# DANBRED BREEDING PROGRAMME

The Danish pig breeding programme, **DanBred**, is organised by the National Committee for Pig Production. At present there are 2 cooperative slaughterhouse companies in Denmark processing more than 24,5 million pigs annually of which approx. 90 per cent are exported.

The **DanBred** breeding programme is responsible for the genetic improvement of the pork products and is therefore considered a very important part of the whole industry.

In carrying out the successful programme, **DanBred** collaborates with 42 private breeders who own a total of 71 herds.

The aim of **DanBred** is to improve the four breeds to obtain the best possible overall economy for the industry.

Selection in the **DanBred** breeding herds is therefore based on results for performance, fertility as well as carcass traits.

## DANBRED GENETIC PROGRAMME

The four breeds in the **DanBred** breeding programme are: Danish Landrace, Danish Yorkshire (Large White), Danish Duroc and Danish Hampshire.

## BREEDS

### Danish Landrace

Danish Landrace is a dam line in the **DanBred** crossbreeding programme for production of **Danhybrid-LY** gilts. The fertility and mothering abilities of the Danish Landrace are excellent.

Danish Landrace is a very long and strong pig with good legs. It is world famous for excellent carcass quality.

### Danish Yorkshire (Large White)

Danish Yorkshire is a second dam line in the **DanBred** crossbreeding programme.

Danish Yorkshire is a perfect allround breed. It is mainly used in the production of **Danhybrid-LY** gilts, but also to produce terminal sires.

The breed is a very effective producer of meat with fast growth, low feed conversion ratio and excellent carcass quality.

The fertility and mothering abilities of the Danish Yorkshire are very good.

### Danish Duroc

Danish Duroc originates from the U.S.A. and Canada and was imported 1977-1979 to be used as a

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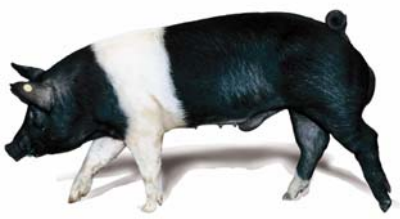
terminal sire in the crossbreeding programme.

Since the importation, Danish Duroc has been improved particularly with regard to lean meat percentage and slaughterloss.

Today **DanBred** has the largest population of purebred Duroc in Europe.

Danish Duroc performs very well as a terminal sire in combination with **Danhybrid-LY** females. Danish Duroc produces large litters as well as fast growing slaughter pigs with low feed conversion ratio and a high lean meat percentage. As an extra benefit Danish Duroc produces carcasses with excellent meat and sensory qualities.

## Danish Hampshire



Danish Hampshire was also imported from the U.S.A. and Canada in the late seventies to be used as a terminal sire.

Danish Hampshire is mainly used in the production of crossbred terminal sires. A very popular terminal sire in Denmark is the first cross between Danish Duroc and Danish Hampshire, **Danline-HD**. By mating **Danhybrid-LY** sows to **Danline-HD** boars, the pig producer obtains full benefit of the hybrid vigour.

Danish Hampshire produces lean carcasses with good meat quality.

## STRUCTURE

## NUCLEUS HERDS

**DanBred** pig breeding has a total purebred sow population of 9,200 sows. The **DanBred** purebred population is free of the halothane stress gene. The distribution of sows is shown below:

Danish Landrace.....3,600 sows
Danish Yorkshire.....2,600 sows
Danish Duroc.....2,100 sows
Danish Hampshire.....900 sows

71 herds with the four breeds are approved by the National Committee for Pig Production.

**The breeding herds produce:**

| **Purebred Males** | **Purebred Females** | **Crossbred Males** |
|---|---|---|
| **G**reat **G**rand **P**arents for further genetic improvement | **G**reat **G**rand **P**arents for further genetic improvement | **P**arent boars for **A.I.** stations **Danline HD** |
| **G**rand **P**arent boars for multiplier herds | **G**rand **P**arents for multiplier herds | |
| **P**arent boars for production herds | | **P**arent boars for production herds |

## MULTIPLIER HERDS

180 herds are approved for multiplication. The sow population in the multiplier herds is 46,000 sows.

**The multiplier herds produce:**

| **Crossbred Females** |
|---|
| **F1 Danhybrid LY/YL** to be used as **P**arent **F**emales in the production |

The structure of the **DanBred** breeding programme is shown in Diagram 1.

# DANBRED BREEDING PROGRAMME

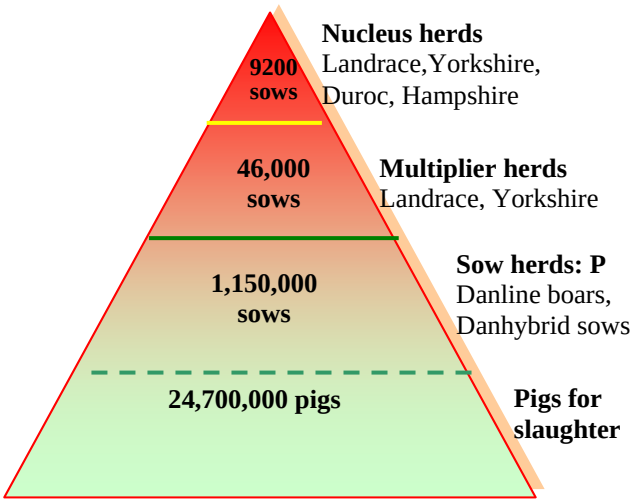



**Diagram 1.** The DanBred breeding programme

## BREEDING GOAL

The breeding goal for DanBred is set in close cooperation between the pig producers and the slaughterhouses. The breeding objectives differ for the male and female lines. The table below shows the traits of the breeding goal for the four breeds.

| Trait | Economic coefficient | Unit |
|---|---|---|
| Daily gain *(0-30 kg)* | 0.020<br>0.016 | $/gramme<br>€/gramme |
| Daily gain *(30-100 kg)* | 0.019<br>0.015 | $/gramme<br>€/gramme |
| Feed conversion | 14<br>11 | $/kg gain/pig<br>€/kg gain/pig |
| Lean meat percentage | 1.4<br>1.1 | $/%/pig<br>€/%/pig |
| LP5*: *dam lines* | 3.5<br>2.8 | $/piglet<br>€/piglet |
| Longevity: *dam lines* | 4.2<br>3.4 | $/point/pig<br>€/point/pig |
| *sire lines* | 2.1<br>1.7 | $/point/pig<br>€/point/pig |
| Slaughterloss: *sire lines* | 0.8<br>0.7 | $/kg/pig<br>€/kg/pig |

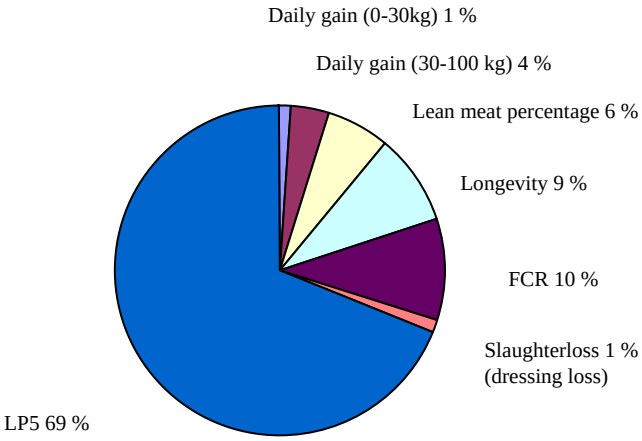
*LP5: live piglets at day 5 after farrowing.

As can be seen from the table, live piglets at day 5 after farrowing is included in the breeding goal for the dam lines, and slaughterloss is included for the sire lines. Longevity is weighed twice as much in the dam lines as the sire lines.

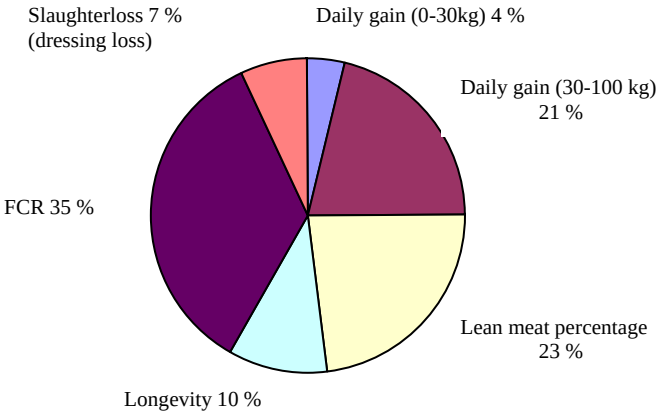
From time to time, changes in genetic parameters and economic coefficients caused by selection and the production/marketing situation justify an adjustment in the ranking of breeding stock. This is considered every 3 or 4 years.

The expected progress for the dam and the sire lines respectively on the basis of the breeding goal is shown in the following figures.

### Landrace and Yorkshire




### Duroc and Hampshire




As can be seen, great progress in LP5, daily gain, lean meat percentage and feed conversion ratio is expected.

# DANBRED BREEDING PROGRAMME

## TESTING

The testing of DanBred breeding pigs is carried out at the **central test station** and **on farm** under the supervision of the National Committee for Pig Production.

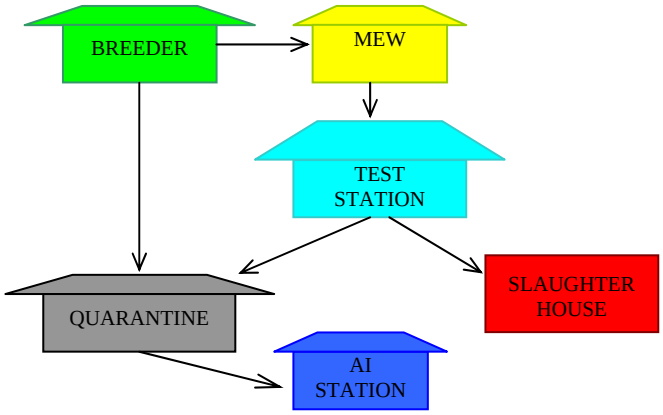
### Testing Programme

| On station | On farm |
|---|---|
| **5,000** males per year | **98,000** males/females per year |
| ➢ daily gain 30-100 kg | ➢ daily gain 0-30 kg |
| ➢ lean meat percentage | ➢ daily gain 30-100 kg |
| ➢ feed conversion | ➢ lean meat percentage |
| ➢ conformation | ➢ conformation |
| ➢ slaughterloss (sire) | ➢ LP5 (dam) |

All litters from Landrace and Large White sows are recorded both in breeding and multiplier herds. This is a total of 111,000 litters per year.

On farm and on station testing is carried out in the interval 30-95 kg. The pigs are fed ad libitum during the whole growth period. A specific feed composition and specific feed dispensers common to all DanBred herds and controlled by DanBred are to be used.

The principles and the structure of the test procedure are shown in the figure below.




At the end of the test all pigs are weighed and the backfat thickness is measured ultrasonically. Finally, the conformation of each animal is evaluated.

To measure individual feed intake, a transponder feeding system is used on the test station (ACEMA). Approximately 85 % of the boars that are being tested on the station are slaughtered after the test is completed.

The production results for the **DanBred** breeding herds and central test station appear from the tables below.

### Breeding herds - average production results for boars

| Breeds | Pigs, number | Daily gain (0-30 kg), g/day | Daily gain (30-100 kg), g/day | Lean meat percentage | Longevity |
|---|---|---|---|---|---|
| Duroc | 9,679 | 371 | 1,022 | 59,8 | 2,92 |
| Hampshire | 3,058 | 358 | 843 | 61,9 | 2,94 |
| Landrace | 17,619 | 375 | 969 | 62,2 | 2,94 |
| Yorkshire | 13,840 | 357 | 943 | 61,4 | 3,04 |
| Total | 44,196 | | | | |

### Breeding herds - average production results for females/gilts

| Breeds | Pigs, number | Daily gain (0-30 kg), g/day | Daily gain (30-100 kg), g/day | Lean meat percentage | Longevity |
|---|---|---|---|---|---|
| Duroc | 10,925 | 368 | 973 | 59,9 | 3,02 |
| Hampshire | 3,825 | 359 | 807 | 61,8 | 3,08 |
| Landrace | 23,589 | 378 | 937 | 62,1 | 3,09 |
| Yorkshire | 15,435 | 358 | 913 | 61,3 | 3,12 |
| Total | 53,774 | | | | |

**Central test station - average production result for boars**

| Breeds | Pigs, number | Daily gain (30-100 kg), g/day | Feed conversion FUs/kg of gain | Lean meat percentage | Longevity | Slaughter loss, kg |
|---|---|---|---|---|---|---|
| Duroc | 1,244 | 975 | 2,33 | 60,0 | 2,92 | 25,9 |
| Hampshire | 517 | 854 | 2,46 | 62,2 | 2,94 | 24,7 |
| Landrace | 918 | 929 | 2,39 | 61,4 | 2,94 | 26,3 |
| Yorkshire | 938 | 916 | 2,32 | 61,7 | 3,04 | 25,7 |
| Total | 3,617 | | | | | |

## INDEX CALCULATION

All data from the breeding and multiplier herds combined with all the other data recorded by the owner are sent to **DanBred's** database. Every Thursday evening a new index calculation will be automatically carried out in the central computer. Consequently, each Friday morning a new index for all animals in the breeding programme will be available.

The calculations are made by a UNIX computer using the PEST programme developed by E. Groeneveld.

The BLUP method is used for index calculations:

1. All relatives contribute to the estimation of the breeding values for each individual.
2. Simultaneous correction for fixed effects and estimation of breeding values.
3. Breeding animals from different generations can be accurately compared.

A reliable multi-trait animal model is developed on the basis of well-founded assessments of genetic correlations and heritabilities so that known correlations between the various traits of the breeding goal are used. This is very important when a trait is measured on a few animals, such as feed conversion, which is only measured at the test station.

When computing the breeding values the results are obtained using the following model:

**Y = S + K + a + l + p +e**
where:

**S** is the effect of section (contemporary group)
**K** is effect of **sex**
**a** is the **BREEDING VALUE**
**l** is the effect of **litter**
**p** is the effect of **pen**
**e** is residual.

In the **DanBred** breeding programme 90-95 percent of the sows are artificially inseminated. By means of AI and the station test, genetic relationships are created between the breeding stock in different herds. This genetic relationship allows the efficient use of the multi-trait BLUP method.

## DOES IT WORK?

### Genetic trend

The purpose of breeding is to create a genetic improvement for the traits that are part of the breeding goal. The table below shows the average genetic improvement for all four breeds achieved during the last four years.

# DANBRED BREEDING PROGRAMME

**Breeding progress 2000-2004**

| Breed | Daily gain (0-30 kg) G/day | Daily gain (30-100 kg) g/day | Feed conv., FUs/kg of gain | Lean meat percentage | Slaughter loss, kg | LP5 | Longevity |
|---|---|---|---|---|---|---|---|
| Duroc | 3,3 | 19,0 | -0,03 | 0,16 | -0,14 | | 0,03 |
| Hampshire | 0,18 | 7,9 | -0,02 | 0,11 | -0,05 | | 0,01 |
| Landrace | -0,2 | 13,6 | -0,03 | 0,06 | 0,06 | 0,14 | 0,04 |
| Yorkshire | 0,9 | 12,1 | -0,03 | 0,04 | 0,11 | 0,20 | 0,07 |
| **Average (All breeds)** | **1,04** | **13,1** | **-0,03** | **0,08** | **-0,01** | **0,17**** | **0,02***/0,06* *** |

As shown there is a significant genetic improvement for all traits in the breeding goal. The genetic progress created by DanBred has a **high economic value**. It is estimated that Danish breeding pigs get $1.5/ €1.2 more competitive per pig per year.

When such an improvement has been made, the important question is whether it penetrates to the production herds or is there a genotype by environment interaction between the results from the breeding herds and the results in the production herds? DanBred has carried out two trials to shed light on this question. The trials included the traits daily gain, lean meat percentage and litter size.

The tables below show how the genetic improvement achieved in the breeding programme is being transferred to the production herds.

**Transfer of production traits measured on 4,500 slaughter pigs (crossbreds)**

| | Daily gain | Lean meat percentage |
|---|---|---|
| Males | 104% | 83% |
| Females | 84% | 93% |
| Castrates | 37% | 185% |
| Average (females + castrates) | 61% | 139% |
| Average (females + males) | 93% | 88% |

Consequently, DanBred is a breeding programme that does not merely create genetic improvement in the nucleus. It has been established that the production herds benefit from these improvements.

## HEALTH STATUS

**Denmark** is free of all contagious diseases such as Classical and African Swine Fever, Foot and Mouth Disease, SVD, Aujeszky's Disease and Teschen's Disease as well as Brucellosis, Tuberculosis and Trichinosis.

**SPF/MS.** The registered breeding and multiplier herds under the SPF programme are the pig farms with the highest health status. These farms are free of the specific pig diseases such as Dysentery, Pneumonia, Atrophic Rhinitis, Lice, Mange etc.

From the SPF/MS system all animals are transported in specially equipped trucks with pressurized airfilter ventilation to avoid contamination of the animals during transfer from one farm to another.
The SPF system is based on the Caesarian operation and is used in connection with e.g. the establishment of new herds.

The use of growth promoters are not allowed in the **DanBred** breeding herds.
**The conventional breeding farms** also obtain a high health status by only introducing new animals from farms with better or the same health status and by observing only limited access to the herd. All breeding farms are regularly visited by a veterinarian and diseases as well as any medication are recorded.

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