

## The Effect of Holstein X Meat Cattle Breeds Crosses(F1) on Meat Production Increasing in Small Scale Farms Conditions

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About 80 % of Albanian small scale farms farming 1-2 dairy cows. The small agriculture land surface on farm property (1-1,5 ha) is the main limiting factor for cow's number increasing. So the farmer interest is not to increasing the number of cows in their farm but to fattening of calf's born both for nutritive need of the family and market. The main objective of the study was to show the effect of industrial crosses (F<sub>1</sub>) of Holstein Frison cows with meat breeds like as Piemontese(P), Limousine(L), Kianina(C), Sharole(Sh) and Markixhana(M) on meat production increasing on small scale farms. To carried out this objective, two study methods were used: (i) The survey - 284 small scale farms was observed in the Albanian coastal field and (ii) Comparative essay of fattening calves (F<sub>1</sub>) in semi intensive small scale farm condition - 32 calves, F<sub>1</sub> crosses of Holstein cows with above mentioned meat breeds were put in fattening in semi intensive small scale farm condition. 6 Holstein breed (H) calves of 3-4 months age was used as control group. The feeding of animals was based on forages produced in farm: corn silage 30 % D.M, fresh alpha-alpha and its hay. 35 % of dry matter requirements were supplied by bought concentrate feedstuffs with 15 % crude protein on dry matter bases. The fattening period lasted 8 months . The average daily body weight increasing for each crosses and control group were respectively 889g (PxH), 998g (LxH), 850g (KxH), 1010g( ChxH), 953g (MxH) and 702g (HxH). Multivariate analyses according to a linear model with constant factors ( genotype, sex, genotype x sex) and covariance "live body weight in the beginning of experiment" showed that: (i) The effect of crossbreds on average daily gain is evident under the small-scale farms conditions, also, (ii) The average daily gain increases with 23 -38 % , depending on the type of crosses, (iii) The crosses of dairy cattle with Limousine and Sharole result as most effective. The differences between F<sub>1</sub> crosses of Markigiana, Kianine and Piemonteze are not statistically significant, (iv) In semi intensive small scale farms the calf fattening can start from second month of life, (v) The farmers even though small scale farm condition can produce more meat though the crossing of dairy cattle with meat breeds in comparison with pure dairy breed calves.

**Keywords:** Dairy cattle, beef breeds, industrial crosses, small scale farm

### Küçük Ölçekli İşletme Koşullarında Holstein x Et Sığırları Irkları Melezlemesinin (F1) Et Üretimi Etkileri.

Arnavutlukta Küçük ölçekli işletmelerin yaklaşık %80 i 1-2 sağmal inek içermektedir. Küçük ölçekli işletmelerin 1-1,5 hektarlık arazi varlığı inek sayısı artışını sınırlayan başlıca sebeplerdendir. Bu nedenle yetiştiricilerin istemi işletmelerinde inek sayısını arttırmak değilde doğan buzağların Pazar ya da aile tüketimi için besiyeye alınmasıdır. Bu çalışmanın başlıca amacı Holstein Friesian ırkı ineklerle Piemonteze(P), Limousine(L), Chianina (C), Şarole(SH) ve Markixhana(M) gibi et ırkları ile melezlemesinin Küçük ölçekli işletmelerdeki et üretimini araştırmasıdır.

Bu maksadı sağlamak için 2 metot kullanılmıştır. Bu metotlardan biri Arnavutluk sahil kesim alanlarındaki 284 Küçük ölçekli işletmelerdeki survey gözlemleri diğeri de yarı entansif küçük ölçekli işletme koşullarındaki besiyeye alınan F1 Holstein ineklerinin yukarıdaki ırklarla melezlerinin karşılaştırmalı besi denemesidir.

Hayvanların beslenmesi işletmede üretilen kaba yemler esasına göre %30 kuru maddeli mısır slajı ve taze yonca ile yonca samanıdır.%35 kuru madde ihtiyacı kuru madde esasına göre %15 ham protein içeren kesif yem satın alınarak sağlanmıştır. Besi dönemi 8 ay sürmüştür.

Günlük canlı ağırlık artışı sırasıyla 889 g (PxH) 998 g (LxH) 850 g (KxH) 1010 g (CHxH) 953 g (mxH) 702 g (HxH) şeklinde olmuştur. Genotip, cinsiyet GenotipxCinsiyet sabit faktörleri ile deneme başı canlı ağırlık kovaryası içeren doğrusal modele göre en çok değişkenli analiz melezlerin günlük canlı ağırlık artışına göre küçük ölçekli işletmelerde etkili olduğunu ayrıca melezleme tipine göre günlük canlı ağırlık kazancı artışının %23-%38 fazla olduğu Limousine ve Shorole ile melezlemenin etkili olduğu gözlemlenmiştir.

Markigiana,Kianine,ve Piemonteze ile melezleri arasındaki farkın istatistik önemi olmadığı gösterilmiştir.Yarı intansif küçük ölçekli işletmelerde buzağı besisi 2 aylık yaşta başlamakta olup küçük ölçekli işletmelerde süt sığırlarıyla et sığırlarının melezlenmesi suretiyle saf süt sığır buzağlara göre dah çok et üreteceği gösterilmiştir.

**Anahtar kelimeler:** Süt Sığırı, Et Sığırı, Endüstriyel melezler ,Küçük ölçekli çiftlik

## Introduction

In Albanian, domestic meat production is estimated about 141 000 tons live weight/year, of which 47.3 % cattle, 30.1 % small ruminants, 11.3 % pig and 11.3 % poultry. This production constitutes about 60 % of annual meat amount that contain food diet of a person. Other amount is provided by import (*Agriculture and Food Statistics of Albanian, 2008*). If compared these data with statistics reported in 1997's results that during these 10 years, meat production in Albania is increase about 27.3 %, of which 53 % of this is the effect of increase of meat production from cattle and 28 % as a consequence of increasing meat production from small ruminants. Nevertheless, Albania continues to be a European country of the lowest level of meat production and consumption per capita. Amongst factors that influence in this situation is also breeding structure of ruminants, in general and the cattle one, in particular.

396 thousands of cows are reared in Albania which calve around 298 thousands of calves per year. 229 thousands of them are fattened for meat production. Being calves of milk breed cattle they

have genetically limited capacity for meat production. Beef cattle breeds are not reared in Albania. This is because of high cost of pure beef breeds management and high market prize for buying them. Apart from, the small scale farms where the extensive production system is predominant and the level of knowledge of farmers doesn't respond the demands of management technologies of beef cattle breed. According the Agriculture and Food sector Strategy, 2007-2013, in Albanian conditions one of the best alternative for increasing the beef meat production could be the use of beef breeds in crosses with milk breeds (Holstain/frisona breed and its advanced crosses). During last 10 years the interest of farmers to use the industrial crossbreeds (F<sub>1</sub>) is increasing. As seen in Fig. No.1, the structure of biological material (semen for A.I), in period 1998–2007 has underwent significant change. From 1 % in 1998 to 21,6 % in 2007's for beef cattle breed and to dual purpose "Milk&Meat" from 14 % to 38 %. (*Annual Report of Animal Production Department ,MoAFPC, 1998,2007*)

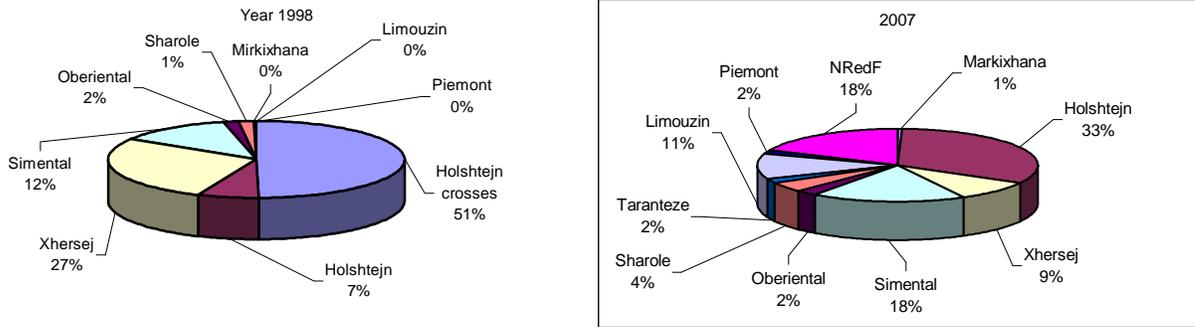


Fig.No.1 Dynamic of breeding structure of biological material that have be used for AI during 1998 -2007

To evaluate the effect of industrial crossbreed ( $F_1$ ), under the conditions of small scale farms, as well as to formulate recommends for farmers concerning the beef cattle breeds that should use in their farm to increase the beef meat production, a study was performed.

### Material And Methods

For carrying out this study two methods were used.

#### (I) The method of survey.

A questionnaire was used to carrying out the study. This questionnaire was compiled in order to collect the data concerning:

- (i) Farm size, number of cows, age, number of lactation, breed.
- (ii) Sire breed in previous calving and actual calving or pregnancy.
- (iii) Calving ease (0 to 5 points corresponding to situations - normal, difficult, with assistance, cesarean, still born)
- (iv) Sex and live weight in birth.
- (v) Live weigh of calve at age 1, 2, 3, 4 months
- (vi) Age of calve in slaughtering / selling to meat and live weight.

#### (II) Comparative essay of fattening calves ( $F_1$ ) under semi intensive small scale farm condition

The experiment to study and evaluate the level of heterosys effect on  $F_1$  crosses were performed in semi-intensive production system. The main objective of the study was to evaluate the effect of industrial crosses ( $F_1$ ) of Holstein Frison with meat cattle breeds like as Piementose(P), Limousine(L), Chianina(C), Charole(Ch) and Markixhana(M) on meat production increasing on small scale farms and to evaluate the crosses

more effective in economic point of view. 30 calves of 3-4 months age,  $F_1$  crosses of Holstein cows with above mentioned meat breeds, were put in fattening in semi intensive small scale farm condition. 6 pure Holstein (HF) calves of 3-4 months age was used as control group. The tries lasted 12 months. During the experimentation period, live weight gain and feed consumption were monitored. At the end of the experiment, live weight of animals, their charkas weight and organo-leptyce quality of meat were evaluated. The cost production of 1 kg live weight and 1 kg of meat were also calculated

To estimate the rate of influence of heterosis effect in the dynamics of live weight gain of fattening calves, the data was processed according to multivariate analyses (Harvey, W.R. 1960) following General Linear Model, with the fixes effects :

$$Y_{ijk} = \mu + a_i + b_j + (ab)_{ij} + r(x - x_{ijk}) + e_{ijk} \quad (1)$$

$Y_{ijk}$  - average daily gain of calve

$a_i$  - effect of type of crosses

$b_j$  - effect of sex

$(ab)_{ij}$  - effect of interaction "Type of crosses x sex"

$r(x - x_{ijk})$  - effect of covariance – live weight of calve at the beginning of experiment.

$e_{ijk}$  - random residual effect

### Results And Discussion

#### (I) Survey

894 small scale farms was observed in the Albanian coastal field area that is considered as

most important area for livestock and agriculture development. According the data survey, about 85 % of the cattle population in this region is Holstain/frisona breed and its advanced crosses with the local breed. In the most part of small scale farms of this area, in average 2-5 cows of this breed and 2-3 born calves per year, are managed. Only 1-2 calves born in a 3-4 years period are used as breeding animals. The other calves fattened and sold for meat. In about 36 % of farms, second and over lactation cows were served on beef breeds of which about 35 % of this, the Sharole breed sire were used, 32 % were

served by Limousine breed, 24 % by Piemonte breed, 7 % by Markixhana and only 2 % by Kianina. Simmental breed sire were used to serve cows in 31 % of the total farms surveyed. Farms that used Holstein sire to serve cows constituted 33 % of the total of farms observe by us. Also, in all farms heifers were inseminated with Holstein sire.

In Tab.No.1 show the statistical evaluations of birth live weight of calves ( $F_1$ ), age at slaughtering time, average daily gain during the suckling period and live weight at slaughtering time.

Table 1. The average of different traits of calves ( $F_1$ ) farming in the small scale farms - estimation data

Crosses breed	Birth live weight (kg)	Age at slaughtering time (month)	Average daily gain (g)	Live weight at slaughtering time(kg)
HF x P	34,8	3,5	860	125,2
HF x L	28,6	4,2	930	145,8
HF x C	31,2	3,8	820	124,6
HF x Ch	41,2	4,5	935	167,1
HF x M	36,8	4,1	842	140,6
HF x HF	30,7	3,6	710	107,4

As show, average age of slaughtering calves is ranged from 3,5 – 4,5 months. Calves are slaughtered immediately after weaning or during suckling period. This situation is conditioned by two factors:

- (i) Albanian consumers prefer meat of much small calves
- (ii) In smallholders the sources of calve fattening are limited. Feed provided by farm is mainly used for cows feeding and farmers have the limited financial possibility to buy the feed.

The above results are similar with the informations published by Tartari, T. and Shtylla, N. (1980), Boshku, K. (1987) and Beli, P. and al. (2003).

By comparing average live weight gain during suckling period, realize by the different type of crossbreed ( $F_1$ ), results that crosses of Sharole and Limousine breeds are the best. Meanwhile in all of cases observed by us, crossbreeds ( $F_1$ ) have reached higher gain that Holstein pure breed calves. These gains are about 16 – 32 % higher. As these gains are realized during suckling period

of calves, those are completely converted to additional farm income, because farmer doesn't make any of additional expense.

The survey underlined the fact that crosses of beef breeds didn't have negative effects in calving. Deaths of calves were observed in three cases only (two cases Sharole crosses and one case of Markixhana crossbreed) as well as cesarean intervention was observed in five cases only.

The question "What kind of beef breeds would farmers prefer to serve their cows", the answer was : 41 % Charole, 32 % Limousine, 12 % Simental, 6 % Markixhana, 3 % Piemontese and 3 % Kianina breeds. This results are in accord with Pleqi, A. (2001).

#### **(II) Comparative essay of fattening calves ( $F_1$ ) under semi intensive small scale farm condition**

Statistical evaluation of calve live weight at the beginning of experiment period, average daily gain realized during all the experiment period and

their live weight at the end of experiment, as given in Tab. 2.

Sex ratio in all experiment's groups is 1:1. Differences in live weight and age of calves in the beginning of the experiment are observed not only within each of group, but also between groups. This is a consequence of fact that these calves were chosen randomly in different farms.

Calves that have begun to be feed with other feeds apart from milk, were accepted to include in experiment. To reduce negative effect of this situation in linear model that will be used to analyze the experiment's data, a covariance factor will be included – *calve live weight at the beginning of experiment*.

Table 2. Average of meat production traits

Type of Crosses breed	Live weight at beginning of the experiment		Average daily gain		Live weight at slaughtering time	
	Average (kg)	CV %	Average (g)	CV%	Average (kg)	CV %
HF x P	135,2 ± 17,1 <sup>a</sup>	11,6	889 ± 44,1 <sup>a</sup>	4,9	375,2 ± 21,2 <sup>a</sup>	5,7
HF x L	113,1 ± 26,5 <sup>b</sup>	21,2	998 ± 24,8 <sup>b</sup>	2,5	384,4 ± 18,7 <sup>ab</sup>	4,9
HF x K	83,5 ± 8,7 <sup>c</sup>	10,4	850 ± 23,6 <sup>a</sup>	2,7	351,2 ± 24,1 <sup>c</sup>	6,8
HF x Ch	152,4 ± 21,4 <sup>d</sup>	14,1	1010 ± 57,9 <sup>c</sup>	5,7	394,8 ± 25,1 <sup>b</sup>	6,4
HF x M	135,2 ± 17,1 <sup>a</sup>	12,6	953 ± 35,8 <sup>ab</sup>	3,7	371,2 ± 19,3 <sup>a</sup>	5,2
HF x HF	108,2 ± 7,2 <sup>b</sup>	9,8	712 ± 48,2 <sup>d</sup>	6,8	284,5 ± 21,2 <sup>d</sup>	7,5

a-d Means, within a column with no common superscript differ significantly, P<0.05

Interpreting the results of multivariate analyses (Model 1) show at the Tab.No.3, could formulated the following:

Liner model is statistically acceptable (P<0,05). This accounts for about 36,2 % of total variance of daily live weight gain .

Variation of average daily live weight gain of fattening calves is statistically conditioned by genetic factor "Type of crossing" (P<0.01)

Average daily gain is affected by sex of calve (P<0.05)

Effect of reciprocal interaction "genotype x sex" is statistically unproved.

Covariance – is factor that doesn't show statistically proved influence.

Supported on upper data can state: Holstein Frisian x Charole and Holstein Frisian x Limousine resulted as most suitable in technical and economic point of view. The above (F<sub>1</sub>) crosses had live weight at slaughtering time respectively 38% and 35% more than calves of pure bred Holstein Frisian. Other (F<sub>1</sub>) crosses had live weight at the end of fattening 23 -32 % more than pure Holstein breed calves. Non significant effect of interaction "Genotype x sex" and the significant effect of "Type of crosses" in an other hand, support the positive effect of industrial crossbreed in amelioration of meat performances production in the small scale farms, also.

Table 3. Analysis of variance – model 1

Resource of variance	d-l.	MMS	F
Genetic factor -Type of crosses	5	915,72	3.91 <sup>**</sup>
Sex	1	1433,30	6.12 <sup>*</sup>
Interaction "Genotype x sex"	5	437,95	1.87
Covariance	1	235,54	1.01
Residual	25	234,2	

\* P<0,05 \*\* P<0,01

Those results are similar with results that was published by Mukthoty H., Berg R.T., 1971, Boshku, K. 1987, Pleqi A. 2001, The report meat /bone in crosses calves of Holstein Frisian x Charole and Holstein Frisian x Limousine was increased with 12.4 % and 10.3 % and the percentage of meat for biftek increased with 17.6% . The organoleptic evaluation classified (F<sub>1</sub>) crosses with 4 and 3.6 point more. The cost of 1 kg live weight produced by crosses mentioned above, in comparison with the cost of 1 kg live weight produced by Holstein Frison calves, was decreased with 11.6 % and 9.6% respectively.

### Conclusion

1. Using the industrial crossbreed as a biotechnologies method to produce F<sub>1</sub> crosses

calves is an effective alternative way to increase meat production in Albania

2. Effect of crossbreed in average daily gain of calve live weight is show in suckling period, also. This effect is more present and have the most positive economic output in the case when calves, after weaning put on fattening. Also, under the condition of semi intensive production system that is characterize of the small scale farms in Albania, effect of industrial crosses (F<sub>1</sub>) in increasing meat production is considerable. Calves (F<sub>1</sub>) have a increase of average daily gain of about 23 - 38 %.

3. Under the condition as small scale farm in Albania the best results have been achieved by crosses Holstein Frisone x Charole and Holstein Frisone x Limousine. Crosses of Markixhana and Piemontese there are non significant difference between them.

### References

- Anonymous, 1998. Annual Report of Bull Station. Agriculture and Food Statistics of Albanian.
- Baker, J. F., C. R. Long and T. C. Cartwright. 1984 "Characterization of cattle of five breed diallel. V. Breed and heterosis effects on carcass merit". J. Animal Sci. 59,4 922-933.
- Beli, P., L. Papa, Th. Piu, and M. Petushi. 2003 "Meat production in Albania" Research and Technology transfer for increasing the meat production. National Symposium, November, Durres, Albania.
- Boshku, K. 1987. "Use of industrial crosses for increase the beef meat production under the semi-intensive production system". Paper presented in Animal Production Symposium, Livestock Research Institute, Tirana, Albania
- Harvey, W.R. 1960. Least square analysis of data with unequal number. U.S.D.A., A.R.S., 20 (8)
- Mukthoty H. and R.T Berg. 1971. Influence of breed and sex on allometric groth patterns of major bovine tissues. Animal Production 13, 219-228,
- Pleqi A. 2001 "Study of crosses breed effect to meat production traits in milk cattle breeds" *Thesis of Master of Science, UB, Tirana*
- Tartari, T. and N. Shtylla. 1980 Meat production in Albania. 223p., SHPB, Tirane, Albania