

Iowa Pork Regional Conferences, February 20-24, 2006



Maximizing Productivity and Throughput: Reflections from Denmark

ISU Swine Field Specialists –

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Welcome to Denmark

5.4 million people
16,000 sq miles
62% farmed

132 acres average
farm size
Crops: wheat, barley,
rape



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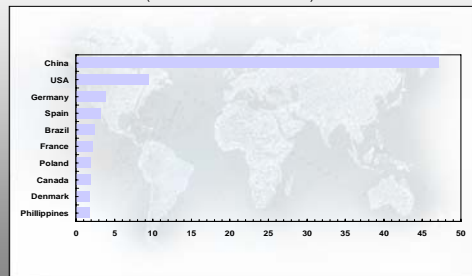


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World Pig Meat Production 2004



(estimate - mil. metric tons)



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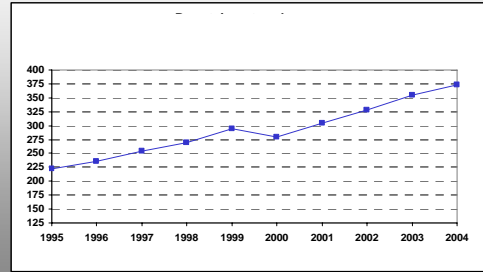
Production



	USA (2005)	Iowa (2005)	Denmark (2004)
• Swine inventory	60.50	16.10	13.26
• Breeding inventory	5.97	1.07	1.40
• Market hog inventory	54.53	15.03	11.86
• Total production	~103.0	29.6	25.2
• Total slaughter		29.8	22.9
• Number of pig farms	65,000	8,800	10,000

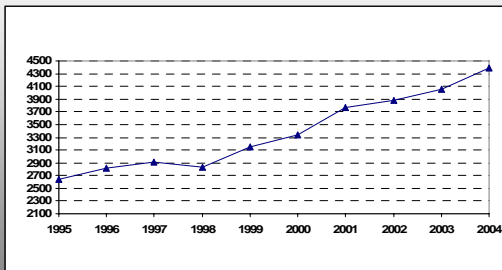
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Herd size, sows



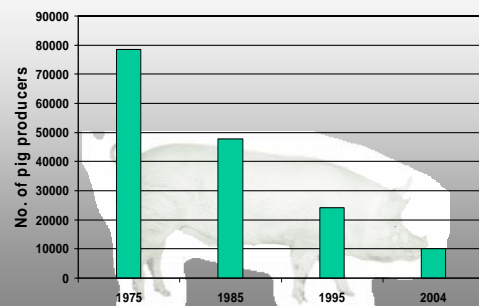
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Herd size, finishers



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Pig producers in Denmark



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Overview of Danish Swine Industry



- Producers are owner operators but the whole system is an integrated system
- Slaughtering and processing are cooperatives owned by producers – one large cooperative is Danish Crown
- Problems/priority areas are identified cooperatively
- Joint research and development to address those problems
- Joint marketing activities and market research

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Keys to Danish Productivity



- C. Johnson

- gilt development
- employee participation
- nurse sows
- experience groups
- genetic progress
- quality matings
- use of advisors
- weaning age
- animal movement
- pig environment

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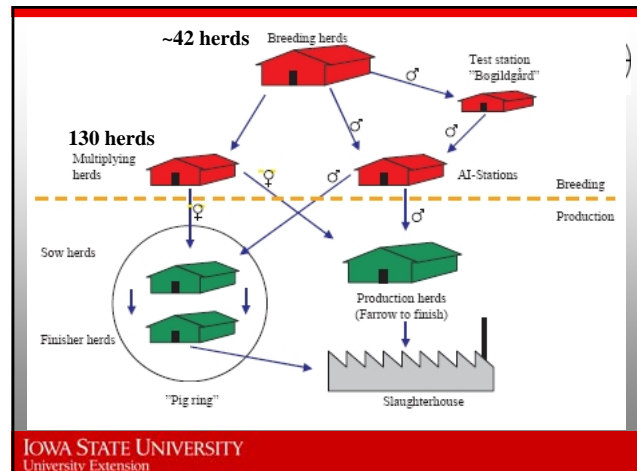
The Danish breeding system

... is a cooperative approach



Objectives established by the National Committee for Pig Production and DANSKE SLAGTERIER

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Multiplier data is available on-line

Provides:
*Index Scores
*SPF Health Status

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- Breeding Programs
 - Purchase replacement gilts
 - On-farm "Nucleus" to produce gilts
 - Zig-Zag ($LY+Y - LYY+L - LYLY = LY$)



All Farms can submit data to generate index criteria for on-farm genetic management

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• Genetics

- Longer sows
- Focused improvement on born alive
- Top herds averaging ~14 born alive



Table 1. Genetic progress in the last four years, per breed and year and stated as average per breed per year.

Breed	Year	Daily gain (30-100 kg), g/day	Feed conversion, FLp/kg daily gain	Lean meat, %	LP5	Conformation, (0-30 kg), points	Daily gain (0-30 kg), g/day	Killing-out percentage, %	Progress, DKK/year
Average 4 breeds	4 years	13.7	-0.03	0.09	0.20	0.02**/0.06*	1.0	+0.01	9.41

*: Average of Landrace and Large White. **: Average of Duroc and Hampshire.

02-05

LP5 = live pigs at day 5

\$1.44

source: The National Committee for Pig Production Annual Report 2005

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Sow Flow ...

- Sows are in crate 5 to 7 days before farrowing
 - Sows typically not washed pre-farrow
 - Many farrowing barns operated 'continuous flow'
- Weaning Age - *by law* - 28 days
- Breeding - breeding stalls or pen
- Gestation -
 - First 28 days - stall housing may be used
 - After 28 days - pen housing is required by 2013

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Farrowing Crates Can Be Used



Future:
Level of freedom during the nursing period



More research is necessary !

Breeding Stalls Can Be Used



Can Be Used Up to 4 weeks post-breeding



Gestation Stalls

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Group Sow housing



- Bedded systems
- Pen systems
- Stall feeding various layouts
- Electronic feeding
- Trickle feeding

>60% currently in group housing

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Danish legislation for sows and gilts



- Loose housing from 4 weeks after service until 7 days before expected farrowing
- Area:

- 1 - 4 sows/group	2.8 m ²	30.1 sq. ft./ sow
- 5 - 10 sows/group	2.2 m ²	23.7 sq. ft./ sow
- 11 - 20 sows/group	2.0 m ²	21.5 sq. ft./ sow
- 21 - sows/group	1.8 m ²	19.4 sq. ft./ sow
- 1 - 10 gilts	1.9 m ²	20.5 sq. ft./ gilt
- More than 10 gilts	1.7 m ²	18.3 sq. ft./ gilt
- Lying area (solid flooring and bedding)

- Sows	1.30 m ²	14.0 sq. ft./ sow
- Gilts	0.95 m ²	10.2 sq. ft./ gilt

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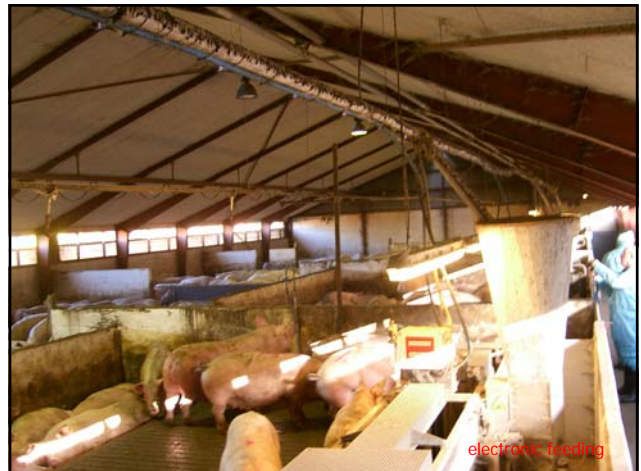


pen gestation

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electronic feeding



Denmark ... High Sow Productivity

Best sow herd - 460 sows	4/2004	1/2005	2/2005	3/2005	All
	Weaning age	25	24	27	28
Born alive / litter	14.5	14.8	14.9	14.7	14.7
Still born / litter	1.3	1.7	1.5	1.6	1.5
Weaned / litter	13.2	13.5	13.7	13.5	13.5
Mortality before weaning, %	9	9	8	8	9
Mortality after weaning, %	1,2	1.1	1.2	1.2	1.2
Age at 30 kg (66 lb)	80	84	90	89	85
Weight at leaving herd	34.2	28.9	30.5	32.7	31.6
Non-productive days / litter	7	8	9	7	8
Litters / sow / year	2.45	2.46	2.38	2.41	2.42
Pigs at 30 kg / sow / yr (to 66lbs)	32.5	32.8	30.5	30.2	31.6
Gross margin, DKK	7120	7840	5709	5628	6592
	\$1100	\$1200	\$880	\$865	\$1010

Internal AI; On farm gilt multiplication; 2 employees; owner in the stable everyday

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source: LandboFyn

Denmark ... High Sow Productivity

Sows and weaners

Year	Average production results				
	2002 All	2003 All	2004 All	2004 Bottom 25%	2004 Best 25%
Weight/sold pig, kg	29.9	29.9	30.6	30.8	29.6
Feed/produced pig, FUp*	106	108	-	-	-
Prod. pigs/sow/year	23.1	23.5	23.7	20.6	26.6
Litters/sow/year	2.25	2.25	2.24	2.16	2.31
Sows/year	267	284	303	239	364
First parity litters, %	21.0	22.0	22.3	22.8	21.6
Live born/litter	12.3	12.6	12.9	12.3	13.4
Stillborn/litter	1.3	1.4	1.5	1.5	1.5
Weaned/litter	10.7	10.9	11.1	10.3	11.8
Age at weaning, days	30	31	31	32.3	29.7
Weaning weight, kg	7.2	7.3	7.3	7.4	7.1
Mortality post-weaning, %	3.6	4.2	4.4	6.8	2.7
ADG post-weaning, g	410	416	420	404	429
Age at 30 kg, days	86	86.1	86.1	89.7	82.8
Non-productive days/litter	16	16	16	20.6	11.7

* incl. feed for young sows

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source: The National Committee for Pig Production Annual Report 2005

- ### Denmark ... High Sow Productivity
- #### How are they attaining 30 p/s/yr
- Genetic focus on live born
 - Moving to live pigs at day 5 (LP5)
 - Skilled labor
 - Management Approaches
 - Two Step Nurse Sows (Double cross fostering)
 - Surprise Breeding
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Denmark ... High Sow Productivity How are they attaining 30 p/s/y



- Keeping pigs alive after farrow
 - Sows and pigs are handled gently with care
 - Sows are in crate 5 to 7 days before farrowing
 - Environment set for sow w/ floor heat and/or hoover for piglets
 - Two or three step cross foster system to keep at least 12 pigs on each sow.

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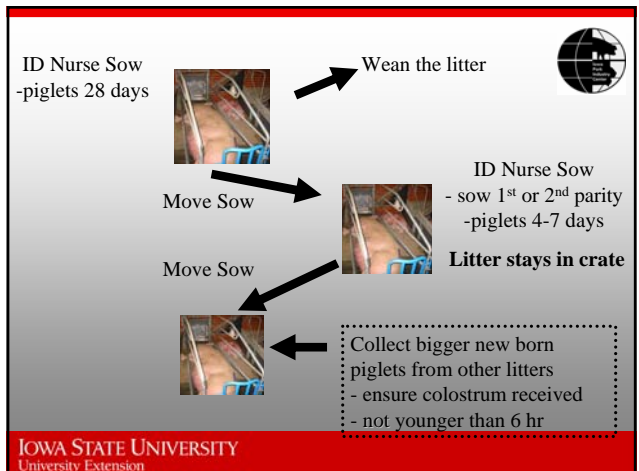
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Two Step Nurse sows



- Wean piglets from a sow
 - It has to be a good litter size and piglets in a good condition
 - Make sure that the sow can function as a nurse sow
 - Don't move the piglets
- Move the sow to a litter with 4-7 days of age, coming from a 1st or 2nd litter sow.
- Move the 1st or 2nd litter sow to a farrowing pen where you have collected a litter of newborn piglets with a good condition and after they've had enough colostrum (bigger piglets down to 6 hours after birth)

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One- or Two-step nurse sow?



	Piglet stayed with mother	One-step nurse sow	Two-step nurse sow
Mortality rate %	6 ^a	18 ^b	6 ^a
Weaning wt., lbs	13.9 ^a	12.1 ^b	14.1 ^a

**Nurse Sow Justified because of High Number Born Live
.... more dinner plates required**

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Breeding - Surprise effect



Example:

Thursday	Weaning: Boar contact
Friday	Boar contact
Saturday	Boar contact
Sunday	No contact (24 hr before insemin.)
Monday	Boar contact, insemin. w/in 20 min.
Tuesday	Boar contact, insemin. w/in 20 min.
Wednesday	Boar contact, insemin. w/in 20 min.

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Gilt Development



- Selection
- Housing space
- Feeding program
 - Avoid ulcers and stress
 - Slower growth
- Stimulating heat

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Gilt Development



Feeding for good gastro-intestinal health

- Coarse feeding structure
 - Coarse degree of grinding, rolled oats
- High-fiber feeds
 - Oats, barley or wheat bran, sugar beet pulp
- Low energy concentration
- Straw

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Feeding strategy - gilts

Weight	FU/ day	Dig. Prot.	Feed
30-50 kg (66-110lb)	Ad lib.	130	Finisher
50-90 kg (110-200lb)	Max. 2.5	110	Lactation, good structure
Over 90 kg (>200 lb)	Condition (2-3)	110	Lactation, good structure
5-10 day before service	3.5	110	Lactation, good structure
After service	2.0	110	- // -

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Gilt Development

Heat management

- Age: 7 months
 - Move to service unit (1 move)
 - Boar contact (at least 20 min. every day)
 - Register heat (move back?)
- 3 weeks later / 1 week before service
 - Move to service unit
 - Boar contact (At least 20 min. every day)
 - Service at about 8 months

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Den-Thought ...

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Swine Welfare

- The discussion reflected the strong and continuing welfare pressure within the EU to increase space allowances and phase out fully slatted floors

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EU Space Requirements



Stage and live weight in lbs.	Min. total area (sq ft/pig)
Weaners	
Up to 22	1.61
22 – 44	2.15
44 – 66	3.22
Rearing pigs	
66 – 110	4.30
110 – 187	5.92
187 – 242	6.99
More than 242	10.76



"The EU Directive on Pig Welfare"

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Provide all pigs with permanent access to materials for investigation and manipulation



- Pigs in fully slatted, or partial slatted, unbedded systems may find that providing hanging chain or tire is no longer acceptable; consider the use of troughs or racks with a rooting material



"The EU Directive on Pig Welfare"

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Bedding



- Straw
- Hay
- Wood
- Sawdust
- Mushroom compost
- Peat



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Hospital pens

- The flow of pigs around the unit should be one-way. Small, weaker pigs should be moved to a specialized sick pen, not held back and (not) mixed with healthy younger pigs.



The EU Directive on Pig Welfare

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Swine Feeding

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Denmark's "Corn Crop"



Feed Grains for Swine

- Wheat
- Barley

Protein Source for Swine

- Soybean meal (imported)
- Fishmeal
- Canola meal

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Example of feed mixtures (%)

	Sow		Weaner			Finisher
	Nursing	Pregnant	I	II	III	
Barley	38	87	15	10	29	24
Wheat	37		50	59	43	50
Soy	13	9	8	16	16	20
Minerals	4	3	4	4	4	3
Fat	4	1	3	3	2	3
Fishmeal	4	0	10	8	6	0
Milk	0	0	10	0	0	0

Source: LandsFyn

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Danish Feed Facts



- Banned the use of antibiotic growth promoters in feed for pigs in January 2000 (1998 in finishers).
- January 2005 – a phosphorus tax was introduced of ~\$.26/lb P in dietary phosphate. Aim: 46% reduction of dietary phosphorus by 2009 vs 2001.
- Guidelines for iodine levels (number of iodine units capable of binding 100 g of fat)– not to exceed 70 in fat and 62 for the feed as a whole.
- Meat and bone meal has been banned from use in pig feeds.
- Approximately 50% of Danish pig feed is manufactured as complete feed; 50% is mixed on-farm.
- Guidelines for feed storage, mixing, etc. to eliminate salmonella.
- Feedstuff manufacturers receive at least 2 visits per year from Danish Plant Directorate.

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Danish Feed Evaluation System



- Recommendations for digestible amino acids, vitamins and minerals are given as amount per energy unit of feed; any effect of daily allowances is not considered.
- Optimizing for the cheapest feed unit with fixed requirements per feed unit means lower protein content and higher levels of synthetic amino acids.
- The practical effect is - lower cost per kg gain, less nitrogen in the manure and fewer problems with diarrhea

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Conventional Dry Feeding Systems



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Liquid Feeding Systems



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Electronic Feeding Systems



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Gilt and Sow Feeding

– good gastro-intestinal health

- Coarse feeding structure
 - Coarse degree of grinding, rolled oats
- High-fiber feeds
 - Oats, barley or wheat bran, sugar beet pulp
- Low energy concentration
- Straw

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Water

	Liters / day	Gals / day
• Gestating sow	12-30	3.2-7.9
• Nursing sow	25-60	6.6-15.8
• Boar	15-40	4.0-10.6

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Grow-Finish



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DENMARK ... AGP's



- Finishing removal ... minimal impact
- Nursery removal ... challenge

Management methods with removal:

- Move to AIAO
- Limiting age variation
- Delay weaning to get larger pig
- Feed additives – acids, focused use of zinc oxide

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DENMARK ... AGP's (antibiotic growth promotants)



- Industry initially voluntary removal
- Jan 2000 – mandatory removal

Will know if using because -

- All swine operations must be visited by a veterinarian every 35 days
- 5% operations checked by authorities
- Veterinarians can not sell antibiotics

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