DEVELOPMENT OF HIGH PERFORMANCE PIG GROUP AND DETERMINATION OF SUITABLE COMBINATIONS IN BREEDING SYSTEM

Breeding goal in pig production is economically genetic improvement under certain conditions. Performance and quality improvement and efficiency are always objectives of all pig producers and also the goal of the government to set up for future pig development program.

Genetics for stocks improvement

Genetic improvement of pig breeding stocks, recently in Vietnam, have been continuously gained through national and international genetic improvement projects (ACIAR and Vietnam-Belgium projects). These projects worked out solutions for pure breeding selection and commercial production. There had been many institutions involved in the project implementation (National Animal Husbandry Institute, Vietnam Animal Husbandry Association, Ho Chi Minh City Agro-Forestry University, Hue University, Ha Noi Agriculture University No-1 and others pig farms in Southern, Central and Northern parts of the country).

Reproduction, growth and carcass quality traits of economic importance haad been recorded and evaluated by using statistical and evaluation software packages (MATLAB, SAS, DFREML, VCE, PIGBLUP and PEST) to calculate genetic parameters, breeding values and heterosis. In the last years, the project "*Selection and development of hybrid pig group and determination of suitable crossing formula for breeding system*" had been carried out on pure and their crossed breeds of Yorkshire, Landrace, Duroc, Pietrain and Mong Cai at state and private farms. The research results of the project indicated:

The Best Linear Unbased Prediction method (BLUP) is the most effective method used to perform breeding value evaluation for nuclear maternal (Yorkshire: YY, Landrace: LL and Mong Cai: MC) and fathernal (Duroc: DD and Pietrain: PP) lines. Breeding value of new born alive increased from 0.1 to 0.5 piglets and growth rate from 0.30 to 50 grams compared to those before the project implemented.

- Mong Cai group: Reproduction and growth rate of third selected generations were better than that of the base generation. Heritabilities of new born alive of MC_{3000} and growth rate and backfat thickness of MC_{15} of the first selected generation (TH_1) were bether than those of the base generation (TH_0) and the second selected generation (TH_2) being 0.13; 0,51 and 0,6 respectively. The lean meat percentage and growth rate

Intervention of Mong Cai in maternal line for litter size improvement

increased more than 3% and 30-60 g/day, respectively. More than 300 Mong Cai breeding pigs had been

tranfered to Lao Cai, Nam Dinh, Thanh Hoa and Nghe An provinces.

Exotic maternal line for improving litter size

- Maternal lines YY and LL: New born alive of these groups was 0.5-1.0 piglet higher than that of the base generation and the litter index increased from 1.9 to 2.1 litters per sow per year. The weight of 60 -day–old pig increased from 5 to 7 kg/pig. The age at first litter decreased 11%. The breeding values of new born alive and litter weight at 21 days had been improved.

- Fathernal lines DD and PP had been genetically improved for age and backfat thickness at 90kg. The results of Table 1 indicated that genetic improvement had not been stable by generation. According to Tom Long (1995) and Mabry (1998), genetic improvement is difficult to gain at the first few years of selection by using BLUP.

In pure breeding, many breeding farms have applied selection indexes basing on phenotypes, just only some farms have applied BLUP method and modern selection indexes. Therefore, there is a need of consistent recording system and speeding up the applied research of BLUP method for pig breeding farms in order to build up the national pig breeding system.

Table 1. Average breeding values of reproduction and growth rate traits

| Breeds | Generation | n | Average breeding values | | | |
			New born alive	Litter weight at 21 days old	Age at 90 kg liveweight	Backfat thickness at 90 kg
Yorkshire	1	116	0.203	-0.413	-5.48	0.03
	2	170	0.173	-0.327	-5.26	0.05
	3	414	0.130	-0.277	-4.59	0.01
Landrace	1	143	0.210	0.230	-1.00	0.20
	2	204	0.270	0.460	-1.53	0.01
	3	468	0.200	0.160	-1.52	-0.05
Duroc	1	62	-0.210	0.280	-6.07	0.01
	2	79	-0.120	0.350	-4.58	-0.04
	3	136	-0.030	0.250	-5.36	-0.07
Pietrain	1	15	-0.050	-0.220	-3.67	-0.22
	2	32	-0.050	0.100	-5.59	-0.13
	3	81	0.020	0.050	-5.57	-0.10

Crossing formula in breeding system

Average daily gain of three and four way crosses between YY, LL, DD and PP was 680-720 g per day and the lean meat was 56-58%. This was 2-4% higher than results of the previous projects. The lean meat of crossed pigs of 50% Mong Cai was 2-7 % higher than the pure Mong Cai. Crossbreds of 1/4 Mong Cai and ¾ exotics have well adapted under ecological conditions of the Central Vietnam and had good growth rate with lean meat of 53%. The lean meat of P x Y.MC could reach 56.87%.

Table 2. Performances of Mong Cai x Exotics at Dong Anh farm, Thai Binh province

	(PP x MC)	(LL x MC)	(YY x MC)
Daily gain (g/day)	520-556	510-537	511-539
Feed conversion ratio	3.20-3.60	3.40-3.60	3.30-3.60
Lean meat (%)	44.03-46.86	43.00-45.60	43.00-45.14

- Performances of crossbreds between Mong Cai and exotics in Thua Thien Hue province

Eighteen crossbreds of ¼ Mong Cai x ¾ exotics including (PP x Y.MC), (LD x P.MC) and (YY x P.MC) were fattened in 99 days. Pigs were fed commercial feed of 16% crude protein and 3100 kg ME/kg during the first period from 27 to 60kg. In the second period, they were received feed with 14% crude protein and 2800 kcal ME/kg from 61 kg to marketweight. Crossbreds (YY x P.MC) had the best growth rate of 150 g and 30.82 g per day higher than that of (LD x P.MC) and (PP x Y.MC) respectively, with significance at $P < 0.05$.

Table 3. Carcas quality of crossbreds in Thua Thien Hue province

	(PP x Y.MC)	(YY x P.MC)	(LD x P.MC)
Backfat (mm)	8.2	14.0	1.03
Carcass (%)	71.10	68.41	71.40
Lean meat (%)	56.87	53.26	56.55

Table 4. Growth performance of crossbreds beteween LY sows x different terminal boars

Crossbreds	D.LY (X ± SD)	P.LY (X ± SD)	PD.LY (X ± SD)	P.PD x LY (X ± SD)	D.DP x LY (X ± SD)
n	64	64	60	68	68
Weight at 60 days of age (kg)	19.80±3.10	21.00±3.20	20.10±2.60	18.80±2.00	21.70±2.30
Weight at 180 days of age (kg)	96.8±7.30[bc]	95.2±4.70[b]	97.8±7.60[c]	91.6±3.50[a]	101.9±7.40[d]
Average daily gain (g)	641±54.30	618±43.90	649±94.20	606±27.50	668±58.50
Feed conversion ratio	2.96±0.21	3.00±0.22	2.86±27.50	2.73±0.12	2,65±0.18
Back-fat thickness (mm)	11.20±1.70	9.70±1.40	10.7±58.50	8.50±1.30	10.30±1.40

Crossbreds between YY, LL, DD and PP had average daily gain of more than 600 g per day and feed conversion ratio of 2.7 to 3.0. Crossbred pigs (D.DP x LY) had the best average daily gain with 62 g per day higher than that of (P.PD x LY). The lean meat percentage of crossbred pigs with Pietrain blood was 1% higher than other ones

There is a need to determinate the contribution of each breed in the crossing formula before conducting crossing experiments in order to have the most effective crossing system suitabe to each ecological and economic conditions. This can effectively reduce the production cost.

Practically, there is a need of regional and national breeding management systems provide that setting the linkage between breeding farms together with the view to have better database of pedigree and performances. This helps to evaluate breeding values with higher accuracy and to effectively and economically exchange genetics among populations of all farms involved in the breeding system.