Integrated Model of Pork Production:

Applying Research Findings in Practice

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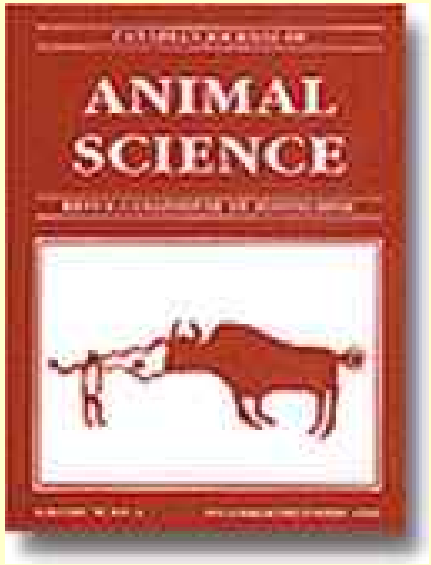
Many factors impact growth performance, nutrient utilization, and profits

Wealth of knowledge on nutrient utilization and animal-environment interactions



Key challenge:

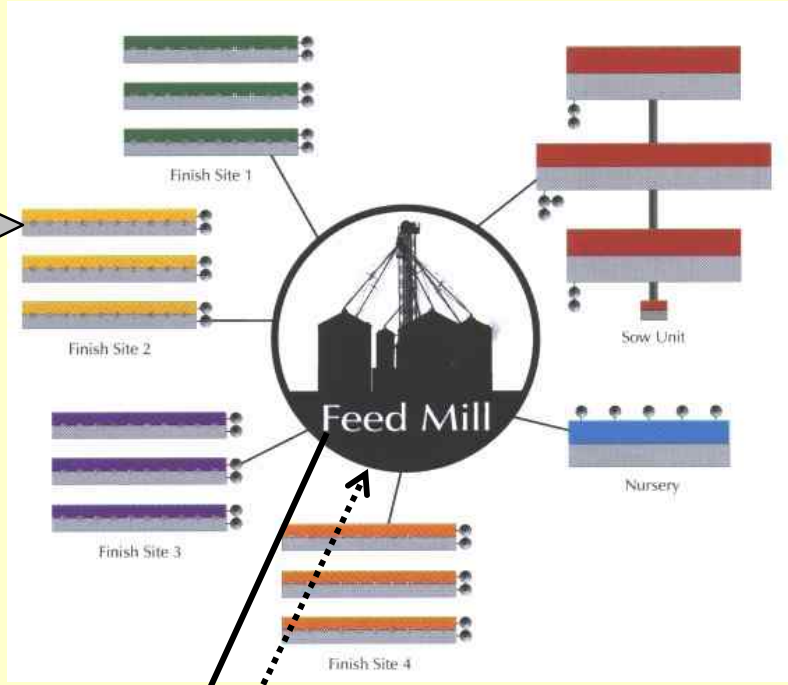
How to use knowledge for informed decision making?

$$ Key Questions $$

- At what costs of protein (lysine) and Paylean™ is Paylean™ cost-effective?
- If my pigs are (too) lean already, will Paylean™ be profitable for me?
- What carcass grading scheme fits my operation best?
- What are the costs of reducing N, P and CH_4 excretion on my farm?
- What is the value of improved health status or increased genetic progress?
- How much can I afford to pay for alternatives to corn?

Towards Integrated Management Systems

Pig unit with BW, feed intake & environment monitoring systems



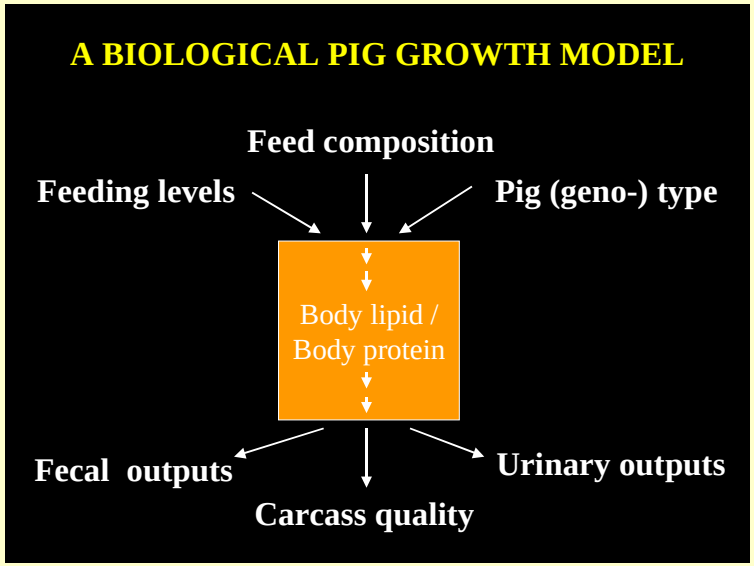
Carcass and meat quality data from packing plant

Identify & implement optimum management strategy

(Mathematical) Pig Growth Models

- Integration of current knowledge into one system
- Can be an effective means for technology transfer:
  - education & training; answer general ‘what-if’ type questions; improve profits on individual animal units
- Need to be:
  - sufficiently flexible

    (represent animal biology)
  - well tested
  - easy to apply in practice
  - simplification of reality



PREDICTED PRFORMANCE:
Close-out data – Cold Springs Farms

	Observed	Modelled		
		Gilts*	Barrows*	Avg
ADG, g/d	807	802	825	814 (+0.8%)
Lean yield, %	61.0	60.9	60.0	60.5(-0.9%)
Average PD, g/d	127	131	129	130 (+2.4%)
Feed usage, kg/d	2.20	2.08	2.19	2.14(-2.9%)
Feed:gain	2.73	2.59	2.66	2.63(-3.7%)

*Lean tissue growth potentials of 145 and 138 g protein gain per day, respectively

2 to 114 kg body weight

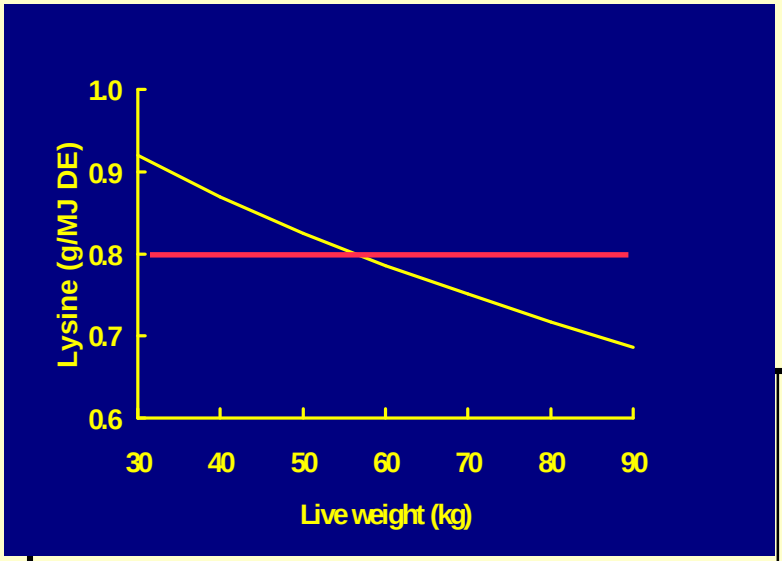
Key Inputs

- (Operational) lean tissue growth potentials
- Levels of feed intake at the various stages of growth
- Production objectives
- Potential alternative management and feeding strategies, including available feed ingredients
- Alternative marketing / carcass grading schemes
- Costs & prices

300 head grow finish room; Liquid feeding; Auto sorter; Feed court

Applications of Dynamic Pig Growth Models

- Represent compensatory growth / phase feeding
- Evaluate impact of between animal variability on optimum dietary amino acid level
- Predict environmental impact
- Estimate response to PayleanTM (& amino acid intake)
- Optimize profits on individual pigs farms



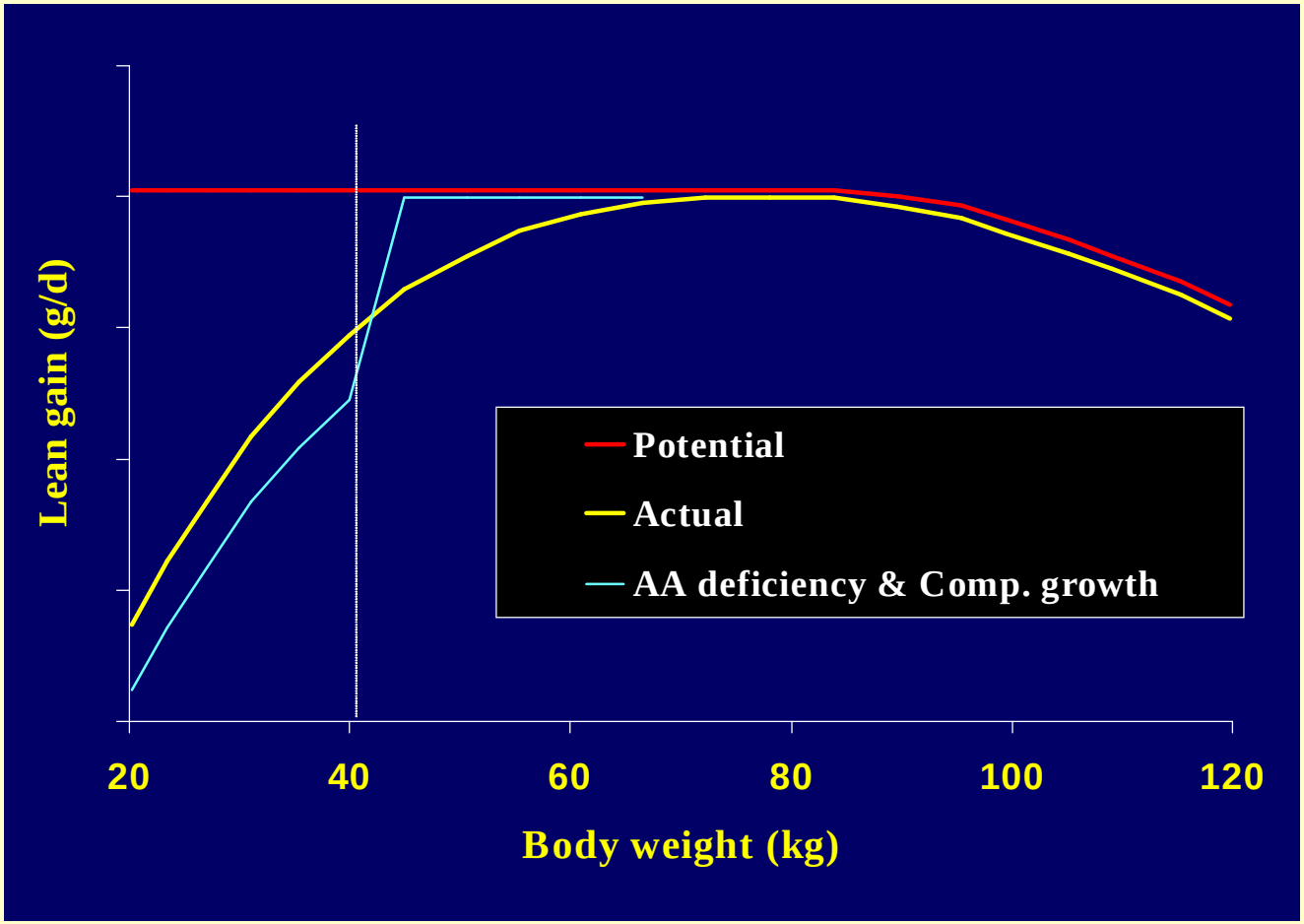
MLC in UK: 1024 pigs in pen groups 35 kg to 102 kg BW

	Single feed	Blend feeding	*P*
Feed intake (kg/d)	2.06	1.99	<.10
Gain (g/d)	886	860	<.10
FCR	2.36	2.36	ns
Carcass (kg)	75.7	74.5	ns
Backfat (mm)	11.67	11.53	ns
UK cost of production (US $/kg carcass)	1.52	1.64	+8%

Gill, 2005

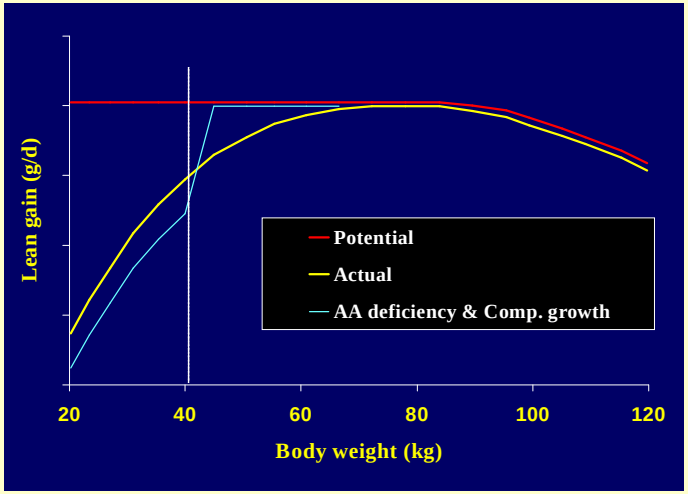
Compensatory Growth

- Only occurs during the energy dependent phase of muscle growth: Especially in low apatite pigs with high lean tissue growth potentials & during the grower phase



Compensatory Growth

- Only occurs during the energy dependent phase of muscle growth: Especially in low apatite pigs with high lean tissue growth potentials & during the grower phase
- Must provide pigs with additional nutrients and time to allow expression of compensatory growth
- Benefits:
  - Avoid negative impact of high protein feeding on gut health
  - Avoid feeding expensive protein (lysine) during early stages of growth
  - Reduced need for phase feeding



Environmental Impact: P, N, CH_4

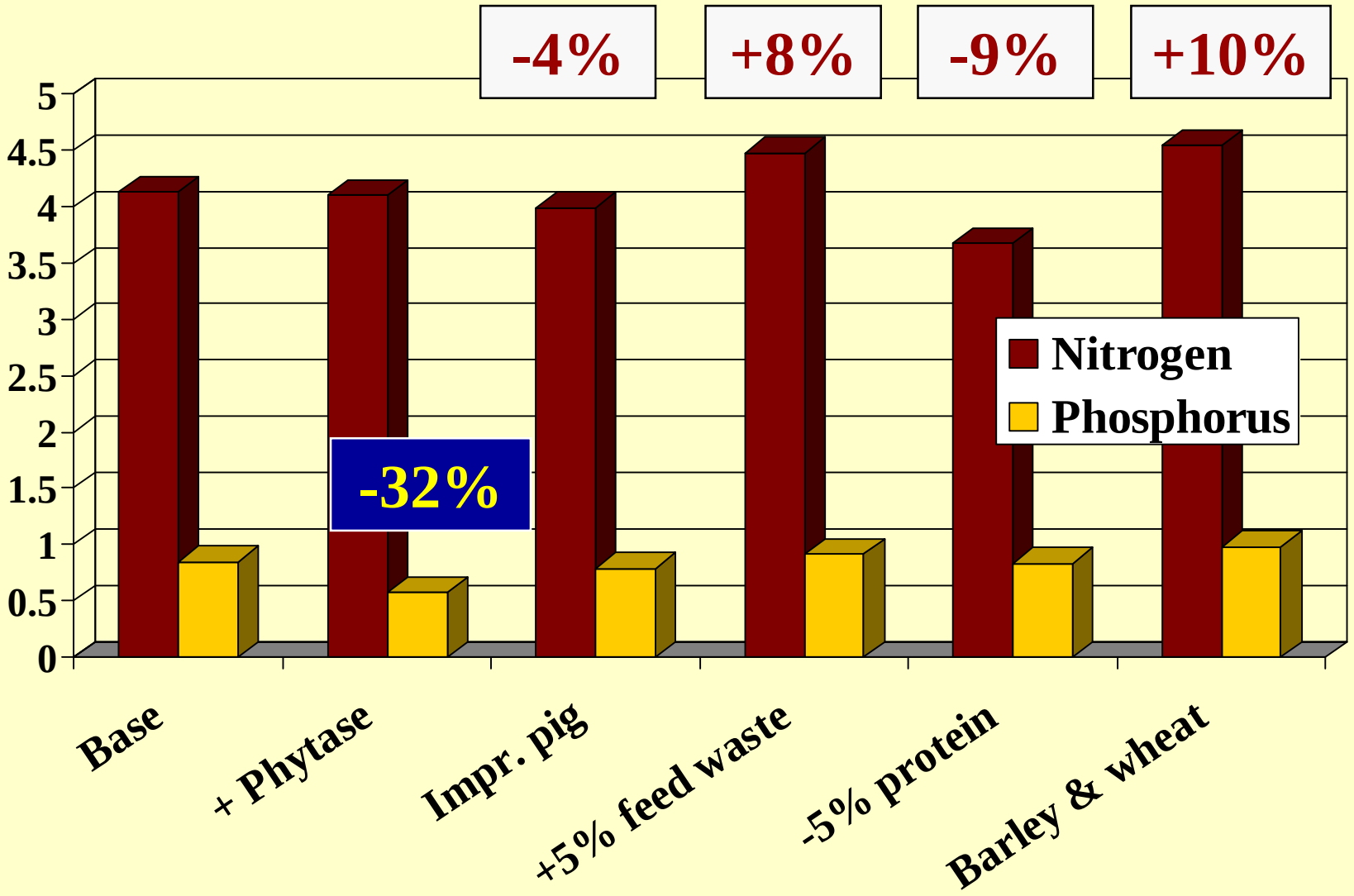
- **P excretion:**
  - Indigestible P intake, influenced by phytase
  - Digestible P intake minus maximum P retention
- **N excretion:**
  - N intake minus N retention
  - fecal N (protein) & urinary N (non-protein N; NH_3)
- **CH_4 losses:**
  - Small amounts from the pig (16 liter / kg fermentable organic matter intake; Noblet et al., 1994; Reijmers, 1997)
  - Potentially from manure (211 liter/kg fecal organic material, IPCC 2000; Marinier et al., 2005)

Simulation of Environmental Impacts

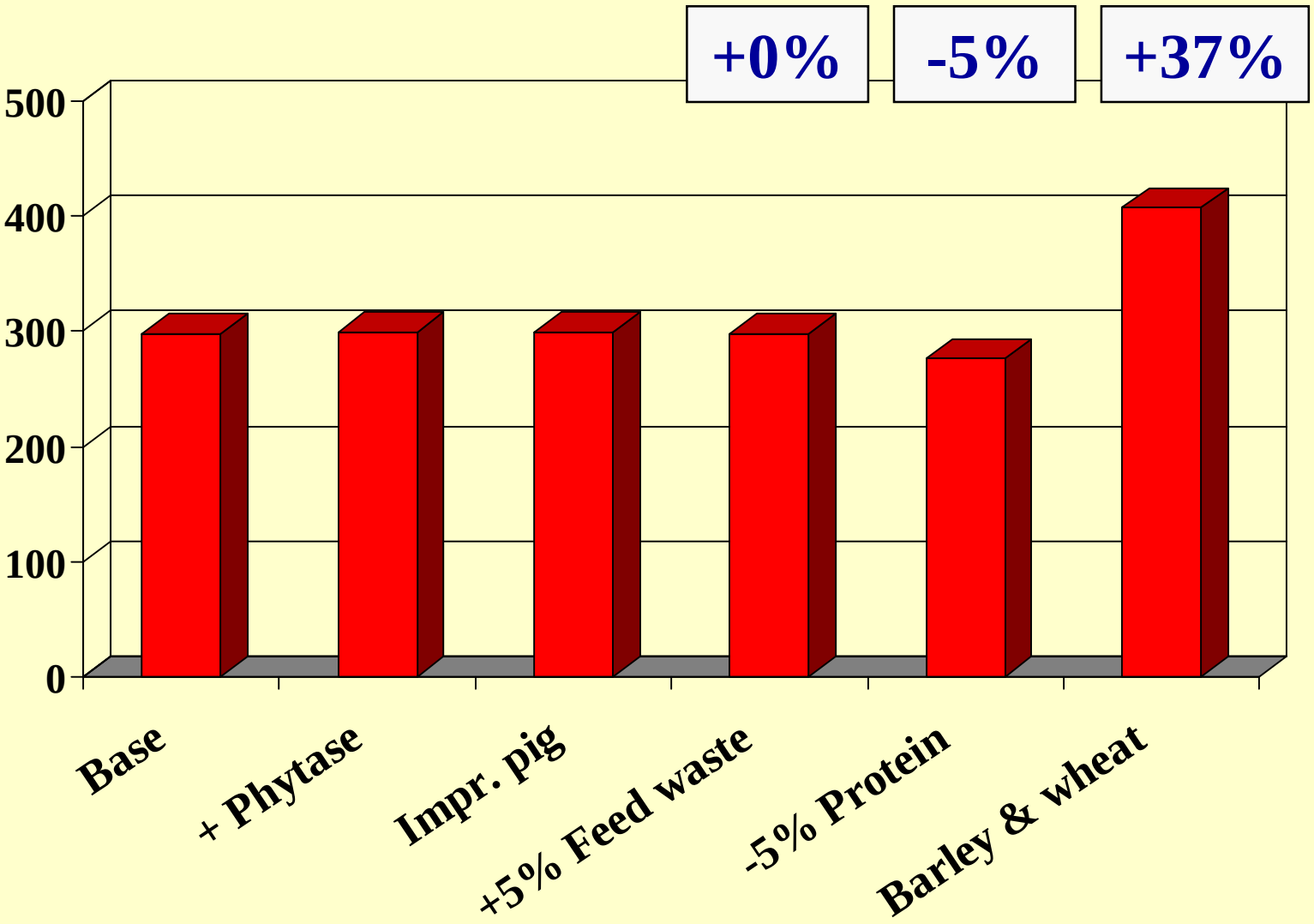
- Base:
  - Average pig (max lean tissue growth rate 350 g/d; PDmax 140 g/d): 25 to 110 kg body weight
  - Average feeding level (90% of NRC & 5% feed wastage)
  - Corn & soybean meal based diets (3 phase; switch 45 and 80 kg BW; 1.0, 0.80 and 0.65% avail. lysine)
  - Typical prices (see proceedings)

Nitrogen (N) and Phosphorus (P) excretion

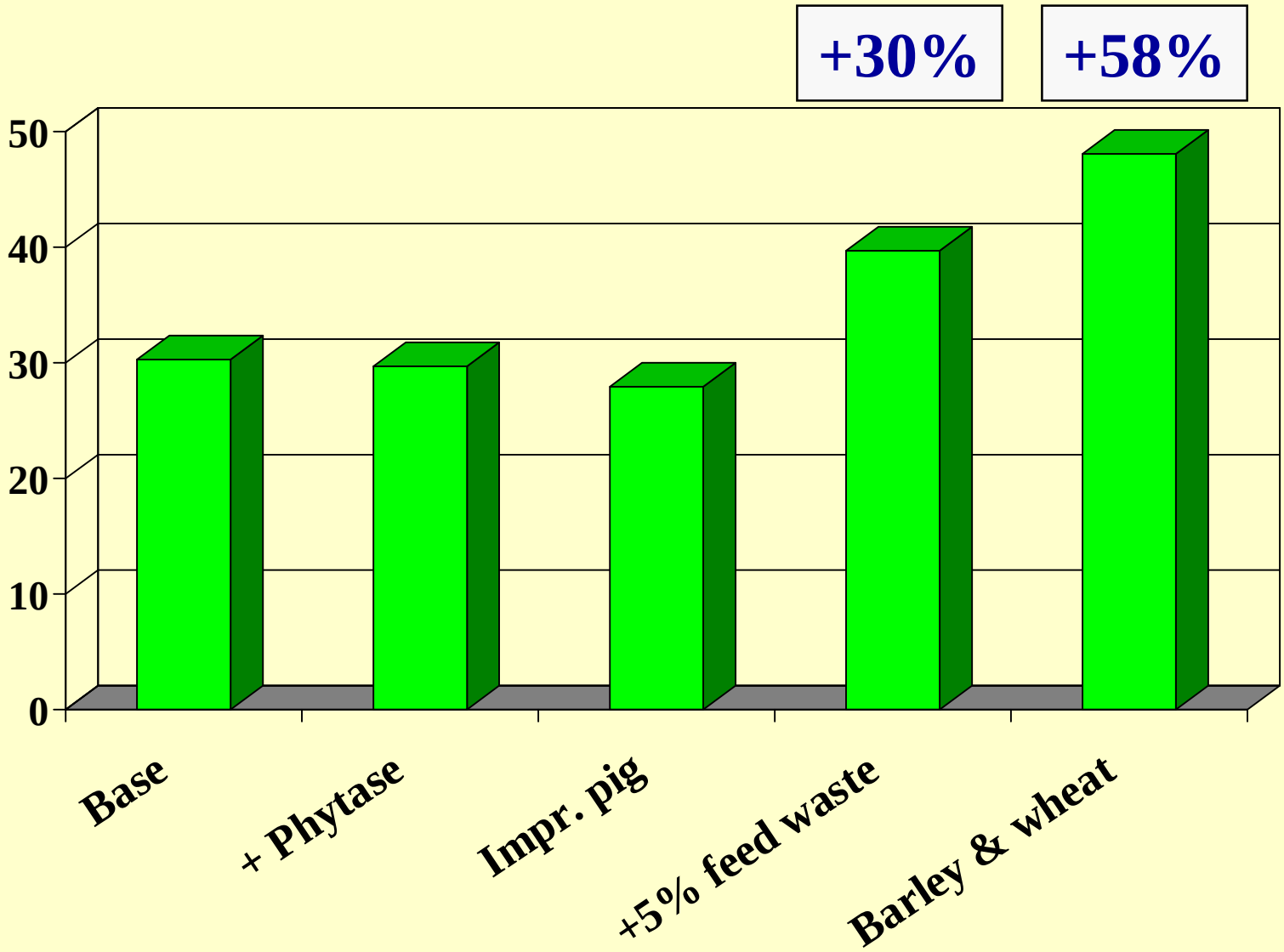
(kg per growing-finishing pig)



CH_4 due to enteric fermentation
(L per growing-finishing pig)

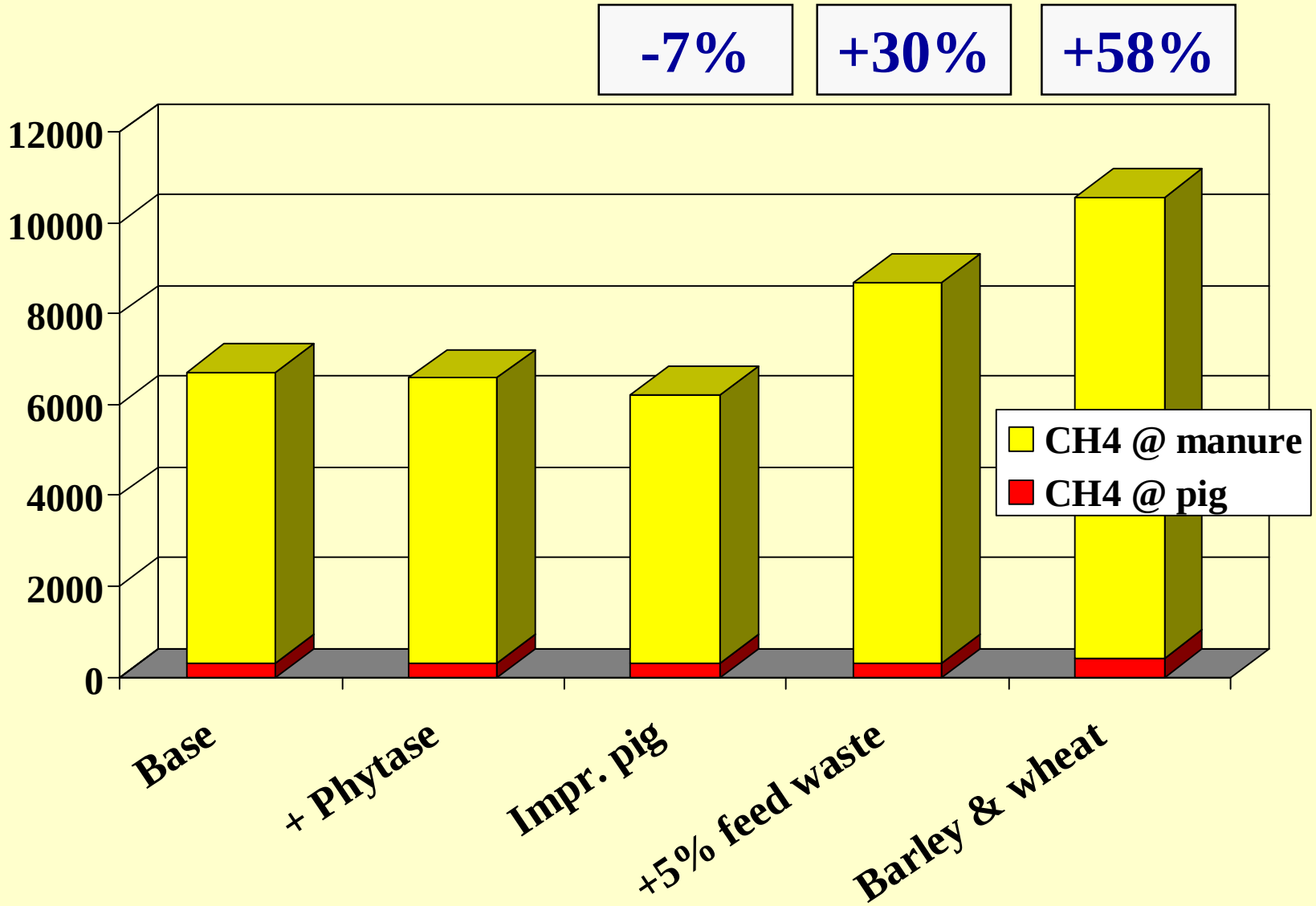


Organic Matter (OM) excretion
(kg per growing-finishing pig)



CH_4 due to enteric fermentation + manure

(L per growing-finishing pig)



Pig manure fermentation for 4,000 sow FF unit in Brazil at no cost to the pig farmer

Integrated Modelling of Pork Production

Current activities

- On-farm studies to demonstrate cost-effective reduction in N and P excretion
  - AAFC & Great Lakes Nutrition
- Refinement and testing of estimated nutrient excretion using NMan
  - OMAFRA
- Representing variability between individuals pigs within a group & web-based simple decision support system
  - NSERC & Ontario Pork

Thank you !