Growth Management

- Growth Rate or Average Daily Gain
- Feed Efficiency
  - Phase feeding
  - Split sex feeding
- Carcass Quality
  - Low backfat
  - Large loin eye
  - Red color
  - Marbling - 3%
  - Firmness
Market Pigs

Hold it you Knuckleheads! I just figured out the REAL prize for the first pen to slaughter!
Factors Affecting Productivity

Genetics
Environment
Nutrition
Disease
Management
1940s Pig
2008 Pig
**US Pig Products**

![Graph showing yield of lean pork and lard from 1950 to 2010.](image)

*Source: National Pork Board*
Lean Pork

% of RDA in a 3 Ounce Serving of Roast Pork Loin

Source: USDA, 2007
Taste of Elegance

Hawai`i Winner: Chef Marc Anthony, Sarento’s Top of the “I”

Photo: Mike Uno
Lean Pork Compared with Lean Chicken

Total fat in 3-ounce roasted or broiled servings with visible fat trimmed after cooking

Source: USDA ARS 2006
Environment

Grower-Finisher Pen

Source: Veterinary Infectious Diseases Organization
Growing-Finishing Pigs

Source: Pork Checkoff Report
Feed Guide Pyramid

- Fat
- Minerals
- Vitamins
- Protein
- Fiber
- Energy
And Water!

- Sources of water
- Water that is consumed
- Water component of feedstuffs
- Metabolic water, originates from breakdown of carbohydrate, fat, and protein
Pig Growth

% of total growth made each day

Time

Nervous tissue
Bone
Muscle
Fat
## Nutrition

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Starter</th>
<th>Grower</th>
<th>Finisher</th>
<th>Gestation</th>
<th>Lactation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy kcal/kg</td>
<td>3400</td>
<td>3400</td>
<td>3400</td>
<td>3400</td>
<td>3400</td>
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<tr>
<td>Protein percent</td>
<td>24</td>
<td>16</td>
<td>14</td>
<td>13</td>
<td>17.5</td>
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<tr>
<td>Minerals percent</td>
<td>0.8</td>
<td>0.6</td>
<td>0.5</td>
<td>0.75</td>
<td>0.75</td>
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<tr>
<td>Vit A IU</td>
<td>2200</td>
<td>1300</td>
<td>1300</td>
<td>4000</td>
<td>2000</td>
</tr>
<tr>
<td>Intake lb/da</td>
<td>1</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: National Research Council, 1998
Feed Guide Pyramid

Fat
Salt, limestone
Vitamin-mineral premix
Soybean
Beet pulp, molasses
Grain
# Swine Feeds

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Starter</th>
<th>Grower</th>
<th>Finisher</th>
<th>Gestation</th>
<th>Lactation</th>
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</thead>
<tbody>
<tr>
<td>Energy</td>
<td>62.5%</td>
<td>77.5%</td>
<td>82.5%</td>
<td>77.5%</td>
<td>72.5%</td>
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<tr>
<td>Grain</td>
<td>27.5%</td>
<td>20%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Protein</td>
<td>7.5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soybean</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.5%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Milk</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.5%</td>
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</tbody>
</table>
Nutritional Needs Depend On Many Factors

Source: Patience and Thacker, 1989
## Effects of Porcine Somatotropin (pST) on Pig Growth

<table>
<thead>
<tr>
<th>Study</th>
<th>pST (µg/kg/d)</th>
<th>ADG</th>
<th>Feed/Gain</th>
<th>Carcass Fat</th>
<th>Carcass Protein</th>
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<tbody>
<tr>
<td>Chung 1985</td>
<td>22</td>
<td>10%</td>
<td>-4%</td>
<td>0%</td>
<td>6%</td>
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<tr>
<td>Etherton 1986</td>
<td>30</td>
<td>10%</td>
<td>-19%</td>
<td>-18%</td>
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<tr>
<td>Etherton 1987</td>
<td>70</td>
<td>14%</td>
<td>-17%</td>
<td>-25%</td>
<td>19%</td>
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<tr>
<td>Campbell 1988</td>
<td>100</td>
<td>16%</td>
<td>-24%</td>
<td>-32%</td>
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<td>Eveck 1988</td>
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<tr>
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<td>-63%</td>
<td>46%</td>
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<td>Bryan 1989</td>
<td>70</td>
<td>18%</td>
<td>-22%</td>
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<tr>
<td>McLaughlin '89</td>
<td>4 mg/d</td>
<td>33%</td>
<td>-33%</td>
<td>-21%</td>
<td>13%</td>
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<tr>
<td>Agonist Animal</td>
<td>Study</td>
<td>ADG</td>
<td>Feed/Gain</td>
<td>Protein or Loin Eye</td>
<td>Fat</td>
</tr>
<tr>
<td>----------------</td>
<td>-------</td>
<td>-----</td>
<td>-----------</td>
<td>---------------------</td>
<td>------</td>
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<tr>
<td>Clenbuterol</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Sheep</td>
<td>Baker 1984</td>
<td>10%</td>
<td>14%</td>
<td>14%</td>
<td>-20%</td>
</tr>
<tr>
<td>Cimaterol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sheep</td>
<td>Beermann 86, 87, Kim 1987</td>
<td>22%</td>
<td>15%</td>
<td>30%</td>
<td>-40%</td>
</tr>
<tr>
<td>Pigs</td>
<td>Jones 1985, Hanrahan 1986</td>
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<td>2%</td>
<td>5%</td>
<td>7%</td>
</tr>
<tr>
<td>Cattle</td>
<td>Hanrahan 1986</td>
<td>30%</td>
<td>30%</td>
<td>41%</td>
<td>-26%</td>
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<tr>
<td>Ractopamine</td>
<td></td>
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<tr>
<td>Pigs</td>
<td>Jones 1989</td>
<td>9%</td>
<td>12%</td>
<td>15%</td>
<td>-14%</td>
</tr>
</tbody>
</table>
Local Feeds

- Local energy sources
  - Cooked food waste
  - Roots, eg cooked sweet potato, cassava, taro
  - Fruits and vegetables, eg ripe banana, breadfruit, coconut

- Local protein sources
  - Fish waste
  - Cooked meat scraps
  - Cooked food waste

- Milk sources
  - Expired milk or dairy products
Local Feeds

- **Bulk or fiber sources**
  - Fruits and vegetables, eg papaya, broccoli, cabbage
  - Molasses

- **Mineral sources**
  - Fish waste
  - Expired milk or dairy products
  - Cooked food waste

- **Vitamin sources**
  - Fruits and vegetables
  - Bacterial action in gut
Pigs Recycle!

Feed Pigs

Pork

Food Waste

Feed People

Vegetables

Fruits

Manure

Plant Waste

Grow Plants
Food Waste Recycling
Feed Delivery

- Maintain quality
- Prevent separation of ingredients
- Avoid waste
- Feed availability
  - floor feeding
  - self feeders
- Avoid contamination, spoilage
EPA Regulations

Animal Feeding Operations (AFO)
Concentrated Animal Feeding Operations (CAFO)
Comprehensive Nutrient Management Plan

Hawai`i Department of Health
Livestock Waste Management Guidelines
Water Quality

"Let's just hope they all went to the bathroom first!"
Livestock Industry Partnership
Swine Lagoon Effluent Irrigation

5,500 gallons/acre/day on kikuyu grass
Waimea, Big Island

Forage yield
Crude protein

Treated
Untreated

Source: DuPonte, Kawabata, Wu, Gitlin, Keala 1997
Odor

Non Sequitur

THE RURAL ENTREPRENEUR

EARL'S HOG FARM

EARL'S AIR FRESHENER STAND
Swine Waste Management Solutions

Drying: Guam DOA Farm, Adaniya Farm
Solid-Liquid Separation: Guam, Pohnpei
Composting: PATS Farm, Shinsato Farm
Deep Litter Systems: Shibuya Farm
Pasture Systems: Ahualoa Farm
Digester: M & H Kaneshiro Farm
Irrigation: Lazy 5 Ranch, Pohnpei, Aloun Farm
Constructed Wetland: Ulehawa Farm, Pohnpei
On Farm Assessment and Environmental Review (OFAER) Program

Five major assessment categories
1. General site conditions; records
2. Buildings, sheds and lots
3. Manure collection, storage and treatment
4. Manure utilization
5. Mortality management