Implementation of genomic selection in small populations – Croatian case

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Abstract

Dual purpose Simmental breed represents dominant cattle population in Croatia which is mainly raised in limited number of countries (Germany, Austria, Czech Republic, north Italy, Slovenia, and Croatia). Holstein is the second largest Croatian breed population. In order to maintain and improve production of young Simmental bulls based on genomic breeding value, Croatia joined to German-Austrian system of genomic evaluation in July 2013. The inclusion was justified since the breeding of Croatian Simmental is closely related to Austrian and Bavarian breeding. Bull's sires and dams are coming from these populations and there is a long-standing import of breeding heifers and bull's semen for artificial insemination (AI). In contrast to Simmental, the main goal of genomic improvement in Holstein population is based on female calves in order to identify potential dams at a young age. Croatia does not have a sufficiently large reference population. Therefore the potential female candidates were included in German Holstein genomic evaluation system, starting from 2016.

Young male and female candidates were chosen based on parent average, interesting bull lines, as well as dam exterior. Based on these criteria, 220 young Simmental and 80 Holstein calves were selected, genotyped and genomic breeding values were estimated for them. When calves were ranked based on genomic breeding values, around 10% of calves are wrongly assigned to the top of the list compared to the rank based on parent average. Additional benefits of genomics, beside genomic evaluation, are parentage verification and information about major gene/disease defects specific either for Simmental or Holstein populations. The recommended criterion for entry of potential young Simmental bulls in the centres for AI is total merit index over 130. Furthermore, candidates should not be carriers of known genetic defects or be recessive for them. On the basis of agreed criteria, seven young bulls were selected as potential bulls for AI. The recommended criteria for selection of Holstein female candidates are a total merit index of 150, without gene defects and so far none of them reached these standards.
Croatian Agricultural Agency as milk recording organization is deeply included in genomic services through recording data, breeding value estimation and consequently parent average calculations, processing and publishing of the genomic evaluation results. At the farm level, genomics for females becomes an attractive option to capitalise benefits of using this technology. At the national level, Croatia has gone from a country that imported most of its genetics to a country which now uses own semen. The usage of genomic bulls has increased from 8% of all used bulls in 2012 to 23% in 2016. In addition, Croatian AI companies are now marketing semen of two young bulls internationally.

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