Implementation of genomic selection in small populations – Croatian case
Z. Ivkić, M. Dražić, Z. Barač, M. Špehar

Speaker: Marija Spehar
Implementation of genomic selection in small populations - Croatian case

Marija Špehar, Zdenko Ivkić, Maja Dražić, Zdravko Barač

Croatian Agricultural Agency,
http://www.hpa.hr/
Structure of Croatian cattle population

- Simmental: 62.8%
- Holstein: 24.3%
- Brown Swiss: 2.8%
- Crossbreeds: 5.6%
- Other: 4.3%

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[Logos: HPA, ICAR]
Figures and milk recording cows in Croatia

- Cattle population – 462,000
- All cows – 168,000
- Dairy and dual purpose cows – 151,000
- Milk recorded cows – 93,000
- Herds in milk recording – 5,000 (avg. 19)
Past – present – future

- Transition period – lack of powerful breeding organizations
- Limitation factors
  - Use of average bulls - do not provide expected genetic gain
  - Huge import of heifers
  - Small number of tested bulls from the national breeding program
- Revitalization - genomic selection (GS)
GS in Simmental breed

- German-Austrian genomic evaluation system
- July 2013
- Close relation to Austrian and Bavarian breeding
  - Bull’s sires
  - Long-standing import of breeding heifers
  - Bull’s semen for artificial insemination (AI)
Goals of GS

• To maintain and improve production of semen from domestic young bulls
• Genomically tested young bulls
• Future perspectives - potential bulls dams
GS in Holstein breed

- German Holstein genomic selection system
- March 2016
- Long-standing import of breeding heifers
Goals of GS

• Produce young females to
  – Reduce import of breeding animals
  – Produce own replacement heifers
  – Ensure market of female breeding material

• Perspectives
  – Intergenomics for small populations (IgHOL)
(Pre) Selection criteria

- Young male and female candidates (from Croatian population)
  - Progenies of the genomically and progeny tested sires
  - Pedigree (interesting lines)
  - Parent average
  - Dam exterior
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Partners

- Breeding Associations
- Croatian Agricultural Agency
- AI centres
Selection criteria

Total merit index (GEBV) ≥ 130

Without known genetic defects

Seven young bulls were selected as bulls for AI
Distribution of GEBV for main group of traits

- **Fitness**: N = 34, 137, 71, 4, 3
- **Total Merit Index**: N = 66, 139, 41, 3
- **Meat Index**: N = 94, 128
- **Daily Milk Index**: N = 71, 142, 34, 2

The diagram shows the distribution of GEBV for different traits, with categories for fitness and total merit index on the left, and meat index and daily milk index on the right. The x-axis represents the distribution of GEBV, with intervals from 100 to 130.
Croatian bulls in Neustadt Aisch centre

Wamures

Mozilla
Selection criteria

Total merit index $\geq 150$

Without known genetic defects

None reached these standards so far
Distribution of GEBV for main group of traits

- **Distribution of GEBV**
  - **daily milk index**
    - N: 9
  - **conformation index**
    - N: 9
  - **total merit index**
    - N: 9
  - **reproduction index**
    - N: 9

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**GS - benefits and obstacles**

**Benefits**
- Parentage verification
- Information about major gene/disease defects
- Increased usage of semen from domestic bulls - from 8% in 2012 to 23% in 2016
- Bring back breeders confidence in the national breeding program

**Obstacles**
- Small number of included breeders
- Insufficient use of the ‘best bulls’ as bull sires
- Adaption of German system to the national
- A high price of GS
- Lumpy skin disease
Conclusions

• Croatian Agricultural Agency - deeply included in genomic services
• Farm level - motivation of breeds to use benefits of genomics
• National level
  – Breeding revitalization through production of genomically tested young bulls
  – Usage of semen from domestic bulls
  – Marketing semen of two young bulls internationally
Perspectives

- InterGenomics Holstein service
  - Very good solution for small population - low input for quality service
  - No duplication of work process – fast implementation
  - Results for all animals at all scales of participation countries
  - An efficient way of connecting small populations
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