



FAO-CIHEAM Network on Sheep and Goats
Sub-Network on Nutrition



14th International Seminar
2nd Symposium of LowInputBreeds

Feeding and management strategies to improve livestock
productivity, welfare and product quality under climate change

Hammamet, Tunisia, 15 - 18 May 2012



Organised by:

National Institute of Agricultural Research of Tunisia (INRAT) and the Pasture and
Livestock Agency (OEP-Tunisia)

International Centre for Advanced Mediterranean Agronomic Studies –
Mediterranean Agronomic Institute of Zaragoza (CIHEAM-IAMZ)

In cooperation with the European large integrating project LowInputBreeds

Second Announcement

Web: <http://www.iamz.ciheam.org/tunisia2012>

Background and objectives of the Seminar

Most of world's rural people depend on livestock for their day-to-day livelihood especially in the Mediterranean, African and many Asian countries. To reduce poverty, fight hunger and ensure global food security, there is an urgent need to increase livestock production in sustainable ways. However, livestock production systems in target areas are constrained mainly by low genetic potential, feed shortage, nutrient deficiency, inappropriate husbandry and zoonotic and other emerging infectious diseases. Climate change is also expected to exacerbate the vulnerability of livestock systems and to reinforce existing factors that simultaneously challenge livestock production such as rapid population and economic growth, increased demand for food and products, and increased conflicts over scarce resources (e.g. land tenure, water, and feed). There is an urgent need to assess the interaction between climate change and livestock in different production systems and to identify appropriate options that can help livestock keepers adapt to climate change. The challenge is to improve livestock productivity and to produce safe and dietetic meat and milk under these constraints. Scientific advances in animal nutrition and new strategies in livestock feeding may undoubtedly contribute to this aim, as nutrition is one of the main factors driving livestock systems functioning, efficacy and efficiency.

The National Institute of Agricultural Research of Tunisia (INRAT) will host the 14th Seminar of the FAO-CIHEAM Sub-Network on Sheep and Goat Nutrition on "Feeding and management strategies for improved livestock productivity, welfare and product quality under climate change", during 15-18 May 2012 in Hammamet. This seminar is organized jointly with the 2nd Symposium of LowInputBreeds, an EC-collaborative project ("Development of integrated livestock breeding and management strategies to improve animal health, product quality and performance in European organic and 'low input' milk, meat and egg production"). This will be an opportunity for participants to showcase their basic research, findings and practices in the various thematic sessions stated below.

Since challenges concern all livestock species, we believe this seminar is a good opportunity to bring together specialists in sheep and goat production through the FAO-CIHEAM Subnetwork on Sheep & Goat Nutrition along with those involved in the European-funded LowInputBreeds project (<http://www.lowinputbreeds.org>) to present and discuss recent advances on the topic "Feeding and management strategies to improve livestock productivity, welfare and product quality under climate change". The objective is to encourage participation and interaction between scientists and technicians involved in animal production systems, specially in animal nutrition, with a view to introduce methodologies and experiences in small ruminants and other species nutrition that may help to improve sustainability of livestock production by yielding safe and quality products more efficiently and by increasing the capacity of production systems to adapt to current environment and socio-economic changes.

Organisation

The Seminar is organised by the National Institute of Agricultural Research of Tunisia (INRAT), the Pasture and Livestock Agency (OEP-Tunisia) and the Mediterranean Agronomic Institute of Zaragoza from the International Centre for Advanced Mediterranean Agronomic Studies (IAMZ-CIHEAM, with the collaboration of the Food and Agriculture Organization of the United Nations (FAO). The Seminar will provide 2 days of forum for scientific and technical exchanges and a one-day field trip. The 4th day will be allocated for the LowInputBreeds meeting to discuss project achievements and its future programme. The scientific and technical exchanges will be structured in 4 thematic sessions, with keynote guest speakers and will also be open to free contributions.

Grants, covering all or part of the expenses derived from the participation in the Seminar, will be awarded to applicants selected by the Scientific Committee.

Scientific Committee

N. Atti, Tunisia
H. Ben Salem, Tunisia
M. Ben Salem, Tunisia
L. Biondi, Italy
G. Butler, UK

Ch. Damergi, Tunisia
M.A. Darghouth, Tunisia
P. Frutos, Spain
D. Gabiña, Spain
H. Hoste, France

N. Lassoued, Tunisia
J. Leenhouders, The Netherlands
G. Luciano, Italy
H.P.S. Makkar, FAO-Italy
V. Maurer, Switzerland
M. Mehouchi, Tunisia
E. Molina-Alcaide, Spain
P. Morand-Fehr, France
D. Morgavi, France

N. Moujahed, Tunisia
T. Papachristou, Greece
S. Prache, France
A. Priolo, Italy
M.J. Ranilla, Spain
M. Rekik, Tunisia
S.M.A. Sallam, Egypt
D. Yáñez-Ruiz, Spain

International Organisation Committee

H. Ben Salem, Coordinator of the FAO-CIHEAM Sub-Network on Sheep & Goat Nutrition
D. Gabiña, Deputy Director of IAMZ-CIHEAM
A. López-Francos, IAMZ-CIHEAM
P. Morand-Fehr, General coordinator of the FAO-CIHEAM Network on Sheep & Goat
H. Willer, LowInputBreeds, Switzerland

The Mediterranean Agronomic Institute of Zaragoza will hold the Secretariat of the seminar.

Convenor

H. Ben Salem (INRAT)

Local Organizing Committee

Staff of the Laboratory of Animal & Forage
Production (INRAT)

Staff of the Pasture & Livestock Agency
(OEP-Tunisia)

Provisional Programme

15 May

- 08.30 - 09.30 Registration
- 09.30 - 10.15 Opening ceremony & presentation of the agenda and objectives of the seminar
- 10.15 - 10.45 Coffee break and poster viewing
- 10.45 - 12.45 Session 1. Production and overall nutrition efficiency**
Chair: P. Morand-Fehr. AgroParisTech, Paris, France
Invited paper:
- 10.45 - 11.15 Some areas of research to improve the production and nutrition efficiency in small ruminants. *S. Giger-Reverdin. INRA UMR MoSAR, Paris, France*
- Oral presentations:**
- 11.15 - 11.30 Effects of forage type on diversity in bacterial pellets isolated from liquid and solid phases of the rumen content in sheep and goats. *L. Abecia. EEZ-CSIC, Granada, Spain*
- 11.30 - 11.45 Rumen fluid traits in Sarda ewes fed Chestnut and Quebracho Tannins. *N. Castañares. Univ. Sassari, Italy*
- 11.45 - 12.00 Use of tannins to modify ruminal biohydrogenation in sheep. *H. Benhissi. IGM-CSIC, León, Spain*
- 12.00 - 12.15 Effect of alternate supplementary feeding on semen and sexual behavior traits of Barbarine rams. *N. Lassoued. INRAT Tunis, Tunisia*
- 12.15 - 12.30 Poster presentation
- 12.30 - 12.45 Discussion Session 1
- 12.45 - 14.00 Lunch

- 14.00 - 17.30 **Session 2. Local feeding resources based systems**
Chair: *M. Rekik. ENMV, Sidi Thabet, Tunisia*
- 14.00 - 15.15 **Sub-session 2.1. Animal response to alternative feed resources**
Invited paper:
- 14.00 - 14.30 Animal responses to alternative feed resources. *M. Ben Salem. INRAT, Tunis, Tunisia*
- Oral presentations:**
- 14.30 - 14.45 The effect of local legume grains used as dietary supplement on sheep milk production and fatty acid composition. *A. Bonanno. Univ. Palermo, Italy*
- 14.45 - 15.00 Effect of partial replacement of concentrate with feed blocks including tomato wastes from greenhouse horticulture on methane and milk goat production and milk composition. *M. Romero-Huelva. EEZ-CSIC, Granada, Spain*
- 15.00 - 15.15 Discussion sub-session 2.1
- 15.15 - 15.45 Coffee break and poster viewing
- 15.45 - 17.30 **Sub-session 2.2. Rumen manipulation for better use of local feed resources**
Invited paper:
- 15.45 - 16.15 Strategies to drive rumen fermentation towards optimal feedstuffs utilization. *E. Molina-Alcaide. EEZ-CSIC, Granada, Spain*
- Oral presentations:**
- 16.15 - 16.30 Reproductive response of female and male sheep to targeted introduction of cactus (*Opuntia ficus-indica f. inermis*) cladodes in the diet. *M. Rekik. ENMV, Sidi Thabet, Tunisia*
- 16.30 - 16.45 Feeding behaviour of fat-tailed Awassi sheep offered steppe shrubs in a multiple choice situation as affected by familiarization with the shrubs. *J.S. Meier. ETH Zurich, Switzerland*
- 16.45 - 17.15 Poster presentation
- 17.15 - 17.30 Discussion sub-session 2.2

16 May

- 08.45 - 12.30 **Session 3. Animal welfare / Product quality**
Chair: *E. Molina-Alcaide. EEZ-CSIC, Granada, Spain*
- 08.45 - 10.15 **Sub-session 3.1. Animal welfare**
Invited paper:
- 08.45 - 09.15 The role of biotic and abiotic stress factors on sheep welfare: The example of parasites and climatic changes. *S. Sotiraki. NAGREF, Thessaloniki, Greece*
- Oral presentations:**
- 09.15 - 09.30 Is sheep milk quality/quantity affected by gastrointestinal nematodes parasitism and subclinical mastitis? *N. Voutzourakis. NAGREF, Thessaloniki, Greece*
- 09.30 - 09.45 In vivo and in vitro efficacy of sainfoin against *Eimeria* spp in lambs. *A. Saratsis, NAGREF, Thessaloniki, Greece*
- 09.45 - 10.00 Subclinical mastitis and gastrointestinal nematode parasitism in dairy sheep flocks of Greece. Their role in low input management systems and interactions between them. *N. Tzanidakis. NAGREF, Thessaloniki, Greece*
- 10.00 - 10.15 Effect of different condensed tannin sources on gastrointestinal nematodes in periparturient ewes. *S. Werne. Res. Inst. of Organic Agric., Frick, Switzerland*
- 10.15 - 10.30 Discussion sub-session 3.1
- 10.30 - 10.45 Coffee break and poster viewing
- 10.45 - 12.30 **Sub-session 3.2. Product quality**
Invited paper:
- 10.45 - 11.10 Plant secondary compounds in small ruminant feeding: effect on meat oxidative stability. *A. Priolo. Univ. Catania, Italy*

Oral presentations:

- 11.10 - 11.25 Effects of management practices on the sensorial quality of pasture-fed lamb meat and carcass. *S. Prache. INRA, UR Herbivores, Theix, France*
- 11.25 - 11.40 Effects of feeding system and Acacia condensed tannins on lamb growth, carcass and meat characteristics. *N. Atti. INRAT, Tunis, Tunisia*
- 11.40 - 11.55 Feeding sainfoin to goats - influence on Milk and cheese quality and quantity. *F. Heckendorn. Res. Inst. of Organic Agric., Frick, Switzerland*
- 11.55 - 12.15 Poster presentation
- 12.15 - 12.30 Discussion sub-session 3.2
- 12.30 - 14.00 Lunch
- 14.00 - 16.15 Session 4. Options for mitigating/coping with climate change**
- Sub-session 4.1. Sheep and goats**
Chair: A. Priolo. Univ. Catania, Italy
Invited paper:
- 14.00 - 14.30 Propolis as new source of natural bioactive agents in ruminants. *S.M.A. Sallam. Alexandria Univ., Egypt*
- Oral presentations:**
- 14.30 - 14.45 Effect of a heat stress on feeding behavior in dairy goats bred under temperate climates. *S. Giger-Reverdin. INRA UMR MoSAR, Paris, France*
- 14.45 - 15.00 Effect of antimethanogenic garlic extracts on the amylolytic and cellulolytic activities in the rumen. *G. Martínez. EEZ-CSIC, Granada, Spain*
- 15.00 - 15.15 Brazilian and Egyptian propolis as modifiers for rumen fermentation and methane mitigation in vitro. *A.S. Morsy. APRI, Dokki, Egypt*
- 15.15 - 15.30 Coffee break and poster viewing
- 15.30 - 15.45 Poster presentation
- 15.45 - 16.15 Discussion Sub-session 4.1
- 14.00 - 16.15 Sub-session 4.2. Other species**
Chair: G. Butler, United Kingdom
Invited papers:
- 14.00 - 14.30 Climate change and dairy production. *S. König, Univ. Kassel, Germany; and G. Butler, Newcastle Univ., United Kingdom*
- 14.30 - 15.00 Local feed resources for poultry. *F. Leenstra, Wageningen Univ. and Research Centre, The Netherlands*
- 15.00 - 15.15 Adaptation of poultry to hot climates using tropical relevant major genes. *A.R. Sharifi. Georg-August-Univ. Gottingen, Germany*
- 15.15 - 15.30 Coffee break and poster viewing
- 15.30 - 15.45 Genetic aspects of heat stress in pigs expressed in fertility traits. *S. Bloemhof. Wageningen Univ., The Netherlands*
- 15.45 - 16.15 Discussion Sub-session 4.2
- 16.15 - 18.00 General discussion & close of the seminar**

17 May

- All day Field trip - Northern Tunisia
Visits to farms (sheep, goat, cattle) & touristic cities

18 May

Morning

Public presentations from the LowInputBreeds subprojects

Report from Subproject 1: Improving performance, animal health & welfare, environmental impact and product quality in organic and 'low input' dairy cow and beef cattle production systems. *G. Butler, Newcastle Univ., United Kingdom*

Report from Subproject 2: Improving performance, animal health, welfare and product quality in organic and 'low input' sheep production systems. *H. Hoste. UMR 1225 INRA/ENVT, Toulouse, France*

Report from Subproject 3: Improving performance, animal health & welfare and product quality in organic and 'low input' pig production systems. *J. Leenhouvers, IPG, The Netherlands*

Report from Subproject 4: Improving performance, animal health & welfare, environmental impact and product in organic and 'low input' laying hen production systems. *V. Maurer, Res. Inst. of Organic Agric., Frick, Switzerland*

Report from Work package 5.1: Economic and multi-criteria impact assessment. *T. Dedeurwaerdere, Catholic Univ. of Louvain, Belgium*

Language

The working language of the Seminar will be English.

Seminar Proceedings

The Seminar Proceedings, including the text of keynote lectures, theatre presentations and posters accepted by the Scientific Committee will be published in the CIHEAM journal *Options Méditerranéennes*. Texts are to be written in English.

Registration. Deadline: 8 May 2012

Registrations received after the deadline may not be accepted. Before 31 March 2012 registration fees for the two days of seminar and the technical visit will be 250 euro, after which fees will be 300 euro. Fees include attendance to the Seminar, refreshments and lunches and a copy of the Proceedings.

Payment should be made by bank transfer to the following account:

Account holder: CENTRE INT HAUTES ETUD AGRON MEDIT INST AGRON MEDITER DE ZARAGOZA
IBAN ES60 2085 1425 5603 0018 8187

Bank Name: IBERCAJA

Swift Code: CAZRES 2Z

To be indicated on the Bank Transfer: "tunisia 2012"

Postal Address: Av. Montañana 290, 50059 Montañana (Zaragoza), Spain

(Note: All transfer expenses must be paid by the sender)

For registration, fill out the Registration and hotel booking form (available in MS-Word format at www.iamz.ciheam.org/tunisia2012) and return it together with proof of payment, preferably by e-mail, by 8 May 2012, to:

CIHEAM - Instituto Agronómico Mediterráneo de Zaragoza

Avda. Montañana 1005, 50059 Zaragoza, Spain

Tel: 34 976 716000 - Fax: 34 976 716001 - E-mail: iamz@iamz.ciheam.org

Accommodation. Deadline: 8 May 2012

Pre-booking at special low rates has been arranged with the hotel Alhambra Thalasso (Ysamine Hammamet) at a price of 60 TD (approx. 30 euro), breakfast and taxes included in single room and 120 TD (60 euro) in double room. For hotel reservation see Registration and hotel Reservation form (available in MS-Word format at: www.iamz.ciheam.org/tunisia2012).

Deadline for sending the Hotel Reservation form is 8 May 2012. Hotel reservations received after the deadline are not guaranteed.

List of posters (provisional)

Session 1 - Production and overall nutrition efficiency

- 1.1 Body condition score of lactating ewes and lambs from three Moroccan breeds reared on two feeding regimes. *El Fadili, M., Lakhssassi, K.*
- 1.2 Evaluation of body condition score as a method to estimate body composition in mature Sarda dairy sheep. *Gaias, G., Boaventura Neto, O., Mazza, A., Cannas, A.*
- 1.3 Relationship of internal fat depots of mature Sarda dairy sheep with body condition score and *in vivo* somatic measures. *Gaias, G., Boaventura Neto, O., Fenu, A., Spanu, G., Cannas, A.*
- 1.4 Chemical composition of carcass sawdust residue as a predictor of chemical composition of carcass in mature Sarda dairy sheep. *Boaventura Neto, O., Cannas, A., Gaias, G., Barreto, L.M.G.*
- 1.5 Body composition and protein requirement for growth of male and female kids Saanen. *Boaventura Neto, O., Teixeira, J.A., Resende, K.T., Cannas, A., Mendonça, A.N., Souza, S.F., Oliveira, D., Figueiredo, F.O.M.*
- 1.6 Effect of essential oils from *Rosmarinus officinalis* and *Thymus capitatus* on *in vitro* rumen digestion in sheep. *Moujahed, N., Bouaziz, Y., Khelfa, A.*
- 1.7 Effects of *Rosmarinus officinalis* and *Artemisia herba alba* essential oils on intake, digestion and growth of Barbarine lambs. *Aouadi, D., Ben Salem, H.*
- 1.8 Effect of tannins (Quebracho) and or saponin (*Yucca shidigera*) on intake and digestion in Barbarine sheep. *Nasri, S., Ben Salem, H., Makkar, H.P.S.*
- 1.9 Production effects of use DDGS in semi-intensive fattening of lambs. *Borys, B.*
- 1.10 Meric mastication of Ile de France lambs fed mulberry hay. *Garcia da Silva, A., Alves, L.G., Brancacci, N.M., Columbeli, A.C., da Silva, G., Marques da Silva, L., Desidério, L.*
- 1.11 Ovarian activity and reproductive performance of Barki ewes supplemented with calcium soap of fatty acids (CSFA). *Abd El-Hamid, I.S., EL-Zarkouny, S.Z., Zaghloul, A.A., Nour El- Din, N.M.*
- 1.12 Sheep management in the eastern Moroccan area: Livestock breeders' practices and effect of ewes' supplementation on the lambs' growth and fattening performances. *Faraji, A., Mounisif, M., Keli, A.*
- 1.13 Small ruminant performance under different feeding strategies in hot/dry areas of Egypt. *Metawi, H.R.M.*
- 1.14 Characterization of goat production systems and on- farm evaluation of the growth performance of grazing goats supplemented with isonitrogenous protein sources in Harshin Woreda, Ethiopia. *Mohamud, M.*
- 1.15 Diurnal variations of WSC and nitrogen fractions in ryegrass fresh forage in Mediterranean environment. *Avondo, M., Pagano, R.I., De Angelis, A., Luciano, G., Priolo, A.*

Session 2 - Local feeding resources based systems

- 2.1 Tables of nutritive values for farm animals in tropical and Mediterranean regions: An important asset for improving the use of local feed resources. *Tran, G., Heuzé, V., Bastianelli, D., Archimede, H., Giger-Reverdin, S., Sauvant, D.*
- 2.2 A study on feeding practices of small ruminants kept under various production systems in Punjab, Pakistan. *Younas, M., Yaqoob, M., Shahzad, F.*
- 2.3 Analysis of ruminant's feeding systems in some Algerian farms: Obstacle to achieve autonomy. *Abdeldjelil, M.C., Bensegueni, A., Benazzouz, H., Messai, A., Aimeur, F., Agabou, A.*
- 2.4 On the role of the Pasture & Livestock Agency to transfer research findings on alternative feed resources to smallholders in Tunisia. *Gouhis et al.*
- 2.5 Assessment of small ruminant management practices in Kamaqoray and Derbigakabel of Harshin Distric of Somali Regional State, Ethiopia. *Mohamud, M.*
- 2.6 Seasonal dynamic of fodder production in Sahelian pasture and its impact on animal production. *Sanon, H.O., Ouattara, F.*
- 2.7 Effects of feed resources in arid lands on growth performance of local goat kids in southern Tunisia. *Ayeb, N., Seddik, M., Barmat, A., Hammadi, M., Harrabi, H., Khorchani, T.*
- 2.8 Evaluation of the nutritive value of the sheep Ouled Djelal food's in semi-arid zone. *Djaalab, I., Mehennaoui, S., Lakhdara, N., Haffaf, S., Djaalab-Mansour, H.*
- 2.9 Influence of vegetables by-products as non conventional feedstuffs on ewes performance and their offspring. *Mohamed, A.H., Khial, A.A., Abou El-Fadel, M.H., Ashmaoy, T., Hussin, A.A.*
- 2.10 Nutritive evaluation of foliage from some Acacia's characteristic of Algerian arid and semi-arid areas. *Bouazza, L., Bodas, R., Boufennara, S., Bousseboua, H. and López, S.*

- 2.11 Effect of oil-cakes supplementation on the fat profile of sheep's milk. *Mandaluniz, N., García-Rodríguez, A., Amores, G., Virto, M., Arranz, J., Barrón, L.J.R., Ruiz de Gordo, J.C., Ruiz, R., Nájera, A.I., Albisu, M., Pérez-Elortondo, F.J., de Renobales, M.*
- 2.12 Effect of whole sunflower seeds supplementation on performance of Zaraibi goats. *Mohsen, M.K., Bassiouni, M.I., Gaafar, H.M.A., El-Shafiey, M.H., El-Sanafawy, H.A.A.*
- 2.13 Sheep response to waste dates and prickly pear fruits-containing feed blocks. *Ben Salem, L.*
- 2.14 Effect of faba bean intake on growth and carcass characteristics of lambs from three breeds. *Hajji, H., Atti, N., Mahouachi, M.*
- 2.15 Three varieties of faba bean as alternative concentrate feed for Barbarine lamb. *Ghlem, R., Ben Salem, H.*
- 2.16 Feeding behaviour of Ile de France lambs fed mulberry hay. *Garcia da Silva, A., Alves, L.G., Teixeira, V., Ulian, F., Endo, V., Alves, F., Lins Lima, N.L., Milani, G.*
- 2.17 Sexual behaviour of Ile-de-France rams receiving a short term flushing with lupins. *Sakly, C., Rekik, M., Menassol, J.B., Fabre-Nys, C., Scaramuzzi, R.J.*
- 2.18 Chemical composition and *in vitro* fermentation characteristics of several pastoral species from the Central region of Tunisia. *Moujahed, N., Darej, C., Taghouti, M., Bouaziz, Y., Ben Mustapha, Ch., Kayouli, Ch.*
- 2.19 Chemical composition, *in vitro* digestibility and fermentation kinetics of arboricultural and agro-industrial by-products in the north of Morocco. *Ayadi, M., Arakrak, A., Chentouf, M.*
- 2.20 Effect of oxalic acid on ruminal function and microbiota in sheep fed a low quality diet. *Benbati, M., Belenguer, A., Hervás, G., Frutos, P.*
- 2.21 Effect of the nature of the concentrate feed on the end products of digestion in the Sicilo-Sarde sheep. *Selmi, H., Tibaoui, G., Hammami, M., Jamali, B., Ben Gara, A., Rouissi, H.*
- 2.22 Effects of tannins *Acacia cyanophylla* supplementation on digestibility, nitrogen balance and ewe's milk yield in triticale pasture. *Maamouri, O., Atti, N., Kraiem, K., Mahouachi, M.*
- 2.23 *In vitro* ruminal fermentation of diets containing wheat straw and date pits as forage. *Lakhdara, N., Ranilla, M.J., Tejido, M.L., Bererhi, E.H., Carro, M.D.*
- 2.24 n-Alkanes for grazing studies with ruminants: Where can we go? *Alloui, N.A., Keli, A.B., de Vega, A.*

Session 3 - Animal welfare / Product quality

- 3.1 *In vitro* anthelmintic activity of some Tunisian plants against *Haemonchus contortus* infective stage. *Aissa, A., Manolaraki, F., Pardo, E., Znaïdi, I.A., Ben Salem, H., Kraiem, K., Hoste, H.*
- 3.2 Changes in the Butyrivibrio group of the rumen in lactating sheep fed a diet supplemented with sunflower oil with or without marine algae. *Castro-Carrera, T., Toral, P.G., Hervás, G., Frutos, P., Belenguer, A.*
- 3.3 Physiological responses of Tunisian local goats to water deprivation in hot season. *Harrabi, H., Hammadi, M., Ayeb, N., Chniter, M., Atigui, M., Khorchani, T., Salama, A.K., Caja, G.*
- 3.4 The mother-young attachment in D'man sheeps. *Chniter, M., Hammadi, M., Khorchani, T., Lévy, F., Nowak, R., Ben Hamouda, M.*
- 3.5 Effect of carob pulp on dietary, technology quality and the fatty acids composition of meat and perirenal fat goat. *Ayadi, M., Arakrak, A., Bouassab, A., Chentouf, M.*
- 3.6 Effect of feeding system on meat quality and fatty acids composition of intramuscular lipids of Sarda x Ile de France heavy lambs. *Fiori, M., Scintu, M.F., Sitzia, M., Addis, M.*
- 3.7 Effect of lupin on characteristics of carcass and meat quality on growing and fattening goat kids. *El Otmani, S., Ayadi, M., Chentouf, M.*
- 3.8 Effects of replacing corn and soya beans with white sorghum and faba beans on milk quality, the urea content and fatty acid composition and conjugated linoleic acid (CLA) content of Sicilo-Sarde dairy ewes in Tunisia. *Selmi, H., Kamoun, M., Tibaoui, G., Ben Gara, A., Rouissi, H.*
- 3.9 Effects of rosemary extracts incorporation on Barbarine lamb's growth, carcass characteristics and composition. *Smeti, S., Atti, N., Mahouachi, M.*
- 3.10 Growth performances and carcass composition of Barbarine breed lambs: Effect of two replacing rates of soya bean cake by faba beans (*Vicia faba*). *Boukhris, H., Damergi, C., Najjar, T.*
- 3.11 Meat quality of Black of Thibar and fat tail Barbary breed lambs: Effect of two replacing rates of soya bean cake by faba beans (*Vicia faba*). *Damergi, C., Boukhris, H.*
- 3.12 Quality of culinary meat from lambs fattened semi-intensely with DDGS. *Borys, B., Grzeskowiak, E., Borys, A.*

- 3.13 The effect of the incorporation of sorghum in the diet of fattening kids on performance, carcass characteristics and meat quality. *El Otmani, S., Ayadi, M., Chentouf, M.*
- 3.14 The effect of formic acid as an additive in the fermentation process of date palm by products (DPBP) for silage. *Akrout, H., Martínez-Fernández, A., Khorchani, T.*

Session 4 - Options for mitigating/coping with climate change

- 4.1 Antimethanogenic activity of the thirty commercial essential oils products. *Sallam, S.M.A., Morsy, A.S., Soltan, Y.A., Alencar, S.M., Abdalla, A.L.*
- 4.2 *In vivo* methane emission, apparent digestibility and nitrogen balance of leucaena diet fed to sheep with or without polyethylene glycol. *Soltana, Y.A., Abdalla, A.L., Morsy, A.S., Lucasb, R.C., Sallam, S.M.A., Louvandini, H.*
- 4.3 The effect of polyethylene glycol addition on methane gas production parameters of some browse plant species collected from Algerian arid rangelands. *Boufennaraa, S., López, S., Bouazza, L., Bousseboua, H., Bodas, R.*
- 4.4 Drinking saline water on feed intake, digestion in Barbarine sheep. *Yousfi, I., Ben Salem, H.*
- 4.5 Effects of water deprivation on some blood parameters of Barbarine ewes. *Khnessi, S., Lassoued, N., Ben Salem, H., Rekik, M.*
- 4.6 Growth performance of lamb fed salt-tolerant plants under semi-intensive production systems in Sinai, Egypt. *Alsheikh, S.M., Youssef, K.M., Fahmy, A.A., El-Essawy, A.M., El Shaer, H.M.*
- 4.7 Enhancing fodder security for livestock in the semi-arid tropics of southern India under changing climate scenario. *Shivakumar, B.G., Biradar, N.B., Kulkarni, N.S., Kumar, V.*
- 4.8 Effects of bio-ecological factors on testosterone activity and trace metals of the local crossbred Rams in North East Algeria. *Ounas, I., Abdennour, Ch.*

