FLECKVIEH SIMMENTAL BREEDING IN CROATIA

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  - Implementation of the genetic improvement of Simmental breed
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CATTLE PRODUCTION:
- one of the most important agricultural branches in Croatia
- mostly small mixed production units – family farms (approx. 3,5 cows/farm); farm size is growing
SITUATION AND CURRENT TRENDS IN CATTLE PRODUCTION

Table 1. Breed structure of the active part of the cattle population at the end of 2006

<table>
<thead>
<tr>
<th>Breed</th>
<th>Breeders</th>
<th>Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Simmental</td>
<td>22.311</td>
<td>84.06</td>
</tr>
<tr>
<td>Hostein</td>
<td>2.424</td>
<td>9.13</td>
</tr>
<tr>
<td>Brown</td>
<td>1.650</td>
<td>6.22</td>
</tr>
<tr>
<td>Other</td>
<td>158</td>
<td>0.59</td>
</tr>
<tr>
<td>Total</td>
<td>26.543</td>
<td>100.00</td>
</tr>
</tbody>
</table>
NUMBER OF CATTLE

- Decrease in the number during a long period; >100,000 cows and pregnant heifers lost during the war in 1990s

- Declining trend was still present afterwards (less intensity) until 2000s; today it is stopped, there is a slight increase in the number of animals
### SITUATION AND CURRENT TRENDS IN CATTLE PRODUCTION

Table 2. Trends in the number of cattle

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cattle</th>
<th>Number of cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>417.113</td>
<td>251.059</td>
</tr>
<tr>
<td>2003</td>
<td>444.320</td>
<td>255.506</td>
</tr>
<tr>
<td>2004</td>
<td>465.935</td>
<td>231.009</td>
</tr>
<tr>
<td>2005</td>
<td>471.025</td>
<td>241.314</td>
</tr>
<tr>
<td>2006</td>
<td>485.268</td>
<td>242.261</td>
</tr>
</tbody>
</table>
SITUATION AND CURRENT TRENDS IN CATTLE PRODUCTION

- Milk production:

Table 3. Trends in milk production

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of milking cows</th>
<th>Milk production Total (.000 lit.)</th>
<th>Per cow (lit)</th>
<th>Milk delivery (.000 lit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>257.019</td>
<td>925.436</td>
<td>3.705</td>
<td>498.777</td>
</tr>
<tr>
<td>2003</td>
<td>237.472</td>
<td>979.176</td>
<td>4.137</td>
<td>525.028</td>
</tr>
<tr>
<td>2004</td>
<td>238.050</td>
<td>1.011.469</td>
<td>4.249</td>
<td>532.841</td>
</tr>
<tr>
<td>2005</td>
<td>239.430</td>
<td>1.073.848</td>
<td>4.485</td>
<td>605.721</td>
</tr>
<tr>
<td>2006</td>
<td>234.548</td>
<td>1.063.675</td>
<td>4.535</td>
<td>631.619</td>
</tr>
</tbody>
</table>
Trend of growth:
– better management
- system of state subsidies for production
SITUATION AND CURRENT TRENDS IN CATTLE PRODUCTION

BEEF MEAT:
- EARLIER – production sufficient for own needs and export
TODAY – decline of production, export negligent; smaller number of calves for fattening

CHANGES IN THE PAST FEW YEARS – growing number of slaughtered animals; domestic and imported calves for fattening
### Table 4. Trends in the number of slaughtered animals

<table>
<thead>
<tr>
<th>Animal category</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulls and calves</td>
<td>115.063</td>
<td>111.239</td>
<td>125.088</td>
<td>113.050</td>
<td>165.018</td>
</tr>
<tr>
<td>Other cattle</td>
<td>193</td>
<td>262</td>
<td>265</td>
<td>235</td>
<td>247</td>
</tr>
<tr>
<td>Total</td>
<td>126.673</td>
<td>121.608</td>
<td>138.088</td>
<td>125.869</td>
<td>181.781</td>
</tr>
</tbody>
</table>

Final weight at the slaughtering is growing
Simmental breed:
- most used
- Dual purpose: milk and meat
PRODUCTION SYSTEMS OF SIMMENTAL BREED IN CROATIA

Milk production:
- Small family farms:
  - primarily milk production
  - calves: partly fattened at the farm
    partly sold for fattening or slaughtering
PRODUCTION SYSTEMS OF USING SIMMENTAL BREED

Milk production:
- Large number of farmers: some have low level of production
- Restructuring of the milk sector:
  Operational program of the development of cattle production:
  - new farms with 20-100 cows
  - reconstruction existing farms
  - establish cow-calf system
PRODUCTION SYSTEMS OF USING SIMMENTAL BREED

Beef production
- Small family farms as part of milk production: calves from farms
- Specialised farms for fattening: calves from milk farms or import
- Suckle cows: farms for production of calves for fattening
- Cow-calf system: keeping animals on pastures
- Changes in fattening system – higher final weights: more meat from same number of calves
HISTORY OF SIMMENTAL BREED IN CROATIA

First introduction of Simmental in Croatia at 2nd part of 19th century; owners of large farms, for crossing with domestic breeds

1898.-1905. Croatian government researches most suitable breeds

1903., 1907., 1908. imports from Germany (Baden) Austria (Salzburg) and Switzerland

Attention was given to breeding of bulls for crossing or pure blood breeding

Simmental breed soon becomes dominant

Ongoing link with other populations

Since 1948 (a.i. started) there is a continuing breeding connection with other populations – import bulls for a.i.
HISTORY OF SIMMENTAL BREED IN CROATIA

• Genome structure of the Simmental breed in 1971 (Šebalj):
  • 45.02 % Swiss blood
  • 19.98 % German blood
  • 12.25 % Austrian blood
  • 22.75 other populations and non-defined crossbreeds
• Since 1973 there is a new breeding programme; this genome is different today
BREEDING WORK - HISTORY

• Introduction of Simmental breed—start of breeding work in Croatia
• Breeding organisations: basic goal is to organise use of bulls and expansion of this breed
• 1904-1911 12 organisations established
• 1912 established Association of cattle breeding organisations, started working in 1913—start of organised breeding work in Croatia
BREEDING WORK - HISTORY
BREEDING WORK - HISTORY

- Breeding organisations had herd books from the beginning.
- First herd book from 1908 in Sv. Ivan Žabno
BREEDING WORK - HISTORY

1930 Milk control
1969 Electronic data processing
1996 Apart from milk fat, proteins are also analysed
2003 Milk ingredients are tested in Central laboratory for milk control
- fat, proteins, somatic cells and urea
BREEDING WORK - HISTORY

Central laboratory for milk control
BREEDING WORK - HISTORY

Artificial insemination
1939 research on introduction of artificial insemination
1948 implementation of artificial insemination on population
1957 Association of cattle breeding organisations joined Cooperative Livestock Alliance in order to:

Join breeding work on family and state farms

1960 Croatian Livestock Selection Centre: today Croatian Livestock Centre – inheritors

Today: Breeding work will be implemented by breeders:

- legal basis established
- breeding organisations partly established
Since 1973 genetic improvement is mostly achieved via implementation of the breeding programme. It is implemented by:

- breeders
- Croatian Livestock Centre
- breeding organisations
- centres for artificial insemination
- testing stations
BREEDING WORK – IMPLEMENTATION OF GENETIC IMPROVEMENT OF SIMMENTAL BREED

Central place in programme implementation has production of bulls via selection of parents:
- bull mothers
- bull fathers.

After ascertaining heritage (blood type or DNA analysis), selected calves then go to performance test lasting 120-365 days.

At the end of test the purpose of each bull is decided on the basis of test results (daily growth), exterior and data about breeding values of mother and father as well as reproductive traits.

Best (20-30%) move to a.i.; others are moved to natural breeding or culled.

Young bulls in a.i. pass test insemination and wait for results of progeny test and calculation of breeding values for:
- Calving difficulty
- Type
- Progeny test of meat traits
- Progeny test of milk traits

Calculation of breeding values – BLUP Animal model
BREEDING WORK – IMPLEMENTATION OF GENETIC IMPROVEMENT OF SIMMENTAL BREED

1991.- new version of breeding programme:
  - basic principles of genetic improvement still same; taken into account changes in population and production, and new scientific knowledge

2007- proposal of new breeding programme;
  - partly change in implementation; central role of breeders
  - change of breeding weight of some traits
Table 5. Changes of breeding importance of specific traits in breeding goal

<table>
<thead>
<tr>
<th>Trait</th>
<th>Breeding programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>55</td>
</tr>
<tr>
<td>Meat</td>
<td>45</td>
</tr>
<tr>
<td>Fitness</td>
<td>-</td>
</tr>
</tbody>
</table>
Scheme 1. Overview of the proposal of the breeding programme for Simmental breed

- **Bulls for a.i.** (40 – 50)
- **Imported bulls** (live, semen., embryos)
- **Bull fathers** (3 – 5)
- **Foreign Simmental populations**
- **Simmental cows**
  - Total population (170,000 cows)
  - Active population
    - Under milk control (57,000 cows)
    - **150 – 200 bull mothers**
    - **Bull mothers (MOET)**
      - **Index**: development and pedigree type
      - Reproduction traits
    - **Bull mothers** (planned mating)
      - **70 – 80 male calves**
      - **Performance field test**
    - **10 – 15 young bulls**
      - **Bulls for**
        - Natural mating
        - Culling
      - **Milk Meats**
      - **Type**
    - **2 – 4 best bulls**
      - (bulls for artificial insemination)
      - **Milk Meats**
      - **Type**
Breeding programme sets new generations of bulls will come from:
- Domestic breed
- Other populations:
  - male calves moving to performance test
  - bulls in test
  - tested bulls
Greater emphasis is placed on breeding cooperation with other Simmental populations.
BREEDING WORK – RESULTS OF THE IMPLEMENTATION OF THE BREEDING PROGRAMME

Breeding programme has been implemented for almost 35 years

Every year:
- 350-400 bull mothers inseminated with semen of 5-6 best bulls
- approx. 70 male calves for performance test

Until 2006 performance test was done in testing station in Varazdin; since then in field conditions (field test)
BREEDING WORK – RESULTS OF THE IMPLEMENTATION OF THE BREEDING PROGRAMME

Table 6. Results of performance test in Performance test station Varazdin

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of tested animals (1974-2005)</td>
<td>1.744</td>
</tr>
<tr>
<td>Total number of tested animals (1974-2005)</td>
<td>508</td>
</tr>
<tr>
<td>Average daily gain during test (120-365 days) in grams</td>
<td>1609.65</td>
</tr>
<tr>
<td>Average wither height at the end of the test (cm)</td>
<td>129.74</td>
</tr>
<tr>
<td>Average chest girth at the end of the test (cm)</td>
<td>197.32</td>
</tr>
</tbody>
</table>
Progeny test of fattening traits and meat quality is made in test station, and since 2007 also on the basis of EUROP carcass data for:
- class
- net growth
- carcass percentage

Results:
- Performance test: daily growth 1.609 gr.
- Progeny test: daily growth 1.357 gr., carcass percentage 58,23 %, muscle percentage 62,37 %
BREEDING WORK – RESULTS OF THE IMPLEMENTATION OF THE BREEDING PROGRAMME

Milk traits
AT and B method
Lactation production in 2006
4.456-4,07-181-3,35-149
Genetic improvement for milk traits (lactation production)
Genetic improvement of milk traits (lactation)

\[ y = 31.088x - 61664 \]

\[ R^2 = 0.7104 \]
ARTIFICIAL INSEMINATION

From 1948 on more than 75 % of population Simmental bulls are in 4 centres for artificial insemination

Table 7. Structure of live Simmental bulls for artificial insemination (2007)

<table>
<thead>
<tr>
<th>Bulls from breeding programme - live</th>
<th>Bulls from import - live</th>
<th>Total no. of live bulls</th>
</tr>
</thead>
<tbody>
<tr>
<td>In test</td>
<td>Tested</td>
<td>In test</td>
</tr>
<tr>
<td>17</td>
<td>15</td>
<td>20</td>
</tr>
</tbody>
</table>
CONCLUSION

1. Simmental breed is in Croatia for over 100 years
2. Croatian livestock production is mostly based on production traits of Simmental breed which will continue in future
3. There is an ongoing reform of cattle production; there are large production units - farms
4. Ongoing establishment of new organisation of breeding work with formation of breeding organisations with breeders as primary implementors of the breeding work
5. Active breeding cooperation in genetic development of Simmental populations of individual countries will contribute to better genetic improvement of the breed as a whole