

# The six economies of swine production



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# What is the objective?

- Productivity
- Profitability
- Predictability
  
- Plus
  - Sustainability
  - One health
  - One welfare
  - Compliance
  - ...



# What is the objective function?

- Economics: Finding the greatest good while facing unlimited needs with limited resources
- Optimalities often claimed but rarely analyzed
- Often like partial budgets, partial optimizations are needed
  - We need to know how change affects the objective function(s)

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# Pork production is across six economies

- Pigs
- Workers
- Owners
- Processors and consumers
- Environment
- Public expectations



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# Optimization calculations

- Needs:
  - Objective function eg sum of economies
  - Constraints

Problems:

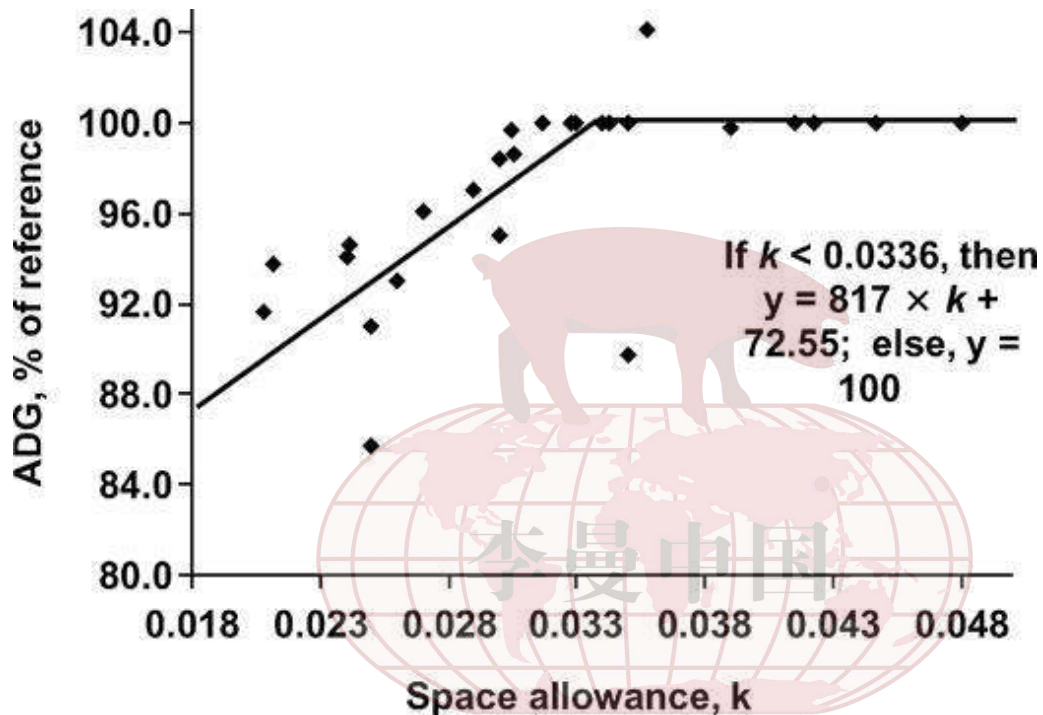
Nonlinearity (the hockey stick problem)

Lack of common units

Lack of common technical understanding



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H. W. Gonyou, M. C. Brumm, E. Bush, J. Deen, S. A. Edwards, T. Fangman, J. J. McGlone, M. Meunier-Salaun, R. B. Morrison, H. Spoolder, P. L. Sundberg, A. K. Johnson, Application of broken-line analysis to assess floor space requirements of nursery and grower-finisher pigs expressed on an allometric basis, *Journal of Animal Science*, Volume 84, Issue 1, January 2006, Pages 229–235,



# Optimization is complicated

- Win-win-win-win-win-win's are already found
  - Should be celebrated
- Power and knowledge is unevenly distributed
- Too often a change by one area is assumed to have no effect in other areas
- Often best to identify shadow values (marginal change)
- Non-linear, often driven by inflection points
- Broad impact statements can be useful

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# Types of Thinking





# Optimality means each economy is understood



**The Observer**

World Bank's funding of 'hog hotel' factory farms under fire over climate effect

Environmental and animal welfare groups call on lender to phase out support for 'industrial' livestock operations

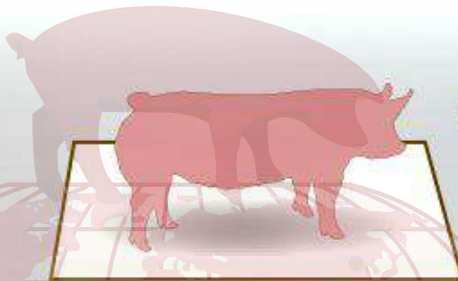
**Jon Ungoed-Thomas**

Sun 7 Apr 2024 12:00 BST

- Most changes in price, markets and rules affect all parties (yet we pretend they don't)
- No one has all the expertise
- Often devolves to virtue signaling and its opposite

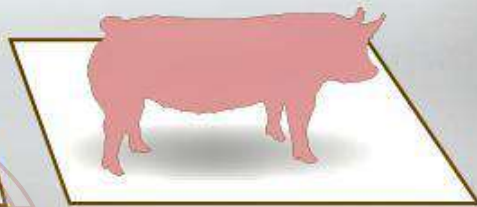


# CALIFORNIA PROP 12



16 - 18 sq. ft.

Today's Typical Space Per Sow



24 sq. ft.

Prop 12's Space Requirement

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# Prop 12:

- Sows: more space but more mixing (fighting and lameness)
- Laborers: more demands, especially in breeding
- Owners: more costs in labor, buildings and often productivity and inputs
- Processors and consumers: limited supply and more segregation of product, increased cost of product
- Environment: more buildings, increased input requirements
- Public expectations: sow welfare improved, no other changes

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# Marginal values: example lameness

- Sows: long-term painful condition – affects behavior
- Workers: surveys suggest major welfare observation, frustrating work
- Owners: affects productivity, replacement rates, profitability
- Processors: Inhibits processing, raises costs
- Earth: decreases efficiencies
- Public: no knowledge

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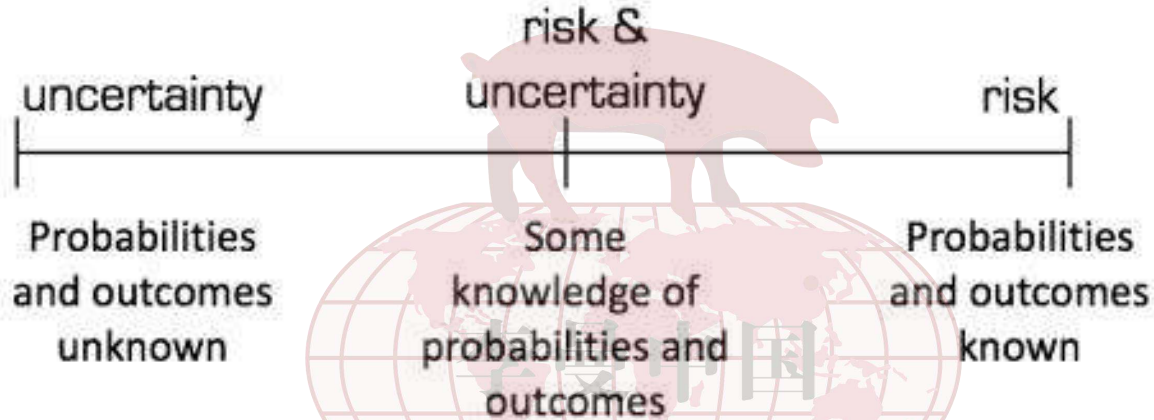


# Another question: what would each economy do with extra investment (shadoe)

- Sows: More food
- Labor: Increased security
- Farmers: Risk management
- Processors and consumers: Acceptance
- Earth: reduce wastage
- Public: marbling



# Risk & Uncertainty Continuum



Source: Casavant, Kenneth, Infanger, and Bridges

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# Observations

- Get ready to explain your shadow values
- Optimization is not an exact equation for this problem, but we need to know the effects of changes
- Ignorance is risk



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