

CENTRE INTERNATIONAL DE
HAUTES ETUDES AGRONOMIQUES
MEDITERRANEENNES

INTERNATIONAL CENTRE
FOR ADVANCED MEDITERRANEAN
AGRONOMIC STUDIES

MEDITERRANEAN AGRONOMIC INSTITUTE OF BARI

**COURSE ON
MEDITERRANEAN ORGANIC AGRICULTURE**



ZNAÏDI IBRAHIM EL-AKRAM
(TUNISIA)

**SHEEP AND GOAT ORGANIC MEAT PRODUCTION
IN THE MEDITERRANEAN REGION**

ACADEMIC YEAR 2000-2001

ACKNOWLEDGEMENT

I would like to express my gratitude to all IAM Bari staff, particularly to the Director, Dott. C. LACIRIGNOLA, who gave me the chance of attending the academic year, for their kindness and hospitality.

My heartfelt thanks to all the professors, who held this course for their efforts to provide abundance of interesting materials- and their expertise.

My sincere thanks and gratitude to my Advisor Vincenzo Verrastra for his helpful advice while writing my thesis, and for his encouragement.

I am very grateful to our tutor Dott. N. DRIONECA, who patiently helped us during this academic year, my appreciation to him.

My deep thanks to Dott. ssa. O. ANTONELLI, the Head of the training office; Dott. M. RAELI, the Administrator; the scientific committee: Dott. F. DE CASTRO, Dott. V. FERSMO, Dott. D. PETRUZZELLA and Dott. ssa. L. AL-BITAR, who made every efforts to facilitate our work and to organize the course.

I would like to seize the opportunity to thank our interpreters for their help in translating our study materials: Dott. ssa. E. LAPEDOTA, Dott. ssa. M. MARINI and Dott. ssa. T. TURSÌ.

Finally, I owe a special thank-you to my family for their love and continuous encouragement.

My love and respect to all my course colleagues.

Znaïdi Ibrahim El Akram

INDEX

I/ INTRODUCTION	4
II/SHEEP AND GOAT MEAT PRODUCTION IN MEDITERRANEAN COUNTRIES	7
A/characteristics of Mediterranean climate	7
B/specificities of agricultural structures and means of production in Mediterranean region	7
C/ EXAMPLE OF MEDITERRANEAN COUNTRY: TUNISIA	12
1/LOCATION	12
2/CLIMATE AND AGRO-ECOLOGICAL ZONES	12
3/LIVESTOCK PRODUCTION SYSTEM	15
4/PASTURE RESOURCE	18
III/TECHNIQUES OF FLOCK CONDUCT IN TUNISIA	22
1. SHEEP FLOCK CONDUCT	22
2.GOATS FLOCK CONDUCT	24
IV/HOW TO CONVERT FROM THE CONVENTIONAL TO THE ORGANIC	25
1/CHARACTERISTICS OF ORGANIC AGRICULTURE IN TUNISIA	25
V/PROBLEMS OF CONVERSION	34
VI/PROSPECTS OF ORGANIC SHEEP AND GOAT MEAT PRODUCTION	36
VII/CONCLUSION	39

Introduction

The Mediterranean area is characterised by its climate and soil nature presents a great extent of natural spaces where grows a varied pastoral vegetation containing considerable forage varieties for sheep and goat livestock. So in area represented by Morocco, Algeria, Tunisia, Libya, Egypt, Palestine, Lebanon, Jordan, Syria and Turkey number of sheep and goats represents respectively 200.219 million heads and 25.359 million heads (MEDAGRI 2001a).

Elsewhere sheep and goat production is characteristic of Mediterranean basin not only according to their pedoclimatic conditions but also according to the farmer's behaviour, sheep and goats are still managed under extensive nomadic and semi-sedentary system based on native pasture and crop residues.

Sheep and goats flock conduct is almost the same in all the countries of the Mediterranean area. The exploitation system in the majority of case is extensive or semi-intensive, food for animals is based on rough crops like straw and other crop residues. In some flock conduct technics animals can receive food supplementation through flushing and steaming only during the period of reproduction and pregnancy, That is why in the Mediterranean region sheep and goat production yield essentially little meat and lamb needs very long time to bring weight for slaughter.

In some cases it is possible to find intensive exploitation system essentially for milk production, in this system there is a high rate of concentrated aliments in the ration. This system is efficient only if the sheep and goat milk is processed in cheese.

The sheep and goat flock conduct presents some differences between the two species due to the specificity of every species. This differences appear clearly in animal behaviour at grass, goats prefer generally fodders and sheep herbaceous plants.

Besides exploitation system, sheep and goat livestock in the Mediterranean region is characterised by a multitude local breed, well adapted to the local conditions. This characteristic represents the most significant asset in terms of conversion from conventional to organic.

Actually in the Mediterranean area what we are interested sheep meat production represents 972000 tons. In 1999 this production was the more suited animal production to become organic because there's generally no intensive ,use a lower quantity of entrants in equilibrium with environment and respect it.

The conversion toward organic for this type of breeding presents several advantages like sustainability of pasture system. In the Mediterranean zone there is the problem of overgrazing of pastures and rangelands by small ruminants especially goats, natural pasture have deteriorated and threat to native plant species.

Also organic production is based on the prevention not on the curing methods and it proceed the follow up a production chain that guarantees a product of quality to the consumer, many studies which compare organic meat to conventional in the base of colour and taste indicate that there's significant quality difference between the two kind of meat in favour of organic (Jaubert 1997).

The minimisation of entrants, the use of products originating from the same farm and other products certified as organic minimise to the maximum the risks of diseases like foot and mouth disease and the brucellosis. The use of organic regulation in small ruminant meat production will give to consumers

the possibility to verify all the steps of this production, since every animal has an identification card which provides all the this recent organic data related to the breed of the animal, the date and place of birth, the kind of food etc.

Finally for certain Mediterranean undeveloped countries which currently export their animal products toward to the Europe countries, the homologation under the label of organic products according to the European standards will allow them to gain access to enter new markets.

Although organic meat production presents many advantages as compared to the conventional one it has many problems in terms of application because many Mediterranean countries do not have local organic animal regulations which is the first condition to be accredited for entering European market.

For the countries whose organic regulation is generally based on IFOAM standards or/and EU standards it is not easy to adapt to these standards and to the reality of every country.

The adaptation and modification of techniques and rules of organic animal production to the land reality represent the major research that we must do during the few next years.

II/SHEEP AND GOAT MEAT PRODUCTION IN MEDITERRANEAN COUNTRIES

A/characteristics of the Mediterranean climate

The Mediterranean climate is characterized by cool, wet winters and summer drought. Temperature may vary considerably, some areas have hard frost at all; in some other areas, summers are unbearably hot and dry, others mild and foggy. Plants native are genetically programmed to withstand these specific conditions. One common form of adaptation is a summer dormancy period which has an important impact on sheep and goats livestock.

- Mild, moist winter, hot dry summers
- Cool, often foggy coast
- High percentage of sunshine
- High summer diurnal temperature range
- Frost danger during winter

B/specificities of agricultural structures and means of production in Mediterranean region:

Mediterranean countries are characterized by the low availability of arable land because of their high demography. This can be observed in all the Mediterranean countries, but it is more important in the region of our study. For every 1000 inhabitants, 333 ha are cultivated in the north and 200 ha in the south. Climatic conditions, low rainfall and bad soil fertility present strong constraints in the southern countries. (MEDAGRI 2001b).

For sheep and goat livestock it is important to know the area of permanent pasture which is there's the main area of this kind of livestock.

The analysis of table 1 demonstrate that the majority of Mediterranean countries of this study have important superficies of permanent pastures compared to the total superficies of agricultural area.

TABLE 1: PERMANENT PASTURE AND AGRICULTURAL AREA IN MEDITERRANEAN REGION (MEDAGRI 2001b)

COUNTRY	PERMANENT PASTURE(1000 HA)	AGRICULTURAL AREA (1000 HA)
MOROCCO	21000	30976
ALGERIA	34467	42640
TUNISIA	4000	8900
LIBYA	13300	15415
EGYPT	-----	3300
PALESTINE	145	582
LEBANON	16	324
JORDAN	791	1181
SYRIA	8285	13769
TURKEY	12378	39346

The countries included in our studies contain 100.11million sheep head and 26.18 million goat head distributed like in the table 2.

TABLE 2: EFFECTIVE OF SHEEP AND GOATS IN MEDITERRANEAN REGION (MEDAGRI 2001a)

COUNTRY	EFFECTIVE OF SHEEP (1000 HEAD)	EFFECTIVE OF GOATS (1000 HEAD)
MOROCCO	16576.4	5114.4
ALGERIA	18200	3400
TUNISIA	6600	1300
LIBYA	6400	2200
EGYPT	4400	3261
PALESTINE	340	73
LEBANON	355	460
JORDAN	2000	795
SYRIA	15000	1200
TURKEY	30238	8376

Table 3 shows the amount/quantity of mutton and lamb of meat produced ,the consumption of sheep meat and the percentage of sheep meat is compared to the other kind of meat in the region of our study.

It appears that the main countries which produce and consume sheep meat are the northern Africa countries , Syria and Jordan. The maximum of consumption per year and per capita is 11 kg in Libya and the minimum is in Palestine and Egypt 1 and 2 kg /year/capita.

This difference in sheep meat consumption between the Mediterranean countries is due to traditions and habits, In Middle East there are other kinds of meat which replace mutton and lamb meat

Table3:characteristics of sheep meat production in Mediterranean region (MEDAGRI 2001c)

COUNTRY	MUTTON AND LAMB MEAT PRODUCTION (1000 TONS)	SHEEP MEAT AVAILABILITY PER CAPITA (KG/YEAR/PERS)	PERCENTAGE OF MEAT LAMB COMPARED TO THE TOTAL MEAT PRODUCTION
MOROCCO	120	5	22.5
ALGERIA	163.2	6	32.46
TUNISIA	50	6	25.27
LIBYA	72	11	35.42
EGYPT	66	2	5.08
PALESTINE	5.4	1	1.65
LEBANON	8.8	4	7.84
JORDAN	14	7	10.67
SYRIA	155.7	10	49.51
TURKEY	317	6	25.48

The analysis of Mediterranean breeds of sheep and goats (table 4) shows that in Mediterranean region there are a lot of breeds well adapted to local conditions which can represent an important help for small ruminants livestock conversion from the conventional to organic

**TABLE 4: MEDITERRANEAN BREED OF SHEEP AND GOATS
(FAO 2001)**

COUNTRY	SHEEP BREED	GOATS BREED
MOROCCO	Ait Baraka, Ait Haddidou, Ait Mohad, Aknoul, Beni Ahsen, Beni Guil, Beni Meskine, Berbere, D'Men, Doukkala, Harcha, Marmoucha, Rehamna, Sraghna, Sardi, Souss, South Moroccan, Tadla, Timhadite, Tounfite, Tounsint, Zaian, Zemmour, Zemrane, Zoulay	Attaouia, Berber, Yahyaouia.
ALGERIA	Algerian Arab, Beni Guil, Berber, D'Man, Hamra, Raimbi, Tadmit, Tuareg, Tunisian Barbarin	Arabia, Berber, Kabyle, Makatia, Mzabite, Sahelian, Tuareg.
TUNISIA	Sidi Tabet cross, Tadmit, Thibar, Tunisian Barbarin	Nubienne, Maltaise
LIBYA	Barki, Ghimi, Lybian Barbary.	Libyan
EGYPT	Ancient Egyptian, Barki, Fellahi, Ibeidi, Kurassi, Ossimi, Rahmani, Saidi, Sanabawi.	Baladi, Barki, Saidi, Sharkawi, Sinai, Wahati, Zaraibi.
PALESTINE	Assaf, Awassi, Israeli improved Awassi.	Israeli Sanen, Mamber, Negev, Sinai
LEBANON	Awassi	Damascus, Mamber.
JORDAN	Awassi	Damascus, Mamber
SYRIA	Awassi, Herki, White Karman	Mamber, Samar, Shami
TURKEY	Acipayam, AK-Karaman, Antolian Red, Asaf, Awassi, Central Anatolian Merino, Cine Capari, Dagliç, Gökçeada, Güney Karaman, Halkali, Hemsin, Herik, Herki, Kamakuyruk, Kangol, Karacabey Merino, Karacabey-Kivircik, Mor-Karaman, Ödemis, Ramliç, Red Sheep, Sakiz, Tahirova, Tuj, Türkgelo.	Abaza, Anatolian Black Goats, Ankara, Bezoar, Damascus, Hair Goat, Kilis, Kurdi, Mingrelian, Saanen Kegisi.

C/ EXAMPLE OF MEDITERRANEAN COUNTRY: TUNISIA

1/LOCATION:

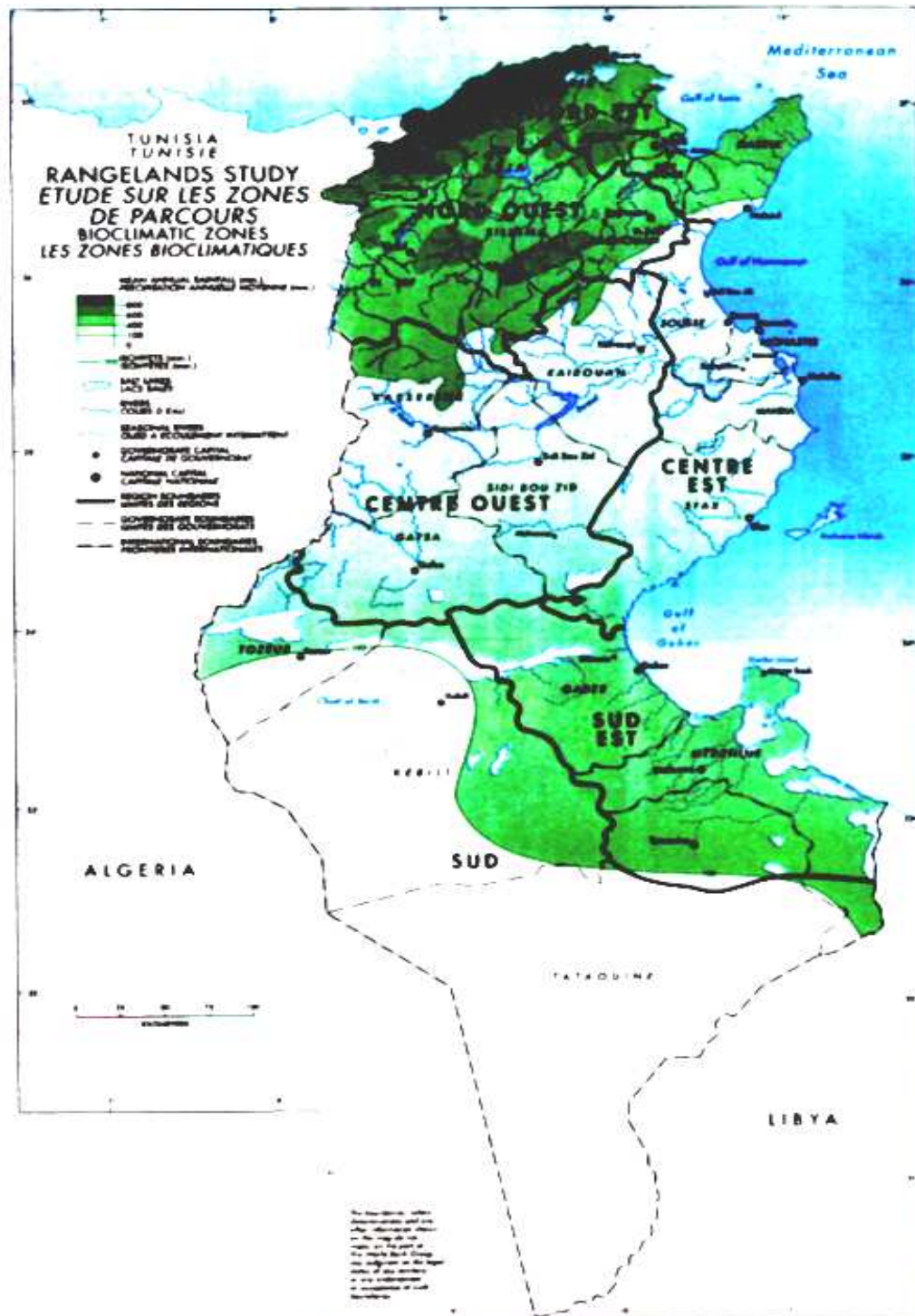
The Tunisian Republic is bordered by the Mediterranean to the North and East, to the South by Libya, and to the West by Algeria. It covers 162155km² with a population of 10 000 000, its capital is Tunis. Tunisia has a privileged geographic position at the cross-road of Eastern and Western basins of the Mediterranean, between Europe and Africa.

2/CLIMATE AND AGRO-ECOLOGICAL ZONES:

The Tunisian climate is Mediterranean ,characterised by hot dry summers and cool moist winters that limit the growing period, precipitation is very irregular and the rainfall varies considerably from the North to South. Tunisia is divided into four large geographical units: Northern, Eastern, Central and Southern regions (figure 1).

There are five bioclimatic zones in going from the most arid to the most humid based on rainfall (table 5).Rainfall is not the only bioclimatic determinant temperature and especially winter temperature is also important

**Figure 1: BIOCLIMATIC ZONES OF TUNISIA
(TUNISIAN MINISTRY OF AGRICULTURE 1999)**



This is not only governed by altitude but by the degree of continentality, inland stations have relatively hotter summers and colder winters than areas which benefit from the buffering effects of the sea. Bioclimatically, therefore, the country is also divided into areas of warm, cool and cold winters.

TABLE 5: THE BIOCLIMATIC ZONES OF TUNISIA

ANNUAL RAINFALL (mm)	BIO-CLIMATICAL STRATA
800-1200	Humid
600-800	Sub-humid
400-600	Semi-arid
100-400	Arid
20-100	Desert (Saharan)

(TUNISIAN MINISTRY OF AGRICULTURE 1999)

Depending on the annual rainfall, there are four main agricultural regions which can be summarised as follows (table 6).

TABLE 6:THE AGRO-ECOLOGICAL ZONES.

ZONE	ANNUAL RAINFALL (mm)	AGRICULTURE AND LAND USE
North	500<Rain<1000	Natural forest, maquis and grazing area, possibility of rainfed crops: annual crops and horticulture.
Dorsal	400<Rain <500	Forest, maquis and rangeland but fragile; possibility of cropping but with risky annual crops and tree crops adapted to edaphic and topographic conditions.
Centre	200<Rain<400	Forest and maquis very fragile in favourable edaphic and topographic conditions, rangelands are fragile. Possibility of cropping but with risky annual crops and tree crops
South	Rain<200	Very fragile steppe in favourable edaphic and topographic sites. Rangelands very easy degraded. Rainfed agriculture is locally possible with good management of run-off.

3/LIVESTOCK PRODUCTION SYSTEM:

Livestock has an important share of agricultural production; it contributes approximately 40 percent of the total agricultural product, but this is clearly inferior to

cereals and olive that dominate traditional Tunisian agriculture. However, in recent years, the government has been encouraging animal production to increase national self-sufficiency in animal products (meat and milk). There are 380 000 farms in Tunisia and 65 percent keep livestock, mainly smallholders, with an average agricultural area of 20 ha. Which represent 80 percent of the livestock statistics for 1998 (see Table 7). Sixty five percent of the cattle are in the North, 60 percent of sheep and goats are in the Centre, and 80 percent of camels in the Centre and the South.

TABLE 7: Ruminant numbers, meat and milk production, 1986, 1994 & 1999 (TUNISIAN Ministry of Agriculture)

Item	1986	1994	1999
Friesian cattle ('000)	83	124	185
Local & cross Breed Cattle ('000)	265	250	240
Sheep ('000)	3000	3500	3800
Goats ('000)	500	700	800
Camels ('000)	70	40	55
Beef & veal ('000 tonnes)	30	42	52
Sheep & Goat meat ('000 tonnes)	40	50	58
Milk ('000 tonnes)	330	520	1000

Ruminant meat production has increased considerably, from 70 000 to 110 000 tons between 1986 and 1999. Meat from cattle, sheep and goats form 95 percent of national production, while 5 percent comes from camels and horses. The total meat consumption is 30 kg per capita per year: poultry (15), beef (7) and sheep and goat (8). Because of the high price of ruminant meat, Tunisia is almost self-sufficient with national production covering 95 percent of consumption.

Ruminant production systems vary according to the variety of feed resources which decrease with aridity .Farm income in most of the sub-humid and semi-arid areas is based on cereals, vineyards, orchards and livestock, whereas small ruminants are the basic source of income in arid areas (Ben Dhia 1992).

Sheep and goats system of production in Tunisia is extensive or traditional system, They have limited productivity and are largely based on marginal lands, and on less productive breeds of livestock, mainly local sheep and goats. The main problem is low fertility due to poor seasonal feeding and high mortality. These problems are often linked to overstocking, and seasonal feed scarcity. These systems have low economic efficiency but are very well adapted to the environment and have a high ecological efficiency (Kayouli 2000).

Two thirds of sheep and goats are in Central Tunisia; they play a very important role, besides their production they are kept by small farmers as savings. Traditional livestock production in arid and semi-arid areas is based on adaptation to low and variable rainfall, poor fragile soils and extensive grazing similar to the Sahel of Sub-Saharan Africa. Traditionally, sheep were 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. Increase in settlement of nomads, increase in sheep numbers in marginal zones, expansion of cultivation and reduction of fallow have greatly increased pressure on available land and reduced soil fertility. Grazing land is becoming scarcer and meagre as more and more land is put under crops. Sheep and goats traditionally grazed on hillsides and steppes in winter in the Centre, and stubble in summer in the North during transhumance. This continues, but is much reduced.

Increased purchasing power has raised the demand for livestock products so farmers are changing to intensive sheep rearing with feed supplements, based on imported cereals (Kayouli 2000).

a) SHEEP AND GOATS BREEDS IN TUNISIAN LIVESTOCK (ESAM 2000):

- Fat-tailed Tunisian Barbarin: represents 61% of Tunisian sheep flock; specialized in meat production ,this breed is the more adapted to local conditions and expresses it self better in extensive system.
- West Fine-tailed Sheep: represents 35% of Tunisian sheep flock ; specialized in meat production , adapted to extensive and semi-intensive livestock system.
- Black Sheep of Thibar: represents 3% of Tunisian sheep flock ; specialized in meat production, adapted just to semi-intensive and intensive livestock system
- Sicilo-Sarde: represents 1% of Tunisian sheep flock; specialized in milk production and need intensive livestock system.

For goats there is local population composed by Nubien and Maltese characterised by low yield of production. That's why ,in order to improve local breed by crossing and to increase goats productions (meat and milk), Tunisian ministry of agriculture has imported foreign goats breed like Alpine, Saanen, Poitvine for milk production and Boer for meat production.

4/PASTURE RESOURCE:

There are four main forage sources in Tunisia (Tunisian Ministry Of Agriculture): natural pasture, fallow and stubble, sown fodder and crop residues.

- NATURAL PASTURE:

The pastoral flora of Tunisia is very rich, especially in the humid, subhumid and semi arid zones. Unfortunately in the better-watered areas, most has been turned into crop land and that marginal land left for grazing is so overgrazed that the better species are often barely visible, they soon return, however, with improved management, especially if grazing pressure is reduced and/or the pasture is closed rotationally for the start of the growing season. Many of Tunisia's pasture plants belong to species which have been domesticated and brought into cultivation elsewhere; the annual legumes and *Lolium rigidum* have become notably important in Australia.

Important pasture grasses include: *Ampelodesma mauritanica* ("diss" its large clumps are a salient feature of many hillsides), *Aristida* spp. (common on degraded hillsides and in the steppe; (*Avena bromoides*, *Cynodon*

dactylon, *Dactylis glomerata*, *Festuca arundinacea*, *Hyparrhenia hirta*, *Imperata cylindrica*, *Koeleria* spp., *Lolium multiflorum*, *Lolium perenne*, *Lolium rigidum* (an important component of fallows), *Lygeum spartum* ('alfa, an important steppe grass gathered as a fibre), *Oryzopsis miliacea*, *Phalaris aquatica*, *Phalaris coerulescens*, *Phalaris truncata* (the phalaris are important on heavy clays "marnes" often in association with

Hedysarum), *Phleum pratense*, *Sorghum halepense* and *Stipa* spp. (which are very important in the steppe).

Forage legumes are as rich as are the grasses, as is common under Mediterranean conditions. *Anthyllis tetraphylla*, *Anthyllis vulneraria* (where winters are mild), *Astragalus hamosus*, *Astragalus caprinus*, *Hedysarum coronarium* (very widespread on marl), *Hedysarum spinosissimum*, *Lotus* spp., *Medicago sativa*, *Medicago falcata*, *Medicago* spp. (many annuals but most important in fallows q. v.), *Trifolium fragiferum* (on sites with permanent moisture, often in association with *Festuca arundinacea*), *Trifolium isthmocarpum*, *Trifolium resupinatum* and *Trifolium subterraneum*.

Other important herbaceous forages include *Bupleurum balansae*, *Moricanda arvensis*, and *Sanguisorba minor*. Many trees and shrubs provide browse; *Artemisia herba alba* (a major component of steppe grazing), *Fumana* spp., *Globularia alypum*, *Olea europea* (which may be browsed into a cushion), *Phillyrea angustifolia*, *Quercus* spp. (notably *Q. coccifera* which is usually seen in the form of a low, browsed shrub), *Rosmarinus officinalis* and *Thymus* spp.

Despite their net decline, natural pastures play an important role in livestock feeding. During the last twenty years, natural grazing areas have decreased by 20 percent. The area of natural grazing varies according to climatic zones. The humid, sub-humid and semi-arid zones represent only 2, 2 and 9 percent respectively of the total natural grazing. Natural pasture is mainly in arid zones (45 percent) and Saharan zones (42 percent). In the Central and Southern regions (arid and semi-arid ecological zones) the vegetation is a steppe which is composed mainly

of: *Stipa tenacissima*, *Artemisia herba-alba*, *Artemisia campestris*, *Aristida pungens* and *Cynodon dactylon*.

Pasture and shrubs in desert areas: There are many salt tolerant fodder species in the Saharan parts which are grazed by camels and goats. The most common: 1) trees are *Tamarix*, 2) shrubs *Salicornia*, *Salsola*, *Suaeda* and *Atriplex*, 3) perennials are *Aeluropus*, *Sporobolus*, *Puccinellia* and 4) annual species are *Hordeum maritimum*, *Lepturus cylindricus*, *Frankenia* and *Melilotus*.

- FALLOW:

Fallow has been a very important part of rainfed cereal rotations, originally one year in two or three lay fallow (bour) and furnished excellent grazing from autumn through spring; intensification of crop production in some areas is reducing the fallow acreage but it is still an important source of high quality seasonal grazing for small ruminants. Many of the fallow plants of the Mediterranean zone have been domesticated in Australia and incorporated into cereal-fallow rotations in their areas of Mediterranean climate; there have been many attempts to re-import these plants and its associated technology into North Africa but with very limited success; more Phosphatic fertiliser in the rotation, probably on the cereal, and careful grazing management would greatly improve the natural fallow grazing - but large cereal farmers are not livestock owners and fallow are often let to passing transhumant herds which graze them to bare ground. The rich pastoral flora of the fallow includes: *Avena sterilis*, *Lolium rigidum*, *Hippocrepis spp.*, *Lathyrus aphaca*, *Lotus spp.*, *Medicago ciliaris* (particularly well adapted to heavy soils), *Medicago littoralis*, *Medicago orbicularis*, *Medicago polymorpha* (the commonest with many highly productive forms) *Medicago rugosa*,

Medicago scutellata, *Medicago truncatula*, *Melilotus* spp., *Scorpiurus* spp. and *Trifolium cherleri*.

- STUBBLE:

These are an important source of summer grazing for small ruminants; where weed control has not been intense, there may be considerable herbage other than the bases of wheat stems on offer. There are frequent cases of toxicity due to *Hypericum* spp. which causes photosensitive symptoms in sheep.

- CROP RESIDUES AND BY-PRODUCTS:

As noted above, feed supply is a serious constraint on animal production in Tunisia. Imported feeds, which lead to a trade deficit, have been used traditionally. There is renewed interest in all local feed resources. Large quantities of crop residues, by-products and animal wastes are produced and better utilization of these products has been studied . The crops residues and by-products studied and which are frequently used by farmers in Tunisia are: cereal straws, olive cake and fresh olive leaves and twigs, grape seeds, sugar beet pulp, tomato pulp, brewers' grain, wheat bran, date palm residues, fruits and poultry litter.

About 1 500 000 tons of straw are produced yearly from wheat, barley, oats and triticale. Straw has been a traditional feed-stuff for sheep and cattle during winter. A huge amount of research was done on the use of straws in ruminant feeding and on methods to improve their nutritive value, using NaOH in the beginning and later ammonia gas and urea. Some years ago, straw ammoniation using 3 percent anhydrous ammoniac was widely used on large scale farms as well as on smallholdings (Nyarko-Badolu and all 199)

III/TECHNIQUES OF FLOCK CONDUCT IN TUNISIA

1. SHEEP FLUCK CONDUCT (ESAM 2000):

a/ The Shearing: this operation comes before mating because after mating shearing can provoke embryological abort. In Tunisia shearing takes place in spring ,this technique gives wool for sale also stresses the ewe and favours entrance in horsing.

b/ Sheep Dip: After shearing, there is sheep dip in order to eliminate parasites on the animal fleece, there are two methods to do it:

-Introduce the animal in basin with water and insecticide.

-Pulverisation of insecticide on the animal fleece.

c/ MATING:

-Period of mating: Normally mating period for sheep must be in autumn (short days) but for nutritional reasons, (grazing will come in the dry season) in Tunisia mating period comes in spring. This can be realised because Tunisian ewes breed can lamb out-of-season.

-Different type of mating:

+Free mating: This is the most used method because it is easy to realise ,just let the ram with ewes. This method presents some disadvantages:

- Hard to determine paternity so hard to do selection
- No control of sterility
- Long mating period

+Controlled mating: this kind of mating controls paternity and is obligatory for Barbarin breed sheep because of its fat-tailed ewe.

-Ram effect: meet between ewes and rams can stimulate ewes hosing if ewes don't meet rams since one month and rams live at least 250m far from ewe flock.

-Sex Ratio: for mating we use rams 3 to 4 years old.

In Free Mating: 3 rams for 100 ewes .

In Controlled Mating: 5 or more rams for 100 ewes.

REMARK: If we use rams older than 7 years or hogs we must increase the number of male/100 ewes.

-Mating duration: sexual cycle of ewe is 17 days and maximum duration of mating must be 3 cycles so less than 2 months in order to have regrouped lambing.

-Flushing: one month before mating and during mating period give to animals alimentary supplementation good forage or concentrate for ram and ewe (better crushed grain of oat for ram).Flushing will increase the rate of fat so the ovulation rate.

d/ Steaming: In the last 1/3 of pregnancy (total duration of pregnancy 5 months) the weight of foetus increase considerably so of ewe ingestion capacity .we must give to ewes concentrated aliments. The period of steaming in Tunisia is summer . This technique reduces (0-5 days) lamb mortality which represents 80% of total lamb mortality.

e/ WEANING: for meat sheep production there is traditional weaning when lamb is 4 months old, weaning must be progressive in order to avoid mastitis problems.

f/Reform and Replacement: we must reform 25% of sheep flock every year for several reasons:

-Age more than 7 years

-Sterility

-Frequent diseases

Replacement rate must be 5% per year for five years.

g/fattening period: In Tunisia the fattening period is not really long because of food scarcity. The majority of farmers slaughter their lamb just after weaning (6 months old), few farmer, fatten their lambs when they are 1 year old at most.

2.GOATS FLOCK CONDUCT (ESAM 2000):

for goat there is the same conduct technique is applied with some differences: there is no shearing, also the mating period takes place (for meat goat production)in autumn (October - November) in order to have meat in summer when Tunisian consumer likes eating goats meat.

Moreover, there are some differences in sexual behaviour between goats and sheep, sexual cycle of goats is 21 days ,and there is precoce sexual male maturity that's why we must separate early male from female in order to avoid mating and control reproduction for better selection.

IV/ HOW TO CONVERT FROM THE CONVENTIONAL TO THE ORGANIC

1/CHARACTERISTICS OF ORGANIC AGRICULTURE IN TUNISIA (Tunisian country report 2001):

Organic agriculture is relatively new in Tunisia. The main crops are olives, date palms, almonds, jojoba, vegetable, fruit trees, aromatic plants and honey. All the production is directed to the export market. Most of the organic farmers are located mainly in the center and south of the country.

Many agricultural areas and crops can be easily converted to organic agriculture because the conditions are very favourable: unfavourable climatic conditions for pests and diseases, most traditional techniques and practices and biodiversity. The main difficulties to convert farms to organic agriculture in some areas are: the lack of products for use in fertilization and soil amendments, the lack of products for plant pest and disease control, the lack of unrestricted veterinary medicines and the lack of experience in marketing organic products.

In 2000, Tunisia has about 137 farmers and 18 035 ha. This important development was the result of policies supporting this sector in a national strategy:

-Aids: 30% of subsidies for all equipment used in organic agriculture and 70% of subsidies for certification fees during the coming five years with a maximum of 3500 US\$.

-Information: the Technical Center for Organic Agriculture, the Bureau of Organic agriculture in the Ministry of Agriculture and the National Agency

for Investment promotion in Agriculture offered all the information related to various aspects in organic agriculture to technicians and farmers.

-Training: the Technical Center for Organic Agriculture in collaboration with the National Institution for Agricultural Research and Higher Education and the Mediterranean Agronomic Institute of Bari offered many training days, short sessions and short courses in various topics of organic agriculture to technicians and some farmers. Some modules in organic agriculture are being offered to student in the University.

-Marketing: some subsidies are given by the National Center for Export Promotion to facilitate the marketing of organic products.

- **Regulatory aspects:**

-The reference legislation in Tunisia is IFOAM Basic Guidelines, EEC and Tunisian regulations. A national regulation was issued in April 5, 1999 and February 14, 2000. The complete national regulatory framework will be ready by the beginning of the year 2001. The last national technical standards on plant and animal production and processing are being prepared.

-The competent authority is the National Commission for Organic Agriculture. It's main tasks are:

- +the proposal to promote organic agriculture and the support of this sector

- +the study of all files and documents related to organic agriculture

- +the agreement given to certification bodies and it's withdrawal

-The inspection and certification system is consistent with the IFOAM standards, EEC regulation and the Tunisian legislation .The inspection and certification bodies are:

+INNORPI (Tunisian)-BIOAGRICOOP (Italian):the personnel is Tunisian and Italian (9% of total organic area).

+ECOCERT International: the inspectors are mainly Tunisian (90% of the total organic area)

+LACON,BCS:the inspectors are German (0.7% of total organic area)

+AIAB: the inspectors are Italian (0.3% of total organic area)

TUNISIAN ORGANIC LEGISLATION FOR ANIMAL PRODUCTION
(draft standards):

As mentioned before, Tunisian legislation is mainly based on UE-Regulation 2092/91,IFOAM Basic Standard and Tunisian Regulations. The legislation of organic animal production is being prepared and will be published in Tunisian Official Book before the end of 2001.The actual draft standards is a copy of UE-Regulation (Tunisian Ministry of Agriculture 2001).

(a)principal steps for conversion :

When the inspection system applying specifically to livestock production is first implemented, the producer and the inspection body must draw up :

-a full description of the livestock building, pasturage open-air exercise areas, open air runs, etc , and where applicable, the

premises for the storage, packaging and processing of livestock, livestock product ,raw materials and inputs.

-a full description of the installations for the storage of livestock manure.

-plan for spreading such manure agreed with the inspection body or inspection authority, together with a full description of the areas given over to crop production.

-where appropriate the arrangement laid down by contract with other farms as regards the spreading of manure.

-management plan for the organic-production livestock unit (e.g. management for feeding, reproduction ,health ,etc).

-all practical measures to be taken on the livestock farm to ensure compliance with this regulation.

The description and the measures concerned are to be set out in an inspection report countersigned by the producer concerned.

(b)The principals ideas of UE-Regulation(Hansper 2000) which stressed sheep and goats livestock are:

▪ **Conversion period:**

-conversion of land associated with organic livestock production: where a production unit is converted, the whole area of the unit used for animal feed must comply with the rules on organic farming.

By derogation from this principle, the conversion period may be reduced to one year for pasturage, open air runs and exercise area used by non-

herbivore species. This period may be reduced to six months where the land concerned has not ,in the recent past , received treatments with products other than allowed in UE-Regulation.

-conversion of livestock and livestock products: if livestock products are to be sold as organic products, the livestock must be reared according to the rules laid down in UE-Regulation for at least six months in the case of small ruminants.

By derogation just for the constitution of small ruminants flock ,meat production can be sold as organically reared during a transitional period expiring 31 December 2003, provided that:

+they come from extensive husbandry

+they are reared in the organic-production unit until the time of sale or slaughter, for a minimum period of two months.

+the origin of the animals complies with conditions expressed in the UE-Regulation.

▪ **Origin of the animals:**

In the choice of breeds or strains ,account must be taken of the capacity of animals to adapt to local conditions ,their vitality and their resistance to disease.

By derogation , when a flock is constituted for the first time and organically reared animals are not available in sufficient numbers, non-organically reared livestock may be brought into an organic livestock production unit, subject to the condition that ewes and goats must be

reared according to the rules of this regulation as soon as they weaned and in any case they must be less than 45 days old.

By derogation ,the renewal or reconstitution of flock shall be authorised in case of high mortality of animals caused by health or catastrophic circumstances.

By derogation, 20% of the adult ovine and caprine livestock may be brought in ,as female (nulliparous) animals, from non organic-production stock farm per year.

Feed:

Feed is intended to ensure quality production rather than maximising production, while meeting the nutritional requirements of the livestock at various stages of their development. Fattening practices are authorised in so far as they are reversible at any stage of the rearing process. Force-feeding is forbidden.

Livestock must be fed on organically produced feedinstuffs.

The feeding of young mammals must be based on natural milk, preferably maternal milk. All mammals must be fed on natural milk for a minimum period, depending on the species concerned , which shall be 45 days for sheep and goats.

Where relevant, member states shall designate areas or regions where transhumance (including movement of animals to grazing areas in mountains) is practicable, without prejudice to the provisions on the feeding of livestock.

Rearing systems for herbivores are to be based on maximum use of pasturage according to the availability of pastures in the different period of the year. At least 60% of the dry matter in daily rations is to consist of roughage, fresh or dried fodder, or silage.

By derogation ,for a transitional period expiring on 24 August 2005 the use of limited proportion of conventional feeding stuffs is authorised where the farmer is unable to obtain feed exclusively from organic production. The maximum percentage of conventional feeding stuffs authorised per year is 10% in the case of herbivores

Feeding stuffs, feed materials, compound feeding stuffs feed additives, processing aids for feeding stuffs and certain products used in animal nutrition must not have been produced with the use of genetically modified organisms or products derived there from.

▪ **Disease prevention and veterinary treatment:**

Disease prevention in organic livestock production shall be based on the following principles:

- (a) the selection of appropriate breeds or strains of animals.
- (b) The application of animal husbandry practices appropriate to requirements of each species, encouraging strong resistance to disease and the prevention of infection.
- (c) The use of high quality feed, together with regular exercise and access to pasturage, having the effect of encouraging the natural immunological defence of the animal.
- (d) Ensuring an appropriate density of livestock ,thus avoiding overstocking and any resulting animal health problems.

The use of substances to promote growth or production (including antibiotics, coccidiostats and other artificial aids for growth promotion purpose) and the use of hormones or similar substances to control reproduction (e.g. induction or synchronisation of oestrus), or for other purposes, is prohibited. Nevertheless, hormones may be administered to an individual animal as a form of therapeutic veterinary treatment.

▪ **Husbandry management practices, transport and identification of livestock products:**

-husbandry practices:

in principle, the reproduction of organically reared livestock should be based on natural methods. Nevertheless artificial insemination is permitted. Other

forms of artificial or assisted reproduction (for example embryo transfers) are prohibited.

Operations such as attaching elastic bands to the tail of sheep must not be carried out systematically in organic farming ,this kind of operations may however be authorised by the inspection authority or body, for reasons of safety or if they are intended to improve the health ,welfare or hygiene of the livestock. Such operations must be carried out at the most appropriate age by qualified personnel and any suffering to the animal must be reduced to a minimum.

Keeping livestock tethered is forbidden. Nevertheless by derogation from this principle, the inspection authority or body, can authorise this practice for individual animals upon justification by the operator, that is

necessary for safety or welfare reasons, and such tethering is only for a limited period of time.

Where livestock are reared in groups, the size of the group must depend upon their stage of development and the behavioural needs of the species concerned. The keeping of livestock in conditions, or on a diet, which may encourage anaemia, is prohibited.

-transport:

Transport of livestock must be carried out so as to limit the stress suffered by the animals in accordance with the relevant national or community legislation in force. Loading and unloading must be carried out with caution and without the use of any type of electrical stimulation to coerce the animals. The use of any allopathic tranquilliser, prior to and during transport is prohibited.

Livestock and livestock products are to be identified at all stages of their production, preparation, transport and marketing.

- **Free range areas and livestock housing:**

Housing conditions for livestock must meet the livestock biological and ethological needs (e.g. behavioural needs as regards appropriate freedom of movement and comfort). The livestock must have easy access to feeding and watering. Insolation, heating and ventilation of the building must ensure that air circulation, dust level, temperature, relative air humidity and gas concentration are kept within limits which are not harmful to the animals. The building must permit plentiful natural ventilation and light to enter.

All mammals must have access to pasturage or an open air exercise area or an open-air run which may be partially covered , and they must be able to use those area whenever the physiological condition of the animal , the weather conditions and the state of the ground permit, unless there are community or national requirements relating to specific animal health problems that prevent this. Herbivores , must have access to pasturage whenever conditions allow.

By derogation the final fattening phase of cattle pigs and sheep for meat production may take place indoor, provided that this indoor period does not exceed one fifth of their lifetime and in any case for a maximum period of three month.

V/ PROBLEMS OF CONVERSION

Sheep and goats organic livestock is a part of organic farming system that's why problems of conversion are not only specific to animal system but concern all the farming system .

Ben Kheder (2001) listed the main practical obstacles and constraints to conversion in Mediterranean countries:

As organic agriculture seems fairly similar to many traditional farming system in developing countries ,conversion from these traditional systems and certification may appear to be an obvious thing to aspire. However, certification is costly and for subsistence farmers with small marketable surpluses, it may not be economically feasible. Additionally, smallholder production systems may cause soil degradation and are not environmentally sustainable.

The adoption of organic farming techniques may also be constrained by the lack of know-how and the absence of training and extension facilities. Furthermore, expertise on local farming conditions is a basic requirement and outsiders, even if they may be conversant with the principle of organic farming, may not have this expertise.

Research into these conditions is essential to organic farming :for instance, a certain cropping system may be preferable in one area, whereas in another area the threat of a certain pest would dictate a different approach.

Uncertainties about ownership and access to land are real obstacles to conversion .Farmers have to be sure that they will be able to benefit from investing, for example, by improving soil fertility in order to make such investment. Different access to credit is another factor often impeding initiatives and the implementation of conversion projects.

Some farmers do have access to financial resources and more likely to consider conversion . However, they also have to satisfy marketing constraints. The market for organic products is still comparatively small and is mainly concentrated in European Union, the United State and Japan. Having access to both market information and markets themselves is difficult. The length of the conversion period , normally two to three years ,is also a barrier, as products usually cannot be sold as organic during this period.

These are some of the impediments to conversion by smallholder. However, the issue is wider and more complex .Take the question of external costs of high-input conventional farming. These costs, which take such forms as for instance the pollution of drinking water and reduced bio-diversity, are not reflected in the market prices of these

products of wider and more complex . Take the question of external costs of high-input conventional farming; if they were what, these products would perhaps be less price competitive. Furthermore, some enterprises have an interest in promoting the inputs on which these conventional systems are based , and stimulate activities promoting their use, including technical research.

Individual smallholders are usually advised to join or to form co-operatives or other farmer groups in order to overcome some of the problems described above, create the required critical mass, build the necessary infrastructure (primary processing and packing facilities), cut costs and improve market access.

VI/ PROSPECTIVE OF ORGANIC SHEEP AND GOAT MEAT PRODUCTION

International Trade Centre published in Organic Food And Beverages (1999), that trade in organic foodstuff has become an important global agribusiness. Preliminary estimate for 1998 indicates retail sale in seven markets (Denmark, France, Germany, Netherlands, Sweden, Switzerland, United Kingdom)and in Austria, Italy, USA and Japan is about \$13 billion to \$13.5 billion.

The organic trade is of particular interest in a development context because of the spectacular growth that has taken place in recent years, with growth rates between 5% and 40% expected over the medium term, depending on the market in question. It should be noted that the continuous growth in the organic sector is all the more remarkable since overall food sales is experiencing either slow growth or stagnation.

Product development and innovation in packaging by food processors and manufacturers, as well as supportive government policy in many

countries , will also push up world demand. It seems clear at least in the short to medium term that an insufficient supply of organic products will be the main problem rather than lack of demand. Though domestic production is growing rapidly in many markets, demand appears to be expanding even faster. This opens up opportunities for exporters in developing countries, not only for those already in the business but also for others who would like to start production. A review of the world supply situation shows that more than 130 countries produce certified organic food and beverages in commercial quantities, including at least 65 developing countries of which about 15 are least developed(LDCs). Production also exists in most transition economies.

It should be noted that interest in promoting organic agriculture in developing as well as developed countries is rising.

There is no doubt that the world markets for organic food and beverages will continue to offer developing countries profitable export opportunities.

The International Trade Centre reported that for organic animal products world supply ,the European Union and the United States are important producers of organic meat and dairy products. Organic meat is likewise produced in Argentina, Uruguay and New Zeland (lamb).

-The major markets for animal products are:

- **Denmark:** dairy products and eggs accounted for 47.3% of the total sale of organic food and beverages, 6.7% meat and meat products 6.7%.

At the time of the survey dairy and meat products had highest growth rate.

- **France:** these three product groups together currently represent about half of the total organic market and are expected to grow from 10% to 20% annually .Dairy products, meat ,meat products , prepared and pre-cooked dishes are among the products for which demand will probably grow the fastest over the next five years, at an expected annual rate of over 20% .
- **Germany:** to date meat has had a minor place in organic food sale but it is now the faster growing sector .One reason for its slow development in the past was the high cost of production. It is expected that the extension of the EU regulation on organic food to animal products ,which took place in June 1999, will further stimulate production and trade in organic meat
- **Netherlands:** there is a small but increasing demand for meat stimulated by consumer worries about BSE ,salmonella and growth hormones.
- **Sweden:** meat and cured meats represent 3% of total consumption of organic foods. Domestic production of organic meat and cured meats is not well developed. The market demand is far bigger: it is thought that production of organic cattle and lamb needs to double and that of organic pigs should rise at least tenfold.
- **Switzerland:** meat and sausages offer few opportunities for developing countries.

- **United kingdom:** meat and dairy products are important segment of the British organic market ,most of meat and meat products supply comes from domestic production. In terms of a potential market for third-country suppliers outside EU, this sector thus provides little potential. Growth prospects are expected to be very good (the market is expected to triple in the next five years). This is so particular for meat, since the United Kingdom has one of the lowest European per capita consumption levels of organic meat. The BSE scare has already catalysed growth in organic meat consumption and concern over animal welfare has further increased consciousness of animal husbandry practices.

Conclusion

All animal livestock of the South Mediterranean Countries suffer from climatic condition of mild region characterised by moist winter and hot dry summer. Crop resources in the majority of the countries cannot cover the animal need, so farmer has two solutions feeding his flock under than necessary with effects on yield of production or adding in the animal ration a concentrate with high energy value but this is costly. Also the majority of small ruminants breeds in Mediterranean countries are local breeds which are well adapted to the local conditions but with low level of production .

For this reasons organic animal production appears the most suited solution to solve these problems because organic agriculture with its specific techniques uses less quantities of inputs (minimum of concentrated aliments) and valorises pasture resources with good management of grazing. As to organic production it is preferable to have local animal breed, the most important criterion is the quality of the product and not the quantity.

Consumers start now to give more importance to quality of meat consumed because of the problems of BSE , toxins and brucellosis. They aim at healthy products with traceability and without any use of OGM crops or animal powder in animal ration. This condition can be easily realised with organic techniques.

Many Mediterranean countries like Tunisia start to make policies supporting the organic agriculture sector and write their own regulation based on IFOAM Basic Guidelines and EU-Regulation.

In Tunisia legislation for organic animal production is in preparation now and must be effective before the end of 2001 but the analysis of draft standards shows that there is a copy of UE-Regulation 2092/91 for

animal production. This legislation may present some problems in terms of application because of the wide differences between European conditions and Tunisian conditions, for instance techniques of flock conduct are different because of the climatic conditions, traditional farm habits and nature of animal breed.

Other problems for Mediterranean countries concern the lack of local markets for organic meat, so all the production is for exportation towards European market and here it seems impossible to export living animal because of European restriction in terms of processing. In the case of Tunisia there is no slaughterhouse which respond to international standards that's why nowadays southern Mediterranean countries cannot export their meat (organic or conventional) towards developed countries. The only solution is to develop local market and to have at international level slaughterhouses , means of storage and meat processing.

References

Ben Dhia M.(1992).L'élevage ovin en Tunisie, situation actuelle et perspectives
d'avenir, cahiers option méditerranéennes volume 6:9-20.

Ben Kheder M.(2001).Mediterranean Agronomic Institute of Bari,
Mediterranean organic
agriculture course, organic vegetable production.

ESAM.(2000).Ecole Supérieure d'Agriculture de Mateur, cours de
production ovine et
caprine de la filière ingénieurs.

FAO.(2001).Annuaire des races animales .www.DAD_FAO.org.

Hansper S.(2000).EU-Regulation 2092/91, Sternwaldstrasse 6a D-79102
Freiburg(Germane).

International Trade Centre.(1999).Organic Food And Beverages:World
Supply And Major European Markets, Major Markets:141-151.

IFOAM,International Federation Of Organic Agriculture Movements
2000 Basic Standard for Production and processing. IFOAM General
Assembly in Basel, Switzerland.Die Deutsche Biobibliothek.3-11.

Jaubert G.(1997).Biochemical characteristics and quality of goat, cahier
option
méditerranéennes , volume 25:71-74.

Medagri.(2001a).Yearbook of agricultural and food economies in the
Mediterranean and
Arab countries, Livestock numbers, sheep and goats:362-363.

Medagri.(2001b). Yearbook of agricultural and food economies in the Mediterranean and Arab countries,Permanent pastures,p240.

Medagri.(2001c). Yearbook of agricultural and food economies in the Mediterranean and Arab countries,Mutton and lamb Meat production p350.

Nyarko-Badolu D.K.,kaouli C.,Ba A.A. and Aziza G.(1993).Valorisation of cereal straw in the feeding of sheep in the North of Tunisia :Treatment with ammonia or urea , complementation with urea molasses blocks.Proceeding of the International Conference on Increasing Livestock Production Through Utilisation of local resources;october 18-22,1993Beijing, China.pp.:172-184.

Tunisian Ministry of Agriculture.(1999).Country pasture/ Forage resource profiles:p1-25.

Tunisian Country report.(2001).Centre technique de l'agriculture Biologique(CTAB).