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METHODS OF ASSESSMENT OF WORTH OF GENETIC RESOURCES OF ANIMALS

The purpose. Analysis and generalization of existing methods of assessment of genetic worth of animals. **Methods**. Materials and publications which map foreign experience of assessment of genetic resources of animals are studied. **Results**. The survey of existing methods of assessment of genetic worth of animals is made. International experience of assessment of breeding programs based on formation of selection indexes is surveyed. **Conclusions**. Genetic worth of cows and bulls of dairy and dairy-meat breeds is evaluated on the basis of special procedures of assessment of breeding value, genetic intransmutations (trends) and determination of economic significance of these attributes in indexes of selection.

Key words: genetic resources, breeding value, indexes of selection, breeding.

Problem grounding. Each breed of farm animals is being bred with certain aim. Therefore, each breed has its own value. It’s a pity, but value of new commercial breeds is not doubted. But, objective and true breed estimation should have reliable criteria. International and native scientists and breeders the last century work over the problem of revealing such reliable criteria. More successful work at this direction was done by specialists abroad. Greater achievements were done in the field of commercial breeds’ evaluation. But, certain achievements are available, concerning unique value of local breeds.

Aim. To analyze international experience of animal genetic resources (AnGR) estimation.

Methods. Investigated materials and publications, which highlights AnGR estimation experience abroad.

Results. Methods of AnGR estimation can be divided into three groups, grounded the aim, for which this estimation can be done [13]. The first group

comprises methods, which define correspondence of expenses for the conservation of these resources programs, i.e., finds out animal value for the environment. This group of methods includes method of unpredicted evaluation, grounded at the willingness to pay (WTP) and willingness to accept payment (WTA) for the conservation of one or other breed; method of productive adverted expenses, which defines the size of potential loses in the case, when conservation measures will not be done, substitutive (alternative value) and of the least expenses. Methods of this and the next group more used for local AnGR and ex-situ collections. The second group of methods comprises methods, which define real breed economic importance, therefore, determine breed value. This group includes methods of mutual proposal and demand, cross-sectoral of farms and husbandries, market share analysis and intellectual properties and contracts. The third group more concerns the estimation of commercial breeds genetic value and comprises methods of «priorities installing at the programs of genetic resources breeding, therefore certain traits' value determination» [13]. This group includes method of breeding programs evaluation, genetic production function, hedonic and farm level profit modelling.

The most informative and widely used at the group is the method of breeding programs evaluation, which is used for expenses and profit estimation of selection programs and/or new breeds creation. Profits and expenses, when use new breeds/animals are being compared and the conclusion is done on their further appointment. For this aim selection indices as the means for multiple selection for several traits is widely and successfully used. Alike mentioned method is the method of genetic production function, but it is used for the breed/animal genetic value prediction.

In modern selection programs besides milk production one obligatory includes such traits as exterior type, limbs strength, fertility, udder quality and its health (number of somatic cells in milk), longevity and some other traits. In European countries weight of these traits is rather different, which is connected as with their economic importance, so with the aim and tasks of selection, which should be resolved by each Dairy Cattle Breeding Associations at certain stage of selection work with breeds [1-6].

Generally, traits, which were included into national indices of different countries, when asssessing Holstein cattle were grouped into three main groups – productivity, longevity and health and the last – reproductive ability. Their relative weight respectively is 59,5, 28,0 and 12,5 %. The main difference between selection indices of different countries was assignment of different weight for production [7, 9, 15-20, 32, 33].

The biggest weight for the productivity is given in Israel (80 %), but in the Netherlands this diget is only 34 % (the lowest between compared) [16]. Noticable attention is given to productivity in British index PLI [10-12] and Japanese NTP (in both cases 75 %) [34]. Except the Netherlands, all countries gave to productivity not less than 50 % in indices [22-28] (Fig. 1).

At the TOP-index (one of two indices, which are used in Great Britain) the biggest weight is given to longevity. TPI of USA follows it (41 %) [31, 32, 37-39], then German RZG (40 %) [10-12, 14], Canadian LPI (38 %) [8, 9] and Spanish ICO (37 %). Israel doesn't give any special attention to this component. Other indices with low relative share on disease resistance та herd-being is Australian APR (16,5 %) [33] and British LPI (20 %) [10-12].

The most attention in Dutch S-index is given to the component "health and reproductive ability" (37 %) [16]. French ISU follows it (25 %) [40-43]. American Net Merit and Israel PD01 give by 20 % for this component [40]. Japanese NTP gives no special attention to the group of components "health and reproductive ability", and Spain gives only 3 % to this component at their index (Fig. 1) [34].

United States has 2 categories of indices for the evaluation of bulls of dairy breeds – it's widely used indices and indices of concrete dairy breeds' associations [22-25, 31]. Associations of breeders of different breeds in USA [12, 44, 46] use indices mainly as means for bulls of different breeds ranging (Table 2).

Literature says, that to form good herd one need to have a sire, whose Net merit index is 80 % and more [34, 46].

In Canada major indices for the evaluation of bulls of dairy breeds are index of breeding value (EBV), to calculate which there are two approaches – they calculate and publish indices of breeding value on breeding and productive traits, and the

second – show estimated breeding value at the scale, which is clear for the farmer [8, 9].

1. Selection indices of dairy breeds' bulls evaluation [20, 29, 30]

Country	Index	Index structure
Canada	LPI	6(3F + 8P) + 4(3 general exterior class + 4 udder + 2 hoofs and limbs + volume)
USA	MFP$	0,04756M + ,68F + 1,52P
	TPI	50[3(P/19) + (F/22,5) + (type/7+ (udder structure/,8] + 234
	NMI	0,7 MFP$ + 11,028 productive life (duration of husbandry use) – 27,528 (score on somatic cells – average breed's score on somatic cells)
Italy	ILQ	4,5(-0,173M + F + 11,3P)
	UCI	0,18 fore udder + 0,16 height of attachment of rear udder + 0,05 width of the rear udder + 0,2 central udder ligament + 0,25 udder depth + 0,16 teat disposition
	ILQM	0,9ILQ + 180UCI
Netherlands	INET	-0,15M + 2F + 12P
	STIERSOM	63 INET + 20,4 milk system + 8,5 hoofs and limbs + 3,4 rumps setting/width + 1,7 volume + body structure + 2 speed of milk outflow
Great Britain	PIN	-0,039M + 0,94F + 2,75P
	PINII	-0,015 M + 0,6 F + 3,84 P + 3,9 angularity + 1,8 limbs setting + 4,8 udder – 4,1 teat length
France	INEL	1,15(P + ,3P%)
	ISU	0,7 INEL + 0,25 (0,6 udder + 0,3 volume + 0,1 limbs) + 0,05 speed of milk outflow
Germany	RZM	92 + 0,15F + 0,6P
Denmark	Y-індекс	-0,004M + 0,28F + 0,724P
	I-індекс	Daily gain + muscles + feed consumption + 100
	S-індекс	0,5 Y-index + 0,31 I-index + 0,23 daughter fertility +

		0,13 calving index + 0,18 mastitis resistance + 0,19 body structure + 0,34 hoofs and limbs + 0,51 udder + 0,15 speed of outflow + 0,03 temperament
Israel	PD91	-0,274M + 6,41F + 34,85P
New Zealland	PBI	-0,2771M + 0,2521F + 1,0251P
	LI	-0,2767M + 0,4226F + 0,8541P
	PI	-0,2768M + 0,3755F + 0,9014P
	TBI	PBI + keeping index + efficiency index + body structure index

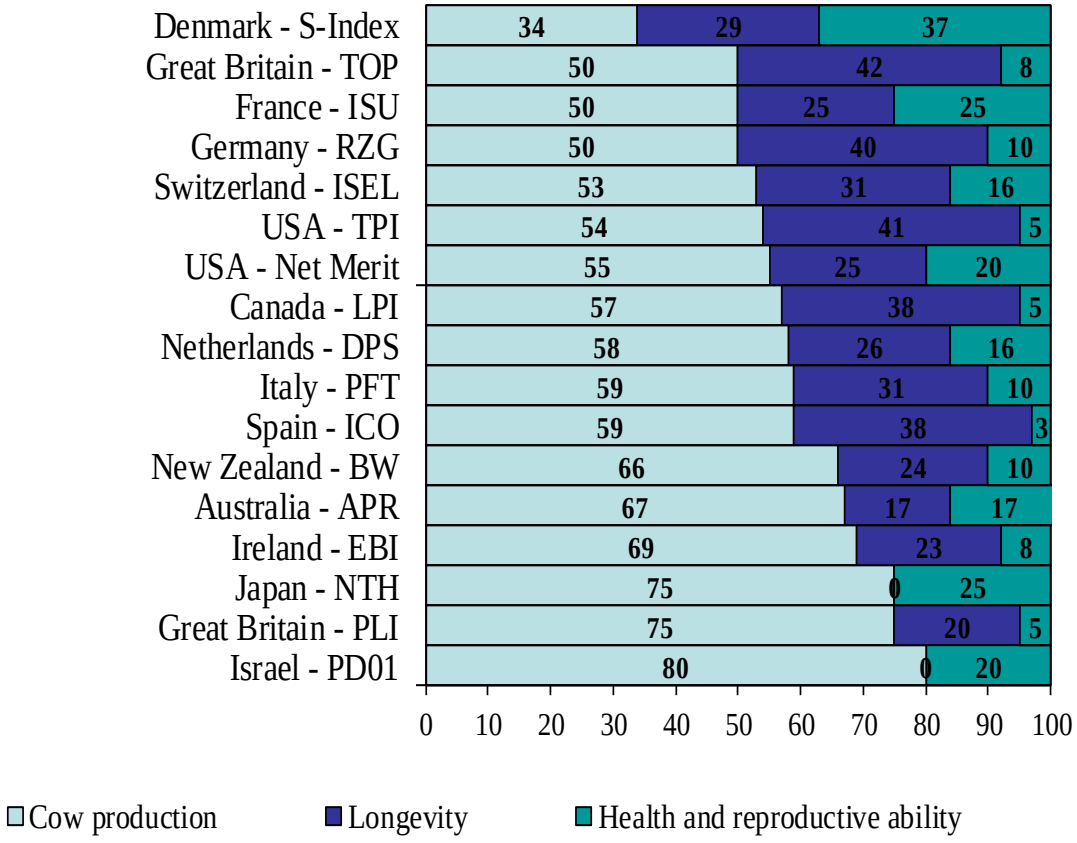

Fig. 1.Relative weight of selection traits of different countries, % [21, 34-37, 43, 45]

Lifetime profit index (LPT) is appointed for the farmers, which sell cattle and plan to have maximum profit for the excellent exterior [8].

Total economic efeciency index (TEV) is used for bull selection. It consists of three sub-indices [8]:

$$TEV = (10 \times PROD + 4 \times LONG + 1.5 \times UDDER) \times 26,$$

де PROD – sub-index on milk production (protein-milk), LONG – sub-index on the duration of productive life, UDDER – sub-index on udder traits.

So, each country develops appropriate evaluation methods, selection indices, value of which are determined by measurement units value of one or other trait and by relative weight of each in complex index, that's why its structure in different countries is different [17, 21-25, 28, 36].

2. Selection indices for bulls of dairy breeds evaluation in USA [31]

Name of index, association	Traits, which are included at index calculation
Commonly used selection indices	
PTA (predicted transmitting ability)	Milk production, health, type
NM$ (net merit)	Protein, fat, productive life, somatic cell number, udder form, form and health of hoofs and limbs, body structure type, daughters' production
Indices of dairy breeds associations	
PTI (production and type index), Ayrshire association	Protein, fat, type, daughters' fertility level, udder depth, somatic cell score
PPR (progressive production index) Swiss association	Protein, fat, somatic cell score, duration of productive life, limbs and udder state, daughters' fertility level
PTI (production and type index), Guernsey association	Protein, fat, somatic cell score, duration of productive life, limbs and udder state, daughters' fertility level, type and strength
TPI (total production index) Holstein association	Protein, fat, somatic cell score, duration of productive life, limbs' state, shape and look of udder, daughters' fertility level, type, daughters' calving ease, daughters' stillbirth calves number, dairy shapes
JPT (Jersey production	Protein, fat, fitness traits index, duration of productive

index), Jersey association	life, somatic cell score, daughters' fertility level

Intensive international exchange with genetic material caused necessity to provide compatibility (to unify) mentioned complex selection indices of different countries of evaluation. To coordinate such work in 1983 European association of Animal Production (EAAP), International Dairy Federation (IDF) and International Committee on Registration of Production of Milk Animals (ICRPMA) under the support of FAO created international committee INTERBULL (International bull evaluation service), which since 1988 was transformed into constant committee ICRPMA. Methodically such unification of estimations can be done by means of proposed in 1985 by Guelph (Canada) University Doctor Larry Schaeffer method of linear model of bulls' evaluation of different countries into single international evaluation of breeding value. Now such procedure of calculation is called MACE (multitrait across country evaluation).

Conclusions. 1. Methods of genetic resources value evaluation can be divided into three groups concerning the aim, for which this evaluation is done. To evaluate commercial breeds the method of breeding program estimation or the method of selection indices is the most widely used.

2. Analysis of international farm animal science literature for the last decade found that abroad a number of traits, which are included into selection process is noticeably increased. It caused switchover into index system of animal evaluation and selection. In common the evaluation of dairy and double direction cows and bulls' genetic value is done using special methodic of breeding value evaluation, genetic changes (trends) and defining of economic importance of these traits in matching indexes.

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