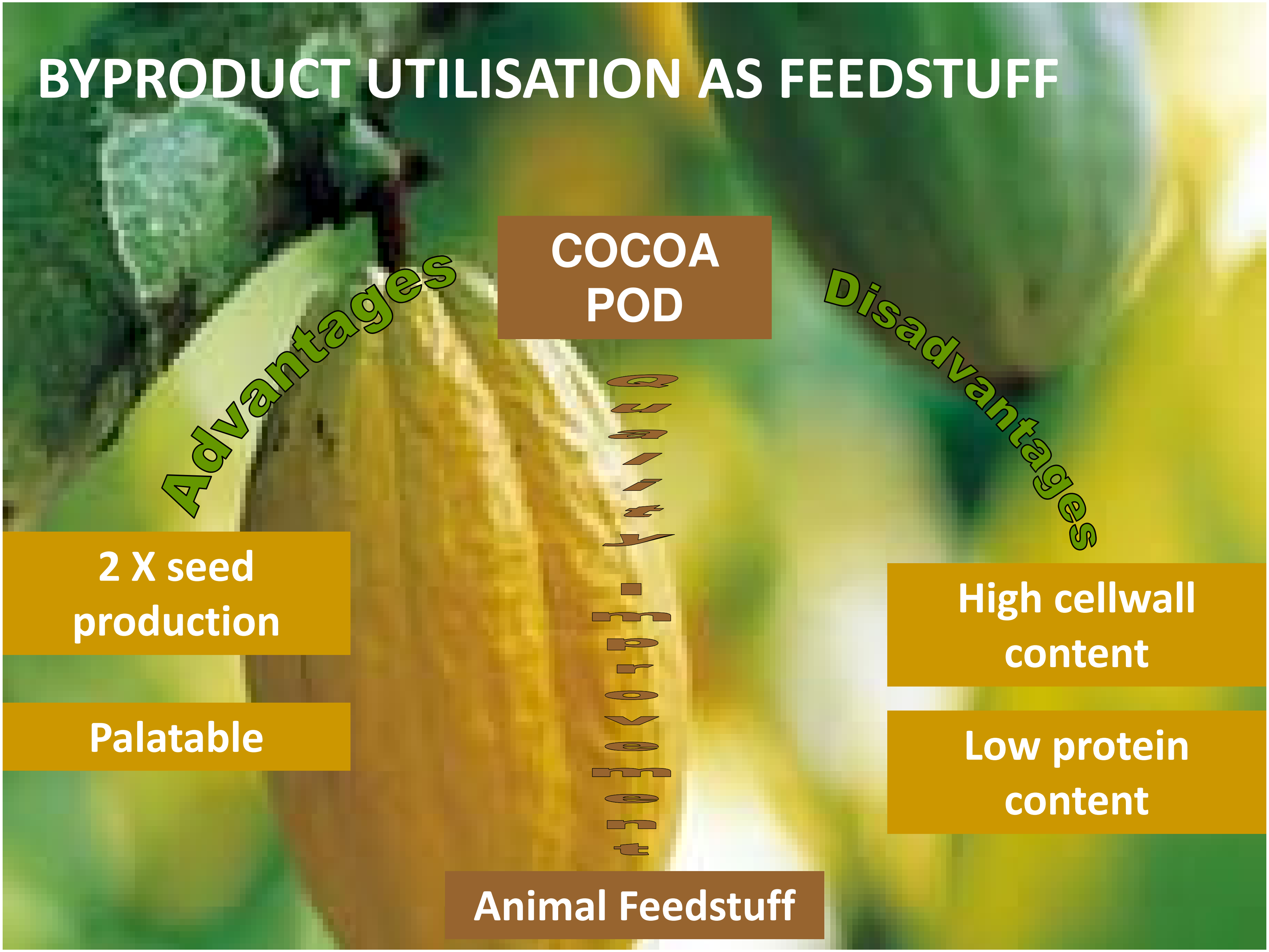
- Tropical vs temperate forage quality

Grade	Chemical composition			DMD (%)
	CP	ADF	NDF	
Prime	>19	<31	<40	>65
1	17-19	31-35	40-46	62-65
2	14-16	36-40	47-53	58-61
3	11-13	41-42	54-60	56-57
4	8-10	43-45	61-65	53-55
5	<8	>45	>65	<53

Nutrient contents of forages

Forage	DM, %	% DM					
		TDN	CP	CF	Ca	P	Ash
Napier grass	17	52	8	32	0.4	0.3	12
Native grass	20	55	10	30	0.4	0.2	11
Banana leaf	10	60	9	22	0.7	0.2	12
Corn-stover	20	60	9	25	0.3	0.2	10

- Fluctuation availability and quality


BYPRODUCT UTILISATION AS FEEDSTUFF
COCOA POD
Advantages
2 X seed production
Palatable
Quality improvement
Disadvantages
High cellwall content
Low protein content
Animal Feedstuff

Previous results

- simple chemical treatment with urea as effective as biological treatment in improving cocoa pods qualities

Experiment

- Treatments
  - Untreated
  - Silage
  - U10 = urea 10 g/kg cocoa pods
  - U20 = urea 20 g/kg cocoa pods
  - U30 = urea 30 g/kg cocoa pods
- Parameters
  - Nutrient content
  - Cellwall constituents
  - Antinutrition
  - Digestibility and metabolisable energy

Nutrient content of cocoa pod

Parameter	Un-treated	Silage	U10	U20	U30
DM, %	87.65	89.44	88.88	88.06	87.96
ASH, %DM	7.88^{b}	6.19^{a}	6.32^{ab}	5.81^{a}	5.49^{a}
CP, %DM	9.34^{b}	8.68^{ab}	19.36^{c}	26.51^{d}	43.24^{e}
Total N, % DM	1.35^{a}	1.69^{a}	2.90^{b}	3.98^{c}	6.77^{d}
True protein N, % DM	1.28^{a}	1.21^{a}	1.73^{b}	1.93^{c}	2.04^{d}
Amino acids N, % DM	0.78	1.11	nd	0.83	nd

CPA = Cocoa pod ash. The cocoa pod was incubated anaerobically for 2 weeks except for fresh treatment.
Different superscript at the same column shows the statistically different at $p < 0.05$

Nutrient content of cocoa pod

Parameter	Un-treated	Silage	U10	U20	U30
Cellwall constituent					
CF, % DM	52.30[c]	42.09[a]	47.18[bc]	49.98b[c]	46.83[b]
ADF, % DM	69.52[b]	62.15[ab]	61.39[ab]	62.13[ab]	58.61[a]
NDF, % DM	79.48	82.04	82.59	81.92	80.07
ADL, % DM	29.08[a]	34.82[b]	29.33[a]	29.87[a]	27.73[a]
Hemi-cellulose, % DM	15.85	16.47	22.08	21.26	22.72
Cellulose. % DM	34.54[b]	30.76[a]	31.18[ab]	30.79[a]	29.62[a]
Crude lignin, % DM	28.64	33.13	29.17	29.66	27.40

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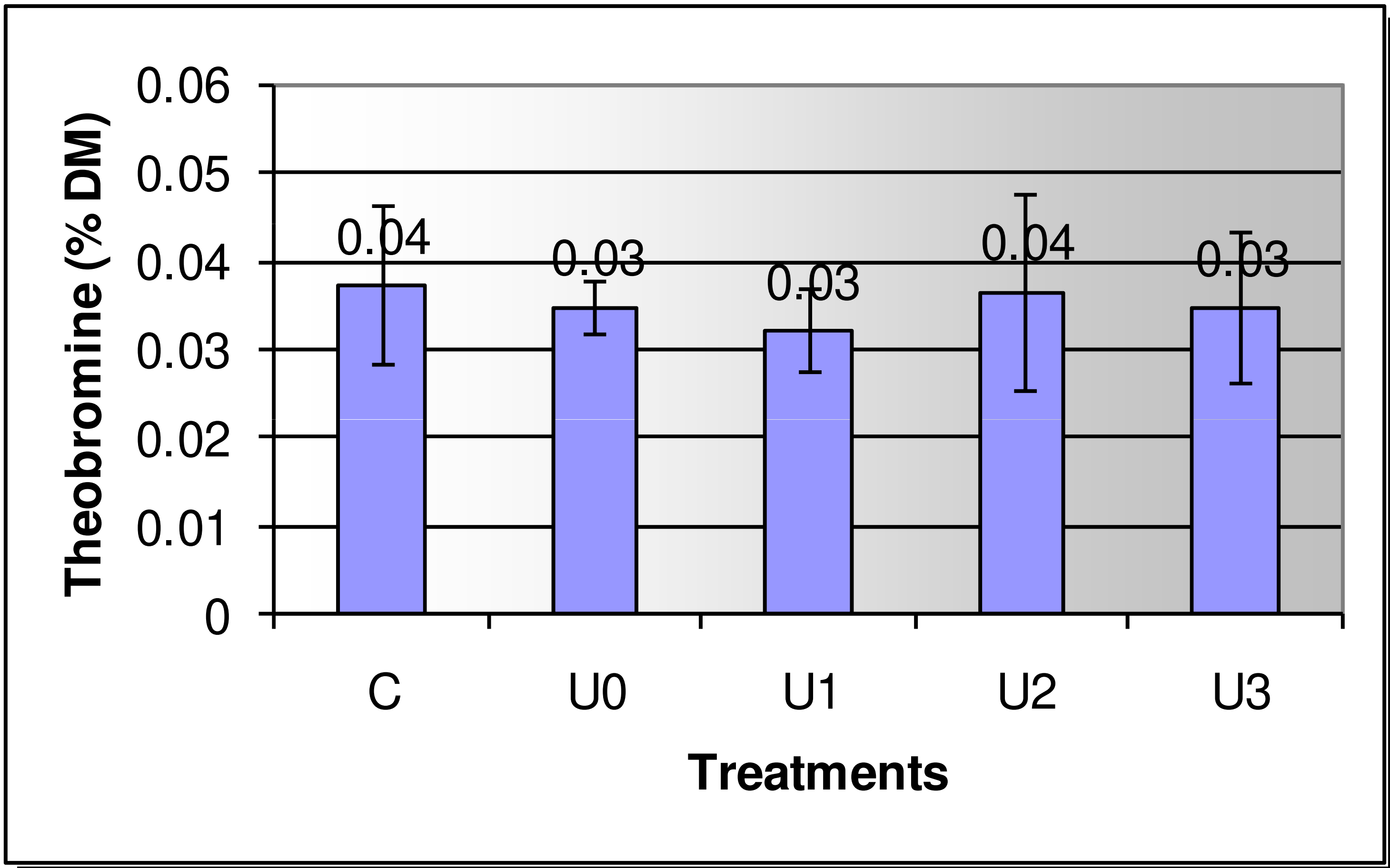
Anti nutrition of cocoa pod



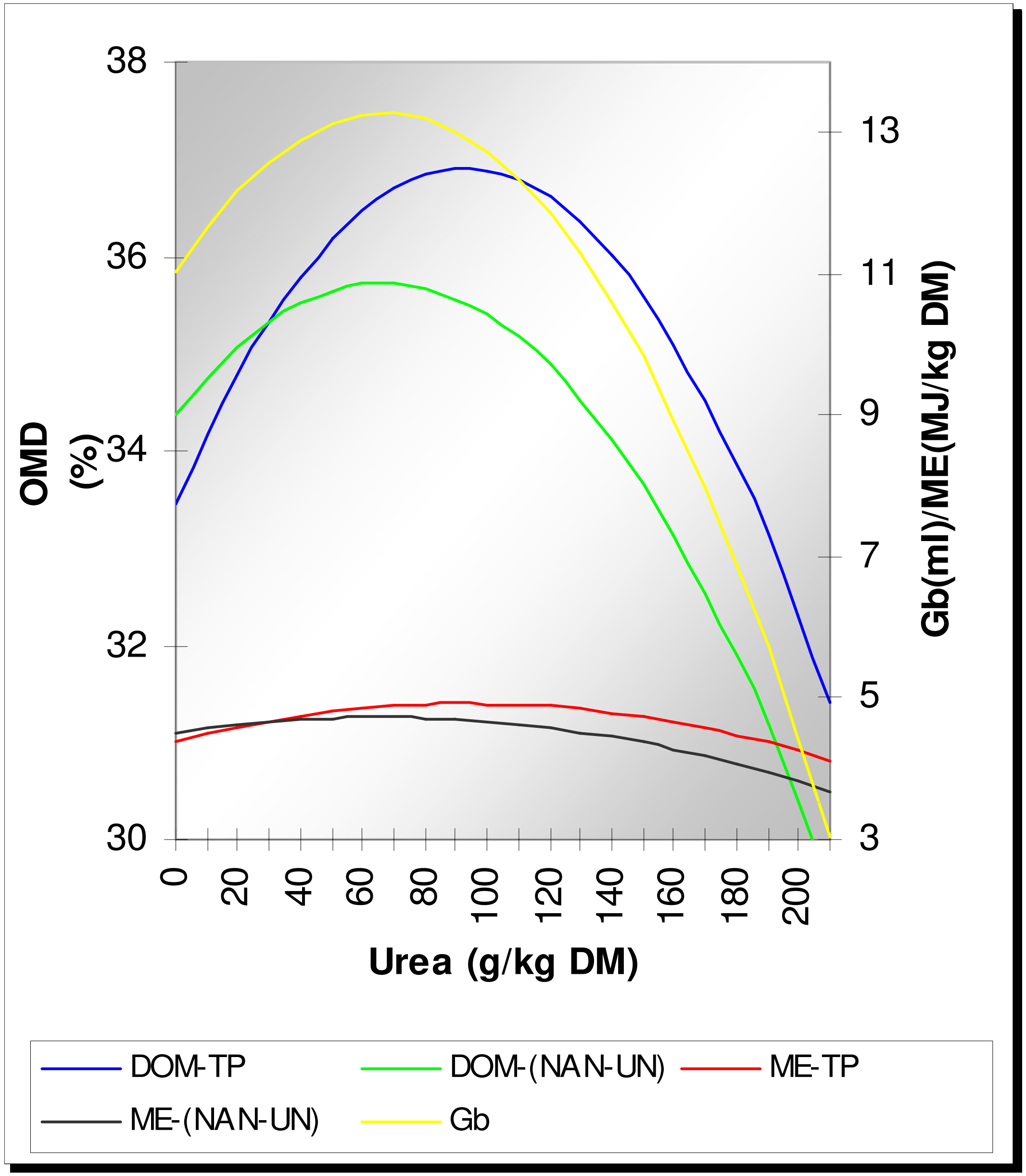
Digestibilities and metabolisable energy of cocoa pod

Treatments	Gb	OMD	ME	ME(r)
	ml/200 mg DM	%	MJ/kg DM	MJ/kg DM roughage
Untreated	9.41^{c}	32.61^{ab}	3.40^{b}	4.03^{b}
Silage	11.51^{d}	33.04^{ab}	3.64^{b}	4.27^{c}
U10	12.07^{d}	38.43^{c}	4.45^{c}	4.95^{d}
U20	12.99^{d}	42.13^{d}	5.08^{d}	5.48^{e}
U30	4.86^{a}	42.07^{d}	5.06^{d}	5.31^{e}

Optimum Urea utilization on cocoa pod quality improvement

No	Formula	Peak	n	r^2	F
	Based on Gb	U (g/kg DM)			
1	$Gb = 11.0306 + 0.067U – 0.0005U^2$	67	12	0.86	0.000
	Based on %TP (TP-N x 6.25)				
2	$OMD = 33.4659 + 0.0743\ U - 0.0004\ U^2$	93	12	0,84	0.000
3	$ME = 4.3889 + 0.0113\ U - 0.00006\ U^2$	94	12	0.84	0.000
	Based on (NAN – UR-N) x 6.25				
4	$OMD = 34.3873 + 0.0401\ U - 0.0003\ U^2$	67	12	0.75	0.000
5	$ME = 4.5191 + 0.0065\ U - 0.00005\ U^2$	65	12	0.72	0.000

The effect of urea application on cocoa pods digestibility



Conclusion

- Ensilage and urea treatments improve the nutritive value of cocoa pods
- U20 resulted better improvement compare to others
- The optimum level for urea application about 65 g urea/kg DM