



report

CHARACTERIZATION AND VALUE ADDITION TO LOCAL BREEDS AND THEIR PRODUCTS IN THE NEAR EAST AND NORTH AFRICA

*Regional Workshop
Rabat, Morocco
19-21 November 2012*



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¹ Arranged by alphabetical order.

Executive summary

The regional workshop on Characterization and Value Addition to Local Breeds and their Product in the Near East and North Africa was held in Rabat, Morocco, on 19-21 November 2012.

Approximately 50 participants attended the workshop. Most of these were National Coordinators for the Management of Animal Genetic Resources, researchers and professionals working on animal genetic resources management in livestock administrations and universities. Other participants included presidents of breeders' associations and representatives of international organizations. Key speakers from the French National Institute for Agricultural Research (INRA), the Agronomic and Veterinary Hassan II Institute (IAV), the Greek National Agricultural Research foundation (NAGREF), the International Center for Agricultural Research in the Dry Areas (ICARDA) shared their expertise and added value to the discussions. In total, 17 representative countries were present: Algeria, Egypt, France, Greece, Iran (Islamic Republic of), Italy, Jordan, Libya, Mauritania, Morocco, Saudi Arabia, Spain, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates and Yemen.

The objectives of the workshop were to strengthen the capacity of participants in phenotypic and genetic characterization of local breeds, to provide an opportunity to share experiences in the promotion of local breeds and to strengthen focal points for animal genetic resources at national and regional levels. By promoting collaboration and dialogue, the participants found common issues that can provide a foundation for future synergies, action and exchange of information.

The workshop was held in three sessions. The first addressed the state of animal genetic resources (AnGR) and inventory, characterization and monitoring activities in the Near East and North Africa. National Coordinators presented the situation in their respective countries. The second session was on the promotion of local breeds and their products. The third was on the roles and responsibilities of National Coordinators and on measures that can be taken to strengthen their roles at national and regional levels. Each session was followed by a group discussion. A field trip to the sheep production area of the Middle Atlas Mountains followed the closure of the workshop.

The key messages highlighted during the workshop were: 1) that implementation of the Global Plan of Action for Animal Genetic Resources in the Near East and North Africa region has been slow and that the characterization of many of the region's breeds is incomplete; 2) that valorization and market-access strategies would help the region conserve local breeds; and 3) that the main regional priorities are improving the management of Awassi sheep and Damascus goats in the Near East region and the conservation of Brune de l'Atlas cattle in the North Africa region. Finally, financial and political support, as well as awareness of the roles of animal genetic resources, were identified as prerequisites for addressing these issues.

Introduction

The diversity of the world's animal genetic resources for food and agriculture (AnGR) is in a continual state of decline. More than 8 percent of known breeds have become extinct within recent decades and another 21 percent are at risk of extinction. Many of these breeds at risk have special or unique traits. In general, locally adapted breeds have been selected, in an empirical and a non-structured manner, to address a wide range of goals, such as adaptability and resilience to harsh conditions, rather than selected only for increased production. The special traits of these breeds often include adaptedness to their particular production environments; for example, they may be resilient to harsh conditions and resistant to endemic diseases. Locally adapted breeds play vital roles in the lives of the human populations in their respective local areas. Their products are appreciated and the livelihoods of smallholder farmers and pastoralists depend on them. It is important that breeds at risk of extinction are recognized for their special virtues and promoted by policies and practices in order to make up for the lack of resources devoted to them and to counter ongoing genetic erosion. This includes the recognition of the non-market values of local breeds and the promotion of their products on the market.

Recognition of breeds' potential depends on the availability of accurate and comprehensive information on their characteristics and their production and marketing environments. Such information can only be obtained through well-designed characterization studies that include pertinent and well thought-out analysis and interpretation of the data collected.

Recently developed tools, technologies and methods can greatly enhance the quantity and quality of information obtained via characterization studies of breeds and their production systems. FAO's guidelines on phenotypic characterization offer practical guidance on the fieldwork required to characterize a breed, including its population structure. New genomic technologies can be used to complement and augment approaches outlined in FAO's new guidelines on molecular genetic characterization of AnGR. These techniques provide opportunities to study gene flow, which generally occurs from more-favoured regions to less-favoured regions, and to improve knowledge of the biological basis of adaptation and other specific traits. Information gathered from a comprehensive characterization process can underpin the design of new approaches to the management of AnGR, including various ways of adding value to their unique traits.

In global terms, the Near East and North Africa (NENA) region includes the centres of domestication of several major livestock species (e.g. cattle, sheep and goats) and thus its breeds are more likely than others to have valuable and unique genetic diversity. The region's climate and production environments vary widely and include numerous harsh environments that combine high temperatures and arid conditions. These conditions give the region's breeds an advantage over exotic breeds that have been raised in temperate climates and more favourable production environments.

Given the comprehensive nature of the characterization activities required, and the novelty of some of the technologies and approaches involved, many

countries lack some of the technical capacity needed to undertake them. A three-day capacity-building workshop held in Rabat (Morocco) was designed for the National Coordinators for the Management of Animal Genetic Resources and other actors engaged in AnGR management and related activities in the countries of the NENA region. The objectives of the workshop were to strengthen the capacity of participants in the phenotypic and genetic characterization of local breeds, to provide an opportunity for sharing experiences in the promotion of local breeds, and to strengthen focal points for AnGR at national and regional levels.

The state of animal genetic resources and inventory, characterization and monitoring activities in the Near East and North Africa Region

The NENA region includes the centres of domestication of several major livestock species, and thus its breeds are more likely than others to have valuable and unique genetic diversity (see Annex I for the number of breeds reported by each country). National Coordinators presented information on the main breeds in their respective countries, including population size, distribution, production systems (including where possible, the proportion of the population found in each production system) and main features. Their reports reviewed inventory and characterization activities and their impacts. In addition, the participants identified future priorities and described specific projects and lessons drawn from them. Finally, an open discussion was held on issues and options for the NENA region. Several concerns and challenges were raised, as well as a number of opportunities for countries to work together.

BREEDS PRESENT IN THE NEAR EAST AND NORTH AFRICA REGION AND THEIR CHARACTERISTICS

Each National Coordinator presented the main breeds in her/his country and the characterization work that has been realized. Detailed information was provided for Algeria, Egypt, the Islamic Republic of Iran, Jordan, Mauritania, Morocco, Tunisia and Yemen. These are summarized below.

Algeria

by Mourad Abdefettah

Two mountain ranges divide Algeria into three ecosystems: the Tellien system, consisting of a succession of mountains, the coastal and sublitoral ranges and their plains; the high plains steppe; and the Sahara, with the massif of the Ahaggar. Algeria has three main production systems: extensive, semi-intensive and intensive.

Algeria has one local cattle breed, known as the Atlas, which has a population of about 1.4 million head. This breed has several subpopulations that are different phenotypically. The imported breeds present in the country are the Holstein, Montbeliarde and Brune des Alpes.

Algeria has about 18 million head of sheep, grouped into three main breeds that are well adapted to the often-precarious production conditions: the Ouled Djellal, representing 60 percent of the national flock; the Rembi; and the Hamra breeds. The Hamra had a population of more than 3 million head at the time of independence, but nowadays the population is no more than 50 000 head. There are six secondary sheep breeds, which can be found in their regions of origin: the Berber, the Barbarine, the D'men, the Sidahou, the Tadmit and the Tazegzawt. The Tazegzawt

sheep population, which is not mentioned in the list of Algerian sheep breeds in Domestic Animal Diversity Information System (DAD-IS)², can be found in the mountains of northern Algeria.

Algeria's local goat breeds include Arbia, Mekatia, M'zab, the dwarf race of Kabylia and Tergui. The local goat population is estimated at 2.5 million head. It is concentrated in difficult and underprivileged areas such as steppes, mountains and oases. There are also exotic breeds (Saanen, Alpine, Murcia and Chami) and their crosses with local breeds.

The country has two types of camel population, the Chaâmbi and the Tuareg, which has several subtypes: Reguibi, Sahraoui, Mahri, Marouki and Ouled Nail.

Inventory and characterization activities have been conducted on the Kabyle Dwarf goat breed and on Tazegzwet and Tadmit sheep breeds. The results show the great potential of these sheep breeds for mutton production, which allows them to compete with other local populations. In addition, there are ongoing projects studying genetic diversity (polymorphism) in the Ouled Djellal sheep breed and in Arbia, Mekatia, Dwarf Kabylie and Mzab goat breeds.

In the case of horses, characterization work has focused on the Arab-Barb breed, the Barb and Thoroughbred.

Egypt

by Ahmed R. Elbeltagy

Egypt has three main regions: the Delta Region or Lower Egypt; Mid-Egypt; and Upper Egypt. Livestock play an important role in the livelihoods of rural people and account for 28 percent of agricultural GDP. A national census is carried out every ten years. Extrapolations are conducted biennially to adjust the population sizes. The census is done at the level of species, type (local, exotic and cross-bred) and geographical locations. It does not collect data at the breed level.

Table 1 Livestock population in Egypt

Species	Livestock population
Cattle	4,921,344
Buffaloes	4,794,768
Sheep	5,488,000
Goats	4,207,400
Camels	192,960
Chicken	155,520,000

The Egyptian cattle are classified as *Bos taurus*. They are relatively small (300 kg for mature female) and have a low milk yield, ranging from 700 to 1470 litres in a lactation period of 155 to 281 days. There are six major populations of local cattle, namely the Beheiri, Monoufi, Domiati, Maryouti, Saeidi and Masri. These breeds are not subject to any structured breed improvement programmes. Uncontrolled crossing of these breeds with exotic breeds has been taking place for a long time.

The buffalo population is estimated at 4.79 million head. Local buffalo breeds are named according to their geographical distribution: Beheiri, Monoufi, Saeidi,

² Domestic Animal Diversity Information System (DAD-IS): <http://dad.fao.org/>

Baladi and Masri. The Egyptian buffalo may be threatened by uncontrolled cross-breeding with the Italian buffalo, which started in 2007.

There are three major sheep breeds: Rahmani (north of the Delta), Ossimi (Middle Egypt) and Barki (rainfed northeastern coastal areas). In addition, there are eight minor sheep breeds: Abidi, Abudeleik, Farafra, Kanzi, Maenit, Saidi, Sanabawi and Sohagi, which are located mainly in the southern part of the country and the oases.

The majority of Egyptian goats belong to the Baladi breed, which is distributed all over the Nile valley and Delta region. Barki goats are found throughout the coastal zone of the Western Desert. Zaraibi goats are a prolific breed with dairy potential – they have shown encouraging response to selection for dairy production while maintaining their high prolificacy. Their milk production is, on average, 249 kg in a lactation period of 210 days. Saidi and Wahati goats are concentrated in the southern region. Black Sinai goats can be found only in the Negev and Sinai deserts.

Projects and scientific research activities have been undertaken on molecular characterization of, and differentiation among, indigenous small ruminant breeds (populations) and comparing them with regional breeds.

Projects have also been undertaken on the molecular genetic characterization of buffalo, using microsatellite markers. Results have differentiated among some local and Italian populations. In 2011, a home page was created for the genome sequence and mapping information from the Egyptian river buffalo (*Bubalis bubalus*).³ The page still requires updating. For cattle, knowledge has improved thanks to a Marie-Curie project that offers a staff exchange programme between the University of Cordoba (Spain), which is responsible for the coordination, the Agricultural Research Institute of Lisbon (Portugal) and the Faculty of Agriculture of Ain Shams University, Cairo (Egypt), including the research staff of Animal Production Research Institute. The buffalo and cattle characterization studies indicated a high level of genetic diversity (the average number of alleles is 6.25). Currently, genomic analyses (based on genome-wide association studies (GWAS) and comparative gene expression approaches) of tolerance to desert abiotic stresses in indigenous breeds of small ruminants (Barki sheep and goats) are being undertaken in collaboration with ICARDA and Iowa State University. For assessing individual tolerance to natural heat and exercise under direct solar radiation (grazing stress), a stress tolerance index based on changes in physiological parameters has been developed. The study will allow estimation of the genetic parameters and identification of candidate QTL of abiotic stress tolerance traits.

Islamic Republic of Iran

by Mohammed Kamali Sarvestani

The Islamic Republic of Iran uses and manages its AnGR through traditional and nomadic, semi-industrial and industrial systems. The percentage of the human population found in nomadic systems decreased from about 10 percent in 1966 to about 2 percent in 1998.

³ Egyptian Buffalo Genome website: <http://egybufgen.webs.com/>

Breed diversity is summarized in the following table:

Table 2 Breed diversity in the Islamic Republic of Iran

Species	Breed
Native cattle	7 breeds
Water buffalo	3 ecotypes
Native sheep	26 breeds
Native goat	9 breeds
Horse	10 breeds
Native chicken	17 breeds/ecotypes
Camel	6 ecotype

There are two local cattle breeds: the Sistani and the native Najdi. Crossbred cattle have increased at the expense of the native cattle population, as shown in following table:

Table 3 Livestock population by species in the Islamic Republic of Iran

Year	2009 (1000 head)	2010 (1000 head)
Pure cattle	9129.5	10070
Crossbred cattle	28424.5	32539
Native cattle	11660	10088
Buffalo	2983.5	3165.5
Sheep	52114	51698
Goat	19317	19163
Camel	847	852.5
Mule	7758.85	7758.85
Total	132234.35	125684

Water buffaloes play an important role in the economy of rural families, where they are kept for milk, meat and draught power. More than 75 percent of the country's buffaloes are of milk type.

The main sheep breeds are the Moghani, the Baluchi (8 million), the Afshari, the Arabi, the Bahmei, the Chal, the Dalagh, the Ghezel, the Lory and the Lory Bakhtiyari. The populations of Gray Shiraz, Karakul (black) and Kurdi are decreasing. The most important goat breeds in the Islamic Republic of Iran are the Najdi, the Native Black, the Raeini, which produces cashmere, and the Tali. A great concern is the decline of the Marghoz goat, whose population has fallen to only 14 000 head. This breed has a great potential because it can produce mohair. Four million goats are still not characterized. The sheep and goat populations decreased from 81 million head in 1987 to 72 million head in 2010. This occurred as result of the settlement of nomadic people in urban areas, long-term drought conditions and a reduction in the size of rangeland areas.

The Islamic Republic of Iran has a wide range of horse populations: the Persian Arab, the Caspian pony and the Turkmen breed. It also has the Bakhtaran camel. Native chickens are also present – the Dashtyary, Lary, Marandy and other ecotypes.

The Islamic Republic of Iran has expanded research on the conservation and characterization of AnGR, especially in the field of biotechnology, with a focus on the preservation of AnGR.

Jordan

by Khaleel Jawasreh

The majority of the cattle reared in Jordan are Holstein-Friesians, of which there are 66 000 head. The number of cattle owned by smallholders has decreased in number because of the feed crisis. The Baladi cattle breed is threatened and can only be found infrequently in the Jordan Valley region. A molecular characterization study of local and Friesian cattle, using RFLP markers, was initiated in 2009.

The main livestock resources of Jordan are its small ruminants, which are based on three main production systems: the nomadic; the semi-intensive; and the intensive. The main sheep breed in Jordan is the Awassi (3.665 million head), which is concentrated in Al-Mafraq governorate. The Romanov, Suffolk and Charollais breeds can be found in station.

Many projects have been conducted on the phenotypic characterization of Awassi and Chios sheep, as well as on the Afec breed and the improved Awassi. Genetic and phenotypic characterization of Awassi sheep lines and the Najdi breed has confirmed that the Awassi lines are genetically clustered together, with dissimilarity among them, but that they are distant from the Najdi breed. The next step is to characterize the Awassi lines (Sagri, Afed and improved) using SNPs and microsatellites. Other recent work on sheep has included research linking some genes and economic traits.

In the case of goats, genetic and phenotypic characterization research has been conducted on four breeds, namely the Shami, Mountain Black, Dhawi and Desert Goat. Some of the Dhawi goats were introduced to a research station for the purposes of phenotypic and genetic improvement.

Phenotypic and genetic characterization of local chickens started in 2010.

Mauritania

by Mohamed Lemine Ould Haki

The Sahara covers three-quarters of the country. The other quarter is part of the Sahelian area. The livestock population is estimated to include 12 million small ruminants, about 2 million cattle and 1 million camels. Agropastoral areas are present. The range of species and breeds raised in Mauritania is relatively large; the seven domesticated species include 26 breeds.

Mauritania has two distinct breeds of cattle. The Moorish Zebu represents 75 percent of the cattle population. It is a hardy breed that can be traced back in the north. The breed is resilient and accesses drinking water only once every two days. Mainly present in central and eastern regions, the breed is primarily used for its milk. The Fulani Zebu is found exclusively in the south of the country (especially in the Assaba and Gorgol Guidimaka). It is used for meat production.

Three sheep breeds can be found in Mauritania. The Moorish short-haired sheep, which is present in the south and southeast, is used for meat production. The Moorish long-haired sheep, which is present in the south and southeast, is appreciated for its long black hair, which is long enough to be woven. The Fulani sheep, whose characteristics are similar to those of the Moorish short-haired sheep, can be found only in the south.

Sahelian goats are present throughout the country and are used for milk and meat. The Dwarf goat, which is found in the southeast, is mainly used for milk production. The Gouera goat breed is kept, mainly for milk, in large cities.

The Aftout dromedary and the Sahel camel are found in the centre, the north and the northeast of the country. Camels are used for milk and meat.

The Arabian horse, which is present in the centre and the southeast, is used for transport, as is the Barb horse in the south. The African common donkey is present throughout the country and is used for work.

Mauritania has many local chickens (*Gallus gallus*), which are used for their eggs and meat. Estimates indicate that there are 3.5 million local chickens kept in the traditional poultry farming system, which also includes guinea fowl and ducks.

Morocco

by Abderrahman Benlekhal

Morocco has four main agroclimatic zones: 70 percent of the sheep population is located in pastoral areas, arid and semi-arid areas and in the mountains; 70 percent of goats are in the mountainous areas and the arid and semi-arid pastoral areas; 80 percent of cattle are located in irrigated agricultural plains; and 90 percent of the camels are in the desert and semi-desert areas of the south and southeast.

The main livestock breeds, i.e. those that are important for the economy and widely distributed, are integrated into breeding programmes and the development plans of the sector. In the case of cattle, the range of local breeds is limited (three local breeds inventoried). The main breeds are the Brune de l'Atlas and the Blonde d'Oulmès-Zaer.

More than 95 percent of the sheep population consists of local breeds, of which six are of major economic interest: the Sardi, Timahdit, Beni Guil, D'man, Boujaâd and Beni Hsen. Local sheep breeds have proven their potential in breeding programmes and provide ever more opportunities for their keepers.

The goat population, despite its small size, is characterized by heterogeneity because of the mixing of different types. The local population is described as rustic and unproductive, but it is difficult to distinguish pure breeds that could present specific qualities to be developed.

The same applies to the dromedary. The camel breeds are the Marmouri, Khouari and Guerzeni breeds.

Morocco has prestigious horse breeds that are continuously being developed. These are the Thoroughbred, Arabian horse, and Beard.

Poultry strains face particularly difficult circumstances. Imported and highly productive industrial strains have led to a major decline of local strains, which are already threatened.

The distribution of the main breeds of sheep, goats, cattle and bees is shown in the following table:

Table 4 Livestock numbers in Morocco by species (millions of animals)

	1980	1982	1990	1995	2000	2005	2010
Cattle	3,3	2,5	3,7	2,4	2,6	2,7	2,7
Sheep	16,5	10,1	16,6	16,5	17,3	16,8	17,5
Goat	6,1	4,09	5,6	4,4	5,1	5,3	5,3
Camel	0,060	0,05	0,02	0,09	0,160	0,180	0,190
Horses	-	-	-	-	-	-	0,160

Table 5 Breed population by geographic area in Morocco

Species	Breeds	Population/bee-hives	Geographic area
Sheep	Timahdit	1 900 000	Middle Atlas
	Beni Guil	1 600 000	Eastern Plateau
	Sardi	2 200 000	Chaouia, Sraghna, Rhamna
	D'man	617 000	South Oasis
	Boujaâd	237 300	West and Centre of Morocco (Khouribga)
	Beni Hssen	390 000	Gharb et Loukkos
Goat	Draâ	120 000	Southeast
	Barcha	220 000	Atlas
	Noire de l'Atlas	350 000	Atlas
Cattle	Oulmès	80 000	Oulmès
	Brune de l'Atlas	600 000	Khénifra
Bees	Abeille jaune	5 000	East and Southeast
	Abeille noire	105 000	The rest of the country

However, the population size of localized breeds is not always defined:

Table 6 Breed population not recorded in Morocco

Species	Breeds	Numbers	Geographic area
Sheep	Mouton blanc	NR	High Atlas
	Siroua	NR	Ouarzazt
	Aknoul	NR	Eastern
Goat	Laâroussia	NR	North
	Laghzalia	NR	North
	Rahali	NR	Anti Atlas
Cattle	Tidili	15 000	Ouarzazate

Tunisia

by Rekik Mourad

Livestock accounts for an important part of the country's agricultural production. It contributes approximately 40 percent of total agricultural output. There are 380 000 farms in Tunisia and 65 percent of the farmers are livestock keepers, mainly smallholders, with an average agricultural land holding of less than 20 ha.

Tunisia has a good record for trends in animal species populations as shown below.

Table 7 Livestock population in Tunisia

Species / type	1990	2000	2010
Dairy cows	348 000	482 000	440 000
• Exotic breeds (Holstein > 90 percent)	99 000	204 000	222 000
• Local and cross-bred breeds	249 000	278 000	218 000
Breeding ewes	3 242 000	4 053 000	4 075 000
Breeding goats	671 000	829 000	811 000
Laying hens	3 606 000	5 327 000	6 485 000
Broilers	30 965 000	57 756 000	75 079 000
Turkeys	-	4 258 000	6 946 000
Breeding female camels	-	-	80 000

The breeds and species differ from one region to another. Tunisia is divided into five production zones, as shown in the following table.

Table 8 Main species and breed by geographical zone in Tunisia

Zone	Description	Main species/breed, production type
1	Humid: Mountainous forests. Pastoral and meadow grazing system	Meat: local and crossbred cattle – local goat – dual sheep (Sicilo-Sarde)
2	Subhumid: Upper semi arid. Cropping area. Agropastoral system	Milk (Holstein). Meat sheep
3	Semi arid: Agropastoral and pastoral system	Meat sheep
4	Semi arid: Coastal, landless (zero grazing) system	Milk (Holstein); Industrial poultry
5	Arid. Extensive pastoral system	Meat: Camels. local goats

In the zone 1, local and cross-bred cattle (120 000 head) contribute to 15 to 26 percent to the production of milk and meat in Tunisia. There are small herds with random cross-breeding among milk and meat types. The bulk of the cattle are local. Grade cattle are owned by small farmers with little or no land. Although described as Brune de l'Atlas, more than half the local cattle show characteristics of imported breeds, such as the Normandy, Eastern Red and White, Brown Swiss and Tarentaise. A characterization study revealed that the Holstein (95 000 head integrated in Zone 2 and 55 000 landless in Zone 3) have relatively low milk yield (3 000 – 6 500 litres). The breed's production and reproduction traits are well documented. Artificial insemination is largely performed using high-merit imported semen. Performance recording involves about 20 000 official controls per year.

Traditionally, sheep are managed under transhumance, but over the past decades, recurrent drought, modern technology and new economic rules have dramatically changed sheep production systems and socio-economic conditions. The Sicilo-Sarde sheep is distributed in large and small flocks. Improvement is done using Sarda semen. The Noire de Thibar breed is kept in integrated and semi-intensive production systems. It is used mainly for meat production from early weaned lambs. Molecular characterization of the breed has revealed the presence of prolificacy genes. The main threat to the breed is the increasing level of inbreeding. The breeding scheme is based on cross-breeding with Noire de Suisse semen and the use of F2 improved rams. Performance recording is done for 6 000 ewes. Characterization of carcasses and meat is at a preliminary stage. The products are characterized and valorized.

Intensive work to characterise the meat of the breeds in the centre of Tunisia is ongoing. The Barbarine sheep, a fat-tailed, hardy and well-adapted breed, is the most numerous. The phenotypic and genetic characteristics of its production traits are well documented. The main threat to the breed is climate change, as well as the reduction of the pastoral area and the social changes. Use of artificial insemination is limited to nucleus flocks. Several initiatives have been hampered by the absence of breed associations. The Queue Fine de l'Ouest sheep has low prolificacy, but is hardy and well adapted to uneven grazing areas with an increasing sheep population. RAPD markers have been used to study genetic diversity in relation to agro-climatic zones. For both sheep breeds (Barbarine and Noire de Thibar), production areas are very open on markets and there are peri-urban fattening units.

Local goats are well documented. They are also threatened by the reduction of the pastoral area.

Camels (Maghrebi population) are very heterogeneous in their external appearance. Some molecular characterization studies are ongoing. Major threats are linked to pasture regression, cross-border smuggling and animal diseases that affect young animals.

Semen is cryoconserved. Tunisian breeds face a severe genetic threat because of cross-breeding. Climate change and related future ecosystem impacts may also have an impact on their diversity.

Poultry in Tunisia is maintained in small to medium-sized holdings, under very heterogeneous traditional rearing. The same applies to rabbits, which have low production levels.

Tunisia has good examples of conservation and characterization (phenotypic and molecular) of wild species. The forest administration develops efficient conservation frameworks for the species concerned, which include the pony of Mogod, oryx, Tunisian wild boar and deer of Berberie.

Yemen

by Saher Ali Ismail

Yemen has about 1.6 million head of cattle. Characterization studies have shown that there are limitations in terms of milk production. Cross-breeding programmes have been designed to overcome this problem and produce more productive cows.

With more than 9 million sheep, Yemen has several breeds, such as the Aansi, White Sana'a, Amran Grey, Black Amran, Yemen White, Red Taiz, Dhamari, Tihami, Marib White and Socotri. The Bab el Mandeb breed is found on the coast of the Red Sea. The Alaghtnam, Althammeh, Alzmaria and Najdi breeds are found in the valley of Moore.

Yemen has more than 8 million goats. The breeds are the Yemeni Mountain, Black Taiz, Red Taiz and Surdud Mawri. Thamud goats are present in the valley of Moore.

Yemen has many donkeys in the rural areas, which are used as a means of transport. There are about 400 000 camels, which are found in coastal areas and in the eastern desert. They contribute significantly to transport in remote areas. The horse population amounts about 1000 head.

Yemen has about 10 million chickens and a large population of rabbits.

PRIORITIES, CHALLENGES AND RECOMMENDATIONS

The National Coordinators for the Management of AnGR gave presentations on priorities and challenges in AnGR management in their respective countries. Some

priorities are common to the whole region. Many countries will have to continue their characterization and inventory work, as this is the first step towards monitoring breeds' risk statuses and putting in place *in situ* and *ex situ* conservation measures, as well as national programmes for AnGR management.

Algeria's priorities are: 1) to undertake the inventory of all breeds at risk of extinction in order to evaluate the situation and identify the main factors responsible for the erosion of AnGR so that an adequate conservation programme for the threatened breeds can be put in place; and 2) to put in place a national programme that adds value to some of the breeds.

Egypt's priorities are: 1) to reorganize the National Focal Point and get some official response/support from government; and 2) to use new technologies for the characterization of AnGR and organize training workshops on their use.

The Islamic Republic of Iran's priorities are: 1) to continue working on *in situ* and *ex situ* conservation of AnGR; 2) to expand the use of biotechnological tools (e.g. fingerprinting), characterization of AnGR and cryoconservation of semen and/or embryos; and 3) to establish station farms for *in vivo* conservation of chickens, cattle, sheep, goats and horses.

Jordan's priority is to characterize the Awassi lines (Sagri, Afed and improved) by using SNPs and microsatellites and to introduce each line into separate stations for conservation.

Morocco's priority is to focus on the development of local breeds according to their area of origin (e.g. the lamb Beni Guil breed meat, goat cheese Chefchaouen, honey Euphorbus) in order to have sustainable use of the breeds and create added value for the producers.

Mauritania's priority is to resolve the problem of negative selection that is taking place in the dairy farms. The poor dairy females are bred quickly following parturition, whereas the good producers are kept for a longer milking period.

Tunisia's priorities are: 1) to increase awareness of professional institutions and NGOs with regard to local AnGR; this constitutes the only option that can provide a basis for implementing conservation programmes for the threatened breeds; 2) to characterize, identify the origin of and label products that would add value to the local AnGR; and 3) to intensify the inventory of species and breeds at high risk and revise the legal framework addressing the creation of breeders' associations with the aim of achieving greater economic competitiveness.

As to the challenges, the National Coordinators mentioned the lack of appropriate infrastructure and the lack of the biotechnological equipment needed to ensure the conservation of AnGR. They also mentioned the importance of effective training in the use these technologies. They considered that more regional/international collaboration and exchanges are needed, including beneficiaries in the field.

The uncontrolled crossing of local breeds with exotic breeds is another challenge. This has been consistently reported as an issue that may endangered the genetic integrity of certain species and breeds. The risk status of any of the breeds of the NENA region is unknown because of a lack of population data.⁴ Countries

⁴ For example, in 2012, 55 percent of breeds recorded in DAD-IS from the Near and Middle East region (as defined for purposes of The State of the World's Animal Genetic Resources for Food and Agriculture, i.e. Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syrian Arab Republic, United Arab Emirates and Yemen) were classified as being of unknown risk status (<http://www.fao.org/docrep/meeting/027/mg046e.pdf>).

need to update and upgrade the information on their livestock breeds and develop their sustainable utilization. NENA is rich in AnGR, but many of these resources still need to be identified.

On this basis, the main recommendation for the region was to increase efforts to characterize AnGR at the phenotypic and molecular genetic levels. Most livestock breeds in the NENA countries have no population data. Such data are necessary to establish the degree of risk of each breed and take the required measures to conserve breeds that are at risk of extinction. Livestock censuses and evaluation of cross-breeding experiments will help to establish measures to protect the integrity of local breeds and limit the cross-breeding at the purpose of its experiments. This procedure is a practical way of conserving valuable local breeds. Such efforts are essential in view of global warming and the specific adaptability of local breeds. With advances in biotechnology, countries can choose the mode of conservation most suitable to their circumstances.

During the discussion, the importance of a global data system was addressed. FAO mentioned that DAD-IS will soon have a component that will allow the description of the production environments of specific breeds, including information on the type of livestock management and animal containment, shelter, water management, reproduction, socio-economic factors and adaptation to diseases and particular climatic conditions.

NATIONAL AND REGIONAL PROJECTS

Five presentations gave an overview of several national and regional projects in the NENA region.

The Funding Strategy of the Global Plan of Action for animal Genetic Resources⁵

by Alizée Sauron

The Funding Strategy for the Implementation of the Global Plan of Action for Animal Genetic Resources was adopted by the Commission on Genetic Resources for Food and Agriculture (CGRFA) in 2009. It covers “all known and potential sources of financial resources” relevant to these objectives. It further recognizes that the main responsibility for its implementation lies with national governments. It also recognizes important roles for FAO, other international organizations, non-governmental organizations and the private sector. The Funding Strategy allows donors to provide funding through a Trust Account established by FAO to support implementation.

The Trust Account has received more than US\$1 million in donations from Switzerland, Norway and Germany. In 2011, the first call for proposals was launched. All government and non-governmental organizations, including research institutions and gene banks, farmers and their organizations, and regional and international organizations in developing countries or countries in transition who are members of the CGRFA were able to submit a concept note. The maximum allocation per project amounted to US\$50 000 for national projects and US\$100 000 for regional and multilateral projects. The duration of the projects was not to exceed two years.

FAO received 52 eligible concept notes – 43 national and 9 regional. The number of concept notes received from the various regions of the world was highly variable:

⁵ Funding Strategy: http://www.fao.org/ag/againfo/programmes/en/genetics/Funding_strategy.html

27 from Africa, 8 from Latin America, 7 from Asia, 5 from Europe, 4 from the Middle East and 2 from the Southwest Pacific. The FAO Secretariat noted that these differences were certainly related to the presence or absence of active regional focal points motivating and coordinating the submission of concept notes by countries. Regional focal points and subregional and regional networks also assisted the Bureau of the CGRFA's Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture to select the concept notes. Through the selection process described in the Funding Strategy,^[3] 13 projects, involving 30 countries, were chosen to receive funding.

In the NENA region, the bilateral project between Morocco and Algeria on the conservation of the Beni Guil sheep breed was the only one selected to receive funds from the Trust Account. This breed is particularly threatened by its absorption by the Ouled Djellal breed in Algeria. The project will facilitate the conservation of the breed through the exchange of experience between the two countries.

The Béni Guil⁶ sheep conservation project between Morocco and Algeria

by Said Fagouri

The zone of origin of the Beni Guil breed extends from the eastern region of Morocco to the border with Algeria. This breed is resistant and well adapted to the conditions of the steppe environment. It is also able to adapt to the conditions in other regions. However, in the breed's zone of origin it is in strong competition with the Oulad Jellal, a breed of larger size. On the Algerian side, after the crossing with Oulad Jellal breed, the Béni Guil experienced a sharp drop in its population (from 2.5 million head in the early 1960s to only 50 000 nowadays). The genetic erosion of the Beni Guil breed threatens its existence in the long term and puts it at risk of extinction, despite the fact that local rural communities depend on it.

To overcome the threat of extinction faced by the Beni Guil breed, a bilateral project between Morocco and Algeria is being funded by FAO in the framework of the Funding Strategy for the Implementation of the Global Plan of Action for Animal Genetic Resources (see above). The project aims to conserve the breed by enhancing knowledge about it and adding value to the genetic potential of the breed and to the underexploited qualities of its products. In order to preserve the genetic potential of the breed, the top 15 rams will be selected according to their genetic value for growth performance. Meanwhile, Algerian farmers and technicians will visit Moroccan breeders in order to be trained on the selection procedures. Providing elite breeders with training on artificial insemination will also contribute to strengthening capacity to conserve the breed.

The European project on genetic adaptation of bovine livestock and production systems

by Denis Laloë

It is predicted that the lands bordering the Mediterranean Sea will be affected by global climate change. It is expected that the Mediterranean zone will expand northwards to the French Massif Central. In the south, heat waves and droughts are predicted to become more frequent. The ability of livestock to adapt to climatic variations will therefore be a factor of great importance in the Mediterranean region. Hence,

⁶ For more information: http://www.anoc.ma/RACE_beni_guil.htm

it is important to understand the genetic basis of their adaptation. The GALIMED (Genetic adaptation of bovine livestock and production systems in Mediterranean region) project proposes a multidisciplinary approach involving 14 selected breeds in the north and south Mediterranean zone (Algeria, Egypt, France, Greece, Italy, Morocco, Spain). This approach combines population genetic, environmental, livestock management and production systems data to characterize Mediterranean cattle, quantify biodiversity, describe the covariation of these different factors, and detect selection footprints associated with heat or drought adaptation.

The objectives of the project are to: characterize Mediterranean bovine breeds, pedoclimatic conditions and production systems; provide a global view of the genetic diversity of Mediterranean cattle breeds and other hardy cattle breeds from the Massif Central (e.g. Salers, Aubrac, Gasconne); identify selection footprints in the bovine genome and the main selection pressures; analyse breeders' practices; and analyse breeders' opinions about adaptation. This research will identify the genetic basis of adaptation.

The project will enhance the resolution of available data on Mediterranean cattle, deliver tools for building guidelines on conservation/breeding objectives, and evaluate management practices and innovation tracks that can be used to address the consequences of climate change. Work on the genotyping of breeds in Algeria, France and Spain is currently ongoing, as is the implementation of a simplified questionnaire survey about breeding practices and detailed studies in Corsica, Sardinia and Morocco. The objective is to identify genomic regions related to adaptation.

Project on the sustainable development of the small-ruminant sector in the Mediterranean area

by Christina Ligda

DoMEsTic⁷ is one of the subprojects of the European project Arimnet. It aims to foster Mediterranean countries' capacity to address agriculture challenges. The project considers Mediterranean biodiversity as a tool for the sustainable development of the small-ruminant sector. Case studies from four Mediterranean countries (Cyprus, France, Greece and Morocco) are being analysed in order to assess associations between the structure of the farming systems, the characteristics of the local sheep and goat breeds, and the sector's resilience and sustainability. The project is investigating the components of the production systems, assessing their sustainability (environmental, economic and social), defining the roles of local authorities and organizations at territorial level, and analysing product distribution, supply chains and market trends. The project also intends to create positive synergies in breed-product interactions by reviewing existing strategies and supporting the development of new ones.

There is a shift from rangeland and pastoral systems to sedentary farming. Historically, knowledge associated with these systems developed gradually in interaction with the environment. Today, these systems are facing new demands, including protection of the environment and biodiversity, and consumer demands for safe high-quality products at affordable prices. As the systems evolve, their components have to adapt so as to be able to provide farmers with sufficient income and acceptable working and living conditions. The project will analyse these changes and will differentiate products and valorize their specificities in order to formulate recommendations for

⁷ For more information: http://www.arimnet.net/index.php?p=fp_domestic

actions needed to ensure the future competitiveness and sustainability of farms in these systems.

ICARDA's programme on characterization and utilization of small ruminant genetic resources

by Barbara Rischkowsky

ICARDA's mission is to improve the livelihoods of resource-poor people in non-tropical dry areas. It targets the needs of resource-poor livestock keepers. Currently, ICARDA is focusing on strengthening the sustainable use of sheep and goat genetic resources. The conceptual framework of ICARDA interlinks several elements: analysis of market constraints and opportunities and their effects on breed utilization; characterization of breeds, production systems and products; matching breeds with environments (GIS); designing community-based breeding programmes for local breeds; and improving production systems.

Work on phenotypic and molecular characterization of Syrian goat populations (Baladi, Jabali and Shami) identified two major goat production regions, with substantial phenotypic and genotypic variability among and within the breeds. Another example is a pilot study in Egypt undertaken to determine tolerance to abiotic stress in sheep and goats. The study showed that there was large variation in the extent of changes to biological parameters (respiration rate, rectal temperature, tidal volume and metabolic rate) before and after exposure to stress within and between Barki sheep and goats. Genomic analysis would determine functional molecular markers that could be used for early detection of tolerant animals.

ICARDA works on matching sheep and goat breeds with the environment by collaborating with FAO on production environment descriptors that allow performance data to be put into context and can be used to indirectly characterize the "adaptive fitness" of breeds. ICARDA has developed a GIS-based approach to determining and combining descriptors of the natural environment.

ICARDA has designed community-based breeding programmes for improving local breeds. The programmes are implemented by communities of smallholder farmers. The farmers' breeding objectives are identified, along with selection traits. Community-based breeding programmes integrate local and indigenous knowledge and institutions. The recording systems are kept as simple as possible. Such programmes have been developed and implemented for four sheep breeds in Ethiopia.

In Tajikistan, ICARDA developed a programme for improving local breeds and their products. The livelihoods of small farmers and rural women have been enhanced through value-added processing and export of Mohair. Tajik Angora goats have been improved by importing genetic stock from Texas Angora bucks. In Tunisia, ICARDA supported the creation of the Sicilo-Sarde Breed Association (SBA) in 2003. It also provided scientific backup to the improvement of production levels (artificial insemination with frozen semen from the Italian Sarda sheep), as well as providing support through the development of market opportunities for cheese production.

There are still gaps in AnGR characterization in the Arabian Peninsula. More work also needs to be done on linking local characterization studies to regional or global diversity and on the identification of adaptive traits related to abiotic and biotic stresses. The use of local breeds has the potential to help in efforts to cope with

climate change. ICARDA conducts research on the characterization of milk, meat and fibre quality and their potential valorization (niche products).

INVENTORY, CHARACTERIZATION AND MONITORING OF ANIMAL GENETIC RESOURCES IN THE NEAR EAST AND NORTH AFRICA: DISCUSSION

After the presentations on the state of AnGR and on the various projects conducted in the region, group discussions were held on the inventory, characterization and monitoring of AnGR in the NENA region. Participants split into two subregional groups (one for the Middle East and one for North Africa).

Issues and options for North Africa

It was noted that some of the region's breeds may face the risk of extinct because of the growing use of exotic breeds, but also that the latter breeds are more sensitive to climate change. It was concluded that this underlined the importance of inventory, characterization and monitoring of AnGR.

The importance of work on the roles of small ruminants and camels in food security in the subregion was highlighted. Some participants noted that countries often focus their programmes on sheep breeds from lowland areas, disregarding cattle and goat breeds from mountainous areas. The Beni Guil and Barbarine sheep breeds and the Brune de l'Atlas cattle breed were mentioned as priority breeds for the entire region.

Concerning characterization studies in the subregion, the participants noted that many phenotypic studies were conducted but few molecular genetic studies. It was also noted that it would be important for future studies to give sufficient attention to functional characteristics such as disease resistance. Participants noted that the countries of the Maghreb region should pay particular attention to the characterization of camels, goats and rabbits.

Finally, participants identified several opportunities to develop joint projects: organizing training workshops for farmers; improving collaboration in *ex situ* conservation by capitalizing on work already done; strengthening labelling measures; establishing a common system for monitoring AnGR; and creating a regional gene bank.

Issues and options for Middle East

It was noted that implementation of the Global Plan of Action for Animal Genetic Resources in the Middle East region had generally been slow, with significant variation between countries. The main reason for this has been a lack of awareness of the role of AnGR in food security. It was further noted that although the Middle East is home to many of the livestock that are adapted to arid conditions, temperature extremes, fluctuations in the availability of feed, drought and water scarcity (low watering frequency), not all the region's breeds have been sufficiently well characterized and that only a limited number of breeds have been characterized at molecular genetic level. It was concluded that better knowledge of their unique features, products, production systems and sociocultural and religious use would help improve the valorization, sustainable use and conservation of these breeds and the development of market access strategies. It was also noted that no population data are available for more than 50 percent of the breeds in the region although livestock

censuses are carried out regularly. General recommendations were that:

- countries need to update and upgrade information on their livestock breeds and develop the sustainable utilization of these breeds;
- more effort should be put into properly characterizing the AnGR of the sub-region at the phenotypic and genetic molecular levels;
- cross-breeding experiments should be evaluated from a farmer perspective, and those that prove useless must be terminated;
- any cross-breeding experiment should consider measures to protect the integrity of local breeds and limit the crossing to the objectives of the experiments;
- structured selection programmes for the improvement of local breeds are needed;
- countries should undertake breed-level population censuses, as such data are needed in order to establish the degree of risk of each breed and take the measures needed to conserve at-risk breeds;
- National Coordinators for the Management of AnGR need to reactivate their roles and countries should establish the infrastructure needed for the management of AnGR, or at least set plans to do so within defined time frames;
- through their National Coordinators, countries should update their breed information in DAD-IS;
- legislation particular to AnGR is needed; and
- countries should network to share experiences on the management of AnGR.

The region is endowed with regional breeds such as Awassi sheep and Shami goats (transboundary breeds). Priorities identified by the Middle East group were to establish:

- a regional (subregional) management programme for Awassi sheep;
- a regional (subregional) management programme for Damascus goats; and
- a regional network for camel genetic resources, including breed patenting and registration systems.

Adding value to local breeds and their products

Locally adapted breeds play vital roles in the lives of poor rural population. Not only are their products appreciated, but the livelihoods of smallholder farmers and pastoralists also depend on these breeds (income generation, capital reserve, etc.). It is important that these breeds are recognized for their special virtues and promoted by policies and practices in order to make up for the lack of resources devoted to them and to counter develop conservation strategies. This includes the recognition of the non-market (intangible) values of local breeds (e.g. ecosystem services, heritage components of local agriculture, pastoralist traditions and maintaining biodiversity) and the promotion of their products on the market. With few exceptions, experiences and practices of value addition to local breeds are found mainly in developed countries. These presentations gave the opportunity to share experiences in the promotion of local breeds and their products and their access to market.

ADDING VALUE TO THE UNIQUE CHARACTERISTICS OF LOCAL BREEDS BY USING A PRODUCTION SYSTEM APPROACH

by Anne Lawvie⁸

The purpose of this presentation was to illustrate, based on two studies, the relevance of a livestock farming systems (LFS) approach as a means of understanding the management of local breeds and options for adding value to them. The management of the local breeds has to consider not only the genetic dimension, but also management at farm level. Indeed, the management of a breed depends on the characteristics of the production system, such as the feed resources available, the aims of the farmer, the type of value addition practised and the decision-making processes followed. The management of breeding animals must also be considered collectively. Thus, breeders' networks and collective organizations (e.g. collective tools for management or value addition) influence the management of animal breeding and how it develops.

The example of the Corsican sheep breed shows that a given local breed may be found in several LFS: in this case, extensive systems on unmechanizable rangelands, extensive systems on roller-chopped native grassland, systems with forage intensification on all land (100 percent of land is mechanizable) and systems with partial forage intensification (limited by the availability of mechanizable areas). The aim of the research was to understand how breeders (participating or not in the official selection scheme) define an animal adapted to their system, which characteristics or abilities adaptation is linked to, and how adaptation is linked to breeders' management practices (choice of breeding animals, etc.).

In the case of the Mérinos d'Arles, some of the breeders practise cross-breeding to obtain lambs that are better fitted to be sold for butchering via the standard market. This raises the question of how to manage the replacement of pure-bred ewes. There are debates among the breeders of Mérinos D'Arles regarding which prod-

⁸ Prepared with Charles Henri Moulin and Jean Christophe Paoli

ucts and markets should be targeted. Pure-bred lambs are sold in the non-standard lamb market, which has reinforced the pure-breeding strategy. The definition of a good Mérino d'Arles ewe is under discussion. The discussion has extended to the size of a good ewe and to the selection criteria for the official collective breeding programme. There are several reasons why farmers may wish to manage the breeding of replacement ewes for themselves: they may wish to avoid the output of cash needed to buy replacements; they may value the opportunity to change priority between lambs and/or breeding ewes marketing and to use the replacement breed.

The LFS approach reveals the importance of the breeders' views regarding the breed. The animals' characteristics depend on the expectations of the breeders in relation to their production systems. The case studies show that a given breed can be valorized in one or in several systems. Collective decisions are crucial, as the management of populations will influence the management of local breeds.

ADDING VALUE TO THE PRODUCTS OF LOCAL BREEDS AND THEIR CONNECTIONS TO THE MARKET

by Abdelilah Araba

In order to conserve or develop local breeds sustainably, it is necessary to find a unique position in the production sector that allows greater value to be added to them. A study aimed to find out whether local resources (breeds; production systems; farmers' knowledge; connections between farmers, slaughterers and butchers; food preparation; meat quality) have attributes that can be used in a collective and valuable approach to the development of products from local breeds and improving their connections to the market. Two examples were described: the Camargue Bull of France, which is enhanced by a protected designation of origin (PDO)⁹, and the Oulmès Zaer cattle breed of Morocco.

The meat of the "Taureau de Camargue" was the very first type of beef to be protected by a PDO in France (1996). The taurine games of the local area, which involve both bulls and cows, are based on a strong cultural identity, but not on a meat tradition. Two breeds are involved: the Brava, which is used for the corrida games; and the Camargue breed, an ancient local breed that because of the PDO application was renamed "Di Biou" in order to avoid confusion between the animals and the beef. Both breeds are maintained in extensive systems in wetland areas. Muscles from the PDO "Taureau de Camargue" are very different from those of other beef breeds in terms of red slow and oxidative fibres. They also have a lower content of intramuscular fat. The explanation for this is that the animals have not been selected for beef production, but only for taurine games. They are fed a grass-based ration and have a lot of physical activity. The beef was normally not market for human consumption (it was used to produce pet food). However, through the process of valorization, the beef is now marketed at a normal price, mainly in supermarkets.

In Morocco, the Oulmès cattle breed is considered to be part of the local agricultural heritage and has special value for breeders. A study showed that this breed has attributes that are potentially interesting from the perspective of value addition, including its adaptability to pastoral farming and its organoleptic properties in traditional cooking (tajine). Value addition and the characterization of

⁹ A PDO covers the term used to describe foodstuffs which are produced, processed and prepared in a given geographical area using recognised know-how. For more information: http://europa.eu/legislation_summaries/internal_market/businesses/intellectual_property/166044_en.htm

the breed and its products could lead to a better position in the market. However, there are questions regarding the practical implementation of such measures, such as problems associated with slaughterhouses (carcass classification by weight and conformation, but not by consumer preferences) and with the traceability of the livestock (loss of information when the meat arrives at the market “souk”). The interprofessional organization needs to be strengthened. The cost of implementation is also an issue. These challenges are not specific to this particular breed or to Morocco. They are relevant to all local breeds and all developing countries and countries with economies in transition. However, the recent development of large retailers (supermarkets) seems to be favourable to a valorization approach, because they have the ability to segment the supply of beef. These retailers target a wide variety of customers, aiming to offer them a wide range of products and to provide them with as much information as possible on these products (through labelling systems).

EXPERIENCES IN ADDING VALUE TO THE LATXA SHEEP AND THE ARAGON LAMB

by Dunixi Gabiña

The purpose of the valorizing a product from a local breed is to increase productivity and improve working conditions. Generally, the addition of value to a breed and to its products starts with the definition of the uniformity of the product, its nutritional and gastronomic value and its marketing (image, promotion and new channels). The involvement of active stakeholders and adapting models that have worked well in other situations can contribute to professional and scientifically based design and development.

The Latxa sheep, a breed of domestic sheep native to the Basque Country of Spain, is well adapted to local conditions and provides ecosystem services in the region. The breeding programme is based on pure-bred selection for milk yield and composition. The Regulatory Council of the Protected Denomination of Origin of Idiazabal cheese, in place since 1988, guarantees that this cheese is made with raw milk coming only from the Latxa and Carranzana breeds in the Basque Country and Navarre, and requires a minimum ripening period of two months. Although the cheese is mainly marketed in the local area, the quality of this PDO has been recognized at international level. The number of cheese-makers has increased since the PDO was established. Seven are industrial processors and the rest are households and artisans, mainly women. Economic assessment shows that on-farm cheese-making can be crucial in assuring the profitability of Latxa flocks. The PDO is therefore an essential tool for maintaining the breed and production system. It is also an efficient barrier to the introduction of foreign breeds.

The Aragón lamb provides a similar example. It shows that a PDO can be a great means of protecting and increasing production from local meat breeds that are hardy and have low productivity (in this case the Ojinegra, Aragonesa and Bilbilitana). The number of carcasses under the PDO increased from about 25 000 in 1982 to about 200 000 in 2011.

EXPERIENCES IN THE COMMERCIALIZATION OF CHEESE FROM THE SICILO-SARDE SHEEP OF TUNISIA

by Riadh Loubichi

The Sicilo-Sarde is a dairy sheep breed found in the valleys and hills between Beja and Mateur in northern Tunisia. The breed experienced a phase of severe decline, passing from 200 000 head in 1990 to 8 500 in 2005, mainly because of the privatization of state farms and the promotion of dairy cattle. Sheep products were not differentiated from products based on cow's milk.

The Sicilo-Sarde is the result of crossing between the Sardinian and Comisana breeds, which are considered to be among the best dairy sheep breeds in the Mediterranean region. Cheese processing has increased the value of sheep milk. The annual production of sheep's cheese amounts to 250 tonnes, which represents only a small part of the production and consumption of cheese in Tunisia. There are two types of cheese products: industrial and traditional. Industrial products, based on imported technologies, target well-off consumers. They are distributed through hotels and shopping centres. They have a significant potential for value addition, but the technical costs and cash flow are high. The traditional cheese products, known as Sicilian and Ricotte, are most often sold fresh and sometimes salted. The investment required is lower, but there is no storage capacity.

The organization of professionals has enabled the development of the dairy sheep subsector and the improvement of milk production (both in quantity and quality), the standardization and intensification of the production system, and the supervision of the members and protection of their interests. The creation of an Agricultural Development Group for Sicilo-Sarde sheep breeders in Beja, and another in Bizerte, has facilitated dialogue between producers and collective bargaining with the processors and distributors to get a minimum price at each link in the value chain. In Beja, a milk collection centre and a non-industrial processing unit were established. Another milk collection centre has been established in Mateur. Consequently, the number of the Sicilo-Sarde sheep has increased from 8 500 in 2005 to 16 000 in 2012.

Future priorities are to protect the Sicilian and Ricotte cheese from internal and external deceptive products and to expand trade opportunities. The specifications for the creation of a protected indication are being validated through an FAO project (TCP/TUN/3202).

EXPERIENCES IN THE LABELLING OF PRODUCTS FROM THE BÉNI GUIL SHEEP OF MOROCCO

by Said Fagouri

The advantages of protected geographical indications (PGI) are multiple: they give distinctive marks to local products – PGI has a good reputation and provides rights to specific and autonomous intellectual property, recognized in the agreements of the World Trade Organization (WTO); they promote heritage and preserve traditions; and they serve as a development tools for maintaining biodiversity and local communities while having a positive impact on local economies, including tourism.

To create a PGI, several elements must be defined. The specification must indicate the applicant group, the name, the type, the description and method of getting the license of the product and the geographical area of production. The link between the

product and its geographical environment or geographical origin (markers) must be justified and distinct. Finally, the specification must contain references to the controls that are in place.

The applicant group may consist of an organization of producers and/or processors working with the same product. It must be representative and available to all who meet the specifications. It may be a legal person, including the state, a local authority or a public institution. It must define the product specifications in detail and be responsible for monitoring their progress. It provides technical advice and implements internal control. It also serves as a venue for dialogue between the different parties. It formalizes operating procedures and is responsible for recording documents. It promotes and stands behind the products.

The specifications should include the description of the product: its main characteristics such as breed, age, weight, types of presentation used in the PGI (live animal, meat) and specific characteristics such as appearance and taste (if such exist). It also defines the geographical area, the production area (region, highlands, altitude, vegetation, etc.) and transactions (selected, born, raised, slaughtered, etc.). A system for proving the origin of the product, traceability (up and down) and identification has to be set up. It is, therefore, necessary to indicate everything that must appear on the label in relation to the PGI. Finally, the specifications, including those for the control plan, must be specific, concrete and pragmatic. It is important that they do not contain subjective elements that are impossible to control. The organization of the controls is also important and must go through an approved inspection body. The control plan usually has three components: control by the operators themselves, internal control by the applicant and external inspection by the inspection body group.

The National Association for Sheep and Goat Breeders (ANOC) has realized the PGI of the Beni Guil. Breeders have a certificate of membership in the process “IGP Beni Guil”. All information on the breeder, lambing, type and stock of feed, health and breeding is recorded. An agreement between ANOC and the certification body “NORMACERT” has been signed to certify operating procedures and the labelling of meat from Beni Guil lambs. The first batch of labelled lambs was produced in 2012.

GROUP DISCUSSION – HOW CAN WE ADD VALUE TO LOCAL BREEDS AND THEIR PRODUCTS?

The discussion addressed the issue of breeds’ access to the market. Participants recalled that it is important not only to enter the market, but also to stay in. It was emphasized that a breed targeted for value addition should have unique or specific attributes. The breed-product combination makes the product more commercial. Breeds with known local products that are already regulated are more likely to be valued. The safety, quality and uniformity of the product over time play an essential role in value addition. Symbolic elements, such as the environment and traditions, and subjective elements, such as the commitment of all the stakeholders to the product and the adherence of producers to the process, should also be considered. Some stakeholders may block the process of value addition (e.g. traditional butchers in Morocco), but others may encourage it (e.g. some restaurants).

In some cases, breeds have attributes that should allow their values to be increased, but the realization of this potential is constrained because some key stakeholders in the value chain are missing. This was the case in Tunisia for the Noire

de Thibar sheep, for which a strong organization of stakeholders was needed in order to enable the sale of the breed's meat in supermarkets. It is necessary that all stakeholders not only adopt the value-addition project, but also contribute to the investments required. The training of farmers is essential.

The sharing of benefits from value addition across the sector was discussed. In this context, the definition of communication channels is essential. For example, in France, value addition is done through restaurants that propose menus featuring products from local breeds. The associations of a product may also facilitate its marketing. Value addition to specific products may also be done through religious or ethnic channels. For example, some very specific products are sold during Ramadan or at Christmas but not during the rest of the year.

Non-marketable products are also important. Examples of ecosystem services were mentioned. Animal manure helps to maintain soil fertility. The sheep in the Spanish Basque Country help to preserve the landscape. Likewise, the Algerian Hamra breed does not pull out the local plants while grazing, unlike some introduced breeds that are deteriorating the soil. In Morocco, the goats eat argan fruits and digest their thick bitter peel and sweet pulp, leaving behind the hard nuts in their droppings. Horses are then used as pack animal for the collection of the hard nuts. Thus, these breeds are not only useful for local people, but also serve to maintain essential ecosystem services, particularly in pastoral areas. The value of these services is often insufficiently recognized.

With regard to adding value to cross-bred animals, participants recommended considering the use of cross-breeds for meat production, as some dairy strains are at risks of disappearance. The Barbarine fat-tailed sheep is appreciated during religious festivities, but its cross with the thin tailed sheep is used for consumption all year round.

In conclusion, in order to add value to local breeds and their products, it is necessary to consider their attributes and to have a corporate policy that frames the steps that need to be undertaken and the stakeholders that need to be involved. The latter must be committed and work collectively towards the same goal. Equitable benefit sharing is one of the key elements. Value addition procedures, which include procedures such as PDO or PDI, can only be implemented in lucrative markets, as these procedures are not lucrative in emerging countries where food security is the priority. The start of the process must be thought through by examining all aspects and defining the objectives and management carefully. Starting a process of value addition is not a neutral action for the future of the targeted breed, it will influence how the breed is managed and will change it.

Strengthening national and regional focal points for the management of animal genetic resources

The NENA region has national focal points in almost all countries, but does not have a regional focal point (RFP). This session included presentations on the roles and responsibilities of national, regional and global focal points for the management of AnGR, on the experience of ICARDA as RFP, and on guidelines for the establishment of RFPs.

A plenary discussion on the establishment of a RFP allowed participants to make suggestions.

ROLES AND RESPONSIBILITIES OF NATIONAL, REGIONAL AND GLOBAL FOCAL POINTS FOR THE MANAGEMENT OF ANIMAL GENETIC RESOURCES

by Paul Boettcher

The Global Plan of Action for Animal Genetic Resources has four strategic priority areas. The proper implementation of the actions of the first three strategic priority areas requires a solid institutional framework, actions required for the establishment of which are outlined in Strategic Priority Area 4.¹⁰ Three levels of coordination are foreseen: national, the regional and global level. FAO has developed guidelines to assist countries in the process of establishing this institutional framework.¹¹

At the national level, the government nominates a National Coordinator for the Management of Animal Genetic Resources, who coordinates national implementation of the Global Plan of Action for Animal Genetic Resources and leads the development and operation of a national network on AnGR. He or she is the contact person for communication with FAO on matters relating to the implementation of the Global Plan of Action for Animal Genetic Resources and with global and regional AnGR networks. The National Focal Point for the Management of Animal Genetic Resources consists of the National Coordinator and his or her support staff within the institution responsible for coordinating activities concerning the management of AnGR. The National Coordinator's responsibilities include monitoring breed data and overseeing their insertion into the Domestic Animal Diversity Information System (DAD-IS), evaluating, coordinating and monitoring national AnGR-related projects, initiating AnGR-related research, promoting networking at national and international levels and making information available to the public through publications and presentations.

¹⁰ Strategic Priority Area 4: Policies, Institutions and Capacity-building has two strategic priorities on institutions for AnGR management; SP12: Establish or strengthen national institutions, including national focal points, for planning and implementing animal genetic resources measures, for livestock sector development; SP 17: Establish regional focal points and strengthen international networks – Action 4: Maintain and strengthen the FAO Global Focal Point for animal genetic resources to promote international networking and collaboration.

¹¹ <http://www.fao.org/docrep/014/ba0054e/ba0054e00.pdf>

RFPs coordinate activities at the region level and contribute to the management of transboundary breeds. They facilitate the sharing of experiences in the implementation of national strategies and action plans, promote best practices, and contribute to capacity development through regional training.

At the global level, the FAO's Animal Genetic Resources Branch serves as Global Focal Point (GFP). The GFP collaborates with member countries to support country-driven efforts to implement the Global Plan of Action for Animal Genetic Resources and serves as the Secretariat of the CGRFA's Intergovernmental Technical Working Group on Animal Genetic Resources. The GFP provides technical support to countries and develops international technical standards and protocols, prepares technical guidelines and organizes capacity-building workshops. It also strengthens international collaboration, information sharing, research and education, and maintains and distributes breed-level information through DAD-IS, which serves as the Convention on Biological Diversity's clearing house for AnGR.

FEEDBACK FROM THE EXPERIENCE OF ICARDA AS REGIONAL FOCAL POINT

by Barbara Rischkowsky

A series of regional and subregional meetings on the sustainable management of AnGR were conducted by FAO in 2005 and 2006 – as part of the process of preparing *The State of the World's Animal Genetic Resources* – to examine regional priorities and collaboration in AnGR management. During the subregional workshop for NENA, held at ICARDA, Aleppo, Syrian Arab Republic, ICARDA agreed to host the RFP for the NENA region.

Many problems were encountered in the formation of RFP during that period. A number of institutions were asked to host RFPs, but countries expected that the establishment of RFPs would be supported by FAO. Follow-up by countries within each subregion was weak due to lack of critical mass in financial and human resources and of political support at national and regional levels. The role of NFPs was (and still is) not strong enough to mainstream AnGR in national policies and strategies and to support the RFP.

It should be recalled that the funding for an RFP cannot be provided by FAO and that it is the role of participating countries to ensure the sustainability of the RFP. FAO can assist in approaching donors and encouraging countries and international organizations to contribute. The starting point for the establishment of an operational RFP is to secure a minimum budget for travel and meetings.

GUIDELINES FOR THE ESTABLISHMENT OF REGIONAL FOCAL POINTS¹²

by Badi Besbes

The guidelines provide a stepwise approach to the creation of a RFP. In short, they recommend the establishment of an interim regional steering committee that will oversee the preparatory process. This interim regional steering committee will assess the needs, objectives and benefits of the RFP, develop the terms of reference, and draft a concept note for the establishment of RFP. The guidelines capitalize on lessons learned from previous successes and failures in the establishment of RFPs.

¹² For more information: FAO. 2011. Developing the institutional framework for the management of animal genetic resources. FAO Animal Production and Health Guidelines. No. 6. Rome. <http://www.fao.org/docrep/014/ba0054e/ba0054e00.pdf>

GROUPS DISCUSSION ON INSTITUTIONAL FRAMEWORK AND CREATION OF A REGIONAL FOCAL POINT

The group discussion on the institutional framework for the management of AnGR and the creation of a RFP began with a recognition that FAO cannot fund RFPs. FAO's role is to provide technical support for their establishment. The European experience was cited as a successful example of the creation of a RFP. The latter needed five years to develop its structure with the commitment of eleven countries, including the voluntary contributions of some countries on a very long term.

For the NENA region, the first objective is to strengthen NFPs. It is important that these are connected to decision-making centres. The meeting also discussed options for the creation of a RFP. The Arab Organization for Agricultural Development (AOAD) was considered by some participants to be best suited to host the RFP. However, the only concrete proposal was made by the NC of Saudi Arabia, who proposed his institution as host for the RFP. He was invited to prepare a concept note in this regard. FAO stands ready to support its preparation.

Conclusion of the workshop

During the final session of the workshop the participants formulated the following conclusions and recommendations.

The implementation of the Global Plan of Action for Animal Genetic Resources in the NENA region has generally been slow. The lack of awareness of the role of AnGR in food security is one of the main reasons. Countries should develop national actions plans for the management of AnGR with a defined time frame. There is ample experience in AnGR management within the region, and countries should network to share these experiences (e.g. a Dgroup¹³ for NENA could be established).

Not all breeds have been sufficiently well characterized. There is a need to better acknowledge the unique features of these breeds, their products, their sociocultural and religious uses, and their production systems. Their valorization and the development of market access strategies for them should help the region to better respond to the erosion of AnGR. Cross-breeding could be used as a tool for value addition to local breeds as long as the contributory local breeds are not threatened. Some progress has been achieved in adding value to local breeds and labelling products from North African local breeds, these experiences are worth disseminating to other subregions.

The management of Awassi sheep and Damascus goats is regarded as a top priority in the Near East region. For the North Africa region, the conservation of the Brune de l'Atlas breed is a high priority. Molecular characterization and valorization of breeds' products should be encouraged. Finally, a regional network for camel genetic resources should be established.

¹³ Dgroups is a discussion platform. For more information see: <https://dgroups.org/directory>

Annex I

Number of breeds reported by the countries of the Near East and North Africa region¹⁴

	Bactrian Camel	Buffalo	Cattle	Chicken	Dromedary	Goat	Horse	Sheep
Algeria			8		10	8	2	9
Bahrain								1
Egypt		7	17	29	4	10	3	19
Iran (Islamic Republic of)	1	3	12	3	1	10	21	31
Iraq		1	14	10	3	6	2	13
Jordan			4	2	1	7	1	4
Kuwait								3
Lebanon			2			2		1
Libya			2			1		3
Mauritania			6	1	2	8	4	4
Morocco			12	10	5	7	5	31
Oman			4	1	8	6		4
Saudi Arabia						4	3	7
Sudan			20	3	5	11	5	17
Syrian Arab Republic		1	6		1	4	2	3
Tunisia			6	11	1		7	5
Yemen			2	1	4	8	7	11

¹⁴ Source DAD-IS 2013: <http://dad.fao.org/>

Annex II

Agenda

Monday 19 November	State of animal genetic resources (AnGR), and inventory, characterization, and monitoring activities in the NENA¹⁵ region	Moderator: A. Benlekhal, DFP
8:30 - 9:30	Registration Opening ceremony Workshop objectives and agenda	MAPM, IAV, FAO M. Bengoumi, FAO
09:30 - 10:00	State, role and importance of AnGR in the NENA region	M. Tibbo, FAO
10:00 - 10:30	Coffee break and group photo	
10:30 - 12:30	Country reports	NC-AnGR
12:30 - 13:30	Lunch	
13:30 - 14:30	Country reports	NC-AnGR ²
14:30 - 15:30	Presentation of FAO Guidelines on characterization: - Phenotypic - Molecular genetic	B. Besbes, FAO P. Boettcher, FAO
15:30 - 16:00	Coffee break	
16:00 - 18:00	DAD-IS training	FAO
Tuesday Morning 20 November	State of animal genetic resources (AnGR), and inventory, characterization, and monitoring activities in the NENA Region (continued)	Moderator: M.A. Kamali, MoA
08:30 - 10:00	Presentation of national and regional projects: Funding Strategy of the Global Plan of Action for AnGR and results of the first call for proposals Conservation of Béni Guil sheep through semen exchange between Morocco and Algeria Genetic adaptation of bovine livestock and production systems in Mediterranean region (Galimed) Mediterranean biodiversity as a tool for the sustainable development of the small ruminant sector: from traditional knowledge to innovation (DoMEsTIc) ICARDA's programme on characterization and utilization of small ruminant genetic resources	A. Sauron, FAO S. Fagouri, ANOC D. Laloe, INRA C. Ligda, NAGREF B. Rischkowsky, ICARDA
10:00 - 10:30	Coffee break	
10:30 - 12:00	Inventory, characterization and monitoring of AnGR in NENA: Issues and options	Group discussion
12:00 - 13:00	Summary of group discussions	
13:00 - 14:00	Lunch	

¹⁵ MENA: Middle East and North Africa

¹⁶ The National Coordinators for the management of AnGR will present the State of AnGR and the activities for the management of these resources, in their countries

Characterization and value addition to local breeds and their products in the Near East and North Africa

Tuesday Afternoon 20 November		Moderator: F. Casabianca, INRA
Adding value to local breeds and their products		
14:00 - 16:00	Adding value to the unique characteristics of local breeds by using a production system approach	A. Lauvie, INRA
	Adding value to products of local breeds and their connections to the market	A. Araba, IAV
	Experiences in adding value to the Latxa sheep and the Aragon lamb	D. Gabiña, IAMZ
	Experiences in the commercialization of cheese from the Sicilo-Sarde sheep of Tunisia	R. Louhichi, CGIV Lait
	Experiences in the labelling of products of the Béni Guil sheep of Morocco	S. Fagouri, ANOC
16:00 - 16:30	Coffee break	
16:30 - 17:30	How can we add value to local breeds and their products?	Group discussion
17:30 - 18:00	Conclusions and recommendations	
Wednesday 21 November		Moderator: B. Rischkowsky, ICARDA
Strengthening of National and Regional Focal Points for the Management of AnGR		
08:30 - 09:00	Roles and responsibilities of National, Regional and Global Focal Points for the Management of AnGR	P. Boettcher, FAO
09:00 - 09:30	Feedback from the experience of ICARDA as regional focal point	B. Rischkowsky, ICARDA
09:30 - 10:00	Guidelines for the establishment of regional focal points	B. Besbes, FAO
10:00 - 10:30	Coffee break	
10:30 - 12:00	Review of past experiences and measures needed to strengthen national and regional focal points	Group discussion
12:00 - 19:00	Field visit	

Annex III

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1. Impact of animal nutrition on animal welfare – Expert Consultation, 26–30 September 2011, FAO Headquarters, Rome, Italy. 2012 (E)
<http://www.fao.org/docrep/017/i3148e/i3148e00.pdf>
2. FAO's support to the One Health regional approach towards integrated and effective animal health–food safety surveillance capacity development in Eastern Africa. 2013 (E)
<http://www.fao.org/docrep/018/i3391e/i3391e.pdf>
3. Characterization and value addition to local breeds and their products in the Near East and North Africa – Regional Workshop, Rabat, Morocco, 19-21 November 2012 (E)
<http://www.fao.org/docrep/019/i3622e/i3622e.pdf>

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E - English
F - French
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