SMALL RUMINANTS RESEARCH AND DEVELOPMENT IN THE NEAR EAST

PROCEEDINGS OF A WORKSHOP
HELD IN CAIRO, EGYPT,
2–4 NOVEMBER 1988
The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Le Centre de recherches pour le développement international, société publique créée en 1970 par une loi du Parlement canadien, a pour mission d'appuyer des recherches visant à adapter la science et la technologie aux besoins des pays en développement; il concentre son activité dans six secteurs : agriculture, alimentation et nutrition; information; santé; sciences sociales; sciences de la terre et du génie et communications. Le CRDI est financé entièrement par le Parlement canadien, mais c'est un Conseil des gouverneurs international qui en détermine l'orientation et les politiques. Etabli à Ottawa (Canada), il a des bureaux régionaux en Afrique, en Asie, en Amérique latine et au Moyen-Orient.

El Centro Internacional de Investigaciones para el Desarrollo es una corporación pública creada en 1970 por el Parlamento de Canadá con el objeto de apoyar la investigación destinada a adaptar la ciencia y la tecnología a las necesidades de los países en desarrollo. Su actividad se concentra en seis sectores: ciencias agrícolas, alimentos y nutrición; ciencias de la salud; ciencias de la información; ciencias sociales; ciencias de la tierra e ingeniería; y comunicaciones. El Centro es financiado exclusivamente por el Parlamento de Canadá; sin embargo, sus políticas son trazadas por un Consejo de Gobernadores de carácter internacional. La sede del Centro está en Ottawa, Canadá, y sus oficinas regionales en América Latina, Africa, Asia y el Medio Oriente.

This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.
SMALL RUMINANTS RESEARCH AND DEVELOPMENT IN THE NEAR EAST

Proceedings of a workshop
held in Cairo, Egypt, 2-4 November 1988

Editor: A.M. Aboul-Naga

Material contained in this report is produced as submitted and has not been subjected to peer review or editing by IDRC Communications Division staff. Unless otherwise stated, copyright for material in this report is held by the authors. Mention of proprietary names does not constitute endorsement of the product and is given only for information.
SPONSORING ORGANIZATIONS

* Ministry of Agriculture (MOA), Egypt.

* International Development Research Centre (IDRC), Canada.

* In cooperation with:

  - FAO, Near East Regional Office
  - European Association of Animal Production (EAAP)
  - International Centre for Advanced Mediterranean Agronomic Studies (ICAMAS)

ORGANIZING AND SCIENTIFIC COMMITTEE

A.M. Aboul-Naga, Animal Production Research Institute (APRI), MOA, Egypt.
E.S.E. Galal, Ain Shams, University, Egypt.
M.B. Aboul-Ela, Mansoura University, Egypt.
Ferial Hassan, APRI, MOA, Egypt.
M. El-Serafy, Ain Shams, University, Egypt.
Eglal Rashed, IDRC, Cairo.
CONTENTS

FOREWORD ................................. 1

KEYNOTE LECTURE: The role of small ruminants in agricultural systems in developing countries.
C. Spedding ......................... 2

PART I: IMPROVING LAMB AND KID PRODUCTION IN INTENSIVE AND SEMI-INTENSIVE SYSTEMS

Selection for improved reproductive performance of native sheep.
J. P. Hanrahan ....................... 9

Selection for reduced seasonality in sheep.
G. Ricordeau ......................... 20

National breeding and recording systems for sheep and goats under semi-intensive production conditions: the Cyprus experience.
A. Constantinou ..................... 34

Crossbreeding for improving fecundity in native sheep.
A. M. Aboul-Naga, and M. H. Fahmy .... 44

Potential sheep and goat breeds in the Near East.
R. A. Guirgis ......................... 54

Potential of dual purpose goats.
C. P. Gall .................. 67

Seasonality of reproductive activity in native sheep and goat breeds and their crosses with introduced breeds.
M. B. Aboul-Ela and P. Chemineau .... 74

Control and manipulation of reproductive functions in native sheep. A. Lahlou-Kassi, R. Boukhliq, A. Tibary and A. Sghiri .... 88

Meat production from goats in semi-intensive systems.
M. Hadjipanayiotou ................... 101

PART II: STRATEGIES FOR SMALL RUMINANTS PRODUCTION

Stratification of small ruminants production systems.
E. S. E. Galal ......................... 111
Goat production in small farm systems.
C. Devendra ........................................ 120

Improving sheep feeding systems in Morocco during the stubble grazing and the feeding straw phases.
F. Guessous and O. Benslimane ............ 132

Strategies of goat feeding in intensive and extensive systems of production.
P. Morand-Fehr ................................. 140

Feedstuffs supplementation in deteriorated rangelands: Effects on performance of small ruminants in arid and semi-arid regions.
A.M. El-Serafy and A.S. El-Shobokshy .... 158

Use of Syrian marginal land for fat-tailed sheep production.
F. Bahhady, A. Osman and L. Russi ....... 172

Methods of evaluating productivity of native sheep under both research farm and producers conditions.
E.S.E. Galal and A.A. Younis ............... 184

Some economic aspects affecting small ruminant development in Near East countries.
I. Soliman ....................................... 192

PART III: ROUND TABLES AND RECOMMENDATIONS

Round table 1: "Implementation of intensive lamb production systems: incorporation of native breed and maximizing the utilization of their potentials".
(Working paper by: A.M. Aboul-Naga) .... 199

Round table 2: "Planning requirements for executing small ruminants development programmes, research priorities and linkages with regional programmes".
(Working paper by: A.W. Qureshi) ........ 201

Recommendations........................................ 215

List of Participants................................. 217
IMPROVING SHEEP FEEDING SYSTEMS IN MOROCCO DURING
THE STUBBLE GRAZING AND THE FEEDING STRAW PHASES

F. GUESSOUS and O. BENSlimANE

Department of Animal Production,
Hassan II, Institute of Agronomy and Veterinary Medicine,
B. P. 6202, Rabat Institute, Morocco

ABSTRACT

Improving sheep nutrition during the end of gestation and
beginning of lactation while grazing cereal stubble or
feeding straw is the objective of two trials reported here.
In trial one, ewes in the last month of pregnancy, grazing
wheat stubble (stocking rate of 12 or 24 ewes/ha) were
supplemented with concentrate at high or low level
(cottonseed meal and barley). Neither stocking rate nor
level of supplementation had significant effect on ewe body
weight change although higher level of supplementation
tended to produce higher body gains. Lamb birth weight also
was not affected. In trial 2, male sheep were used to
evaluate effect of supplementation and urea treatment on
straw digestibility and intake. Thirty animals were randomly
divided into 5 lots affected to 5 diets; D1: untreated
straw (S); D2 : S + corn + soybean meal; D3 : S + molasses +
urea; D4 : urea treated straw (US); D5 : US + molasses. D2
was formulated to contain 10% CP and 30% concentrate in
content. Diets 3 & 5 contained the same amount of molasses.
Untreated straw was fed chopped.

During the digestibility measurement period, untreated and
treated straws were offered at a level of 30 g DM/kg-75 in 4
meals per day. Straw allowance was progressively increased
during the intake measurement period. Straw used had a
relatively high CP and low NDF contents (respectively, 6.2
and 68.0% DM). When fed alone, straw showed a high
digestibility of organic matter (DOM) and intake levels
(51.4% and 60.7 g/kg-75, respectively). Urea treatment
significantly improved DOM (58.9%) but not intake (71.2
g/kg-75, P > 0.05). Lignocellulose digestibility was also
increased. Straw DOM in diets D2 and D3 was not
significantly different from D1. Diets showed the same straw
digestibility as D4. Intake was high in all diets.

These results suggest that urea treatment has been more
effective to improve straw digestibility than supplementation with energy. Application of such results to gestating and lactating ewes seems to be of great interest.

INTRODUCTION

Besides the oasis areas where sheep has very particular characteristics, sheep production in Morocco can be classified in two main systems: the pastoral and agro-pastoral systems. Within the pastoral system, sheep feeding depends strongly on range and large movements of herds can occur during the year. At the opposite, the agro-pastoral system is characterized by a limited contribution of range to feed supply. Farming is a major source of feeds and consequently animals tend to remain close to the farm all the year around. Sheep productivity, although low on the national level basis, tends to be somewhat higher in the mixed crop-livestock system than in the pastoral one.

Under the agro-pastoral system which seems to be the most susceptible to intensification in Morocco, the main breeding season starts usually in June at the same time as cereal harvest. Consequently, the first half of gestation occurs while animals are grazing stubble. Lambing happens in fall when stubble grazing and straw are the main components of diet. Straw feeding continues until January-February when forage availability in fallow and pastures starts increasing. Nutritional conditions of both ewe and lamb usually improves during spring.

Within such feeding calender, the period between September and February is obviously the most critical for ewe productivity. It corresponds to the end of gestation and beginning of lactation where nutrient requirements of ewes increase rapidly. It also coincide with the coldest months of the year where poor management conditions and undernutrition can lead to high lamb mortalities. Consequently, research on intensification of sheep production in Morocco has focused on this period with 2 objectives:

1) supplementation of ewes grazing stubble during the end of gestation, and,
2) improvement of straw utilization through urea treatment and / or energy and nitrogen supplementation.

Avoiding animal weight losses during cereal stubble grazing phase has been the main objective of several studies reviewed by Guessous et al. (1988, unpublished). When total
stubble biomass available at beginning of grazing period ranged between 4 and 6 T dry matter DM/ha, sheep liveweight has been maintained during the first 10 to 12 weeks of grazing either by low stocking rates or by supplementing ewes under high stocking rates with both protein and energy sources after the first 4 weeks of grazing.

Straw represents a major component of sheep diet during fall and winter in the agro-pastoral system. Even during the end of gestation and beginning of lactation, straw is usually fed either alone or with small amounts of energy supplements (barley). Consequently, nitrogen is the first limiting factor in diet.

Ammonia treatment has been shown to increase both intake and digestibility of straw by cattle and sheep (Alibes et al., 1984; Sundstol and Coxworth, 1984). However, anhydrous ammonia is not available in many less developed countries and urea has been suggested as an alternative source for NH₃ treatment.

MATERIALS AND METHODS

In order to evaluate effects of urea treatment and/or supplementation on straw nutritive value, hard wheat straw (rectangular bales) was treated with a solution of urea calculated to reach levels of 6% urea (straw DM basis) and 30% humidity. Grinded soybean was added as source of urease at a rate of 1.2% DM. Straw was then hermetically covered with plastic for 78 days during a season where average minimum and maximum temperatures were 6.9 and 17.6°C, respectively (December 86 to February 87). Thirty yearling lambs; 14 months old and 32 kg liveweight were randomly divided in 5 lots and affected to 5 diets: D₁ to D₅). Diets 1 & 4 consisted of untreated or treated straw fed alone with mineral and vitamin mixtures. Diet 2, consisted of untreated straw supplemented with sugarbeet molasses providing equal amounts of metabolizable energy as corn and soybean in D₂. Urea was added to have N content of D₃ similar to that of D₄ and D₅. Diet 5 was treated straw supplemented with the same amount of molasses as D₅.

Animals were adapted to diets during two weeks. Digestibility was measured by total fecal collection during 10 consecutive days; both untreated and treated straws were fed at a rate of 30 g DM/kg·75. At the end of the digestibility trial, straw offered was progressively increased during 10 days without changing the nature and quantities of supplement. Straw intake was then measured during 10 days; diets were adjusted daily (10% refusible
allowed) and straw was offered 4 times a day (at 0800, 1100, 1400 and 1800 hr).

RESULTS AND DISCUSSION

In the grazing trial summarized in table 1, one month pregnant Sardi ewes were stocked at 12 or 24 ewes / ha of wheat stubble. Animals under high stocking rate treatment with no supplementation lost 0.6 kg during the first 10 weeks of grazing (table 2). Supplementation with small amounts of alfalfa hay between 5 and 10 weeks of grazing had a positive and significant effect on weight variation (+3.6 kg). Similar weight gain was achieved by supplemented ewes stocked at low rate. At the start of the 11th week of grazing corresponding to the last five to six weeks of pregnancy, alfalfa supplementation was discontinued and animals in each treatment were randomly divided into 2 subgroups receiving a high (200 g cottonseed meal and 300 g whole barley) or low (200 g cottonseed meal and 50 g whole barley / animal) concentrate supplement (table 1). Concentrate level had no significant effect on ewe liveweight changes during the last four weeks of gestation although low levels tended to give lower weight gains (table 2). Lamb birth weight also was not affected (P > 0.05) by level of supplementation during the last month of gestation.

The trial stresses the need for adequate supplementation of pregnant ewes grazing stubble during the last part of gestation. Supplementation is necessary because available biomass tends to be very low after 12 weeks of grazing (1 to 2 T DM/ha). It is also necessary because diet collected by sheep after the first month of grazing stubble has been shown to have low nutritive value, particularly in terms of crude protein (CP) content (Guessous et al., 1987). However, level of supplementation should be modulated also depending on ewe body conditions at the beginning of the 5th month of pregnancy and number of foetus.

In comparison to other data on Moroccan straws (Benata, 1977; McCann, 1985), untreated straw used in this trial had an exceptionally high CP content (6.2 % DM) and relatively low cell wall content (86 % NDF). This can explain why in vivo digestibility of organic matter (DOM) and intake were very high when untreated straw was fed alone without energy or N supplements (51.4 % and 60.7 g/kg-75 respectively, table 4).

Similar levels of intake have been reported in Portugal by Dias Da Silva and Sundstol (1986) when chopped straw was fed alone to male sheep; DOM however was 44% only. These results
TABLE 1

Stocking rate and supplementation of pregnant ewes grazing wheat stubble\(\ast\), (adapted from Outmani et al., 1988, unpublished).

<table>
<thead>
<tr>
<th>Weeks of grazing (months)</th>
<th>Stage of pregnancy</th>
<th>Stocking Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>1-2</td>
<td>stubble</td>
</tr>
<tr>
<td>5-10</td>
<td>2-4</td>
<td>stubble</td>
</tr>
<tr>
<td>11-lambing</td>
<td>4-5</td>
<td>stubble +</td>
</tr>
</tbody>
</table>

\(\ast\) animals in all treatments are supplemented with minerals and vitamins mixture.

\(\ast\) hay supplemented at .5% liveweight

\(\ast\) concentrate provided at high (200 g cottonseed meal and 300 g whole barley) or low level (200 g cottonseed meal and 50 g whole barley / animal / day).

TABLE 2

Effect of stocking rate and level of supplementation during the end of gestation on ewe weight changes and lamb birth weight (kg).

<table>
<thead>
<tr>
<th>Item</th>
<th>Stocking Rate</th>
<th>Concentrate (last 4 wks of gestation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Ewes liveweight change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- first 10 weeks of grazing</td>
<td>2.9(\ast)</td>
<td>-0.6(\ast)</td>
</tr>
<tr>
<td>- last 4 weeks before lambing</td>
<td>3.4</td>
<td>2.8</td>
</tr>
<tr>
<td>Male lambs birthweight</td>
<td>4.1</td>
<td>3.9</td>
</tr>
</tbody>
</table>

\(\ast\): standard error of the mean.

\(\ast\)=: means within rows followed by different letters are significantly different (\(P < 0.05\)).
TABLE 3

Diets Composition (dry matter / day)

<table>
<thead>
<tr>
<th>Diets</th>
<th>Untreated straw a</th>
<th>Urea treated straw a</th>
<th>Soybean meal b</th>
<th>Corn b</th>
<th>Molasses</th>
<th>Urea b</th>
<th>Minerals and vitamins mixture b (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D₁</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>D₂</td>
<td>30</td>
<td>41</td>
<td>140</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>D₃</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td>162.5</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>D₄</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>D₅</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td>162.5</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

a. straw allowance is progressively increased at the end of digestibility trial.
b. per head

are in contrast with other European data (Chenost and Dulphy, 1987) who suggest that untreated straw DOM and intake usually do not exceed 45% and 40 g/kg-75 respectively. Higher nutritive value of Moroccan straw can be explained by several parameters including varieties cultivated, extent of weed control and method of harvest. Higher levels of intake can also be related to number of meals /d. However, besides nutritional characteristics, these differences may also reflect a better adaptation of some Mediterranean breeds of sheep to high fiber and low quality diets.

Urea treatment increased significantly straw DOM by 7.5 percentage units (table 4). The same variations were noticed for energy and ADF digestibilities. Intake tended to be higher although differences were not significant (P > 0.05).

Supplementation of untreated straw with both energy and nitrogen did improve DOM of the whole diet (D₂ and D₃). However, when corn, soybean and molasses digestibilities were estimated from literature (Demarquilly et al., 1978) and when straw digestibility was calculated by difference, it appeared that supplementation did not affect straw DOM nor ADF digestibility. Straw intake also did not change. These results suggest that urea treatment has been more effective in decreasing ligno-cellulose bonds in the straw than supplying rumen microorganisms with rapidly available sources of energy and nitrogen. The fact that ligno-cellulose (ADF) digestibility is significantly higher for D₄ in comparison to D₃ corroborates this conclusion.
Comparison between D3 and D5 confirms also the last conclusion. Providing the same amount of urea at feeding time or when treating straw does not lead to the same digestibility of organic matter or ADP. Urea treatment has a better action by affecting cell-wall structure (Chesson, 1986). It may also allow slower NH₃ release into the rumen and consequently better synchronization between energy and N fermentations.

On the average, concentrate supplements represented less than 35% of total DM in diets D2, D3 and D5. Supplementation of untreated or treated straw increased the whole ration digestibility. It had no harmful effect on straw digestibility per se except in diet D2 which showed the lowest energy digestibility percentage.

TABLE 4

Effects of supplementation and urea treatment on nutritive value of hard wheat straw

<table>
<thead>
<tr>
<th>Item</th>
<th>Diets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D1</td>
</tr>
<tr>
<td>Total ration digestibility, %</td>
<td></td>
</tr>
<tr>
<td>Organic matter</td>
<td>51.4a</td>
</tr>
<tr>
<td>A. D. F.</td>
<td>57.3a</td>
</tr>
<tr>
<td>Energy</td>
<td>47.4a</td>
</tr>
<tr>
<td>Straw digestibility, %</td>
<td></td>
</tr>
<tr>
<td>Organic matter</td>
<td>51.4a</td>
</tr>
<tr>
<td>A. D. F.</td>
<td>57.3a</td>
</tr>
<tr>
<td>Energy</td>
<td>47.4b</td>
</tr>
<tr>
<td>Straw intake</td>
<td>60.7a</td>
</tr>
<tr>
<td>g DM / kg</td>
<td></td>
</tr>
</tbody>
</table>

a, b, c, d: Means within rows followed by different letters are significantly different (P < 0.05).

CONCLUSIONS

Recent trials conducted in the Mediterranean area have shown that ammonia-treated straw can be adequately used by
dry, pregnant and suckling ewes (Cordesse et al., 1988). Diets consisted of 50 to 95% of total ration DM; supplemented with high quality protein and energy sources, minerals and vitamins. No negative effect was noted in long term trials neither on lamb growth nor on ewe reproductive performance and body weight. Application of such results to urea-treated straw can certainly contribute to improve sheep productivity under the Moroccan conditions.

REFERENCES


