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Original Contribution

FARMS IN TURKEY: SUSTAINABLE DEVELOPMENT IN THE PRESERVATION OF ANIMAL GENETIC RESOURCES IN TURKEY AND IN THE WORLD

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ABSTRACT

Animal Genetic Resources are components of biological diversity and are important in meeting the food requirement of countries of the world. Countries are competing with one another in the race for development. There is a paradox between economic development and ecology and one of the elements of pollution is the growing tendency in the falling number of animal breeds.

Turkey has a great potential for animal genetic resources and animal production. Development of this country's animal production in the last twenty years brought about a risk of extinction in farm animal genetic diversity. Several examples and the risk potentials in Turkey have been presented.

Cattle population decreased from 18 million down to 11 million within 30 years through several cattle improvement projects in an attempt to increase the productivity of the native breeds. Also sheep and goat population decreased in the last 20 years. Several reasons, including genetic erosion from farm animal genetic sources in Turkey, have been given. But today there is a structure of the global strategy for management of farm animal genetics resources in Turkey. The conservation of Animal Genetic Resources in Turkey, in accordance with the UN convention on Biological Diversity (CBD), the FAO and several NGO's, are explained in the text.

INTRODUCTION

It was estimated that some 1.5 million species have been identified on our Planet that originated 4,500 million years ago It was also argued that domestication of 20-40 species started 10,000 years ago. These figures have reflected only identified number of species rather than the existing ones.

Domesticated farm animals include five species: sheep, goat, cow, pig and horse. Surely there were others such as Arabian camel Bactrian camel, lama, ass, reindeer, buffalo, yak, Bali cow, and mithan that are considered less important in this classification.

Yet other domesticated species include some small mammals like dogs, rabbits, guinea pigs, fox, mink and various birds including the chicken, duck, goose, turkey, etc. Insects are not left out in this classification and they include the useful bee and silk worm.

Human beings needed to domesticate the animals as sources of food such as meat and milk. These animals also provide leather clothes and fuel and could be used for transport. In addition, animals hedge against risks and hence find use in animal husbandry. According to FAO statistics (2000) 1,350 million heads of cattle produced 85.5% and 24.5% of world milk and meat respectively. 1,058 million sheep produced 1.4 and 3.3 % of world's meat and milk, respectively. 720 million heads of goat produced 3.3 and 1.4 % of world's meat and milk, respectively.

Animals were also important for social reasons and played important roles in the cultural life of the community.

Genetic Diversity is the number of breed types in the species and nature of their ecological relationships within their ecosystem. Genetic diversity refers to variations in the level of individual genes (polymorphisms) and provides a mechanism

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for the population to adapt to the ever-changing environment. The more the variation, the better will be the chance that at least some of the individuals will have an allelic variant that is suited for the new environment. And these individuals will produce offspring with the variant capable of continuing the generations (Soysal, M.İ. 2004).

The term breed stands for homogeneous sub-specific group of domestic livestock with definable and identifiable external characteristics that distinguish it visually from other similarly-defined groups within the same species. The breed can also be described as a homogenous group for which geographic separation from phenotypically similar group has led to general acceptance of it as a separate identity (Turton, 1974).

From the zootechnical point of view characteristics of breeds need to be registered and described by related breed associations. This is one of the ways of breed development by means of studbook in developing country and in Europe. So naturally there is no one definition. However, the generally accepted description is this: Breed is a group of animals that have been selected by man to possess a uniform appearance that is inheritable and distinguishes it from other groups of animal within the same species (Clutton-Bruck, 1987).

Cunnıngham (1991) described that a breed is usually associated with a particular ecological zone, geographical area and farming system. Some breeds may however be present in several countries; established crosses between two or more breeds may be recognized as a separate breed but shifting or transitional cross breed groups are not.

The idea of breeds can be traced back to definitions of standards types for the breeds in order to prepare stud book in Europe. This was started from the end of 1700 until the First World War. First studbook has published in 1792. First breed association was formed in 1800. From that practical point of view big deviations from breed standards which were declared by the related farm animal species meant animal couldn't be entered in the studbook.

In other words such animals could not be sold under the name of this specific breed. Sometimes breeds were developed by selection processes in combination with inbreeding as Robert Bakewell practiced in Great Britain. Breeds in Africa and Asia were developed without studbook breed standards or breed society. Sometimes breeds were developed by crossing of imported animals with local breeds. Today, however, a large number of farm animals breeds is in danger of extinction (Hall and Rudner, 1993) due to three main factors.

The first are genetic erosions occasioned by artificial insemination. These gave rise to cross breeding of exotic breeds with local breeds.

The second factor is strong economic pressure on the farmer to focus on single traits such as milk production. This made them work with single breeds that accounted for high proportions of these animals within the species. The third factor is unrestricted and indiscriminate crossbreeding, especially in developing countries. This has led to the dilutions of many breeds.

Under these circumstances efforts have been focused on characterization and documentation of the animal genetic resources in accordance with the United Nations Convention on Biological Diversity (CBD) with the purpose of taking complex measures to conserve genetic sources of plants and animals.

The focus of this paper is mainly on giving some information on farm animal genetic researches. The following will be considered: economic value of a breed, adaptation of breed to the environment, social or cultural value of breed, scientific value of the breed, genetic origins of breed, population size and degree of enlargement.

Documenting the breeds are useful for developing effective breeding programs, giving clear evidence for deciding priority for conservation and also implementing benefit share mechanisms of the Convention of Biological Diversity. The economic values of breeds are sometimes over exaggerated. The most ridiculous misconception about these is the lack of consideration that economic values of breeds may change over time. In other words what is economically important today could change due to market forces, politics and environmental forces. It should therefore be logical to consider the replacements rates, cost of raising replacements, production cost, return from sales and economic, cultural value of all animal products. The latter has a meaning of potential importance of breed in agro-tourist value. This factor implies evaluation of the potential of breeds related to maintenance of the landscape, gastronomy, folklore, etc, which are rising values for today's consumer.

It is not true, as is often believed, that local breeds have poor economic performance

than the exotic or crossbreeds. Generally if all the inputs including lifetime performance are considered, instead of output only, the local breeds have advantages over the exotic and crossbreeds in terms of adaptation and in the evaluation of the existing environmental potential.

Other important reasons that need to be taken into consideration are the production system and traits of major interest of the future which may be different from the present as a result of changes in the global environment.

Each environment has a set of unique features which is varied among the different geographical regions of the world. This must be included in the discussion of cultural and historical values of breeds. The scientific values of breeds include special characteristics such as behavior, disease resistance which could be useful in researches on animal and human genetics.

According to the FAO sources (Cardellino, A.R. 2003) 850 sheep, 815 cattle breeds are identified in animal genetics resources. By 2020 global consumption of meat and milk will go up by 120 million tons and 240 million tons, respectively, compared to 1993.

In order to classify the breeds several morphological traits or neutral genetics markers, including microsatellites and allozymes, can be used as framework in the estimation of genetic distance among them.

We made this kind of study for Turkish sheep and cattle breeds. It is being debated that there are big variations among the Turkish sheep breeds (Soysal, M. İ. 2003).

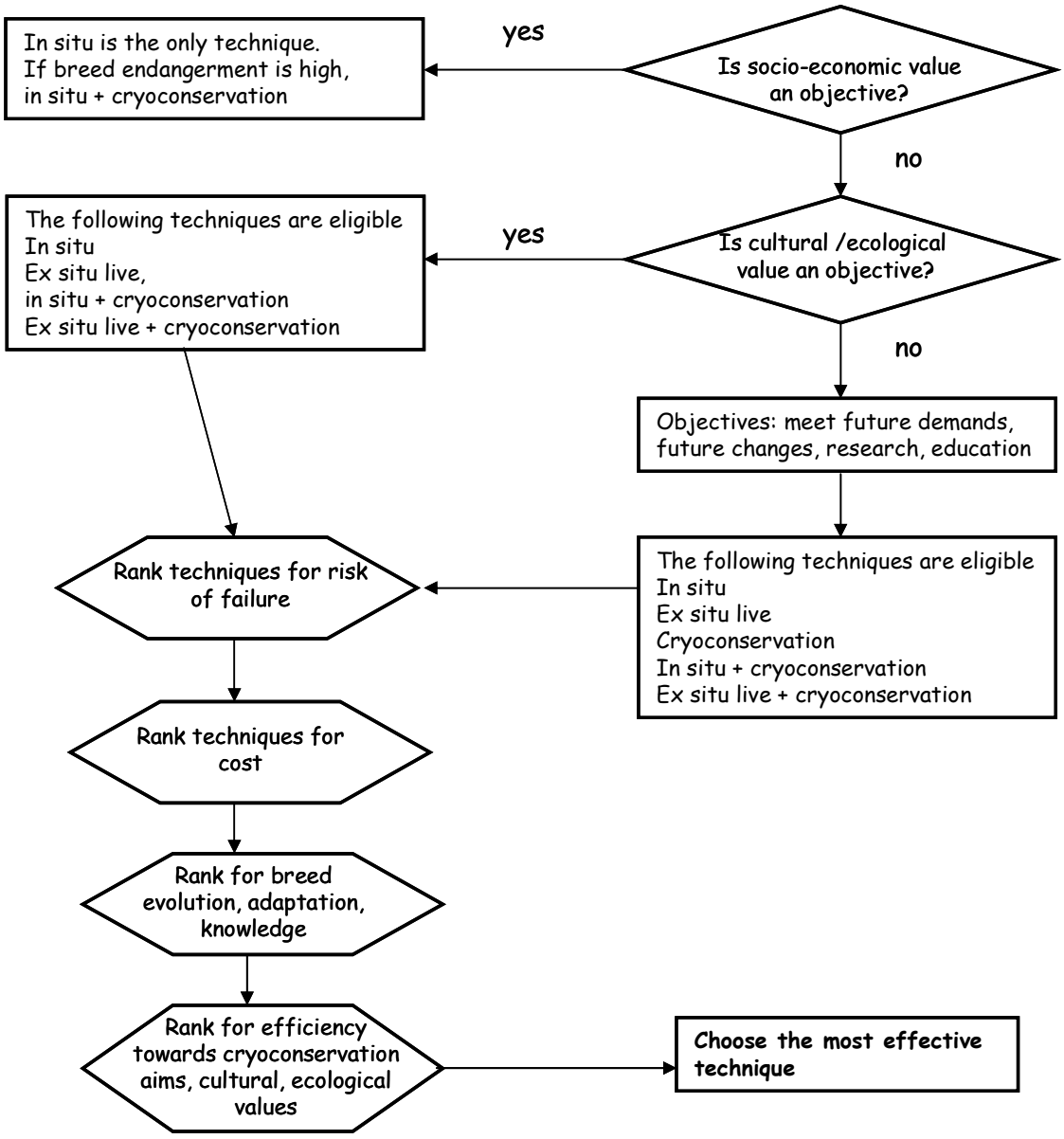
In view of limited financial resources and lack of public awareness, it was decided to carry out the most important step in these conservation studies, which is determining which of the breeds has the highest priority. Consequently we laid down the relevant criteria in combination with what has been stated already with a view to enlarging each of the breeds. Therefore breeds currently at risk of extinction would be given priority. Documentation and monitoring of crucial situations like census and surveys would be employed. Genetic diversity would be employed to help ascertain the current status of these animals.

Sometimes statistical data obtained by estimation rather than real census only have great differences than real number. So it would be necessary to conduct field surveys and census. To increase public awareness and stimulate government interest, it would be necessary to cooperate with relevant non governmental organizations (NGO).

FAO (1998) recommended carrying out census to obtain basic information on what breeds exist within a country. Using such information and others from relevant bodies like universities and related NGO's the study could be fully effected.

The breeds to be studied include the following: Eastern Anotolian, Red Cattle in Erzurum, Angora Rabbit (Poultry Research Ins. in Ankara), native silk worm lines of Bursa region (Silk Worm Research Institute in Bursa), native poultry breed of Turkey, Sakız, Dağlıc, İvesi, Karacabey Merino, Kıvırcık, Karayaka, İmroz sheep breeds (Bandırma Research Ins.), Red Karaman sheep breeds are preserved in Eastern Anotolian Research Inst. in Erzurum.

Figure 1. Choosing the conservation method



According to the World Watch List for domestic animal diversity (Scherf B.D., 2001), ten cattle breeds, two horse breeds and three sheep breeds are extinct. The most important reason for extinction is crossbreeding with exotic breeds (economic reasons).

According to the same source Malakan horse breed and Cine capari sheep breeds are in the endangered state (as breeds at risk). During the last three years the remaining seven breeds of sheep (Kıvırcık, Karayaka, İmroz, Dağlıç, Akkaraman, Morkaraman, İvesi), one goat breed (Angora Goat) and five cattle breeds (Gray Cattle, Native Black Cattle, Eastern Anotolian Red Cattle, Southern eastern Anatolian Cattle, Red Cattle) are under pressure of crossbreeding due to economic reasons. Two research-based databases have emerged in order to create awareness to this problem. One was produced for all farm animal species and is called *Native Farm Animals Genetics Sources* (http://genkaynaklari.sitemynet.com) and was established by Prof. Dr. M. İhsan Soysal of the Department of Animal Science of Tekirdağ Agricultural Faculty of Trakya University. The other one, based only on sheep breeds, was produced by Prof. Dr. İnci Togan of the Middle East Technical University (http://togan3.bio.metu.edu.tr/turkey.html.). This formed a database of sheep breed for Turkey.

The General Directorate of Agricultural Research has also recently constructed the national database of farm animals (http://www.tagem.gov.tr). As a result of census, surveys and scientific papers, the

risk status of breeds can be assessed and priority decision taken.

There are many categories showing various degrees of endangered situations. FAO has categorized these situations into seven areas: extinct, critical, critical-maintained, endangered, endangered-maintained, not at risk, and unknown. These categories are determined based on number of breeding females (BF), number of breeding males (BM), general population size, trend in population size, percentage of females breed to males of same breed, and whether active conservation programs are in place for critical or endangered population.

EAAP Animal Genetic Bank had proposed different systems based on main factor of effective population size (Ne) from the equation: [Ne= (4m.f)/(m+f)]. This criterion strove at calculating the expected increase in breeding over (50) years where 6F generation is (1/2Ne). According to the EAAP system four categories are recognized: not endangered, potentially endangered, minimally endangered, and critically endangered.

FAO recommends three main kinds of conservation studies which are: *in situ* conservation, *ex situ* conservation and cryoconservation.

In situ conservation includes the breeding programs in agro ecosystem where they were developed or are now found. The *in situ* conservation activities also aim to ensure the continued contribution of these resources to sustainable food and agricultural production now and in the future.

Today there are roughly 3000 breeds and varieties of seven major mammalian species (Hall and Roune, 1993). Those with population data of 23 % are considered endangered. For poultry there are 800 breeds including chicken, duck, goose and turkey and of those with 52% population data are thought to be endangered (Scherf, 1995).

FAO has published a book regarding usage of molecular genetic techniques under the name of *Secondary Guidelines Measurement of Domestic Animal Diversity* (MoDAD), Basic experimental design and recommended microsatellite markers.

There are E.U. projects such us AVIANDIV including 52 chicken lines from Europe and other ECONOGEN for sheep breeds. There are some other EU projects using molecular genetic techniques for other farm animal species. It is recommended to choose preferably unlinked microsatellites with more than 4 alleles in constructing genetic distance dendogram among the breeds.

Recently it is argued that higher diversity breeds should receive concomitant higher priority for conservation (Bruford et all, 2003).

Over the past 15 years 300 out of 6000 breeds in all farm animal species identified by FAO have become extinct. It is argued in World Watch List for Domestic Animal Diversity (DAD) that 1350 breeds currently face extinction; 1 to 2 breeds are lost every week. Of 50000 known bird and mammalian species about 30 have been used extensively for agriculture; 15 species account for over 90 percent of global livestock production.

Ex-situ conservation expresses the all conservation of genetics material *in vivo*, but out of environment in which it was developed. The *ex-situ* conservation and *ex-situ* preservations are considered to be synonymous and cover the all-conservation of genetic material *in vitro* including cryoconservation of semen oocytes, embryos, cells or tissues. So the *ex-situ* conservation includes both live (*in vivo*) and cryostorage. European Union Council regulation (No. 870/2004) regulated the *in-situ* conservation in Europe, the conservation of genetics material in ecosystem and natural habitats and maintenance and recovery of species or feral breeds in their natural surroundings; and also in the case of domesticated animal breeds or cultivated plant species in the farm environment where they have developed their distinct properties. There is a wide consensus on conservation by maintaining population within their production systems such as conception biological diversity (CBD), FAO and common agricultural policy of EU (CAP-EU). European Community supports farming of local endangered breeds in their production systems.

FAO member countries have not yet considered a global approach to *ex-situ* conservation. Major constraints for *ex-situ* conservations are lack of financial, technical and legal strategic potential.

The in situ conservation programs are more common at present due to more efficient conservation through sustainable utilization of a breed or specific animal population. It is necessary first to have political commitment to support sustainable livestock production including donor commitment in long-term development projects in order to clarify the countries' needs and identify the sources; then

to construct countries' implementation actions. FAO also established partnership with world association for animal production (WAAP) for AnGR. FAO's global strategy for management of farm animal genetics sources, implemented by FAO as requested by member countries, include intergovernmental support mechanisms such as Commission on Genetics Resources for Food and Agriculture (CGRFA), Intergovernmental Technical Working Group on AnGR (ITWG-AnGR) and National Governments (represented by national coordinators, NC) in order to prepare country report (CR) explaining the state of An GR in FAO member countries.

Each country has her own planning and implementation structure such as national, regional, global focal point and activities related to the donor and state holder involvement. The database (DB) for the list of breeds can be found in the form of Domestic Animal Diversity - Information System DAD-IS (www.fao.org/DAD-IS). Regional focal points where countries indicate their need must be established through extra-budgetary support provided to FAO or through direct funding from within the region.

The other major output expected from the data of member countries is report on the state of the World's Animal Genetic Resources in the form of World Watch List in the framework of national coordinators responsible for preparing country report with the cooperation of NGO 's and universities in the country. FAO uses inter-governmental mechanisms to guide state of World's Animal Genetics Resources Process in the form of regional trainee courses, capacity building training courses, supplying training material etc, and direct help to countries. These activities are funded by FAO, regular programs, extra-budgetary resources; direct natural contributing and some inter national funding sources such as UNDP (www.undp.urg) World Bank (www.worldbank.org) UNEP (www.unep.org), International Fund for Agricultural Development (IFAD).

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