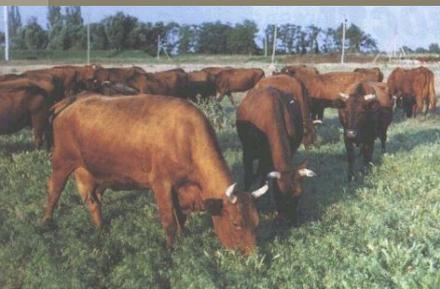




Wageningen, The Netherlands, 14-18 June 2011

1



Regional Workshop

"*In vivo* conservation of farm animal genetic resources: Guidelines and Challenges in practice"

"Some approaches to preservation by a method *in situ* of the gene pool of breeds of principal species of agricultural animals of Ukraine"

The reporter: Igor Guziev - Deputy director of the Institute of Animal Breeding and Genetics of the NAASU, the National Coordinator for management AnGR from Ukraine

The printed materials of scientific discussion of
"the Problem of preservation of a genofond of animals"

УКРАЇНСЬКА АКАДЕМІЯ АГРАРНИХ НАУК
Інститут розведення і генетики тварин



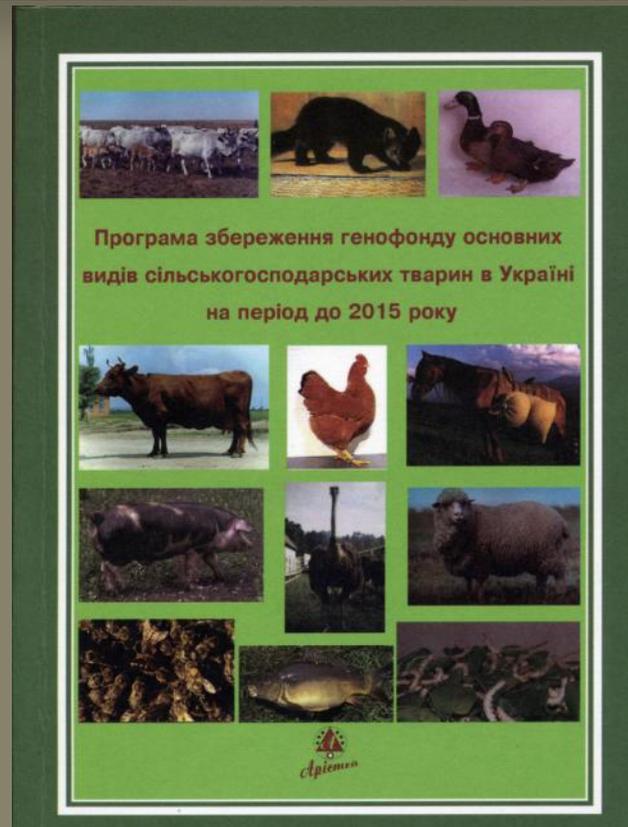
**ПРОБЛЕМИ ЗБЕРЕЖЕННЯ
ГЕНОФОНДУ ТВАРИН**

УКРАЇНСЬКА АКАДЕМІЯ АГРАРНИХ НАУК
Інститут розведення і генетики тварин

Методологічні аспекти збереження генофонду сільськогосподарських тварин



Program of preservation of a gene pool of the basic species agricultural (farm) animals in Ukraine for the period till 2015



In book and in the Program developed on its base – are covered: historical, theoretical and methodological aspects of preservation of a gene pool; are characterized: modern conceptual and methodical principles of strategy of preservation of a genetic diversity of domestic animals, which are based on a combination of a complex of selection, genetic, biotechnological and organizational actions.



The basic strategic postulate:

“ We should keep everything, that has reached up to now, selection property (heritage) of the nation (first of all, all native and local, including again created commercial breeds), including again created commercial breeds and also reserve (for subsequent use in rockforming process and different systems of crossbreeding) thoroughbred genofund of domestic micro-populations of the best world (global) genetic resources “.



**Preservation of a gene pool (biodiversity)
of animal industries of Ukraine**

Strategy of aggregation of problems

The organization of breeding service in the state



We convince the government that now the basic priority not only of inspection, monitoring and the characteristic, but also in all management AnGR there should be a creation of the state centralized Information Database, and also the Center of Genetic Examination of breeding resources of agricultural animals of Ukraine.



Gene pool object –

determined by selectors for long preservation minimally necessary volume breeding (a micro-population in conditions in situ) and genetic (conditions ex situ, in particular in cryo-bank) of resources of the certain genus, kind, subspecies, breed, offspring or type of agricultural (farm) animals.



Domestic classification:

- 1 category [1]** – domestic gene pool object which already at the moment is on the verge of disappearance;
- 2 category [2]** – domestic improving breeds (or their intrabreed: types, offspring's, populations), which for given time have rather normal total number, genealogic structure and the commercial status;
- 3 category [3]** – reserve gene pool of the best foreign improving breeds (offspring's, populations).



The international classification:

1. **Local breeds:** breeds that occur only in one country.
2. **Transboundary breeds:** breeds that occur in more than one country. These are further differentiated as:
 - 2.1. **Regional transboundary breeds:** transboundary breeds that occur only in one of the seven SoW-AnGR regions*.
 - 2.2. **International transboundary breeds:** transboundary breeds that occur in more than one region.

* **Note:** SoW-AnGR regions: seven regions were defined for the SoW-AnGR: Africa, Asia, Europe and the Caucasus, Latin America and the Caribbean, the Near and Middle East, North America, and the Southwest Pacific.

Amount gene pool objects (populations)

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Kind of animals	Amount of objects
Cattle (Large horned livestock)	61
Horse	16
Sheep	28
Goat	7
Pig	23
Hen	86
Turkey	15
Goose	21
Duck	22
Pheasant	18
Quail	12
Guinea fowl	4

Amount gene pool objects (populations)



Meat pigeon	12
Ostrich	3
Fish	23 (from 12 kinds)
Rabbit	17
Nutria	10
Chinchilla	7
American mink	17
Polecat furo	4
Fox	3
Arctic fox	2
Bee	8
Bombyx	131
In total	550



The main obstacles/problems and permission ways are:

Thus an obstacle for the description and the analysis of tendencies is the unknown person for many of them the risk status (except breeding populations).

These statuses to us still should be found out in the long term.



The gene pool status –

it is the organizational form of

preservation of the gene pool objects

(a appropriate condition of the subject of

a breeding affair in animal industries,

which is defined by a format and

specificity of its activity, directed on

preservation of a genofond).



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1. The gene pool population (preserve) – structure which provides thoroughbred breeding of the defined aggregate of animals of one breed in different genofond farms.

2. The gene pool herd – the group of thoroughbred animals allocated for conservation and a reconstruction of a genofond of breed.

3. Relic herd – the group of animals which concern to disappearing breed of animals.

4. Collection herd – the modular (composite) herd submitted by groups of animal different breeds and kinds.



5. Reservation (herd of a reserve genofond) – the gene pool farm, which specializes on breeding of animal of the specified improving foreign breeds or types.

6. The gene pool nursery – the gene pool farm, where separate examples of animals contain.

7. National bank of genetic resources of animals and other cryo-banks – special depository for long-term conservation of a genetic material of animals.

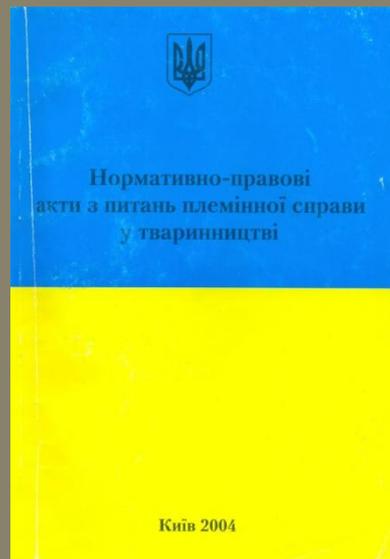


The gene pool subject (farm) –

the subject of a breeding affair (business) in animal industries, to which on a direction of its activity it is appropriated of the gene pool status, therefore it acts as the carrier of the legal rights and duties concerning the contents (guarantee of functioning) specified organizational form of preservation of a genofond.



The main obstacles/problems and permission ways are:



The big problem is absence of corresponding standard base. But we could prepare last year for the Ministry of an agrarian policy and the foodstuffs, the project “Disposition (regulations) about definition and preservation of a gene pool of local and disappearing breeds of agricultural animals”.



Logic of algorithm of calculations of key parameters of the gene pool micro-populations

Stages of definition:

1. Effective population size;
2. Female total number in population;
3. Male's part of populations and
a corresponding ratio of sex in them.

Necessary volume of breeding resources for preservation of the gene pool objects of some species of farm animals



Species	$N_{\text{♀}}$	$N_{\text{♂}}$	/	Lines	Note
Dairy and combined cattle 	100	33	1 : 3	3	Minimum
	300	27	1 : 11	4	Critical optimum
	500	26	1 : 19	6	Optimum
	1000	25	1 : 40	8	Maximum
Beef cattle 	100	36	1 : 3	3	Minimum
	300	29	1 : 10	4	Critical optimum
	500	28	1 : 18	6	Optimum
	1000	27	1 : 37	8	Maximum

Necessary volume of breeding resources for preservation of the gene pool objects of some species of farm animals



Species	$N_{\text{♀}}$	$N_{\text{♂}}$	/	Lines	Note
Horse 	70	17	1 : 4	2	Minimum
	150	15	1 : 10	3	Optimum
	500	14-17	1 : 29 - 36	6	Maximum
Sheep 	200	41	1 : 5	3	Minimum
	350	38	1 : 9	4	Optimum
	500	37	1 : 14	6	Critical maximum
	1000	35	1 : 29	8	Maximum

Necessary volume of breeding resources for preservation of the gene pool objects of some species of farm animals



Species		$N_{\text{♀}}$	$N_{\text{♂}}$	/	Lines	Note
	Pig	100	25	1:4	3	Minimum
		500	21-50	1:10-24	5	Optimum
		1000	21-100	1:10-48	8	Maximum
Hen	 Egg	220	72	1:3	4	Minimum
		300	67	1:3	5	Optimum
		500	61	1:8	7	Maximum
	 Meat	250	84	1:3	4	Minimum
		300	79	1:4	5	Optimum
		500	72	1:7	7	Maximum

Necessary volume of breeding resources for preservation of the gene pool objects of some species of farm animals



Species	$N_{\text{♀}}$	$N_{\text{♂}}$	/	Lines	Note
	42	84	2:1	4	Minimum
	63	126	2:1	5	Optimum
	84	168	2:1	6	Maximum
	200 bee-families and 2400 female bees				Minimum
	1000 bee-families and 12000 female bees				Optimum
	3000 bee-families and 36000 female bees				Maximum
	150	150	1:1	2	Minimum
	200	200	1:1	2	Optimum
	250	250	1:1	2	Maximum



Directions of favorable pressure of separate structural factors on maintenance of a genetic diversity in the closed micro-populations

Increase:

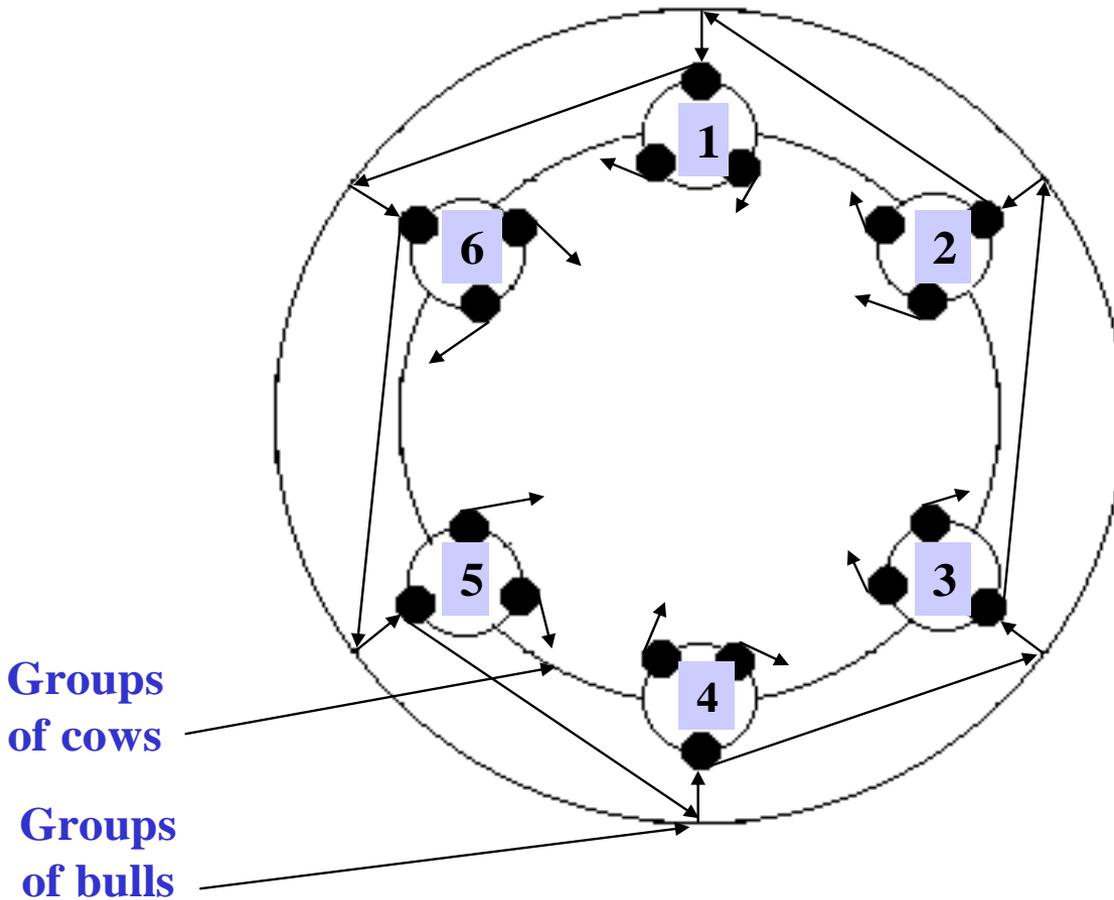
- Population size
- Shares of a male
- Uneven-age male's representation
- Genetic migration
- Interval between generations

Assistance to expansion of a genetic diversity in gene pool micro-populations

Decrease:

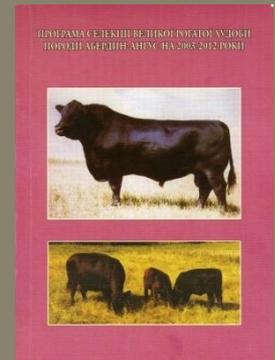
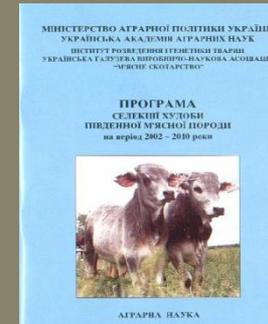
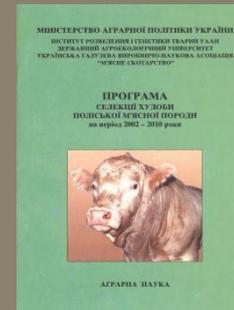
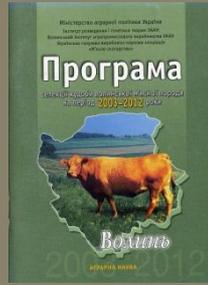
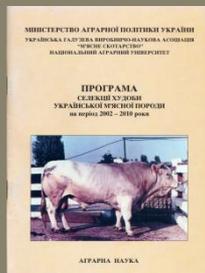
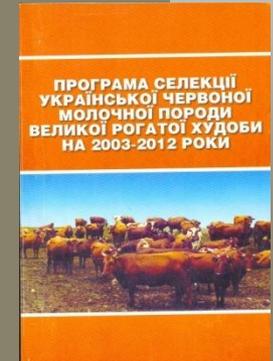
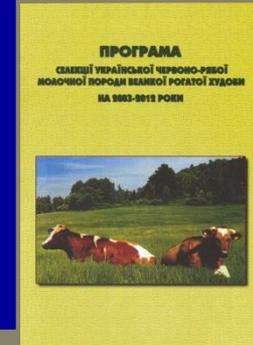
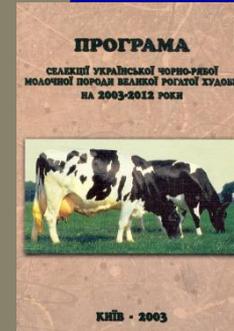
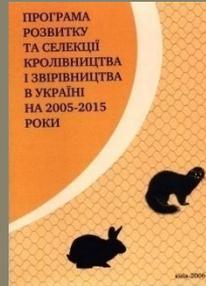
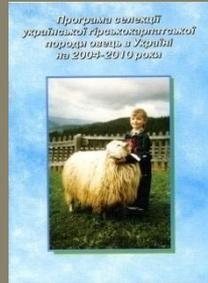
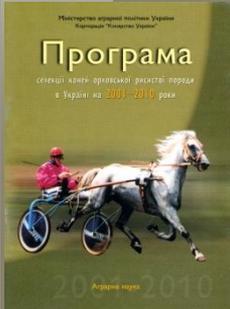
- Linear (family) differentiation
- Level of replacements of herd

The circuit of matching of pairs inside groups and between related groups in closed gene pool herd of cattle



Phenotypic characterization of AnGR in my country

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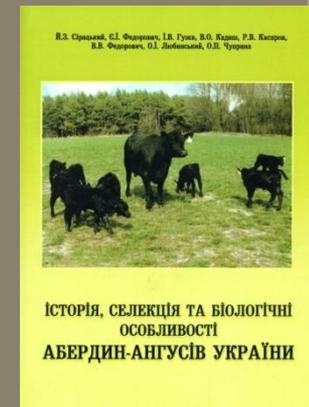
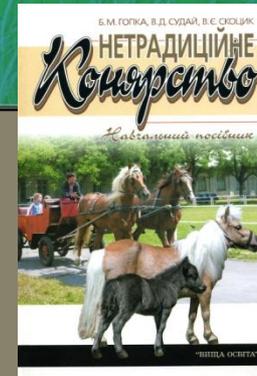
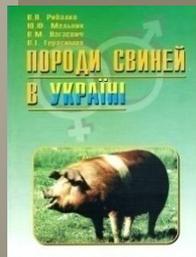
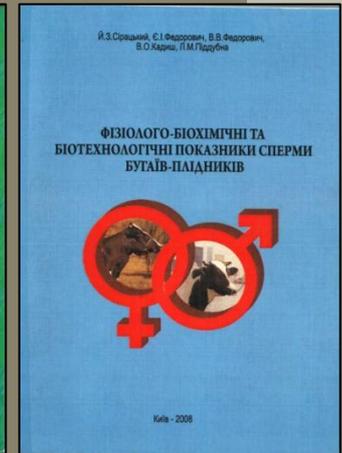
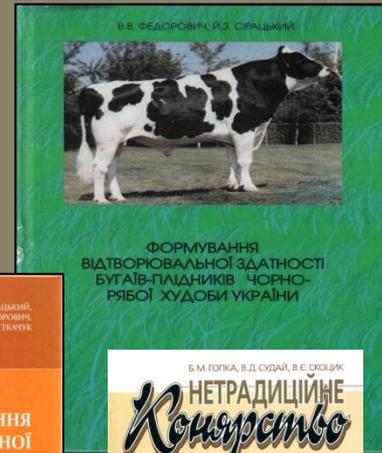
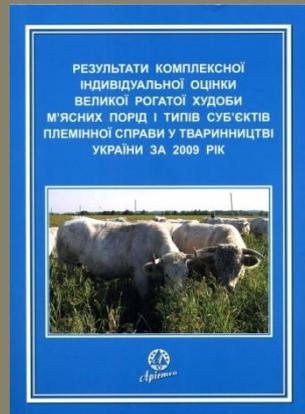
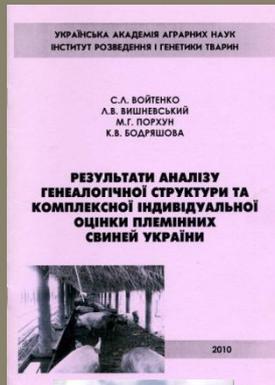
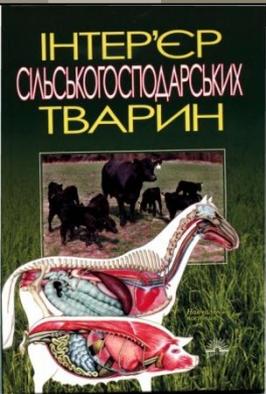


- Earlier variety of government programs of perfection (selection) of the main breeds of principal species of agricultural animals in Ukraine for the period till 2010-2012 has been developed.

In them were, naturally, the basic characteristics of these breeds are described.

Phenotypic characterization of AnGR in my country

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Last years the Ukrainian scientists have published variety of the monographies devoted to detailed enough description of separate breeds or a complex estimation, interior features, formation of reproductive ability and meat efficiency of a considerable quantity of breeds in comparative aspect. Now materials for the edition in the near future the special Catalogue with detailed description AnGR of Ukraine collect.



The main obstacles/problems are:

- Obstacle there is an insufficiency of a methodical basis of significant estimations of adaptable potential of animals.
- Last years a problem is access of domestic experts on large private enterprises which, first of all, specialize on poultry farming and pigstry, and are guided by import AnGR.
- Besides, many breeds are presented by small number and dispersed on small personal (family) economy of agricultural population across all Ukraine.
- The most serious problem in phenotypic characteristic AnGR is absence of the centralized automated information system of registration of producing capacity of basal species of agricultural animals in Ukraine.

THE BASIC STAGES OF SELECTIVE-GENETIC MONITORING



INSPECTION AND INVENTORY BREEDING RESOURCES

Phenogenetic researches

The zootechnic
and the veterinary
information

Cytologic and
molecular tests

The population an estimation of breeds

The population
parameters

The genetic analysis of structure of breeds

The analysis
on pedigrees

Genetic
marking

REVEALING OF GENETIC POTENTIAL OF BREEDS

Head of livestock
breeding animals

The cryo-banks of
gametes, embryos, DNA

The information on
genetic processes in
populations

STRATIFICATION ГЕНОФОНДОВОЙ OF PRODUCTION

SYSTEM OF PRESERVATION A GENETIC DIVERSITY OF ANIMALS



Genetic examination of animals

Immunogenetic
researches

Cytogenetic
researches

Fenogenetichesky
researches

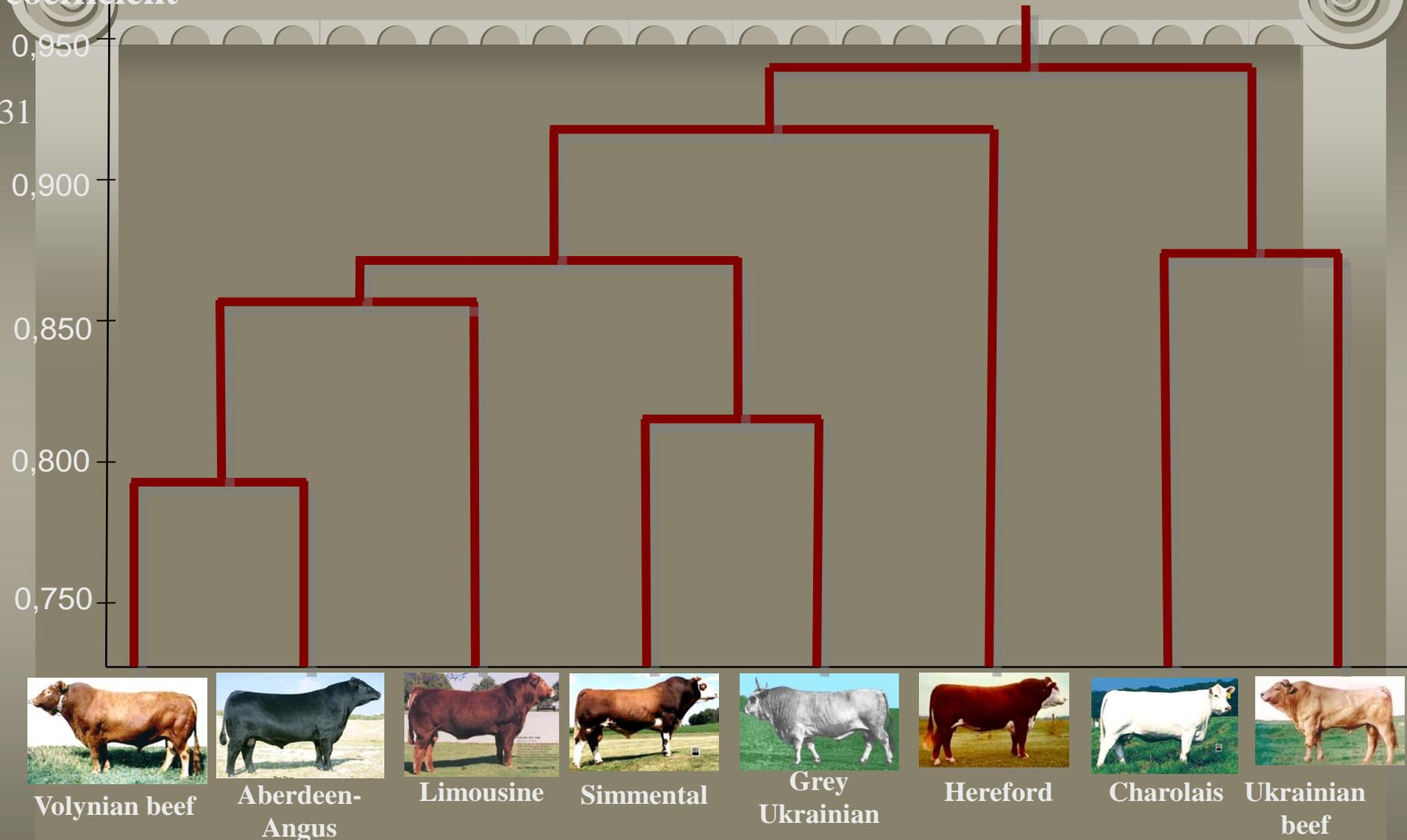
Researches of polymorphic
aluminous systems

DNA - researches

DIRECTIONS OF RESEARCHES

Divergence coefficient

Molecular genetic characterization of AnGR in my country



Volynian beef



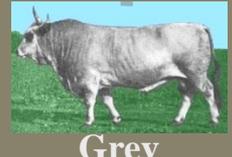
Aberdeen-Angus



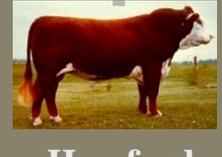
Limousine



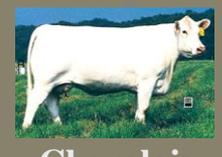
Simmental



Grey Ukrainian



Hereford



Charolais

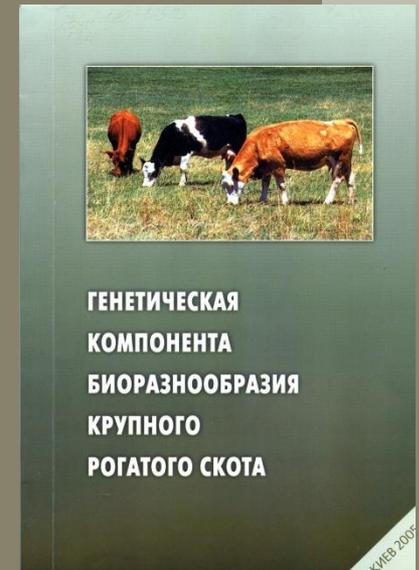
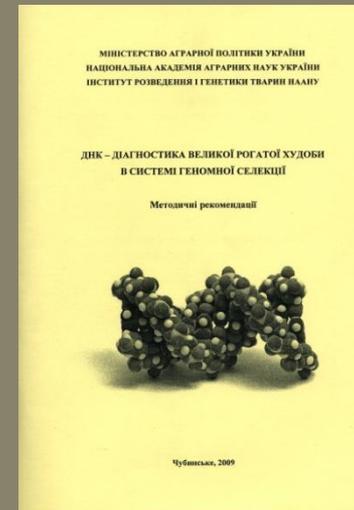
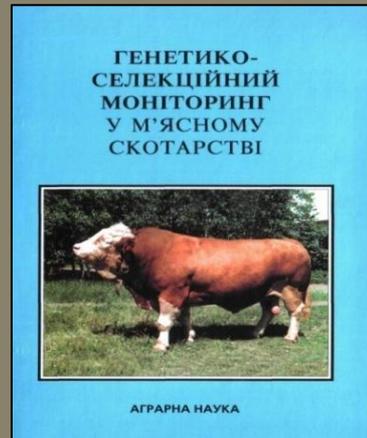
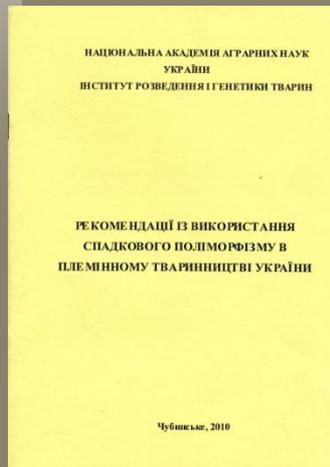


Ukrainian beef

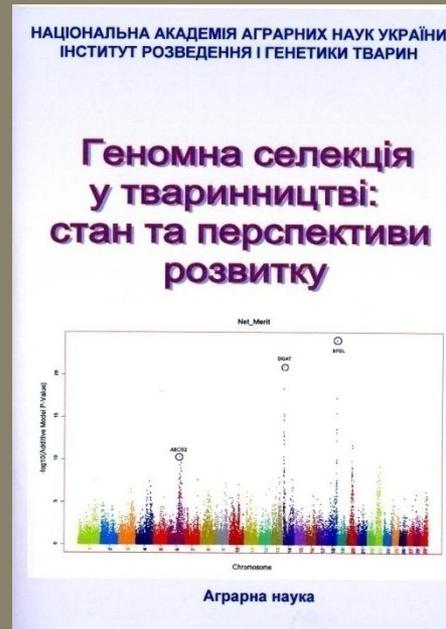
The divergence of breeds of meat cattle on alleles systems EA V

Molecular genetic characterization of AnGR in my country

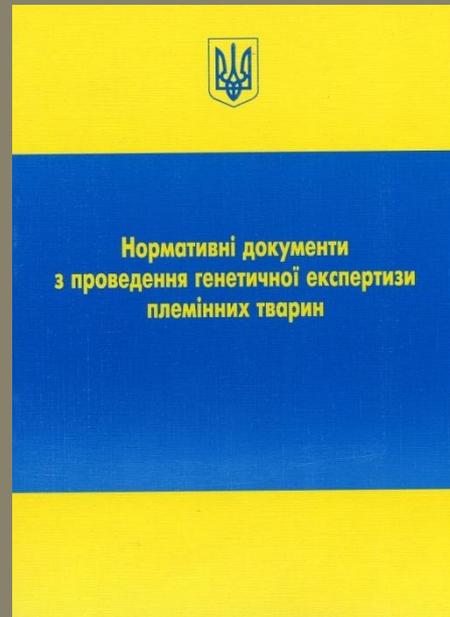
32



Not so long ago our geneticists have published a number of books and methodical recommendations about genetic-selection monitoring, genetic a biodiversity component, to use of hereditary polymorphism in breeding animal industries of Ukraine and cattle DNA-diagnostics.



Exactly two month ago at our Institute of animal breeding and genetics NAASU creative discussion on theme rather new to us has been hold: “Genomic selection in animal industries: a condition and development prospects” which materials have been published.



In Ukraine it is turned already out a number of statutory acts in the order of carrying out of genetic examination of an origin and anomalies, immunogenetic researches, cytogenetic control and testing of breeding animals on DNA-markers.



The main obstacles/problems are:

Having enough qualified personnel of geneticists, the sector of breeding animal industries in Ukraine has not till now, completed with the advanced highly technological labware (first of all, protein sequencers) - of the Center of Genetic Researches of breeding animals.

The gene pool cryo-banks of branch institutes NAAS Ukraine:

Institute of animal industries NAASU
Horse, Cattle, Sheep, Pig, Furry animals

Institute of animal industries of steppe areas "Askanija-Nova" NAASU
Sheep, Cattle

Institute of pigstry NAASU
Pig

Institute of poultry farming NAASU
Poultry

Institute of fish economy NAASU
Fish

Institute of bee keeping NAASU
Bees

Department of sericulture of In-te experim. and clinical vetmedicine NAASU
Bombyx

Institute of Animal Breeding and Genetics of animals NAASU
National bank of genetic resources
The central laboratory of the genetic control
All kinds of agricultural (farm) animals

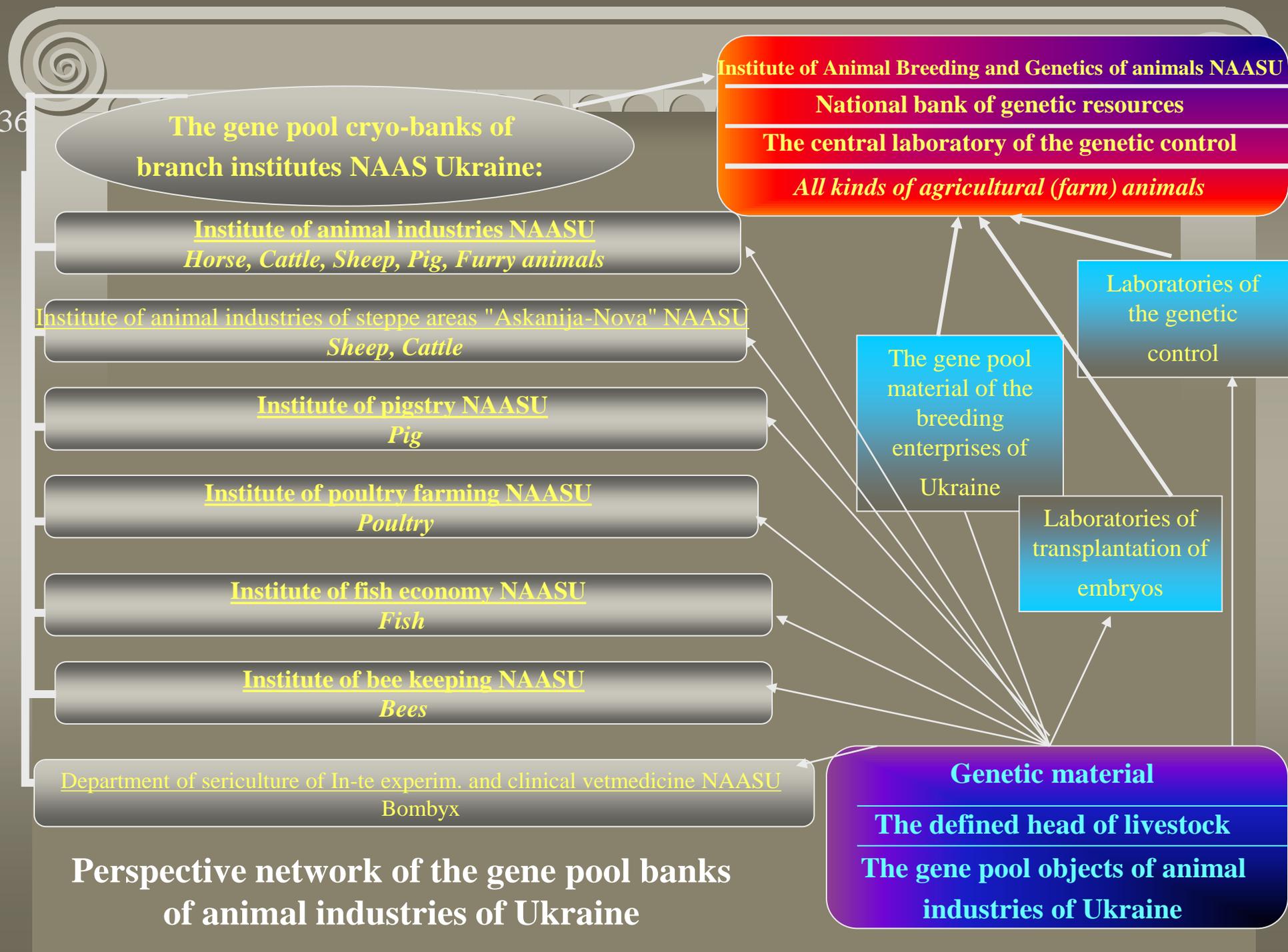
The gene pool material of the breeding enterprises of Ukraine

Laboratories of the genetic control

Laboratories of transplantation of embryos

Genetic material
The defined head of livestock
The gene pool objects of animal industries of Ukraine

Perspective network of the gene pool banks of animal industries of Ukraine

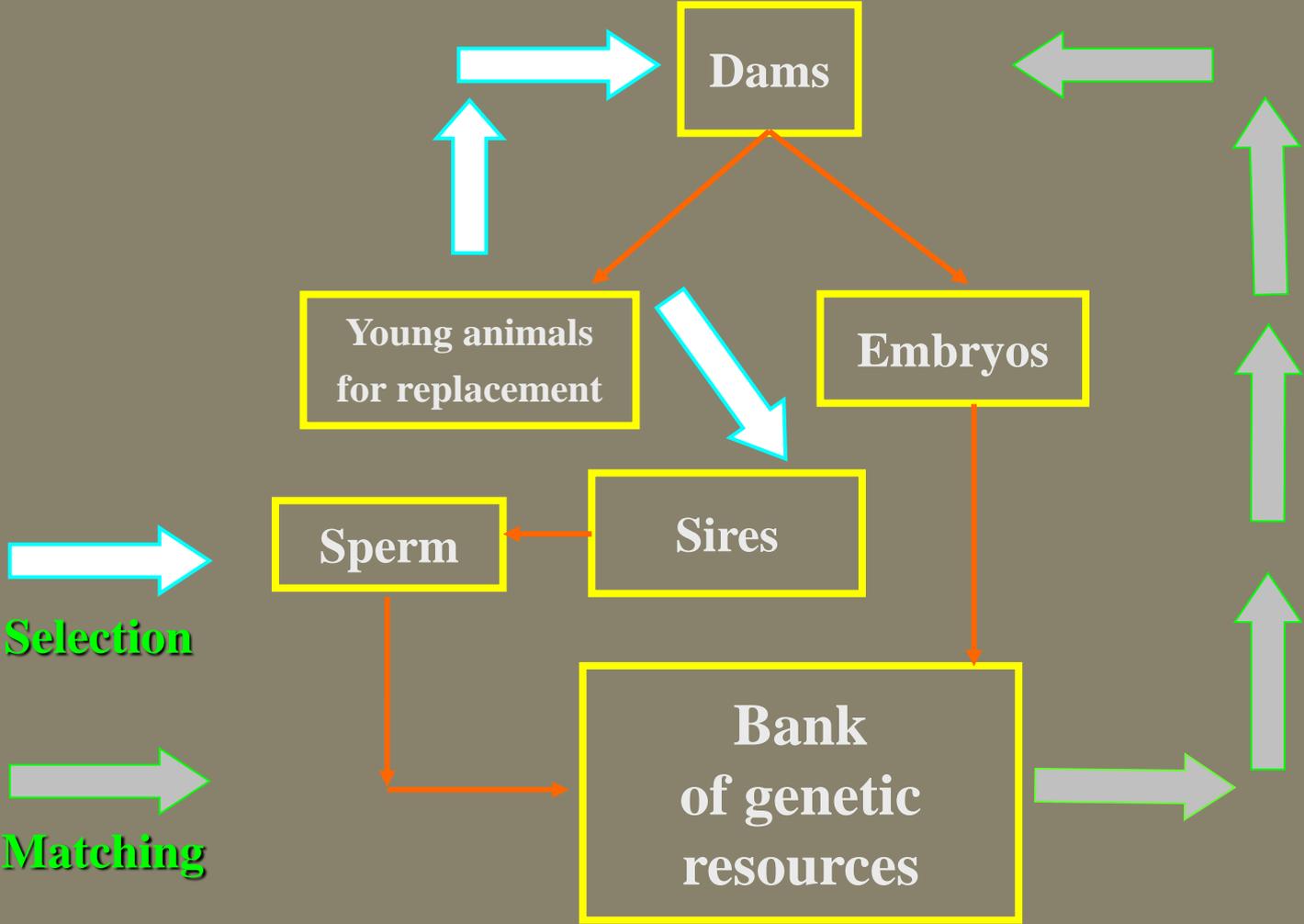


НАЦІОНАЛЬНИЙ БАНК ГЕНОФОНДУ ТВАРИН





THE CIRCUIT OF FUNCTIONING OF VIRTUAL GENE POOL CRYO-HERD (VGCH)

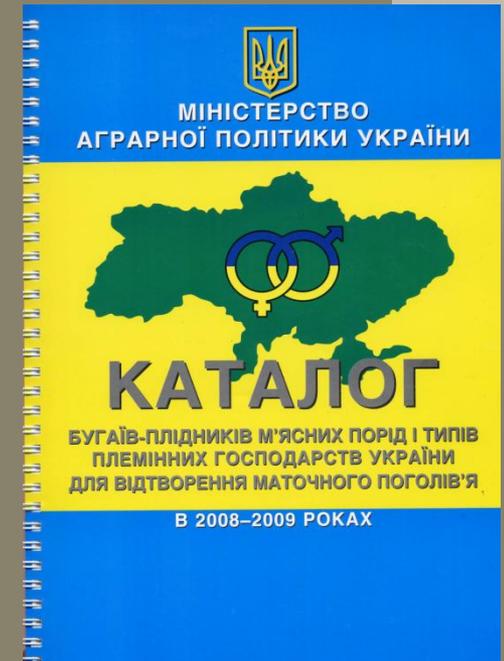


Selection

Matching

Surveying and monitoring of Animal Genetic Resources in my Country

39



Catalogues of sires of the dairy, combined and beef breeds which sperm is both in our Krio-bank, and at all breeding enterprises of Ukraine are prepared. And also the Catalog of beef bulls which are used by a method of natural tugging in breeding herds of our country.

Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine



At inspection of breeds for revealing of the status of risk we consider quantity of herds, males, females, tendencies of change of a livestock, % of the is pure-pedigree cultivation, the new (updated) number of females, effective number of population, levels of inbreeding on generation and for 50 years.

Breeds in a condition of the greatest danger (the critical condition is allocated red) by kinds of animals are presented on following slides:

Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine

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Breeds in a condition of the greatest danger by species of animals

Species	Breed
Dairy and dairy-beef cattle	White-headed Ukrainian
	Brown Carpathian
	Lebedynska
	Red Steppe
	Simmental
Beef cattle	Gray Ukrainian
	Ukrainian Beef
	Znamiansky IBT of the Poliska Beef breed
Horses	Guzul
	Ukrainian Riding (Saddle Horse)
	Novooleksandrivsky Carthorse
	Shetland Pony

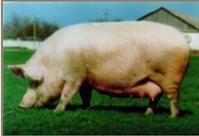


Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine

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Breeds in a condition of the greatest danger by species of animals

Species	Breed	
	Domestic	Foreign
Sheep 	Sokilska	Polwarth
		Texel
		Romanov
		North Caucasian
		Latvian Darkheaded
		Olibs
Pigs   	Ukrainian Steppe Speckled	Welsh
	Mirgorod	Pietrain
	Ukrainian Steppe White	Duroc
		Large Black

Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine

43

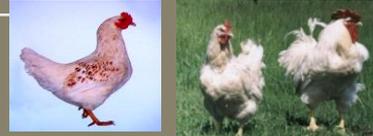


Breeds and populations in a condition of the greatest danger by hens

Species	Breed, population
	→ Ukrainian Black (resynthesis) Ukrainian cuckoo (resynthesis)
	→ Mini-hens striped egg Birkivska meat-egg (4 subpopulations)
<p>Hens</p> 	→ Ukrainian Vushanka Mini-hens meat-egg
	→ Poltava Clay Birkivska Motley













Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine



Breeds and populations in a condition of the greatest danger on a bird

Species	Breed, line
 <p>Turkey</p>	Maternal Line 6 Cross “Kharkov 56” (of the White Broad-chested breed)
	Fatherly Line 5 Cross “Kharkov 56” (of the White Broad-chested breed)
 <p>Geese</p>	Romenska
	Obroshinska (Grey and White)
 <p>Ducks</p> 	→ Ukrainian Grey
	Ukrainian White ←
	→ Ukrainian Clay
	Ukrainian Black White-breasted ←



Foreseen changes in surveying, monitoring and characterization of AnGR in Ukraine

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Breeds (species) in a condition of the greatest danger by species (classes)

Class, species	Species, breed
	Carp Nesvitsky
	Few-scaly IBT of Ukrainian frame breed
	Ljubensky IBT the Ukrainian scaly breed
	Trout rivulet
	Russian sturgeon
	Sterlet
	Spoon-billed cat (paddle-fish)
<p>Bees</p>	<p>Poliska population</p>  
<p>Silkworm</p>	<p>National collection from 122 breeds</p> 

The minimum size of the budgetary grant ('thousand hryvnas)

46



On prime preservation of a disappearing gene pool of agricultural animals



Species of animals

The most minimum Variant

15 principal species agricultural animal (160 objects) in Ukraine

37273,335

Annual correction of annual budgetary grants for a different genetic material of everyone gene pool object is obligatory

The note: 1 grivna ≈ 3,57 roubles ≈ 0,1€



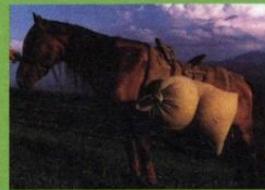


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The main obstacle in work of National Focus Consists
in insufficient state financing Performance (realization)
management programs Animal Genetic Resources (first of all,
for their preservation) , - in reply to calls after their
Inspection, Monitoring and the Characteristics.



**Програма збереження генофонду основних
видів сільськогосподарських тварин в Україні
на період до 2015 року**





*Many thanks
for attention!*