

## KEYNOTE ARTICLES

### ANIMAL GENETIC RESOURCES IN NEAR EAST AND NORTH AFRICA REGION WITH SPECIAL REFERENCE TO EGYPT AND SMALL RUMINANTS<sup>1</sup>

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#### SUMMARY

Near East and North Africa (NENA) countries are endowed with rich animal genetic resources (AnGR). To maintain such valuable diversity, the countries need to update and upgrade the information on their livestock breeds and develop their sustainable utilization. NENA countries are apparently among the least countries with endangered breeds. This conclusion could be due partly to the fact that little development took place for their breeds but could also be due to the fact that the great part of these breeds are with no population statistics, hence no objective evaluation of their degree of endangerment. Iran has got the highest number of reported small ruminant breeds among NENA countries (41) followed by Morocco (38) and Sudan (28). Egypt has got listed 12 breeds of sheep and 7 of goats. Greatly needed is the establishing of the institutional structures for the proper management of AnGR. Countries need to network among them and with the international organization and to establish a Regional Focal Point to catalyze such networking.

**Keywords:** risk, livestock diversity, DAD-IS, characterization, utilization, conservation, sheep, goats

#### INTRODUCTION

This paper covers 22 countries members in the FAO Regional Office for the Near East (RNE). These countries are Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates and Yemen. The most common feature among these countries is that great part of their area is desert and, with few exceptions, water is a very scarce element. This feature shapes land use and consequently the animal production system.

Sheep and goats are of particular importance in the Near East Region. Both species were first domesticated in the Region, sheep in Asia Minor and goats in the area between the present Iran and Iraq. Human population in these 22 countries represented 6% of the world population in 2008 while the figures for sheep and goats were 21% and 15% , respectively, in 2007 (FAOSTAT, 2009), i.e. NENA has more of its share in small ruminants than human

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population. This reflects the importance of these two species and the relevance of the prevailing production environment to them. Furthermore, according to available sheep and goat population estimates the total for these 22 countries were 232 million and 122 million in 2007 (FAOSATAT, 2009). The share of NENA of animal units (AU) from whole livestock represents 7.7% of the world while their share expressed in AU from the small ruminants is 15% (Table 1). The per capita animal units (AU) from the whole livestock in NENA and the world are 0.35 and 0.28, respectively, while the figures from small ruminants are 0.88 head and 0.29 head, respectively. Number of sheep per 1000 humans in NENA in 2004 was 456 while that for goats 308, both figures are by far the highest among all regions of the world, the nearest region to them is Africa with corresponding figures of 250 goats and 231 sheep.

The objective of this paper is to discuss animal genetic resources (AnGR) in the NENA Region, with particular emphasis on Egypt and small ruminants, and to highlight points and issues needy of attention at the regional and national level.

### **1. Livestock Breeds in the Region**

NENA is endowed with relatively rich AnGR. The region harbors 971 breeds<sup>1</sup> (DAD-IS, 2009) of the main livestock species<sup>2</sup> representing 7% of the total world breeds. This number of breeds may be an underestimate for reasons that will be obvious later in the paper. The average number of breeds per NENA country is approximately 47 ranging from Bahrain (1 breed reported) to Egypt 118 (Table 2). Egypt has got listed 7 breeds of goats and 12 of sheep (Table 3). Expectedly, the region got the highest share of the world breeds of any livestock species for camels (59.8%). NENA share of the world sheep and goat breeds is 10.9% and 12%, respectively.

The region is home to small ruminant breeds that have spread to many countries outside their place of origin. Examples are the Awassi sheep that are present now in some 50 countries (Galal, 2005) and Damascus goats. Also the prolific D'man sheep of morocco have been exported to many other countries. Of the chicken breeds, the Egyptian Fayoumi has been exported to more than 20 countries.

### **2. Management of SR Genetic Resources in the Region**

#### **3.1 Characterization**

Characterization is all what it takes to show the distinctness of a population and its production system. Characterization should be done formally. FAO designed forms to guide the characterization of breeds of different livestock species (FAO, 2009). All countries of the region have identified breeds usually basing the identification on their geographical tract but

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<sup>1</sup> A breed is defined as "a subspecific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar group has led to acceptance of its separate identity" (FAO, 2000).

<sup>2</sup>Buffalo, camel, cattle, goat, sheep

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more elaboration is needed to characterize the production system and identify distinctness (or otherwise) among populations living in the same geographical area. Some breeds may go unidentified because they live in remote areas or they look alike other breeds but in fact they are genetically different and they need molecular genetic analysis to elucidate differences among them. Table 4 shows that the degree of completeness of breed data ranges from 25% to 50% in most of countries. The ultimate breed characterization is through molecular genetics. Very few countries in the region have carried out such molecular characterization. Examples of such characterizations are, Egypt for buffalo (Elbeltagy et al., 2008), sheep (Fawal et al., 2009) and goats (Agha et al., 2008); Iran on many sheep breeds and Tunisia for Arbi goats (Vacca et al., 2009).

Characterization should be a continuous process of surveying and monitoring different breeds and their production system in order to register the dynamics of breed population and establish the degree of risk of each breed as defined in FAO (2007). In NENA only 42% of mammalian species have reported population data (as against 47% for the world), and 23% for avian species (as against 44% for the world). Table 4 shows the status of the degree of breed risk<sup>1</sup> in different species as extracted from DAD-IS ([www.fao.org](http://www.fao.org)) in September 2009. Among all breeds in NENA, 9% are endangered. This figure is lower than the world average but it could be misleading as 54% of the breeds have no population data, hence the degree of risk cannot be established for them. Percentage of breeds with unknown population is much higher in avian species than in mammals.

### 2.2 Utilization

Utilization is the second aspect of AnGR management. It simply implies what is been made of the breed. Most of the countries have tried crossing their local breeds mainly with regional or international transboundary breeds but these trials produced little or no tangible results that could benefit producers. The literature is replete with such trials and it is not the intent to review such literature here. Improving breeds through structured selection programs with explicit breeding objectives are little practiced in the region. This requires long-term organized recording and evaluation systems. Two countries in NENA that are relatively more advanced in establishing recording systems are Morocco and Tunisia while Jordan has started such program particularly in sheep. The following table shows percentages of countries with structured breeding activities among the reporting Near and Middle East countries (only 7 countries reported) (FAO, 2007).

	<b>Cattle</b>	<b>Buffalo</b>	<b>Sheep</b>	<b>Goat</b>	<b>Chicken</b>
<b>Near &amp; Middle East</b>	14%	33%	57%	43%	14%
<b>World</b>	47%	22%	33%	27%	14%

### 2.3 Conservation

Conservation of AnGR refers to all human activities including strategies, plans policies

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<sup>1</sup> Risk status is defined according to FAO (2007).

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and actions undertaken to ensure that the diversity of animal genetic resources being maintained to contribute to food and agricultural production and productivity, or to maintain other values of these resources (ecological, cultural) now and in the future (FAO, 2007). *In situ* conservation is when livestock populations (and their production system) are conserved live in their home tract through utilization, while *ex situ* conservation refers to conservation of populations away from their home tract. This can be *ex situ in vivo* conservation where populations are conserved in the form animals, e.g., special farms (eco-farms), reserves, zoos, stations etc or *ex situ in vitro* conservation where populations are conserved in the form of embryos, gametes (cryopreservation), somatic cells or DNA. The use of one or another of these conservation methods depends on facilities available, the immediateness of conservation and the know-how, technology and manpower available in the specific situation.

Example of conservation of endangered AnGR is the conservation of the Zaraibi goat through the collaborative effort of the Egyptian Ministry of Agriculture and Land Reform and FAO. To the author's knowledge, there are only two gene banks established in NENA, one in Egypt and the other in Tunisia. They regularly collect and store semen from livestock breeds. FAO (2007) shows numbers of breeds conserved among livestock breeds in the Near and Middle East countries as follows<sup>1</sup>:

	Cattle	Sheep	Goat	Pig	Chicken	Horse
Conserved in vivo	5	4	3	0	0	0
Conserved in vitro	1	0	0	0	0	0

#### **Institutional Capacity in NENA**

The proper management of AnGR requires an institutional structure to warrant the sustainability of activities. FAO (1998) proposed an outline of such structure but none of NENA countries followed that structure or initiated their own keeping the essential features of FAO proposed structure. Based on country reports, FAO (2007) produced Table 5 showing institutional assessment at country level. Most of the reporting countries are aware of the AnGR topic and knowledgeable about it but greatly lack on other aspects of institutional arrangements.

*Networking.* All NENA countries except UAE and Palestine, have designated national coordinators but most of them are inactive and neither interacting with each other or with regional and international organizations. The countries have to agree on and designate a Regional Focal Point, as per FAO proposed structure.

#### **4.1 Small Ruminant Research Organization**

##### ***Institutions***

Research on small ruminants in the region is carried out mainly by three institutions,

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<sup>1</sup> According country reports – only seven NENA countries reported on this activity.

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research stations belonging to ministries of agriculture, universities, and regional organizations, namely ACSAD and ICARDA. The following table shows these institutions in some countries.

	Institutions and number of stations			
	Ministry of Agriculture	Universities/ Res. Organization	Regional Organizations*	Total
Bahrain	1			1
Egypt	10	13		23
Kuwait	1	1		2
Jordan	5	2		7
Oman	1	3		4
S Arabia				4
Syria	5	10	2	17

\* ACSAD & ICARDA

### *Manpower*

The following table shows research manpower engaged in small ruminants in selected countries.

Country	Institutions and number of research personnel			
	Ministry of Agriculture	Universities	Regional organizations*	Total
Bahrain	2			2
Egypt	120	>200		>320
Kuwait	≈7			7
Oman	9	5		14
Syria	59	7	15	81

\* ACSAD & ICARDA

### *Number of Small Ruminants under Research*

The table below shows number of small ruminant stocks under research in some NENA countries. Sheep are more numerous than goats.

Bahrain	400
Egypt	5300
Jordan	2250
Kuwait	250
Oman	2660
Syria	48850

### ***Ongoing Research***

The broad research activities carried out in small ruminants in different countries are summarized below.

*Bahrain*; breed introduction, crossbreeding

*Egypt*; crossbreeding, selection, breed introduction, reproduction, breed characterization, feeding,

*Jordan*; breed introduction, crossbreeding, reproduction, feeding

*Kuwait* ; breed introduction, crossbreeding

*Oman*; breed characterization, breed comparison, feeding, reproduction

*Syria*; breeding, biotechnology, physiology, feeding, husbandry

An attempt was made to get some idea as how are research papers are distributed over different disciplines by reviewing research papers published in Egyptian Journal of Animal Production (EJAP) which is the only in the Arab world that is devoted entirely too publishing papers on animal production. The author surveyed all the papers published in EJAP since its establishment in 1961 until 2009. There were some 750 papers, one quarter of them are on small ruminants while the rest on different livestock species including fish. Out of these papers on small ruminants, 9% were on breeding, 29% on nutrition, 18% on physiology and 43% on husbandry. This is of course only a sample but it gives some idea on the general trend of research carried out in small ruminants. Because research in breeding requires records for extended periods or/and advance laboratories for molecular genetics, number of researches done in it is the least.

### **3. Global Efforts for the management of AnGR**

In 1992 FAO initiated a priority program called *Global Strategy for the Management of Farm Animal Genetic Resources* with the goal to "overcome the erosion of AnGR and to ensure the global better development of these resources" (FAO, 2000). The *Global Strategy* involved four main components, an intergovernmental mechanism, and a technical program, a geographically distributed and country-based structure supported by regional and focal points (networking), and a reporting component. Efforts in this priority program led to the assessment of global state of AnGR which enabled a gap analysis and the development of *Strategic Priorities for Action*, a global synthesis where countries identified strategic priorities in the field of AnGR management on concrete basis (FAO, 2007). The *Global Strategy* established the *Domestic Animal Diversity Information System* (DAD-IS, <http://dad.fao.org/>) on the internet with relevant information on AnGR management including country breed data bases. The system is now open-source where countries/regions can customize it according to their needs.

### **4. Conclusions and Recommendations**

- NENA is apparently rich in AnGR but many of these resources need to be identified.

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- Great effort is needed to properly characterize AnGR in the region at the morphological, genetic and molecular genetics levels.
- Livestock censuses, which nearly all countries carry out regularly, must be done by breed not by species only as the case in most countries.
- Nearly all countries have experimented with crossbreeding with most of the result of little benefit to producers. Such experiments should be evaluated from a farmer perspective and those that prove useless must be terminated. Any crossing experiment should make sure to establish genetic barriers between the crosses and local breeds to respect the integrity of local breed and limit the crossing results to what the experiments are planned for.
- Extremely few countries actually run well structured selection programs for the improvement of local breeds. This should be encouraged as it is the most practical way of conserving valuable local breeds. Such efforts are essential in view of the global warming and the specific adaptability of local breeds.
- Many breeds have no population data. Such data are necessary to determine the degree of risk of each breed and take necessary measures to conserve endangered breeds.
- With the advances in biotechnology countries can choose the mode conservation most suitable to their conditions.
- AnGR National Coordinators need to reactivate their role and countries establish the infrastructure required for the management of AnGR, or at least set plans with a defined time frame.
- Through their National Coordinators, countries need to update their breed information in DAD-IS.
- There is very little in the region on legislations particular to AnGR and such legislations are often confused with those relevant to livestock in general like livestock movement, quarantine, slaughterhouses etc.
- There is enough experience in aspects related to AnGR management within NENA region. Countries should network to share experiences and complement each other. International help can be obtained for experiences that do not exist in the region.

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Table 1. Livestock population of main livestock species in the Near East and North Africa Region 2007 (FAOSTAT, 2009).

Country	Buffaloes	Camels	Cattle	Goats	Sheep	Total estock AU*	SR AU Tot AU	Shp+Gt	Human Popn	AU/Cap	SR/Cap
<b>Algeria</b>	0	293	1,658	3,774	19,851	5,288	0.63	23,625	33,333	0.16	0.71
<b>Bahrain</b>	0	1	9	23	41	19	0.47	64	709	0.03	0.09
<b>Djibouti</b>	0	69	297	512	466	510	0.27	978	496	1.03	1.97
<b>Egypt</b>	3,977	120	4,550	3,980	5,525	10,387	0.13	9,505	80,335	0.13	0.12
<b>Iran</b>	620	152	7,609	25,531	53,800	19,565	0.57	79,331	65,398	0.30	1.21
<b>Iraq</b>	120	10	1,500	1,650	6,200	2,741	0.40	7,850	27,500	0.10	0.29
<b>Jordan</b>	0	18	69	434	2,496	499	0.82	2,930	6,053	0.08	0.48
<b>Kuwait</b>	0	5	28	160	900	182	0.82	1,060	2,506	0.07	0.42
<b>Lebanon</b>	0	0	77	495	340	194	0.60	835	3,926	0.05	0.21
<b>Libya</b>	0	47	130	1,265	4,500	989	0.82	5,765	6,037	0.16	0.95
<b>Mauritania</b>	0	1,600	1,692	5,600	8,850	5,475	0.37	14,450	3,270	1.67	4.42

3<sup>rd</sup> International Scientific Conference on Small Ruminant Development, Hurghada, Egypt, 12-15 April, 2010

(Follow) Table 1. Livestock population of main livestock species in the Near East and North Africa Region 2007 (FAOSTAT, 2009).

\*Animal Unit (AU): Buffalo = Camel= 1.1, , Cattle =1, Goat = Sheep = 0.14

Country	Buffaloes	Camels	Cattle	Goats	Sheep	Total livestock AU*	SR AU to Tot AU	Shp+Gt	Human Popn	AU/ Cap	SR/Cap
Morocco	0	40	2,781	5,284	16,894	5,930	0.52	22,178	33,757	0.18	0.66
Oman	0	122	314	1,620	366	726	0.38	1,986	3,205	0.23	0.62
Palestine	0	0	34	344	745	187	0.82	1,088	4,018	0.05	0.27
Qatar	0	14	8	160	120	63	0.63	280	907	0.07	0.31
Saudi Ar.	0	260	372	2,200	7,000	1,946	0.66	9,200	27,601	0.07	0.33
Somalia	0	7,000	5,350	12,700	13,100	16,662	0.22	25,800	9,119	1.83	2.83
Sudan	0	4,250	41,404	42,987	50,944	59,229	0.22	93,931	39,379	1.50	2.39
Syria	5	25	1,168	1,561	22,865	4,621	0.74	24,427	19,315	0.24	1.26
Tunisia	0	231	710	1,551	7,618	2,248	0.57	9,169	10,276	0.22	0.89
U A Emirates	0	260	125	1,570	615	717	0.43	2,185	4,444	0.16	0.49
Yemen	0	361	1,480	8,414	8,420	4,234	0.56	16,834	22,231	0.19	0.76
NENA	4,722	14,877	71,365	121,815	231,657	142,411	0.35	353,471	403,814	0.35	0.88
World	177,248	24,246	1,357,184	830,392	1,086,882	1,847,245	0.15	1,917,273	6,602,224	0.28	0.29
NENA as % of World	2.7	61.4	5.3	14.7	21.3	7.7		18.4	6.1		

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Table 2. Number of breeds in the Near East and North Africa (DAD-IS, 2009).

	Ass	Bactrian Camel	Buffalo	Cattle	Chicken	Dromedary	Duck (domestic)	Goat	Goose (domestic)	Guinea fowl	Horse	Muscovy duck	Ostrich	Pig	Pigeon	Quail	Rabbit	Sheep	Turkey	Count
Algeria	1			8		10		8			2		1					9	1	40
Bahrain																		1		1
Djibouti	1			5	1	2		2										4		15
Egypt	6		7	17	29	4	5	7	1		3	1		1			10	12	5	118
Iran	6	1	3	12	3	1		10			21							31		88
Iraq			1	14	10	3		6			2							13		49
Jordan	2			4	2	1	1	7	1		1				7			4	1	31
Kuwait																		3		3
Lebanon				2				2										1		5
Libya	1			2				1										3		7
Mauritania	1			6	1	2		8			4							4		26
Morocco	1			12	10	5		7		1	5				1	1	1	31	4	79

3<sup>rd</sup> International Scientific Conference on Small Ruminant Development, Hurghada, Egypt, 12-15 April, 2010

(Follow) Table 2. Number of breeds in the Near East and North Africa (DAD-IS, 2009).

	Ass bactrian	Camel	Buffalo	Cattle	Chicken	Dromedary (domestic)	Goat	Goose (domestic)	Guinea fowl	Horse	duck	Ostrich	Pig	Pigeon	Quail	Rabbit	Sheep	Turkey	Count	
<b>Oman</b>				4	1	8	6										4		23	
<b>Saudi Arabia</b>							4			3							7		14	
<b>Somalia</b>	2			9		5	8			1							3		28	
<b>Sudan</b>	5			20	3	5	11		1	5	1			1			17		69	
<b>Syria</b>	3		1	6		1	4			2							3		20	
<b>Tunisia</b>	1			6	11	1				7							5		31	
<b>Yemen</b>	4			2	1	4	8			7							11		37	
<b>Near East (NE)</b>	<b>47</b>	<b>6</b>	<b>12</b>	<b>184</b>	<b>97</b>	<b>58</b>	<b>12</b>	<b>132</b>	<b>3</b>	<b>3</b>	<b>97</b>	<b>2</b>	<b>1</b>	<b>12</b>	<b>9</b>	<b>2</b>	<b>12</b>	<b>251</b>	<b>17</b>	<b>971</b>
<b>World</b>	<b>188</b>	<b>16</b>	<b>174</b>	<b>3015</b>	<b>2287</b>	<b>97</b>	<b>354</b>	<b>1160</b>	<b>250</b>	<b>64</b>	<b>1319</b>	<b>50</b>	<b>2</b>	<b>1394</b>	<b>70</b>	<b>5</b>	<b>510</b>	<b>2364</b>	<b>177</b>	<b>1380</b>
<b>NE as % of world</b>	<b>25</b>	<b>38</b>	<b>7</b>	<b>6</b>	<b>4</b>	<b>60</b>	<b>3</b>	<b>12</b>	<b>1</b>	<b>5</b>	<b>7</b>	<b>4</b>	<b>5</b>	<b>1</b>	<b>13</b>	<b>4</b>	<b>2</b>	<b>11</b>	<b>10</b>	<b>7</b>

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**Table 3. Listed goat and sheep breeds in Egypt**

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**Goat**

Abouramad- Halaieb - Shalateen  
Barki (Sahrawi = of desert)  
Saidi Saeidi, Egypt Baladi (= local)  
Sharkawi  
Egypt Baladi (= local)  
Wahati (Arabic= related to oases)  
Zaraibi Egyptian Nubian (Eng.), Nuba, Theban

**Sheep**

Farafra  
Fellahi Egypt Baladi (= local), Fellahi (= peasant)  
Ibeidi (Ibidi)  
Kanzi  
Kurassi  
Maenit  
Ossimi (Meraisi, Ausimi)  
Saeidi Saiedi  
Saidi (Sohagi)  
Sanabawi  
Aboudleik  
Rahmani

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Table 4. Degree of breed data completeness in NENA

Country	Degree of completeness (%)	Country	Degree of completeness (%)
<b>Algeria</b>	25-50	<b>Morocco</b>	25-50
<b>Bahrain</b>	25-50	<b>Oman</b>	25-50
<b>Djibouti</b>	25-50	<b>Qatar</b>	25-50
<b>Egypt</b>	25-50	<b>S. Arabia</b>	25-50
<b>Gaza Strip</b>	0	<b>Somalia</b>	25-50
<b>Iran</b>	25-50	<b>Sudan</b>	25-50
<b>Iraq</b>	25-50	<b>Syria</b>	25-50
<b>Jordan</b>	25-50	<b>Tunisia</b>	25-50
<b>Kuwait</b>	50-75	<b>U A Emirates</b>	0
<b>Lebanon</b>	25-50	<b>West Bank</b>	0
<b>Libya</b>	25-50	<b>Yemen</b>	25-50
<b>Mauritania</b>	25-50		

Reference: <http://dad.fao.org/cgi-bin/>