

# **Moving into more profitable beef production systems: case studies from Indonesia**

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## **The issue, like Vietnam**

- **Indonesia wants to increase beef production**
- **Wants to help farmers move into more commercially oriented supply and value chains**

## Profitable beef production systems

- Profit does not always equate to biological performance
- Easy to increase growth rate
- Hard to do it
  - At a higher profit (daily income over food cost (IOFC))
  - Lower or acceptable risk
- Risk is most important for adoption



# Profitable beef production systems

## Current situation

Region	Breed	Feeding system	LWG kg/day	Income over food cost VND/bull/day
East Java (Ratnawati et al 2015)	Euro X	Village forage and by-products	0.52	24,607
East Java (Priyanti et al 2012)	Euro X	Village forage and by-products	0.26-0.43	2,274-9,260
	Ongole	Village forage and by-products	0.14-0.21	2,252-3,458
Yogyakarta (Winarti et al 2021)	Ongole	Village forage and by-products	0.31-0.39	15,913-24,774
Central Sulawesi (Marsetyo et al 2021)	Ongole	Corn stover	0.30	12,171
	Bali	Elephant grass	0.20	11,991
NTB (Panjaitan et al 2014 and Dahlanuddin et al 2014, 2017)	Bali	100% leucaena	0.40-0.60	29,774-33,863

Ba et al (2008) Increasing level of cassava powder on live weight gain of Laisind bulls fed elephant grass and rice straw

Level of cassava powder DM%LW/d	0	0.3	0.7	1.3 Approx 49% of ration	2.0
Live weight gain kg/d	0.22	0.35	0.43	0.59	0.47

# Profitable beef production systems

What do we need to do

- Increase LWG but at a cost that leads to higher Income over food cost

Questions

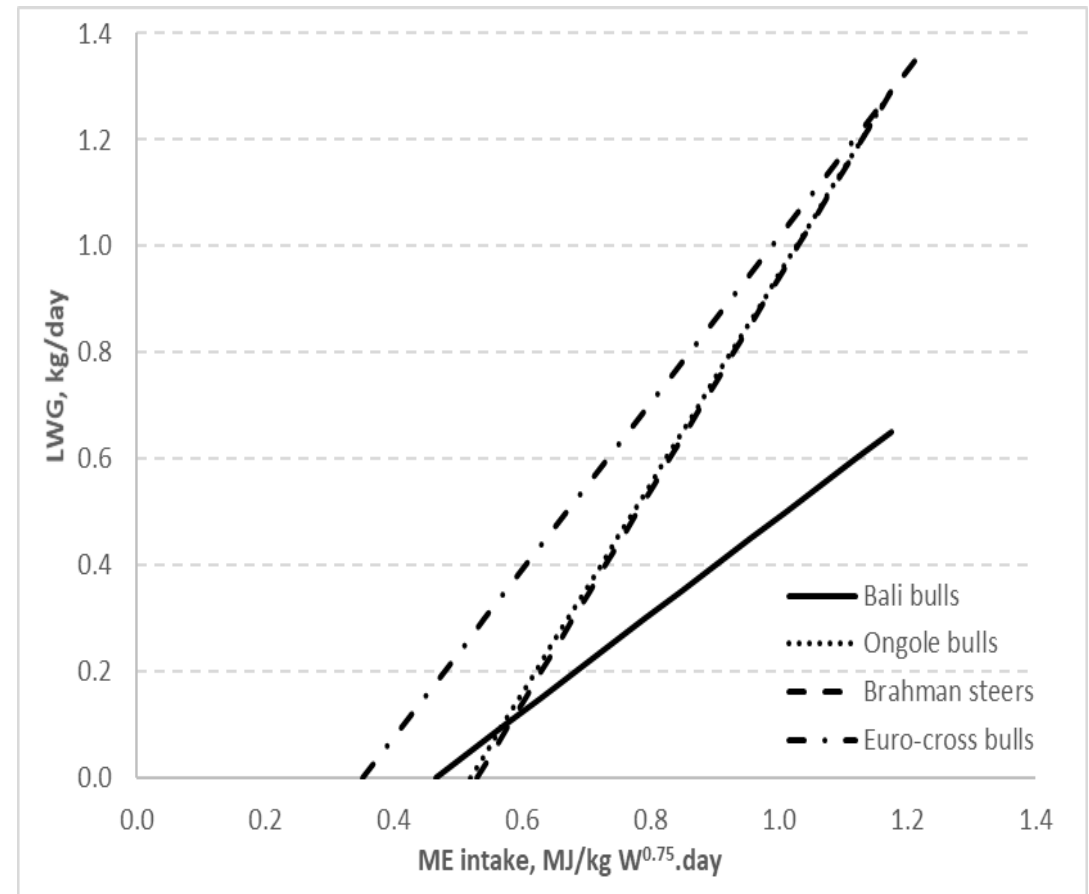
- What breed
- What combination of ingredients to make a ration that results in high LWG
- What level of feeding



# Profitable beef production systems

We need to understand the biological principles of growth of the breeds

- How does LWG respond to metabolizable energy (ME) intake
- How do breeds differ: first collation of breed types
- What effect does this have on IOFC



# Profitable beef production systems

## What does this tell us?

- Growth relationships established for breeds
- No difference between Ongole bulls and Brahman steers
- Maximum LWG (approximate)
  - Bali 0.65 kg/day
  - Ongole and Brahmans 1.06 kg/day
  - Euro X 1.35 kg/day
- Need to feed to high levels to achieve high LWG
- Increase in DM and ME intake leads to increase in LWG. Effect lowest for Bali bulls
- When LWG about 0.2-0.3 kg/day (village observations) Ongole, Brahman and Bali bulls have a similar restricted ME intake (0.7-0.8 MJME/kg W0.75.day)
- At this ME intake LWG Euro X > other breeds (as observed in village)

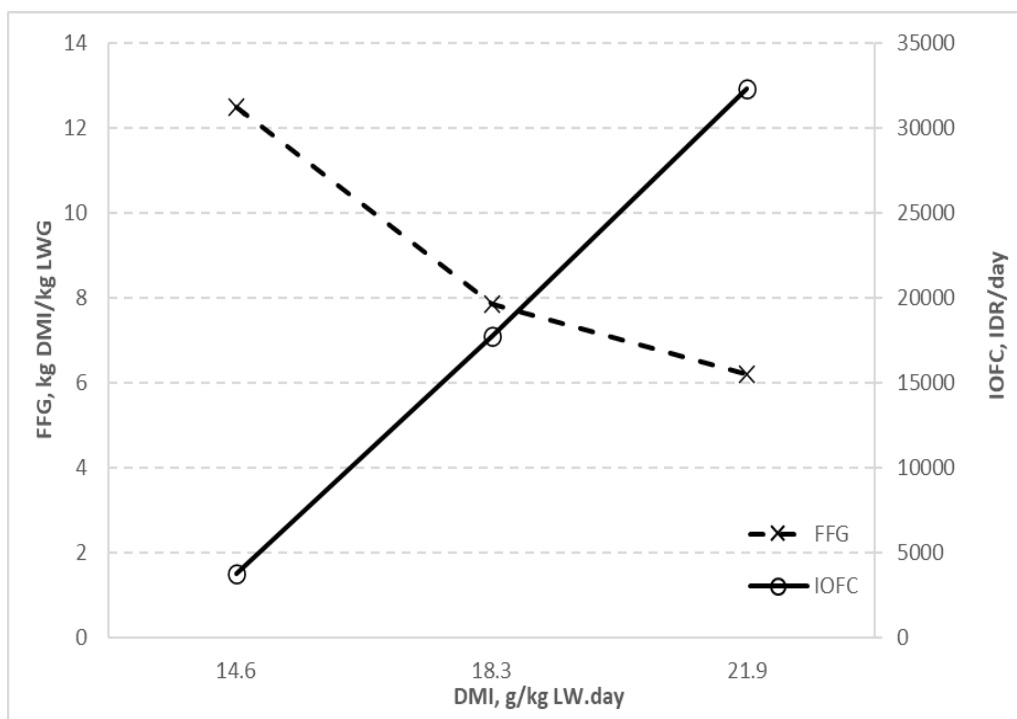
**Profitable beef production systems: close to maximum LWG**  
 More profitable to feed younger bulls and Euro X bulls

Live weight kg	Breed	200 kg	300 kg	400 kg
Feed for gain (kg Feed DM/kg LWG)	<b>EuroX</b>	<b>4.15</b>	<b>5.62</b>	<b>6.97</b>
	<b>Ongole</b>	4.58	6.21	7.70
	<b>Bali</b>	8.32	11.29	14.00
Feed DM required (kg/day)	<b>EuroX</b>	5.60	<b>7.59</b>	9.41
	<b>Ongole</b>	4.86	<b>6.58</b>	8.16
	<b>Bali</b>	5.40	<b>7.34</b>	9.10
Income over food cost (VND/day)	<b>EuroX</b>	<b>77,868</b>	<b>68,122</b>	<b>59,206</b>
	<b>Ongole</b>	58,812	<b>47,328</b>	42,709
	<b>Bali</b>	24,248	<b>14,746</b>	6,124



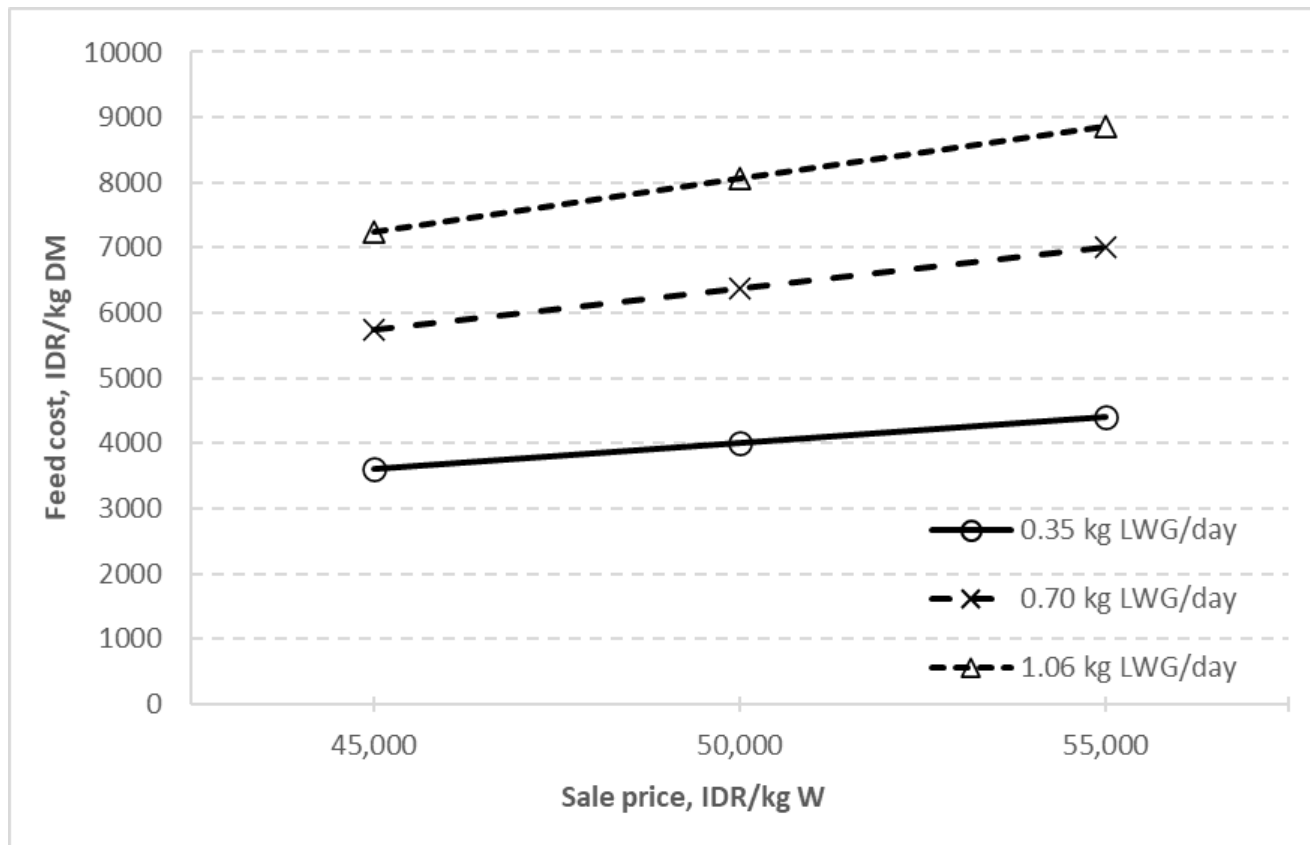
## Profitable beef production systems

Figure 2. The effect of decreasing the feed intake (g DM/live weight (LW). day) of a high quality ration to a 300kg Ongole bull on the feed for gain (FFG, kg feed DM intake (DMI)/kg live weight gain (LWG)) and daily income over feed cost (IOFC, IDR/day) with details in Table 3 for LWG of 0.35, 0.7 and 1.06 kg/day.



- Restricting food intake markedly **increases** feed for gain (FFG, kg DM feed/kg LWG)
- Restricting food intake markedly **decreases** Income over Food Cost (Income over food cost Indonesia Rupiah/bull.day)
- IOFC higher when feed high quality ration compared to current systems

# Profitable beef production systems: break even cost (Income Over Food Cost = zero) for high quality rations for 300 kg Ongole bull



Break even cost for ration more sensitive to LWG (kg/day) than to sale price

# Profitable beef production systems

## What do we really want?

- Formulate a ration that gives high live weight gain (LWG) and low feed for gain ratio (FFG; kg feed DM/kg LWG)
- Formulate rules or a system to be able to replace ingredients if prices change over time or between sites ie a Least Cost Ration formulator (LCR)
- Have a simple system for formulation LCR and App that can be used by extension services, NGOs feed companies, entrepreneurs, village co-operatives, agri-business



## Profitable beef production systems

We have developed

- Simple Least Cost Ration (LCR) system: ACIAR LCR
- App: Beef-upp

Need to specify

- Minimum ME (MJ ME/kg DM): 11-11.5 enables more feed ingredients to be available. Higher the better.
- Minimum CP (12% CP)
- Minimum NDF (30% in final ration)
- Upper limits inclusion some ingredients (eg cassava 40%, copra meal and Palm Kernel Cake (PKC) 25%)
- Need to check final mineral content (particularly Ca, P or add premix)

### Least Cost Ration 1

Custom Name: **Sumbawa**

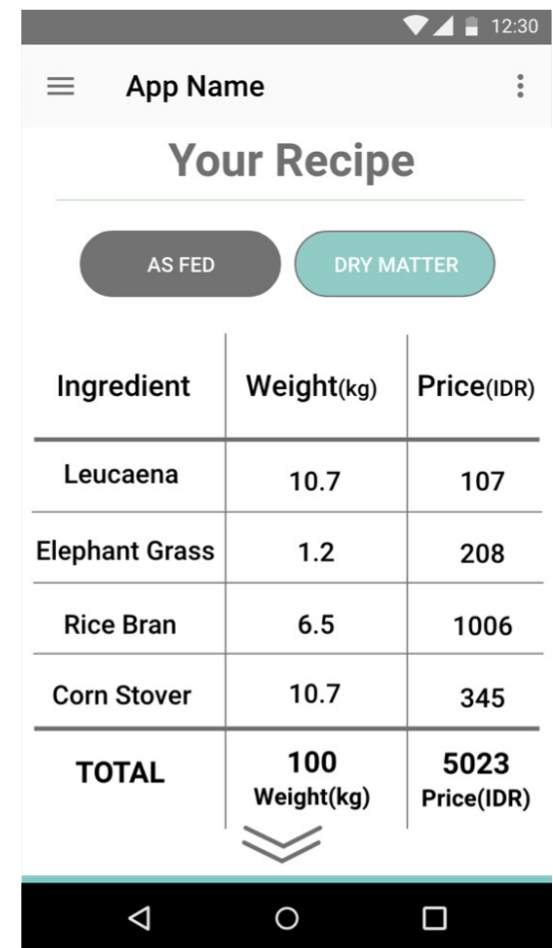
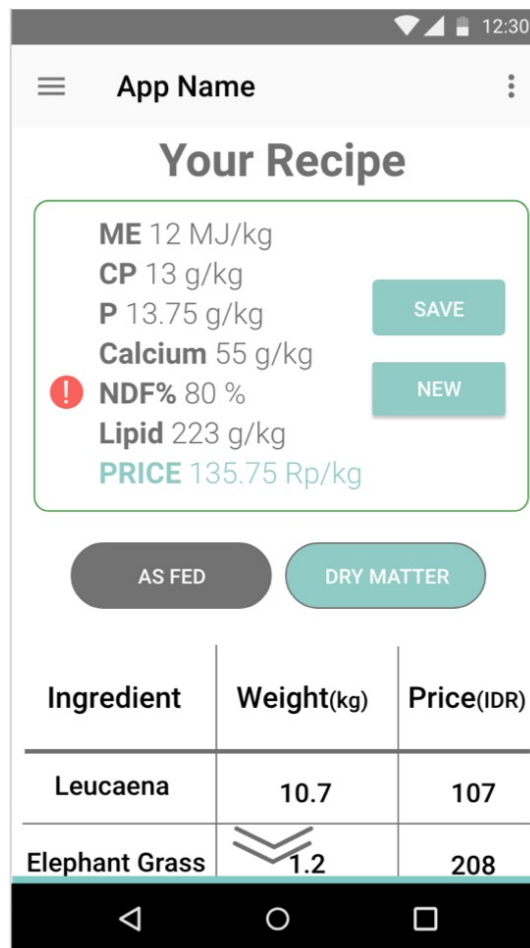
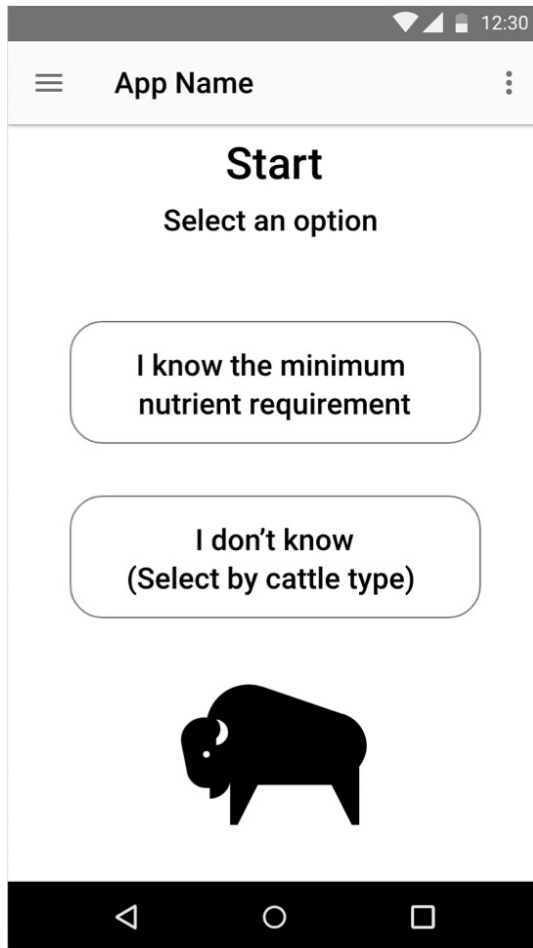
Ingredients:	Leucaena aerial	cassava gaplek			corn (maize)		Palm Kernal	cassava whole		IN RATION
	parts fresh	Elephant Grass	dry	Rice bran 11-20	grain	Urea	Meal expeller	tuber fresh	Copra meal expeller	
% Protein	23.3	9.7	2.9	12.7	9.4	280	16.7	2.6	22.4	<b>13.37</b>
ME MJ/kg	11	8.2	12.8	10.1	13.6	0	11.6	12.2	12.8	11.63
% NDF	40.9	71.5	3.7	34.4	12.2	0	73	7.8	54.7	<b>35.69</b>
g/kg Calcium	10.7	3.6	1.7	0.7	0.5	0	2.8	1.7	1.2	5.13
g/kg Phosphorus	2.1	2.9	1.1	13.8	3	0	6	2.1	5.8	3.08
% Starch	0	0	80.4	22.4	73.4	0	0	80.4	0	32.16
mg/kg Copper	13	11	0	0	2	0	28	0	15	11.55
% Selenium	0	0	0.7	0	0	0	9.2	0	9.8	2.30
% Zinc	0	0	0	0	21	0	0	0	0	0.00
% Vitamin A	0	0	0	0	0	0	0	0	0	0.00
% Vitamin D	0	0	0	0	0	0	0	0	0	0.00
% Vitamin E	0	0	0	0	0	0	0	0	0	0.00
INPUT: cost Rp / kg As Fed OR INPUT: cost Rp / kg Dry Matter	Rp600	Rp500	Rp2,800	Rp2,500	Rp3,800	Rp3,500	Rp1,800	Rp400	Rp4,500	Rp820.00 /kg As Fed
Calculated: cost Rp/kg Dry Matter	Rp2,007	Rp2,793	Rp3,196	Rp2,778	Rp4,403	Rp3,500	Rp1,974	Rp1,064	Rp4,918	Rp1,621.29 /kg DM
Max # we want in a batch	50	100	40	50	60	2	25	40	25	
Min # we want in a batch	0	0	0	0	0	0	0	0	0	
<b>Kg DM in Ration</b>	<b>35.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>25.0</b>	<b>40.0</b>	<b>0.0</b>	<b>100.0</b>
<b>Kg As Fed in Ration</b>	<b>46.7</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>	<b>10.9</b>	<b>42.4</b>	<b>0.0</b>	<b>100.0</b>

[Click Here to Let the Computer figure the Least Cost Ration](#)

**Total ration DM % 48%**

NOTES
Enter values in GREEN cells
GRAY cells are titles and don't change
LIGHT GREEN cells allow selection from Ingredients sheet
LIGHT BLUE cells are values displayed from Ingredients sheet
RED cells are calculated values

	What We Want	
	Minimum	Maximum
% Protein	12	18
ME MJ/kg	11	13
% NDF	20	75
g/kg Calcium	0	100
g/kg Phosphorus	0	100
% Starch	0	40
mg/kg Copper	0	100
% Selenium	0	100
% Zinc	0	100
% Vitamin A	0	100
% Vitamin D	0	100
% Vitamin E	0	100
<b>Total kg:</b>	<b>100</b>	<b>100</b>



## Profitable beef production systems: some examples from ACIAR LCR

Region	Ingredient formulation	ME	CP	NDF	VND/ kg DM
East Java	40% gaplek, 34.2% rice bran, 25% PKC, 0.8% urea	11.5	12.0	31.5	4901
	21.2% gaplek, 50% rice bran, 25% PKC, 3.8% CM	11.2	12.0	38.3	4940
Sumbawa	100% leucaena	11.0	23.3	40.9	2608
	87% leucaena, 13% cassava tuber	11.2	20.6	36.6	2592
	58.9% leucaena, 40% cassava tuber, 1.1% CM	11.5	15.0	27.8	2664
Central Sulawesi	60% gliricidia, 40% cassava tuber	11.8	14.4	32.9	2474
	50% gliricidia, 40% cassava tuber, 10%PKC	11.8	13.9	35.3	2502
	50% gliricidia, 25% rice bran, 25% PKC	11.2	18.5	51.7	2708

Profitable beef production systems: *devising new systems*  
*Malang cassava tubers with PKC and copra meal*

Item	Treatment				
	30% Cassava	40%C	50%C	60%C	70%C
LWG (kg/day)	1.27 <sup>c</sup>	1.35 <sup>c</sup>	1.05 <sup>bc</sup>	0.76 <sup>ab</sup>	0.30 <sup>a</sup>
Feed For Gain (kg DMI/kg gain)	5.44 <sup>a</sup>	5.56 <sup>a</sup>	6.80 <sup>a</sup>	8.46 <sup>a</sup>	19.32 <sup>b</sup>
Feed cost of gain (VND/ kg LWG)	28,104 <sup>a</sup>	28,994 <sup>a</sup>	37,479 <sup>a</sup>	481,94 <sup>a</sup>	111,251 <sup>b</sup>
IOFC VND/d		65,520			





Profitable beef production systems: *devising new systems Central Sulawesi corn stover or elephant grass supplemented %W/day with 1:1 mixture cassava tuber:gliricidia (DM)*

Parameters	Dietary treatment				
<b>Experiment 1 Ongole bulls</b>	CS	CS +0.4CG	CS +0.8CG	CS +1.2CG	CS+1.6CG
<b>Live weight gain (kg/day)</b>	0.31	0.42	0.52	0.61	0.70
<b>Total daily Income over feed costs (VND/bull)</b>	13,423	16,700	20,907	23,022	24,885
<b>Experiment 2 Bali bulls</b>	EG	EG +0.4CG	EG +0.8CG	EG +1.2CG	EG+1.6CG
<b>Live weight gain (kg/day)</b>	0.20	0.28	0.35	0.39	0.46
<b>Total daily Income over feed costs (VND/bull)</b>	12,150	15,070	17,537	18,604	20,924

Profitable beef production systems: *devising new systems*



## Profitable beef production systems: **Conclusions**

- Growth relationships for different breeds established:
  - Euro X > Ongole and Brahman > Bali
- High Metabolisable Energy (ME) content ration needed for high Live weight gain
- If use high cost and high ME ration need to feed ad lib or high level of supplementation.
- Daily Income Over Food Cost more affected by cost of feed and high Live weight gain than sale price (within reason)
- New systems can be devised. Cassava offers a lot of opportunity to mix with pasture grasses or legumes like leucaena or gliricidia.
- ACIAR Least Cost Ration (LCR) enables rapid changes to feed ration recipes to reflect ingredient costs (eg cassava tips and cassava peels)
- Opportunities for agri-businesses and farmers to formulate rations with ACIAR LCR and BeefUpp app which we know will lead to high Income Over Food Cost.

# Profitable beef production systems



## Thank you

We thank ACIAR for funding the bulk of this work and the many staff and students of various Institutions and Universities who have collaborated in these studies.