

## **EVALUATION OF PIG HERDBOOK BREEDING STOCK PRODUCTIVE TRAITS IN CATALONIA (SPAIN)**

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### **SUMMARY**

Structure, registration and testing methodologies applied to the Catalan pig herdbook populations are described. Some phenotypic and genetic values are reported for different periods, traits and breeds. Breeding values are currently estimated using a multitrait animal model. Independent analysis is performed for on-farm and test station evaluations. The possibility of continuous evaluation of breeding stock, integrating herdbook and heterogeneous test information, is currently being investigated for cost effective selection decisions.

### **INTRODUCTION**

Coordinated breeding plans started comparatively late in Spain and the changes in pig breeding structures precede the establishment of coordinated breeding plans. Until the last decade, selected breeding stock was commonly obtained through imports. Only a few private companies and cooperatives undertook their own breeding plans to obtain adapted breeding material. Spanish pig production is concentrated in Catalunya, with close to 30 % of pigs produced and 40 % of pig meat obtained originating here. Pure breed stock is also concentrated in this autonomous region, with more than 50% of the registered animals.

From 1986 the Catalan Pig Breeders Association (ACPS), connected with the National Pig Breeders Association (ANPS), and the Institut de Recerca i Tecnologia Agroalimentàries (IRTA) has carried out a breeding program based on genetic evaluation for productive traits recorded in On-farm (OFT) and in the Central Test Station (CTS) of pure-breed animals. In 1991 Herdbook technical services were transferred to the IRTA Pig Breeding Center and the traditional function of registration has been adapted to suit the new scientific methods.

### **HERDBOOK AND TESTING PROCEDURES**

Herdbook populations in Catalonia are distributed in 31 nucleus herds with close to 7000 pure-breed sows mated in pure-breed. This nucleus supplies an average of 20.000 pure breed sows per year to independent or connected multipliers. Present breed distribution (19% Large White, 47 % Landrace, 5 % Belgian Landrace, 21 % Duroc and 10 % Pietrain) shows a decline in the Belgian Landrace breed and an increase of Large White sire lines compared to the 1986 situation. The most popular sows at production level are single crosses Large White\*Landrace or Landrace\*Duroc. Terminal sires could be pure breed Belgian Landrace, Pietrain or Large White ( and cross-breeds)

Information collected by breeders concerning new boars, dams and piglets, matings, birth and rearing is sent regularly to the herdbook services. More than 250,000 pedigrees and 80,000 litters are reported. The GTEPS pig management program is the standard tool used by most breeders. IRTA technicians supervise the information in the field and produce a complete breed standard appraisal of every new boar or sow in order for it to be registered in the Herdbook.

Every month, pure-breed piglets are collected from the breeding nucleus and tested at the Central Test Station. After a pre-test period (20 Kg), males of the same breed start the fattening period at 35 kg live weight in individual pens, and feed "ad libitum". In addition littermates are tested in groups of 10-12 animals using an automatic feeding recording system (IFR). Test capacity is limited to a maximum of 1000 animals per year with the present facilities. Animal weight, food consumption (or daily consumption in the IFR system) and back fat thickness are measured weekly between 70 and 105 Kg. The loin area is also measured using bi-dimensional ultrasonic equipment in terminal sire breeds. Adjusted parameters (to 100 Kg live weight) like Average Daily Gain (ADG), Food Conversion Ratio (FCR) and Fat Depths (UFD) are used for genetic evaluation. Curves of weight and consumption are also supplied to the breeders in an attempt to detect optimal finishing growing weight or age for breeding stock.

Relatives of centrally tested animal are tested on-farm (OFT) by IRTA technicians every 15 to 21 days using a homogeneous test procedure. Only weight and ultrasonic probe measurements are recorded. Daily Gain from Birth (BGDf) and ultrasonic fat depths (UFDf). Adjusted data (to the average age of group basis: farm, breed, sex and test day) are used to rank tested animals. Appropriate sex\*breed regression coefficients are used to correct raw data. A provisional ranking of the animals (based on selection indices) is obtained immediately after test using the GTEP-S program. Information is sent to the IRTA-CCP center for official evaluation and for more complex analysis. 45,000 OFT and 4,000 CTS records are stored as of now.

#### ESTIMATION OF BREEDING VALUES

Index selection has been used since 1986 in CTS and OFT testing systems. Genetic parameters (from literature) and local economic weights were used to establish the index values. A common breeding goal is taken into account in both procedures and includes the average daily gain and food conversion ratio from 25 to 100 Kg, and the estimated lean percentage.

Multitrait BLUP has been used as a routine since 1991, when RMEL estimates of genetic parameters were obtained from previously tested populations (Tibau, 1992). A multitrait animal model is currently used in CTS to estimate the breeding values (EBV) of tested boars. Breed and batch are the only fixed effects. The PEST program (Groeneveld et al, 1990) is used to obtain the EBV's. A set of programs is used to create adequate data files required for monthly evaluations, to back up the results to the original files and include these estimates in the pedigrees and farm reports.

Different multitrait animal models and genetic parameter estimates are used for the OFT evaluations. Sex, breed and batch are used as fixed effects whereas litter effect and animal breeding values are random effects. Complete pedigree information from herd-book files was included recently to increase the accuracy of EBV's. Up to now only independent BLUP analysis of OFT and CTS was supplied to the breeders. Traits recorded and fixed effects are different. A combined analysis of CTS and OFT records will be possible when accurate estimates of correlations between traits are available. Some preliminary results are available combining specific data sets and using approximate variance components.

### RESULTS

Information regarding CTS and OFT official evaluations is supplied to the breeders by means of hard copies or files transferred by modem. CTS tested animals and relatives are compared across herds monthly in respect of their phenotypic values and EBV's. Within nucleus herds OFT evaluations are obtained every three weeks. Six month reports by herd are obtained and include tested animals, boar and dam evaluations. BLUP estimates obtained in CTS evaluations are included in the pedigrees.

Phenotypic averages of traits recorded between 1986 and 1992 on CTS (table 1) show a clear difference between maternal lines (LW and LS breeds) and terminal breeds (PI and BL). EBV averages over years show a slight improvement in FCR and UFD in all breeds except the LS. ADG overall nucleus averages are favourable except for the LW breed. Genetic trends obtained by regressing EBV averages (of OFT and CTS traits) over time show different patterns across herds according to the preferred selection goals. This is specially evident for ADG and UFD trends in some LW nucleus herds: a parallel decrease in both traits is observed in nuclei producing specialised sire lines.

Table 1. CTS tested boar averages, EBV difference averages and OFT tested boars and sows phenotypic averages (1986 to 1992)

TEST	Trait	Breed : LW	LS	LB	PI	
CTS*	Number	852	1125	1040	480	
	ADG	Mean	959	955	880	812
		G.Dif.	-17	18	3	6.5
		FCR	Mean	2.32	2.41	2.33
	UFD	G.Dif.	-0.01	-0.02	-0.06	0.03
		Mean	13.2	13.7	9.8	8.8
OFT**	G.Dif.	-0.72	0.4	-0.36	-0.73	
	Number	9375	14316	4498	1084	
	ADGg	Mean m.	607	582	496	491
		Mean f.	568	547	465	395
	UFDg	Mean m.	10.9	11.4	8.3	7.9
		Mean f.	11.2	11.1	8.4	7.6

\* (35 to 100 Kg) : ADG:gr/day, FCR: Kg/Kg, UFD : mm

\*\* 0 to Average Test Age : ADGg : gr/day, UFD :mm

G.Dif : genetic differences (1992-1986) , m: males f: females

## DISCUSSION AND FUTURE GOALS

Breeding structure and organization could not be considered in our case as a traditional national breeding program as in other countries (Andersen et al, 1993, Ducos et al, 1992). Nucleus herds are free to use the reproducers ( recognised in the herdbook) according to their own preferences but genetic links between associated ACPS farms have increased. Nucleus sizes and goals may be slightly different across companies and specific analyses are being carried out using self-collected information (Estany et al, 1992).

Breeds like Pietrain and Belgian Landrace have a minimum level of subcutaneous fat. A decrease in this trait may not be desirable in the future. Independent analysis of LW breed shows a clear divergence in selection goals across herds. Different strains in this breed must be considered in the near future. New parameters like daily consumption (or residual feed intake) and loin area are currently investigated as a possible alternative to current traits and a research project involving littermates tested in different environments will permit the estimation of variance components on traits recorded in different testing procedures.

Test stations are useful to compare animals from different nuclei in similar conditions and constitute an effective way of cross herd connection. Existing facilities must be adapted to reduce the pre-test environmental effects, the genotype\*environment interactions and to increase the group capacity. CTS efficiency could also be improved with pre-selection of littermates to be tested. A minimum number of progeny tested animals could be enough to detect best animals (and ancestors) at an early stage in order to facilitate selection decisions and to reduce the generation interval. Independent tests and pedigree datafiles are presently combined in a main relational database.

A complete analysis of breeding structures and within-breed nucleus relationships based on herdbook information is underway in order to detect the extent of nucleus links and the contribution of tested boars. Across-herd BLUP estimates (based on the CTS test) became an effective tool in the identification of potentially interesting animals among their contemporaries, and a way to know the relative position of the different nuclei. Artificial insemination is not a common practise between companies but some semen exchanges contribute to the establishment of new genetic connections between nucleus herds.

Simultaneous (and independent) CTS and OFT genetic evaluations (Batallé, 1992) are possible with existing tools but an effective joint and continuous evaluation is only possible if genetic parameters are correctly estimated, genetic evaluation models are adapted accordingly and fast flow of information is established between nucleus herds and the herd-book services.

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