Country report (Russian Federation)

At present, genetic improvement of livestock populations is achieved through:

а) internal reproduction;

б) imports of genetic resources (mainly live animals and pedigree semen) from North America, Western Europe and Australia.

In 2006-2008, the country implemented the National Priority Project for Development of Agro-Industrial Complex, when the government supported the import of a significant number of pedigree animals of the following species:

- cattle - 132619 heads;
- sheep - 70156 heads;
- pigs - 14249 heads;

The main goals of this part of the project was to increase the amount of livestock products through the use of high-value imported animals and to use their genetic potential to speed up the development of the genetic resources for Russian breeds both in pure breeding (first of all, dairy cattle and horses) and crossbreeding schemes (beef cattle, sheep, pigs, poultry).

It should be noted that the main flows of animal genetic resources have not changed since the previous period, but the intensity of import flow of genetic resources into the country became significantly greater (especially that of live animals, first and foremost, cattle and pigs).

As for the exports of genetic resources, they were exceptionally small in volume in the past ten years and mainly targeted the CIS countries (Azerbaijan, Kazakhstan, Armenia, Kyrgyzstan, Byelorussia).

Livestock Sector Trends.

The State of the World's Animal Genetic Resources for Food and Agriculture (FAO, 2007) sites the following drivers of change in livestock management: purchasing power, urbanization, consumer tastes and preferences, flows of livestock and their products, the rise of large retailers and vertical coordination along the food chain, as well as changing natural environment and advances in technology (mostly in animal feeding and breeding), and policy factors.

Table 1

Drivers of change	Impact on animal genetic resources and their management over last ten years (score)	Future impact on animal genetic resources and their management (predicted for the next ten years) (score)	Describe the effects on animal genetic resources and their management (text)
Changing demand for livestock products (quantity)	small	small	Within the past ten years, these factors did not exercise a significant impact over the demand for livestock products. Some increase in the demand for livestock products has been the result of the overall positive change in the level of life (increasing consumer income); however, this factor was compensated for by rather significant inflation rates (on average, 7-8%), which led to the increase in prices for livestock products. During this time, the number of large retailers (integrated with supermarket chains) has somewhat grown, but this has not led to a quantitative change in the demand for livestock products. Taking into account the current trends in the livestock product market, a small increase in the demand for livestock products should be expected in the near future. So this factor didn't have significant influence on management system with AnGR and didn't have impact on principles of selection for any species of farm animals.
Changing demand for livestock products (quality)	medium	medium	While the quantitative demand for livestock products has not experienced a large increase, the demand for quality of livestock products has grown more. This has been influenced by the increase in income, as well as increase in the awareness of product quality. In

			the future, this tendency will probably be maintained and, according to optimistic forecasts, will even increase. This has been greatly impacted by the media, as well.
Changes in marketing infrastructure and access	small	zero	In the past years, the changes in marketing infrastructure and access of manufacturers to the market of livestock products has been minimal. To a degree, the changes have been the result of the increase in the amount of products produced by farmers and private livestock owners, but there share of the overall market is very small. There is no reason to believe that in the near future the market infrastructure in Russia will change in a way that would encourage (or discourage) more access to the market of livestock products.
Changes in retailing	small	zero	Within the past ten years, the number of chain supermarkets has become somewhat greater (especially in large and medium-size cities), which in its turn led to the increased demand for livestock products (mainly for psychological reasons, as well as due to convenient location). However, the prices and product quality in many supermarkets were not much different from those in small retail shops, which eventually led to only a minimum growth of demand for livestock products. It is most likely that we should not expect any changes in the retailing of livestock products in Russia in the near future.
Changes in international trade in animal products (imports)	medium	medium	The share of imported livestock products in Russia is significant (according to the Ministry of Agriculture, the share of imported beef – 30%, pork – 19%, and poultry, on average, amounted to 13%, the share of imported dairy products constituted 23 %). This percentage remained stable during the past ten years; thus, the changes in the impact that this factor had on the market have been insignificant. At

			the same time, the National Priority Project for. Development of Agro-Industrial Complex included the lease of 105650 cattle, 14249 pigs, 70156 sheep. This resulted in a significant quality change in breeds and populations of the country's livestock. Imported animals were used for both pure breeding and cross-breeding with Russian-based breeds. However, this has not led to great change in the genetic resources management structure. This was, firstly, due to the lack of system in the use of imported genetic material, which in its turn was the result of the lack of effective organizations managing genetic (breeding) resources at the level of breed and population; the lack of up-to-date research-based breeding programs for animals of various species. It seems likely that in the near future there will be less import of live pedigree animals and genetic improvement of populations will be achieved through the imports of semen and embryos, as well as through the optimization of the structural management of Russian-based breeds of various agricultural species. Thus, the level of impact of imported genetic resources over Russian genetic resources will remain medium in the following few years.
Changes in international trade in animal products (exports)	zero	small	The level of exports of livestock products (including pedigree genetic material) in the past years has been minimal and mainly targeted the CIS countries (Azerbaijan, Kazakhstan, Armenia, Kyrgyzstan, Byelorussia). Thus, the impact of this factor over the genetic structure of animal populations has been practically non-existent. In the near future it is possible to expect a more active animal export and, to a greater degree, semen exports, first and foremost, to the developing markets (particularly Central Asia).
Climatic changes	zero	zero	The climatic changes in Russia over the past ten years have not been significant, with the only exception of the summer of 2010, when

			temperatures remained unusually high (with an over 10oC increase compared to the average temperatures at this time of year) for a period of two or three months. This led to a rather significant decrease in livestock products, but there has not been a great change in the genetic resources and their management structure. Forecasts for the following few years do not show that this factor will lead to any change in the genetic resource management.
Degradation or improvement of grazing land	small	small	The state of grazing land has improved somewhat, but not significantly, in the past years. This was the result of the introduction of up-to-date agricultural technologies in the cultivation of feeding crops. This tendency is likely to be preserved in the near future.
Loss of, or loss of access to, grazing land and other natural resources	zero	zero	This factor has no impact on livestock production in the Russian Federation.
Economic, livelihood or lifestyle factors affecting the popularity of livestock keeping	zero	small	Livestock production is not a priority area in Russia due to a number of factors: lack of prestige, great labor intensity, peculiar working conditions and low pay, in many cases – availability of other more profitable jobs, lack of the necessary infrastructure, difficulties with sales etc. Thus, livestock production is not an attractive area of business, especially for smaller owners. Large (industrial) production, especially on specialized land, is more attractive mostly to citizens of the nearby towns and settlements, although the amount of pay to workers and specialists is also low. In the future, livestock production may gain in prestige in several regions of Russia (especially among young livestock production experts) due to the

			implementation of governmental programmes aimed at attracting young people to the agricultural sector (housing benefits, one-time bonuses, social security benefits etc.).
Replacement of livestock functions	zero	zero	This factor has no impact in the Russian Federation.
Changing cultural roles of livestock	small	small	The cultural factor is mainly the influence of clubs for 'old' (aboriginal) breeds, and that is very small.
Changes in technology	zero	zero	New technology has practically no impact over the genetic diversity of animal populations due to high implementation costs.
Policy factors	medium	medium	The government management system for livestock production influences the genetic diversity of animal populations through legislation and regulations for the livestock production sector.
Disease epidemics	low	low	A rigid system of laws and regulations in veterinary medicine, as well as a well-functioning system of state-run veterinary service provides for practically total prevention of epidemics among livestock.

OVERVIEW OF ANIMAL GENETIC RESOURCES

For breeding the main livestock species in the Russian Federation (first and foremost, cattle, pigs, sheep, horses, and chickens) imported genetic resources are intensively used to improve the local animal populations. Generally, the breeds (or species) bred in the Russian Federation are used. Thus, the system of the reproduction of animal genetic resources of various species and breeds is based on the Russian resources supplemented by imported genetic resources within the same breeds (species). Therefore, imported genetic resources cannot be categorized as *exotic.* All imported animals fall within the category of *locally adapted breeds.* Moreover, the breed and species diversity of imported animals is strictly regulated by the annually published *List of species and breeds accepted for breeding in the Russian Federation*.

The number of breeds kept in Russia is as follows:

- cattle (specialized dairy) - 4 breeds;
- cattle (specialized beef) - 12 breeds;
- cattle (multipurpose) - 23 breeds;
- pigs - 17 breeds;
- sheep - 43 breeds;
- horses - 44 breeds;
- goats - 7 breeds;
- rabbits - 11 breeds;
- chickens - 41 breeds;
- ducks - 3 breeds;
- geese - 26 breeds;
- quails - 2 breeds;
- turkeys - 7 breeds.

CHARACTERIZATION

The main livestock species in the Russian Federation are dairy, beef and multipurpose cattle, pigs, sheep, horses, goats, rabbits and poultry: chickens, ducks, geese, quails, turkeys.

Practically each of the above mentioned species is subdivided into breeds (with the exception of quails and turkeys) that are in their turn subdivided into pedigree and cash livestock. The categorization of animals – or, rather, farms specializing in a given species or breed – falls within the domain of the state authority for pedigree livestock management (The Livestock Husbandry and Breeding Department of the Ministry of Agriculture). It has developed a set of requirements that farms have to follow in order to be categorized as breeding farm.

On of the main requirements for a breeding farm is annual reporting on the state of pedigree livestock and results of pedigree and performance assessment o the Ministry of Agriculture of the Russian Federation. Thus, the state of pedigree livestock management per breed, region and breeding farm is annually monitored on the state level. Information on the productivity of cash livestock, which includes not only pure-bred animals, but also crossbreeds, hybrids, i. e. nondescript animals, is collected by the State Committee of the Russian Federation on Statistics. It is generally based not on factual evidence, but on estimates. In accordance with a Decree by the conducts a livestock census. The latest census took place in 2006; the next one is planned for 2015.

In addition, it should be noted that, for the greater majority of the above mentioned species, pedigree livestock constitutes approximately 10-15% of the total population.

Taking all of the above into account, the review of the current state and the description of activities undertaken (the first two columns) covers only the pedigree livestock.

The Ministry of Agriculture of the Russian Federation uses the information collected for all animal species to publish general information books on the state of livestock breeding by breed and region. These books are a result of monitoring and include population sizes, distribution per region or zone, phenotypic characteristics and description. For the main livestock species (specialized and multipurpose cattle, horses and several regional pig populations), there are databases containing information per individual animal. This information is used to conduct periodic genetic diversity studies based on breeding records. Molecular studies are conducted only as part of scientific research on limited samples of animals and, thus, are not sufficient to be included in the table. Genomic estimation studies in Russia are only beginning to be held as part of scientific research on dairy cattle and pigs.

Table 2

Overview of the Current State of Characterization*

Species	Baseline survey of population size	Regular monitoring of population size (working programme)	Phenotypic characterization	Molecular genetic diversity studies – within breed	Genetic diversity studies based on pedigree	Molecular genetic diversity studies – between breed	Genetic variance component estimation	Molecular genetic evaluation
Cattle (specialized dairy)	High		high	none	high	none	low	none***
Cattle (specialized beef)	High		high	none	high	none	none	none
Cattle (multipurpose)			high	none	high	none	none	none
Pigs			high	none	low	none	none	none***
Sheep			high	none	none	none	none	none
Horses**	40	18	high	high	high	high	high	none
Goats			high	none	none	none	none	none
Rabbits			high	none	none	none	none	none

Chickens (specialized eggs)			high	none	none	none	none	none
Chickens (specialized meat)			high	none	none	none	none	none
Chickens (multipurpose)			high	none	none	none	none	none
Ducks			high	none	none	none	none	none
Geese			high	none	none	none	none	none
Quails			high	none	none	none	none	none
Turkeys			high	none	none	none	none	none

* - pedigree population

** - Columns 4-8 show the level of activity for breeds in Column 3.

*** - only as part of limited scientific research projects

INSTITUTIONS AND STAKEHOLDERS

Genetic resources management in the Russian Federation is regulated by the Federal Law *On Pedigree Livestock Husbandry*. In accordance with this law, livestock breeding is managed by the state authority for pedigree livestock management: The Livestock Husbandry and Breeding Department of the Ministry of Agriculture on the federal level and Ministries, Departments and Administrations of subjects of the Russian Federation on the regional level. Thus, state authorities play the major role in the management of livestock genetic resources. Other organizations in pedigree livestock husbandry (breeding farms, breeders' associations, service organizations) act as executives of laws and regulations issued by the state authorities. For example, animal recording, as well as the estimation of phenotypic criteria and breeding characteristics have to be conducted in accordance with the directives issued by the relevant state authorities and the requirements listed thereof.

Research and educational organizations in Russia develop new technologies, principles and methods in livestock breeding and improve the existing ones, including those related to the modernization of the livestock management structure and various elements of breeding programmes. The results of the most promising developments are reported to state authorities on pedigree livestock management, where they are approved and reformatted as improved regulatory documents. Only then can the new methods and technologies in livestock breeding be officially used in the Russian Federation. The above was taken into account while creating a table of capacities and roles that various institutions play in the management of animal genetic resources.

Table 3

Input of institutions into animal genetic resources management

Institutional Capacity	Assessment
Education	Low
Research	Medium
Knowledge	Low
Awareness	Medium
Infrastructure	Medium
Stakeholder participation	Low
Policies	Medium
Policy implementation	Low
Laws	Medium
Implementation of laws	Medium

CAPACITIES IN EACH OF THE AREAS OF ANIMAL GENETIC RESOURCES MANAGEMENT

Education. Capacities: new educational programmes and disciplines for bachelor's and master's degrees devoted to the significance of animal genetic resources and their management; refreshment courses for professors and teachers and for people working in livestock breeding.

Obstacles (constraints): low market demand for experts in animal genetic resources management and their conservation; few numbers and low expertise of teachers in the above mentioned field; subjects taught are not aimed at the need to conserve animal genetic resources, do not emphasize the importance of genetic diversity and the need to maintain it in livestock breeding systems.

Research. Capacities: research and development of genetic monitoring programs for livestock populations to be used in population improvement activities; development of large-scale research programmes in molecular-genetic livestock analysis at the national level and the level of specific breed.

Obstacles (constraints): lack of a coordination center to manage research in the field; lack of researchers involved in the field; lack of technical equipment at most organizations; lack of funding for research in the field; low level of cooperation with international organizations and partners.

Knowledge. Capacities: increase of competence for all stakeholders; organizing refresher courses (first and foremost, for governmental officials, specialists working at organizations for breeding resources management). Implementing the experience of best examples and forecasts in the area. Creating databases of animals for further monitoring and assessment of animals of local, endangered and rare breeds and populations.

Obstacles (constraints): lack of interest (prioritization) from state authorities and lack of state support for events; lack of stable funding sources; low economic feasibility of conservation and improvement of breeds with few animals and low productivity.

Awareness. Capacities: comprehensive promotion of rare breeds, mostly among the rural population; assessment of positive characteristics of rare breeds and provision of access to its results for animal owners; exhibitions, competitions, educational courses, rare breed shows.

Obstacles (constraints): lack of interest on the part of breeding professionals; low funding; lack of access to information for animal owners; low demand for rare breed products.

Infrastructure. Capacities: increasing interest among the existing service structures for conservation and use of rare breeds genetic material; creation of collections, genetic banks of rare breed and species supported by the government; creation of a wide NGO network and development of conservation and distribution programmes for rare breeds and species.

Obstacles (constraints): lack of state-run programmes aimed at the conservation of rare populations genetic resources; lack of public organizations to manage rare breeds and species genetic resources; lack of promotion programmes for such breeds and species at all levels of management.

Stakeholder Participation. Capacities: increasing role of owners of rare breeds and species and involvement of professionals in the management of animal genetic resources; creating organizations for owners of rare breeds and determining their funding sources and support for their activities.

Obstacles (constraints): lack of stable cooperation between the existing organizations of owners of rare breeds and species and governmental bodies of livestock management; lack of targeted programs of conservation and lack of professional experts; lack of clear goals for such activities and lack of perspective both at the national level and at the level of animal owners. Lack of attention to this area among researchers and the industry.

Policies. Capacities: creating federal and regional conservation programmes for rare and endangered breeds and species; development of governmental support programmes aimed at owners of rare breeds and species; creation of gene banks for rare breeds and species; increasing interest in breeding rare and endangered breeds and species among farmers and private plot owners.

Obstacles (constraints): lack of sufficient attention to the issues of rare breeds and species conservation from governmental bodies, both in terms of economic feasibility and in terms of tradition and cultural heritage preservation.

Policy Implementation. Capacities: development of a programme to open non-governmental organizations to deal with the conservation of rare and endangered breeds and species genetic resources; determining funding sources for them; creating conditions for their sustainable operation.

Obstacles (constraints): low priority level of the issues related to the conservation of genetic resources of rare and endangered breeds and species at the national and regional levels of government; lack of organizational structure and course of action for non-governmental organizations of owners of rare and endangered breeds and species.

Laws. Capacities: improvement of the legislation and regulations on livestock breeding; optimization of the livestock breeding management structure for various breeds and species; development and approval of up-to-date regulatory documentations on the assessment of breeding characteristics and breeding records (information databases).

Obstacles (constraints): lack of a single approach to the structure of livestock breeding among the experts; different levels of professionalism among he practitioners, scientists and government officials; unstable funding sources; bureaucratic obstacles to the ratification of legislative and regulatory documents.

Implementation of Laws. Capacities: creating functional structures to manage livestock breeding (breed associations and their chapters in the regions), with a clear description of their powers, funding sources and responsibilities; optimization of the types of breeding organizations; creating single hierarchical information system for livestock management at breed level; development of breeding programmes for specific breeds, with clear-cut goals, tasks and breeding methods.

Obstacles (constraints): redundant governmental regulation in livestock breeding; breeding organizations of different levels lacking rights and responsibilities; concepts, definitions and requirements in Russian livestock breeding not harmonized with the international ones.

The structural organization of livestock breeding in the Russian Federation at the moment is comprised of the following organizations (Table 4).

Organizations are categorized as performing a certain type of activities by the Ministry of Agriculture of the Russian Federation on the basis of *Regulations for livestock breeding. Types of organizations working in livestock breeding* (Moscow, 2013) developed and approved by the Ministry.

All organizations perform the responsibilities based on their functions and contribute to livestock genetic resources management.

Table 4

Structural organization of livestock breeding in the Russian Federation (by type of organization and animal species)

	Species / Organization	Dairy cattle	Beef cattle	Sheep	Goats	Pigs	Horses	Rabbits	Chickens	Ducks	Geese	Quails	Turkeys
1.	Breeding center (association) per breed	19	4	2	1	2	3	1	2	-	-	-	-
2.	Artificial insemination organization	52	18	3	1	1	2	-	2	-	-	-	-
3.	Embryo transplantation organization	3	-	-	-	-	-	-	-	-	-	-	-
4.	Organization for recording, control, performance, quality and pedigree value assessment *	63	13	5	2	7	29	1	3	2	2	1	1
5.	Breeding center for storage and use of pedigree semen	39	12	-	-	-	-	-	-	-	-	-	-
6.	Regional information and breeding center	36	7	3	1	15	17	3	1	1	2	-	-

7.	Breeding farm	473	53	63	1	55	52	39	9	-	4	-	2
8.	Breeding multipliers	866	225	139	10	83	126	68	73	4	3	-	3
9.	Genetic resource farm	14	-	19	2	2	10	7	6	5	10	1	6
10.	Selection hybrid centre	-	-	-	-	4	-	-	-	-	-	-	-
11.	Breeding and genetics center	-	-	1	-	5	-	-	2	2	-	-	1
12.	Horse breeding farm	-	-	-	-	-	10	-	-	-	-	-	-

* the organization for recording, control, performance, quality and pedigree value assessment includes the following: monitoring and testing breeding stations, hippodromes, milk testing laboratories, immunogenetics and molecular genetic testing laboratories, information dissemination centers.

At the same time, there is a number of organizations and associations initiated by animal owners (Union of Livestock Breeders of Russia, Breeding Farm Association, societies of owners of specific breeds and species of rare animals, most of them focusing on poultry breeding). Such organizations have the status of legal entities, but they either focus on lobbying or act as amateur clubs that do not have a significant impact on the state of livestock breeding and policies thereof.

The main role in livestock genetic resources management is played by the Ministry of Agriculture of the Russian Federation (federal government level) and regional Ministries, Administrations and Departments of Agriculture coordinating work on livestock breeding in the republics, regions and districts of the Russian Federation.

ACTIVITIES IN ANIMAL BREEDING (IN ACCORDANCE WITH THE LIST PROVIDED)

The number of breed per livestock species for which activities are undertaken (in accordance with the given list) is presented in Table 5.

In the Russian Federation, there is no official division of livestock breeds into locally adapted and exotic. All of the genetic resources imported to the pedigree (effective) livestock population are breeds approved for breeding or similar. Thus, the Table only shows locally adapted breeds, i.e. adapted to the existing production systems to a degree.

Table 5

Number of breeds for which the following activities are undertaken

Tools	Cattle (dairy)	Cattle (beef)	Sheep	Goats	Pigs	Horses	Rabbits	Chickens	Ducks	Geese	Quails	Turkeys
Animal identification	20	11	29	4	10	33	5	37	3	12	2	7
Breeding goal defined	20	11	29	4	10	33	5	37	3	12	2	7
Performance recording	20	11	29	4	10	33	5	37	3	12	2	7
Pedigree recording	20	11	29	4	10	33	5	37*	3*	12*	2*	7*
Genetic evaluation (classic approach	20	11	29	4	10	33	5	37	3	12	2	7
Genetic evaluation including genomic information	-	-	-	-	-	-	-	-	-	-	-	-
Management of genetic variation (by maximizing effective population size or minimizing rate of inbreeding)	20	11	29	4	10	33	5	37	3	12	2	7
Artificial insemination	20	11	in some farms bred rare breeds (non systematic)									

Animal identification is a necessary activity for categorizing animals as pedigree. Thus, all breeds that have pedigree livestock have been included in the genetic resources identification system. There is a number of different methods of individual identification: ear notches, tagging by liquid nitrogen, ear tags and ear labels, microchips. It should be noted that official state identification systems within the breed or species for at least four pedigree lines have been developed for dairy and beef cattle, pigs, and horses. However, only in horse breeding (pedigree population) a system of unique identification has been implemented and is currently in use. At most farms breeding other species, there is only a unique identification system of genetic resources within the herd. At breed level, there is also a unique identification system for pedigree resources at artificial insemination organizations. There is also a system of pedigree identification at a number of cash livestock industrial farms (dairy and beef cattle, pigs, sheep, goats). It has been introduced mainly to simplify technological (non-pegiree related) activities and is almost totally lacking at privately-owned farms.

Identification of breeds that have breeding goals includes almost all breeding farms as they have pedigree recording and assessment of target traits. Such traits are necessarily mentioned in the breeding programmes and their level is necessarily accounted for during the complex assessment of the animal. However, breeding indices have not been developed or approved for any breed of any species; all weight coefficients in breeding programmes and guidelines for comprehensive animal assessment have been determined by ‘expert estimation’, i.e. with no account of the actual values for phenotypic and genetic variation of traits, their interdependence, heritability estimates, and specific value of economic significance. The only exception to this is the breeding programme for the black-and-white cattle in the Moscow Oblast, where all of the necessary genetic breeding

parameters have been calculated, economic weights for all traits have been developed, and breeding index equations have been worked out.

Performance recording (per each animal) is obligatory for all pedigree animals of mammalian species. For birds, collective (breeding and technological) performance recording is carried out.

Pedigree recording is obligatory for dairy and beef cattle, sheep, horses, pigs, goats, and is partly done for breeds of other species included in the Table.

Genetic evaluation (the classical approach, i.e. based on information on pedigree, individual performance and offspring) is carried out for the pedigree population of all livestock species.

Genetic evaluation based on SNP associations with pedigree value indices is only beginning to be developed in Russia. There is research in this area in major research (the All-Russian Research Institute of Livestock Husbandry, the All-Russian Research Institute of Genetics and Livestock Husbandry) and educational (Moscow State University) institutions. It has no practical application at the moment, although it is accounted for by several breeding farms when importing genetic resources.

The management of genetic change within the population is carried out in the following way:

a) changes to the structure of the pedigree population within the breed (Ministry of Agriculture of the Russian Federation);

б) minimization of inbreeding (artificial insemination organizations, breeding farms).

Changes to the effective (pedigree) population are carried out through including new organizations if their activities meet the requirements of the Ministry of Agriculture of the Russian Federation and the Ministry makes the relevant

decision. This is a constantly active field at the Ministry and a special expert commission has been formed.

Minimization of inbreeding coefficients is done by the staff of breeding farms and/or representatives of breeding organizations in charge of practical implementation of breeding programmes in the regions. For this purpose, for breeding dairy and beef cattle and sheep an information database is used for farm livestock management (developed by Plinor LLC., Leningrad Oblast). This database allows to record individual animals, to update database information on a continuous basis, to calculate all characteristics needed for herd management, to optimize feeding rations, to create pedigree documentation, to analyze the farms economic activities during a given period of time. This software was also used as basis for pedigree animal databases on higher levels of region and breed. However, due to the lack of infrastructure development of livestock management organizations in Russia, this software is popular only in a small number of regions (including Moscow and Leningrad Oblast) and is not used at breed level due to the lack of active unions, associations, centers and groups for livestock management at breed level.

Artificial insemination is widely used to reproduce genetic resources in dairy cattle. It has limited use in beef cattle, sheep, horses and pigs (chilled semen). It is practically not used in the breeding of rabbits and poultry.

BREEDING METHODS

The main breeding method in the Russian Federation is pure breeding. Cross-breeding is generally used in one of the following four cases:

1. to produce cash livestock with pronounced heterosis effect (first and foremost, this is the case in the breeding of pigs and poultry and sometimes of beef cattle and sheep);

2. “refreshing blood” to improve one or few traits in the original breed (practically never used at present);
3. to provide the absorption of a breed’s genetic resources by another breed – for breed replacement (used locally only);
4. to create new breeds – a combined use of two or more breeds (currently used in research).

The number of breeds (by species) used in different breeding schemes is given in Table 6.

It should be noted that in breeding dairy cattle and horses, is some cases, formal crossbreeding is interpreted as pure breeding.

Table 6

Number of breeds subject to breeding programmes

Breeding method	Cattle (dairy)	Cattle (beef)	Sheep	Goats	Pigs	Horses	Rabbits	Chickens	Ducks	Geese	Quails	Dairy
Straight/pure-breeding only	19	-	2	2	-	3	not available	21	-	not available	not available	not available
Straight/pure-breeding and cross-breeding	8	12	41	5	17	41	not available	20	3	not available	not available	not available

This is acceptable if the breeding program for the breed allows for the introduction of genetic resources from another breed (usually related) as well as the use of genetic resources of the main breed.

Some of the examples are cross-breeding of black-and-white and Holstein cows (offspring is considered pure-bred black-and-white) and pure-bred genetic material used in the reproduction of the so called half-breeds in horse breeding (offspring is a pure-bred half-bred).

The list of breeds where such breeding method is acceptable is approved by the Ministry of Agriculture of the Russian Federation. In the Table, this type of breeding is included in the pure breeding data.

RESEARCH AND TRAINING IN ANIMAL BREEDING (BY SPECIES)

In the Russian Federation, higher education degrees (bachelor's, master's) can be received in 55 educational institutions specializing in agriculture. The country has 89 research institutes working in the field of livestock husbandry, which work under the auspices of the Ministry of Agriculture of the Russian Federation (the All-Russian Research Institute of Livestock Breeding) and the Russian Academy of Agriculture.

The levels of teaching different subjects differs significantly in these institutions. Most of them are aimed at training practitioners to work in the industry, both with pedigree and cash livestock. Thus, most of the educational programmes are aimed at training herd management staff (feeding, animal care and animal use). The quality of training in this area is rather high. On the other hand, issues related to contemporary breeding systems at the population level (breeding and genetic indicators characterizing the population, optimizing animal selection, maximizing the rate of genetic progress on the main breeding traits, optimizing breeding

programs per specific breed, development and use of animal databases for breeding purposes etc.) receive minimal attention. As a result, there are very few highly professional experts in this area. At the same time, there are a lot of practitioners of herd management and most of them are top managers, many having trained at industrial farms abroad. Thus, the maximum assessment that can be given to education – in our view – is medium.

As for research institutions, their level (per animal species) depends

- on the amount of state support;
- level of priority of a certain type of product;
- financial status of enterprises manufacturing a type of product;
- availability of qualified experts and researchers in the field.

With all the above in mind, Table 7 follows.

Table 7

State of research and training by livestock species

Species	Training	Research
Cattle (specialized dairy)	medium	medium
Cattle (specialized beef)	low	medium
Cattle (multipurpose)	low	low
Sheep	medium	low
Goats	low	low
Pigs	low	medium
Horses	medium	medium
Rabbits	low	low
Chickens	medium	medium
Ducks	low	low
Geese	low	low
Quails	low	low
Turkeys	low	low

ORGANIZATION OF LIVESTOCK KEEPERS

In accordance with the existing legislation regulating livestock breeding in the Russian Federation, genetic resources management is carried out on three levels: regional (Ministries, Departments, Agricultural Administrations in republics and district, livestock breeding departments, artificial insemination organizations, regional information and breeding centers); breed level (breeding centers (associations) focused on specific livestock breeds), and federal level (Ministry of Agriculture of the Russian Federation).

In addition, there is a number of unions, associations, societies, animal owners' clubs, which act as consultants and information distributors (mainly related to technology) or aim at the conservation of rare breeds or species. Their impact on the genetic resources is minimal.

At the federal level, livestock genetic resources are managed by:

- developing and implementing policy decision on the development of livestock breeding (national programmes for the development of rural areas, individual livestock species, general agricultural structures in Russia);
- developing and approval of legislative and regulatory documentation on livestock breeding (Federal Laws *On Pedigree Livestock Husbandry, On Veterinary Medicine* etc., guidelines on breeding trait estimation, breed and species valuation etc.);
- official registration of breeds, lines and types of livestock, approval of their use in the Russian Federation, official registration of farms and service organizations forming the pedigree structure of livestock management at different levels (farm, region, breed);
- state support to livestock breeding in Russia;

- official monitoring of the state of livestock genetic resources in the Russian Federation (collecting regional reports on the state of livestock resources).

At the regional level, regional executive authorities

- develop and implement livestock breeding development programmes in the region;
- develop regulatory documentation pertaining to livestock breeding (within the domain of the federal regulations;
- collect information on the state of livestock breeding in the region (via regional information and breeding centers or departments of livestock breeding at artificial insemination organizations);
- issue documentation necessary to achieve the status of breeding farm;
- support livestock product manufacturers on the regional level.

Regional information and breeding centers create, maintain and update information in the regional databases of livestock breeds and species, supply information on the state of livestock breeding in the region to stakeholders, develop regional reports on the state of livestock breeding in the region to be submitted to the federal government.

Livestock breeding departments at artificial insemination organizations organize monitoring of the state of livestock breeding in the region (through regional databases of livestock resources), analyze its results, and provide various services to livestock owners (consulting, recommendations, services such as exterior valuation etc).

At breed level, the Ministry of Agriculture of the Russian Federation appoints breeding centers (associations) focusing on specific livestock breeds that provide research, methodology, service and information support to the breeding of a specific breed.

Taking into account the functions of organizations at different levels of government and their performance, Table 8 below was draw/n up (the level of organization of livestock keepers was determined through expert assessment based on breeding programs per breed, research justification, level of structural organization and breeding activities).

Table 8

Degree of Organization of Livestock Keepers (by species)

Species	Organization of Livestock Keepers (degree, assessment)
Cattle (specialized dairy)	medium
Cattle (specialized beef)	low
Cattle (multipurpose)	medium
Sheep	low
Goats	practically none
Pigs	low
Horses	above average
Rabbits	practically none
Chickens	above average
Ducks	practically none
Geese	practically none
Quails	low
Turkeys	practically none

LEVEL OF STAKEHOLDER INVOLVEMENT IN THE VARIOUS ELEMENTS OF BREEDING PROGRAMMES

Since during the implementation of breeding programmes the goals and objectives of different organizations differ quite significantly, their level of participation in the different elements of the breeding programmes also differs (see Table 9).

The functions of the organizations in the implementation of breeding programmes are given below:

Table 9

Level of stakeholder involvement in the various elements of breeding programmes

	Government	Research organizations	Breeders' associations or cooperatives	Individual breeders/livestock keepers	National commercial companies	External commercial companies	Non-governmental organizations	Others
Setting breeding goals	Medium	High	Low	Medium	Medium	None	None	-
Animal identification	High	High	Low	High	Medium	Medium	None	-
Recording	Medium	Medium	Low	High	High	None	None	-
Provision of artificial insemination services	Medium	Low	None	High	High	Low	None	-
Genetic evaluation	High	High	Low	Low	Medium	None	None	-

The government (state authorities in charge of the livestock genetic resources management): determines the overall line of population (species, group of breeds) development at federal and regional levels, provides the regulatory basis and determines funding support; develops and organizes the state system of identification of animals, semen, embryos, and other genetic resources; develops and provides a legislative and regulatory basis for the recording of genetic resources in information systems; develops state-level quality standards for semen, sets guidelines on artificial insemination, determines norms for the use of artificial insemination for different species, provides support to artificial insemination organizations; determines the list of obligatory activities for genetic evaluation of animals of different species, organizes such activities and supports their implementation.

Research organizations:

develop parameters for breeding programs, optimize the sizes of breeding groups and intensity of animal selection at every stage of the breeding process; develop principles, structure and technology for unique identification of animals; develop principles of recording animals of different breeds and species; develop improved methods of artificial insemination; develop methodological, organizational and technological basis for genetic evaluation of animals, provide services on genetic identification and evaluation of animals.

Livestock keepers associations and cooperatives (breeding centers/associations per breed): describe overall breeding goals (set performance standards, exterior standards, standards for animal growth and development, general principles for the selection of animals); in a number of cases, determine principles and terms of identification, may provide animal identification services; enter data on animals in breeding databases per breed and region (on the level of breed, recording is practically non-existent and is performed only in some regions for some dairy

populations); do not provide such services; provide evaluation services on a limited scale (mostly when the breeding center was founded at a research institute).

Individual breeders/livestock keepers (breeding farms): take part in implementing breeding programs, take part in discussing them; perform all functions pertaining to the practical task of animal identification; carry out activities pertaining to data collection and updating the main information in databases; perform artificial insemination; determine which animals need genetic evaluation;

National businesses (national service companies providing breeding services): take part in developing breeding programs (mostly on the regional level); provide services such as purchasing tags and tagging animals; record animals in regional and breed databases, develop software to record animals in information systems; provide semen for artificial insemination to over 90% of livestock breeding organizations using artificial insemination; conduct genetic origin verification (more rarely – genetic anomaly identification).

External businesses: trade in identifiers (ear tag, more rarely - microchips); provide semen, embryos.

Non-governmental organizations have practically no input on the implementation of breeding programs for individual breeds and species in the Russian Federation.

SUPPORT OF BREEDING PROGRAMMES

In the Russian Federation, the only entities supporting breeding programmes are the Government of the Russian Federation, as well as federal and regional state authorities on livestock genetic resources management. The following support is provided:

- implementation of national agroindustrial development programs and their part pertaining to livestock keeping and rational utilization of genetic resources;

- development and implementation of national programmes for the development of individual animal species;
- provision of state support to livestock breeding;
- regional programmes aimed at improving livestock production systems;
- support to research aimed at improving breeding systems (or stages thereof) for specific breeds/species.

Table 10

State Strategic Policies or Programmes Aimed at Supporting Breeding Programmes (by species)

Species	Strategic Policies or Programmes	Brief Description
Cattle (specialized dairy)	Breeding programmes developed for specific breeds or regional populations	For some breeds (or regional populations), breeding indices (breeding goals) have been developed, breeding groups sizes determined, as well as animal evaluation principles. For other breeds – official regulatory documentation on animal evaluation.
Cattle (specialized beef)	Breeding programmes developed for specific breeds or regional populations	See description for specialized dairy breeds
Sheep		General line. Regulatory documents on animal evaluation
Goats	General line	Regulatory documents on animal evaluation
Pigs	General line	Regulatory documents on animal evaluation
Horses	Breeding programmes developed for specific breeds	Description of breeding directions and general implementation principles
Rabbits	General line	General description and directions of breeding
Chickens	General breeding principles	General description of breeding principles
Ducks	Specific technological issues	Livestock care and feeding technology
Geese	Specific technological issues	Livestock care and feeding technology
Quails	Specific technological issues	Livestock care and feeding technology
Turkeys	Specific technological issues	Livestock care and feeding technology

State support is exercises through a system of grants for livestock keeping at breeding farms, a system of pedigree animal lease (in accordance with schemes developed per species), financial subsidies to branch and regional livestock development programmes.

In breeds (regional populations) where relatively modern programmes of genetic improvement have been implemented (dairy cattle in Moscow, Leningrad, Kirov Oblasts and others, beef cattle in Orenburg Oblast) and effective organizational structures for livestock management exist, there has been performance growth, improvement of pedigree characteristics, increase in economic efficiency of livestock keeping at farms and businesses distributing genetic resources. For example, in the past ten years the average milk yield of dairy cattle in Moscow Oblast has been growing annually by 150-200 kg of milk, accompanied by improvement in quality characteristics (fat increase by 0.01%, protein increase by 0.02%). This is largely due to the development of a scientifically based version of the breeding programme (with clear determination of the size of breeding groups, selection intensity at different breeding stages), development of a regional database of pedigree animals, development and implementation of modern evaluation methods (BLUP, breeding index), organization of *Mosplem* non-profit partnership encompassing all breeding farms in the region, of a regional information and selection center and using it as basis for the development of livestock breeding information system. At the same time, the leading livestock breeder in the region (*Moskovskoe* livestock farm), which has its own artificial insemination organization, has significantly widened the semen market for its bulls: at the moment, semen of the best bulls from Moscow Oblast is supplied to pedigree and cash livestock farms in over fifty regions of the Russian Federation.

However, examples like these are few.

For most livestock breeds and species in different regions of the Russian Federation, breeding is based on an obsolete, but still officially approved regulatory procedure developed back in the 1970s-1980s. There is neither organizational structure for livestock management within regions and breeds nor services for livestock breeders. The lack of active functioning breeders' associations leads to breeds being divided into separate regional subpopulations that often are managed without specific breeding programmes or any coordination on the interregional management level. Within breeds, a large number of zone-,region-, and farm-specific animal types are still registered and recognized as breeding success on the governmental level; however, they do not contribute to the conservation of genetic diversity or breed and population improvement in any way. All this is reason enough for a rather low level of development of genetic improvement systems for various breeds and species in the Russian Federation.

To improve the situation, a number of tasks have to be tackled in the nearest future:

1. to develop a modern structural scheme of breeding and service organizations for different breeds and species at all management levels;
2. to develop a detailed technological procedure for livestock breeding per breed and species (unique identification, information systems, breeding traits determination etc.);
3. to develop modern breeding programmes to improve genetic qualities of species, breeds and populations of livestock;
4. to create databases of genetic resources for livestock management at the levels of breed and population;
5. to develop and implement modern evaluation methods at the levels of breed and population, while taking into account breed- and population-specific characteristics and breeding goals;

6. to create a system for the conservation of genetic resources of aboriginal, rare and endangered species and breeds, to determine parameters and terms of use for such a system;
7. to create a modern scientifically based and functional legislative and regulatory basis for livestock breeding in Russia, with the aim of development, sustainable use and conservation of livestock genetic resources;
8. to determine the lines of government policy to enhance cooperation between livestock keepers, their associations and Russian livestock keeping organizations and international structures working on the improvement of systems for the conservation and development of livestock genetic resources.

CONSERVATION

Up to now in Russian Federation there is no official farm animals classification system describing breeds and/or species according risk status. However Federal low “On Animal Breeding” determines the type of breeding farm which is called “genefund farm” (farm with animals belonged to rare breeds). The main object of these farms is “breeding, reproduction and preservation farm animals of small (in number) and endangered species and breeds”. Because of the absence of strict definition for such type of farm the special expert commission created in Ministry of Agriculture decides which farm can be defined as genefund. Of course, the opinions of commission’s members are very subjective. On parity with other types of breeding farms exposed in Low genefund farms can get financial subsidies for keeping and reproduction of animal genetic resources belonging to these farms.

In table 11 presented below it is shown number of genefund farms, number of animal breeds (according specified species) and number of animals in column “In situ conservation”.

Moreover there are three collectinariums for poultry of rare and endangered breeds in Russian Federation. These kinds of farms have been established on base of three research institute in Moscow, Leningrad and Vladimir regions. In table 11 collectinariums mentioned above are defined in column "Ex situ in vivo conservation".

There is no any organization special created and officially confirmed including AI station which is responsible for conservation genetic materials of rare and endangered breeds and species under cryogenic conditions.

Table 11

Species	In situ conservations	Ex situ in vivo conservation	Ex situ in vitro conservation
Cattle (specialized dairy)	none	none	none
Cattle (specialized beef)	none	none	none
Cattle (multipurpose)	High (11-8-3,5)*	none	none
Sheep	High (19-8-10,0)	none	none
Goats	Low (1-1-0,054)	none	none
Pigs	Low (2-2-0,4)	none	none
Horses	High (12-7-2,0)	none	none
Rabbits	Medium (3-3-2,4)	none	none
Hens	High (6-38-32,0)	Low (2-38-8,5)	none
Ducks	High (5-5-23,6)	none	none
Gooses	High (10-9-18,0)	Low (1-25-1,0)	none
Quails	Low (1-2-0,9)	none	none
Turkeys	Medium (6-6-0,7)	none	none

*number of farms – number of breeds – number of animals (thousand heads)

As it was mentioned above the classification animal species and breeds according their risk status is absent in Russian Federation. Consequently, there is no any system of their priorities for conservation. Sometimes (very seldom) clubs of fans of animals (non-formal groups of people) organize animal exhibition where hens, pigs and horses of rare breeds are usually presented.

Besides, the number of research organizations (all Russian research institute of Animal Husbandry, all Russian research institute of genetics and animal breeding, all Russian research institute of poultry housing, all Russian research institute of horsebreeding and some others) are conducting investigations on genetic identification of breeds and populations of animals. These investigations are undertaking within corresponding thematic plans of Russian Academy of Sciences.

Table 12

Factors	Description
Risk of extinction	Formal criteria for the factor is absent, work in this direction is underway
Genetic uniqueness	Purposeful work on this topic are not kept. Some analyses are conducted in the frames of research investigations.
Genetic variation within the breed	The criteria is not formalized, works are not conducted
Production traits	Some works are conducted within frameworks of research
Non-production traits	Some works are conducted within frameworks of research
Cultural or historical importance	The factor is taken into account in the activities of fun clubs and breeders-funs (usually on local level)
Probability of success	The factor is not formalized, works are not conducted

In spite of the fact that the official programmes on in-situ conservation of farm animal genetic resources are not acting, however some political decisions and activity of public structures mostly based on ethnic and religious traditions and principles influence on presentation of some farm animal species and breeds in number of country's regions.

So, confirmed some farms as genefund, state bodies make support for conservation of rare and endangered species and breeds and promote reproduction of their animal genetic resources.

In regions where the majority of the human population are Muslims, as rule, the local authorities and religious organizations provide with some support to owners of sheep stocks including animals of rare breeds. In some cases, the kind of support is provided by Jewish communities.

But these examples are very small in number and have indirect impact on preservation of animal genetic resources in Russia.

There are no genebanks for farm animal's genetic material in Russian Federation. Also it is necessary to add that their creation is not planning in nearest future.

Table 13

Elements of in situ conservation programmes	Operators		Species targeted												
	Public sector	Private sector	Cattle (specialized dairy)	Cattle (specialized beef)	Cattle (multipurpose)	Sheep	Goats	Pigs	Horses	Rabbits	Hens	Ducks	Gooses	Quails	Turkeys
Promotion of niche marketing or other market differentiation (including promotion via the association of breed products with geographical indications or other indicators of origin)	no	yes	no	no	no	yes	no	yes	yes	no	no	no	no	no	no
Community-based conservation progrmmes	no	yes	no	yes	no	yes	no	yes	yes	no	no	no	no	no	no
Incentive or subsidy payment schemes for keeping at risk breeds	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Development of biocultural community protocols	no	yes	no	no	no	yes	no	yes	yes	no	yes	no	no	no	no
Recognition/award programmes for breeders	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Conservation breeding programmes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Selection programmes for increased production or productivity in at-risk breeds	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Promotion of at-risk breeds as tourist	no	yes	no	no	no	yes	yes	no	yes	no	yes	no	no	no	no

attractions															
Use of at-risk breeds in the management of wildlife habitat and landscapes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
Promotion of breed-related cultural activities	no	yes	no	no	no	yes	no	yes	yes	yes	no	no	no	no	no
Extension programmes to improve the mandement of at-risk breeds	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Awareness-raising activities providing information on the potential of specific at-risk breeds	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

REPRODUCTIVE AND MOLECULAR BIOTECHNOLOGIES

Reproductive and molecular biotechnologies are gaining ground in Russian Federation, it is not directly related with all aspects of biotechnological methods which are used in world practice of animal husbandry but some of their technological elements. With all this going on the intensities of biotechnologies using in various species of farm animals are very different. For instance, there are AI stations in about each region of Russia that open all possibilities for artificial insemination of females in each population and each species of farm animals. But AI methods are widely used only in large-scale farms with dairy cattle, less widely used in herds of beef cattle and horses. Artificial insemination is used also in sheepbreeding and goatbreeding but this method of genetic resources reproduction is maintained in very restricted number of farms. Artificial insemination is not widely used in pigbreeing, poultry and work with rabbits. Artificial insemination is practically not implemented in farmer and private small herds (it is only used in a very few number of locations, for instance in some regions of North Caucasus, where points of animal artificial insemination are organized). This situation is related with traditional habits on animal reproduction and also with an absence of service network and other reasons.

The level of embryotransplantation expansion is not high in animal husbandry of Russian Federation. This is caused by the following reasons:

- insufficient results of embryotransplantation;
- lack of practical use of modern methods for female donors and sire selection;
- some veterinary restrictions;
- relatively high costs of embryotransplantation in comparison with other methods of animal reproduction.

As for other biotechnological methods shown in table 14 bellow it is necessary to point out that the insemination animals with sexing semen is used in very restricted

number of herds (as rule, services are provided by foreign companies); some research organizations are conducting experiments with genetic modification of farm animals (for example, All Russian research institute of animal husbandry is carrying out the tests with pigs) and with molecular-genetic or genome information of cattle and pigs.

The levels of reproductive and molecular biotechnologies applied in animal husbandry of Russian Federation is given in table 14.

Even being not very developed, structure of biotechnological methods with farm animals in Russia is due to various factors:

1. Legislation base in the field of animal breeding.

All breeding farms with dairy cattle are obliged to use AI methods for genetic resources reproduction. Another mandatory requirement is the lack of reducing the number of animals. When any farm is in difficulties with reproduction of genetic resources of females specialists sometimes used insemination heifers with sexing sperm in order to get more females in progeny generation.

In some cases legislation base requires to examine the reliability animals of their origin by using of molecular-genetic methods.

2. Price performance.

All AI stations and embryotransplantation centers are highly interested (uniformed as “National commercial companies” in table 15) in expansion of areas of their activities.

3. The interest of scientific and educational organizations in the framework of implementation of projects, programmes and research plans.

Table 14

Biotechnologies	Species												
	Dairy cattle	Beef cattle	Duel purpose cattle	Sheep	Goats	Pigs	Horses	Rabbits	Hens	Ducks	Gooses	Quails	Turkeys
Artificial insemination	high	medium	high	medium	low	low	medium	low	low	none	none	none	high
Embryo transfer	medium	low	medium	none	none	none	none	none	none	none	none	none	none
Multiple ovulation and embryo transfer	none	none	none	none	none	none	none	none	none	none	none	none	none
Semen sexing	medium	none	none	none	none	none	none	none	none	none	none	none	none
In vitro fertilization	none	none	none	none	none	none	none	none	none	none	none	none	none
Cloning	none	none	none	none	none	none	none	none	none	none	none	none	none
Genetic modification	none	none	none	none	none	none	none	none	none	none	none	none	none
Molecular genetic or genomic information	medium	low	medium	low	low	low	medium	none	none	none	none	none	none
Transplantation of gonadal tissue	none	none	none	none	none	none	none	none	none	none	none	none	none

Table 15

Stakeholders	Artificial insemination	Embryo transfer	Semen sexing	Genetic modification	Molecular genetic or genomic information
Public sector	Yes	Yes	Yes	Yes	Yes
Breeder's association or cooperatives	Yes	Yes	No	No	Yes
National non-governmental organization	No	No	No	No	No
Donors and development agencies	No	No	No	No	No
National commercial companies	Yes	Yes	Yes	No	Yes
External commercial companies	Yes	Yes	Yes	No	No

The research investigations in the framework of biotechnologies in animal husbandry are implemented by scientific and educational organizations exclusively. These organizations are represented in table above (table 15) as "Public sector". Basically these studies are carried out within frameworks of thematic plans, the performance of which is provided by state and regional (in some cases) budgets. A very few investigations are based on financial support of private commercial companies which, in general, pursue the goals of identifying advantages of their products (for instance, technologies or sperm or embryo of high quality, etc.).

International cooperation, even it is realized by leading research and educational organization in the field of animal husbandry, is carried out in very restricted scale and is organized on a base of personal contacts with foreign partners.

Table 16

Biotechnologies	Public or private research at national level	Research undertaken as part of international collaboration
Artificial insemination	Yes	No
Embryo transfer or MOET	Yes	No
Semen sexing	No	No
In vitro fertilization	Yes, restricted	No
Cloning	No	No
Genetic modification	Yes, restricted	Yes, restricted
Use molecular genetic or genomic information for estimation of genetic diversity	Yes	No
Use molecular genetic or genomic information for prediction of breeding values	Yes	Yes, restricted
Research on adaptedness based on molecular genetic or genomic information	Yes, restricted	No

THE LEVEL OF AI APPLICATION IN FARM ANIMAL BREEDING

The levels of AI expansion in practical work with farm animals are very variable in relation with species and categories of farms (industrial enterprises, farmer's or private farms). This is due to following reasons:

- systems of animal farming with various species (intensive or extensive);
- features of technological process of animal reproduction (in particular, the complexity of AI us in comparison with natural mating);
- availability of consumer service for artificial insemination of animals (charges for delivery, presence of AI specialists, costs for AI, conditions for AI carry out).

As result, the methods of artificial insemination of animals are practically not used in majority of farmer's and private farms. There are very few examples when these categories of farms can employ method above discussed. For instance, the method is used in cases when small-scale farms are located in immediate proximity to industrial farm which has AI specialists.

The estimation of AI dissemination in various production systems in Russian Federation is presented in Table 17.

Table 17

Dairy cattle	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adopted breeds	low	low	low	high	not in the country
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from tradition (global) breeds	low	low	none	low	
Natural mating	high	high	high	low	

Beef cattle	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen	low	low	none	medium	not in the country

from locally adopted breeds					
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from tradition (global) breeds	none	none	none	low	
Natural mating	high	high	high	medium	

Dual-purpose cattle	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adopted breeds	low	low	low	high	not in the country
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from exotic breeds	none	none	none	none	

Artificial insemination using imported semen from tradition (global) breeds	low	low	none	low	
Natural mating	high	high	high	low	

Sheep (goats)	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adopted breeds	none	none	none	low	not in the country
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from exotic breeds	none	none	none	none	
Artificial insemination using imported semen from tradition (global) breeds	none	none	none	low	
Natural mating	high	high	high	high	

Horses	Ranching or similar grassland based production	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems

	systems				
Artificial insemination using semen from locally adopted breeds	none	none	low	medium	medium
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	none	none
Artificial insemination using imported semen from exotic breeds	none	none	none	none	none
Artificial insemination using imported semen from tradition (global) breeds	none	none	none	none	medium
Natural mating	high	high	high	medium	low

Hens	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adopted breeds	none	none	none	low	none
Artificial insemination using nationally produced semen from exotic breeds	low	none	low	low	low
Artificial	none	none	none	none	none

insemination using imported semen from exotic breeds					
Artificial insemination using imported semen from tradition (global) breeds	low	none	low	low	none
Natural mating	high	none	high	medium	high

Turkeys	Ranching or similar grassland based production systems	Pastoralist systems	Mixed farming systems (rural areas)	Industrial systems	Small-scale urban or peri-urban systems
Artificial insemination using semen from locally adopted breeds	none	none	low	high	none
Artificial insemination using nationally produced semen from exotic breeds	none	none	none	low	none
Artificial insemination using imported semen from exotic breeds	none	none	none	none	none
Artificial insemination using imported semen from tradition (global) breeds	none	none	none	high	none
Natural mating	high	none	high	low	high

Artificial insemination of animals belonging to other species (not shown in table 17) is not used in farms of Russian Federation with exception of pigbreeding where artificial insemination is widely used in industrials farms (level of extension is high, sperm is produced in the same farms), but semen is native, not deep frozen.

III. DATA CONTRIBUTING TO THE PREPARATION OF THE STSTE OF THE WORLD'S BIODIVERSITY FOR FOOD AND AGRICULTURE

The management of animal genetic recourses is integrated with the management of plant, forestry and aquatic genetic resources on the base of problems related with probabilities of damaging to environment by impact of animal farming and materials recovery.

For overcoming these problems there are official requirements (on state legislation level), for execution of which the following special bodies of state level.

Table 18

Type of collaboration	Extent of collaboration (score: none, limited, extensive)	Description (text)
Development of joint national strategies or action plans	extensive	The legislation base is working out and implemented in practice of animal farming with aims of damage minimization to environment; control bodies are setup in each region
Collaboration in the characterization surveying or monitoring of genetic resources, production environments or ecosystem	extensive	The monitoring for conditions of soil, plants, water, aquatic genetic resources is conducted on permanent base; it is provided estimation of production systems impact levels on environment
Collaboration related to genetic improvement	none	-
Collaboration to product development and/or marketing	limited	Organization of limited number farms with exclusive standards to quality of animal products so called "ecological production"
Collaboration in conservation	limited	Joint programmes for

strategies, programmes or projects		conservation of natural reserves and other territories with protected ecological systems
Collaboration in awareness-raising on the roles and values of genetic resources	limited	Organization of animal genetic resources exhibitions, shows (including representatives of rare breeds and species)
Training activities and/or educational curricula that address genetic resources in an integrated manner	extensive	Programmes for studies in secondary schools, agricultural colleges and universities contain special courses of knowledge
Collaboration in the mobilization of resources for the management of genetic resources	none	-

ANIMAL GENETIC RESOURCES MANAGEMENT AND THE PROVISION OF REGULATING AND SUPPORTING ECOSYSTEM SERVICES

The ecosystem services (privileges, benefits, financial support, etc) addressed to stakeholders are practically absent in Russian Federation.

Country's policies, plans and strategies for animal genetic resources management expose special requirements to production system, farming, by-products utilization for farms with all patterns of ownership. The compliance contributed to preservation of ecological situation (the conditions of soils, forests, plants, water, aquacultures etc.) on sufficient level.