SHORT-TERM GAINS IN LIVESTOCK MANAGEMENT
MAY LEAD TO LONG-TERM RANGE MANAGEMENT BENEFITS:
A PILOT PROGRAMME IN MOROCCO

by

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Implementation problems of range livestock projects

Range management and range livestock development projects have had a chequered history. Most have been considered unsuccessful if not outright failures (Baker 1975, Jahnke 1982, Sandford 1983, Dyson-Hudson 1985, Dwyer 1986, and Gow 1987). The reasons offered have mostly tended to be the organisational and administrative problems affecting project implementation rather than the technical (Rondinelli *no date* and Honadle *et al.* 1986). At a 1986 meeting of range management professionals representing the universities, comprising CID (the Consortium of International Development), few of the 32 constraints identified affecting implementation concerned the technology of range management. Most were administrative in nature. One major conclusion, however, was that range livestock projects were too short to measure successful interventions given the arid and semi-arid nature of the resource.

The reasons for short planning and implementation horizons are legion. Most important among these are the budget restrictions of the donor agencies. Also, administrators of both donor and host government agencies fall under immediate scrutiny of their critics when a project begins, necessitating quick results to justify expenditure and involvement. In some donor agencies, staff are rotated frequently. The need for quick, positive results for career advancement only exacerbates the problem.

The Moroccan pastoral system

At an OXFAM arid lands workshop in Benin, Moris (1987) offered an inventory of past technical interventions for African livestock development. Some of these interventions such as fodder banks and restocking projects have enjoyed moderate success, but most, such as water development and animal health, have contributed to greater problems as a result of their implementation (Handulle and Gay 1987). The inventory includes a checklist of characteristics of African pastoralism that impact on the successful implementation of classical range livestock production interventions. This checklist succinctly differentiates the African pastoral production system and the parameters that drive it from our western system that has so often been imposed by range livestock projects. The pastoral system characteristics identified are:

- usually based on multiple animal species
- browse resources as very important
- the key constraint is the long dry season
- there is seasonal/annual movement of animals
- often only loosely linked to a cropping system
- grazing is often a common property resource
- there is an opportunistic build-up of herds in good years
- use of large stock for capital and small stock for trading

The pastoral production system in Morocco may be characterised in general terms using Moris's list, with the exception that it is more tightly linked with cereal cropping. Recent studies at project work sites (see map Figure 1) by a combined team of researchers from Utah State University, the Direction de l'Élevage, and the Peace Corps sponsored by a USAID contract found that small ruminants, sheep in particular, represent the majority of the livestock in Morocco (Banner and Gay 1987) with a national sheep herd estimated by the Ministère de l'Agriculture et de la Réforme Agraire to be about 12 million animals. The proportion of goats in a herd tends to increase as aridity increases and the producer resource base or income level declines. Cattle and horses are generally owned by producers with relatively higher income and resource levels. Mules and donkeys are owned at all income levels and reflect a need for transportation and draft.

Corrals or enclosures are used throughout Morocco to pen livestock at night. The facilities provide protection from weather and predators, but the permanence of the structures and negligence in cleaning results in constant high levels of parasite infestation.

Forage resources vary greatly from the shrub steppe dominated by *Artemesia herba-alba* and *Stipa tenacissima* to the Atlantic Plain dominated by annual species including the genera *Medicago* and *Malva*. The season of use is dictated by the resources available. Producers use the preferred resources first, and move on to less desirable sites as forage availability diminishes. Middle and high income producers have access to crop residues, and if necessary will haul or herd flocks to leased land to graze. Low income producers are limited to the forage available on communal land. Available forage is often insufficient to meet the livestock's nutritional needs.

Figure 1   North-Eastern Morocco indicating project work sites and the selection
demonstration sites

The intensity of livestock management often reflects income levels. Higher income producers generally provide more intensive management. Dividing flocks to enable animals with different nutritional requirements to be managed separately requires additional labour input. Producers with limited resources, or insufficient livestock numbers to justify more than one herder, maintain only one flock and all animals are often treated equally. If animals are separated, it is generally to keep young lambs, old and weak ewes or late gestating and lactating ewes under close scrutiny and for ease of feeding supplements. All producers feed supplements to their livestock at least part of the year. Barley grain is the most common supplement.

Many producers in Morocco keep an excessive number of young males in their ewe flock year round for any type of genetic improvement to occur. These excess animals result in inefficient use of the available forage. The lack of a sterilisation programme for those males destined for the market leads to indiscriminate breeding and prohibits attempts at genetic improvement. Major lambing periods occur in the spring and fall, but lambs are born throughout the year. Ewes that lamb in the spring are more apt to lamb again within a 12 month period than ewes lambing during other periods of the year (percentage of ewes that lambed again within 12 months were 83, 0, 59 and 26 for the spring, summer, fall and winter periods respectively). Annual lamb crop percentages for producers in the drier zones were 35% to 45% and about 60% in the more mesic areas. Intentional weaning of lambs was rarely practised. Producers incurred death losses of 8% of the lambs and 3% to 4% of the breeding animals.

Insufficient forage resources to meet livestock requirements is a problem faced by most producers in Morocco. Inadequate nutrition severely depresses reproductive performance. Few range animals are able to express their genetic potential. It is not unusual for ewes to lose weight the last trimester of gestation or even during the entire gestation period regardless of the lambing date.

Livestock producers consider wool to be a by-product of animal production. Lack of knowledge, market organisation, and price incentives result in little interest in wool improvement. Wool is generally used within the household with only a small quantity sold at the local market for 8 to 13 dirhams per kilo. (At the time of the study, 9 dirhams approximately equalled one US dollar.) Wool quality was low. The majority of fleeces graded in the 'coarse wool' range with spinning counts of 40 to 50 (Mackay 1982) degraded by the presence of kemp and/or hair in about two-thirds of the fleeces.

Wool quality improvement is considered important because of the highly developed carpet and fabric industry in Morocco. Discussions with managers of local factories indicated that all raw wool used in the production of carpets and fabrics for export was imported. The imported wool price quoted at the time of the interviews was 55 dirhams per kilo, FOB the factory. The Direction de l'Élevage indicated that

about 20,000 metric tons of wool is imported into Morocco annually at hard currency costs to support the textile industry.

Creating a programme with prompt results and long-term payoffs

The technicians working in the Range Management Improvement Project were faced with the dilemma of creating a programme that:

1 -   would attack the immediate problems of animal production
2 -   would answer some of the needs of the industry
3 -   would provide an entry into the production system for long-term range rehabilitation programmes
4 -   would create some immediate benefits to producers, and
5 -   to satisfy institutional requirements, would be compatible with the pastoral production system

It was decided that an integrated programme of animal selection had the potential to fulfil these criteria.

A pilot project to test producer receptivity and measure the effects was designed. It was determined that few producers in Morocco took the time to inspect their animals on a periodic basis. Visual observations indicated that a high percentage of animals within the breeding herds exhibited chronic problems that limited their performance. The identification and removal of these unproductive animals would immediately contribute to the improvement of the flock.   Removal of the unproductive animals would also reduce the pressure on limited resources improving the nutritional base of those remaining.   The improved nutritional base would promote an increase in the annual lamb crop percentage, improve weight gains, and reduce the need for costly feed supplementation.

Sheep selection activities with a producer cooperative

As a trial, members of the El Fath Cooperative were approached with the programme. This Cooperative was an organisation of sheep producers with a breeding herd of approximately 1,000 animals utlising 10,000 ha of communal rangeland about 10 km south of Ain Beni Mathar in eastern Morocco. The Cooperative had been organised three years earlier by the Service de l'Élevage in order to improve a traditional tribal grazing area. Individual producers were awarded shares based on the number of adult sheep placed in the management programme of the Cooperative, the proceeds generated were divided among the membership accordingly. In return, the Cooperative was given technical assistance and improvements such as water and animal handling facilities. They indicated that they would be interested in the selection programme, and plans were made to classify and sort the Cooperative herd in March 1986.

The sheep were to be classified using selection criteria based on animal health and age, animal reproductive ability and physical problems, body size, wool quality and fleece characteristics, and, because the Cooperative was interested in producing the Beni Guil breed of sheep (an indigenous breed), breed phenotype would be part of the criteria. Sheep ages were determined and recorded as one to four years or older. All classification criteria were recorded to be used as a reference to show improvements achieved over time.

The criteria for selection in order of priority were:

1 - **Infirmity** All animals were checked for signs of chronic external and internal parasites and/or diseases. Diseased animals were marked for culling.

2 - **Ability to reproduce** Ewes were checked for udder development, damaged udder, vaginitis, and deformities of the genitalia. Rams were checked for testicular development, epididymitis and deformities of the genitalia. Problem animals were marked for culling.

3 - **Ability to forage** All animals were examined for tooth wear and development, deformities such as overbite and underbite, broken mouths or missing teeth and soundness of legs and feet. Problem animals were marked for culling.

4 - **Size** All animals were evaluated for size relative to age. Small, undersized animals were marked for culling.

5 - **Wool quality** The fleece of each animal was graded for quality based on the spinning count system. Hair and kemp in the fleece (defects causing wool to be downgraded heavily in the international wool market) were rated from 0 to 6, with 0 being none and 6 being abundant (Bradford *et al.* 1985).

6 - **Breed phenotype** At the request of the Cooperative, only the animals having met all of the above production related requirements, and expressing the characteristics of the Beni Guil breed were placed in the primary flock.

Animals were classified and grouped as follows:

FLOCK 1 This flock consisted of the highest quality animals that would comprise a breeding group from which the majority of future replacements would be selected. Only those sound animals (criteria 1 to 4) exhibiting a spinning count of 50 (medium or quarter blend wools), or better, qualified for this group. Ewes were selected for Flock 1 only if the amount of kemp and/or hair was 2 or less. Rams were selected for Flock 1 only if the kemp and/or hair was 1 or less. The animals had to meet the phenotypic criteria of the breed.

FLOCK 2 This flock was formed from animals meeting selection criteria 1 through 4, but with wool quality low or not exhibiting the Beni Guil breed characteristics.

FLOCK 3 This group consisted of those animals not meeting the criteria for Flocks 1 or 2. These animals were considered the culls and were to be sold.

The result was an El Fath Cooperative herd of quality Beni Guil sheep that has the potential for producing an annual lamb crop of 100%. Shortly after the work was completed, the breed commission from the National Sheep and Goat Association (ANOC) reviewed the flock. 35 ewes were presented for breed certification from Flock 1. The commission accepted 31 and denied four because the wool quality was too high (a 'problem' that would become a blessing if a strong domestic wool market were developed). The Cooperative flock has no been certified to produce purebred Beni Guil sheep for sale to the public.

The Cooperative was already operating in multiple flocks so the division did not create a labour or management problem. The new flocks, separated according to the classification system simply replaced the three previously unclassified flocks. Instead of maintaining a separate ram herd, rams were placed with poorer Flock 3 as a method to control breeding in the ewes of Flocks 1 and 2. It made little difference if the ewes in Flock 3 were bred out of season since they were to be sold shortly.

Sheep selection activities with individual producers

This work captured the interest of many people. The report of the activity was sent to a recently returned training participant who had been trained in range management and sheep and wool production in the US and was working in the Safi area of western Morocco. A one week training/demonstration programme for Moroccan technicians and producers in the Safi Province was organised. The programme was conducted by the same team that had worked at Ain Beni Mathar.

Eleven Moroccan technicians from various provinces and 76 producers participated in the training/work programme. About 3,000 animals were classified using the selection criteria described above with the exception of the breed phenotype criteria. The technicians felt good about the training received and expressed the opinion that the techniques and skills learned could be used to develop similar programmes in their own provinces. The technicians believed that their efforts were rewarded by the high producer interest, and that the programme had allowed them to achieve an important level of credibility.

The producers were also pleased with the programme. At the end of the first day, it was learned that many of the producers who had participated arrived expecting pharmaceuticals for their animals. Initially, there was concern that this might have been their only reason for participating. However, a team of technicians returned to this work site the following day to find a similar number of producers waiting to have their animals classified who knew exactly the purpose of the programme. Many of these producers waited until after the work to discuss sheep and management related problems.

During the programme, technicians worked with herds ranging in size from 15 to 300 ewes. Participating producers showed genuine interest and desire to have defects identified. They requested explanations regarding methods of avoiding such problems and how they could get into a management programme that would enhance production. One producer asked that the defective animals be coded when marked for culling so that he could return later and study them to better recognise the problems himself.

Many producers when shown the defects in their animals (particularly in wool quality), wanted to know the fastest way of improving their flocks. In general, there was a noticeable lack of high quality rams in the flocks. Discussions with producers frequently involved the possibility of purchasing improved rams from outside the local genetic pool. Arrangements were made with a number of producers to meet at various breed development stations in Morocco in order to purchase rams of higher quality. There was not one case of expressed disinterest by any of the producers in attendance.

Approximately 4,000 sheep were classified in the combined programmes. The programmes served as a method of determining producer interest and providing baseline production information. The collected data (herd composition, age and sex ratio, wool quality and the occurrence of undesirable animal attributes) indicate that the current level of management is low.

After the sheep were classified and grouped according to the selection criteria, 745 ewes of the 3,763 total (20%) qualified for Flock 1. 29 of the 179 rams examined (16%) met all the requirements for this primary breeding flock. An additional 2,097 ewes (56%) and 59 rams (33%) met criteria that placed them in Flock 2. A total of 921 ewes (24%) and 91 rams (51%) did not meet the selection criteria, and it was recommended that they be sold.

548 of the 921 ewes that failed to meet the selection criteria (15% of the ewes examined) were considered to be animals incapable of reproducing satisfactorily (Table 1). 118 of the unproductive ewes were sterile. The other 430 ewes were considered unproductive as a result of physical problems, such as bad udders (84 ewes), poor teeth (37 ewes) or poor health (11 ewes) that inhibited the animals from consuming adequate forage to meet nutritional requirements for reproduction and location.

The remaining 373 ewes (9% of the ewes examined) were culled for traits that did not render them incapable of reproduction, but did make them undesirable animals to be kept in the breeding herds. 22 were recommended to be culled because they were dwarves. Horn presence, an undesirable genetic trait that is often an indication of hormonal imbalance, eliminated 103 ewes. Five ewes that had severe skin infections, one ewe that was blind and another that was crippled were also recommended to be culled. A poor fleece (a spinning count of less than 46 and a kemp/hair rating of 5 or 6) was the reason that another 241 ewes were culled.

91 (51%) of the 179 rams examined were identified for culling (Table 2). 35 (20% of the rams examined) were eliminated because they were considered incapable of reproduction. 22 were found to be sterile. Problems ranged from epididymitis to a cryptorchid ram. The other 13 rams that were eliminated were considered unhealthy (9 with broken

Table 1   Reasons for culling and numbers of ewes culled in the selection programme

REASONS CULLED	NUMBER CULLED	PERCENT OF CULL	PERCENT OF EWES
Reproductive problems	118	12.81	3.14
Bad udder	84	9.12	2.23
Broken mouth	298	32.36	7.92
Poor teeth	37	4.02	0.98
Sickly	11	1.19	0.29
Blind	1	0.11	0.03
Bad legs	1	0.11	0.03
Skin infection	5	0.54	0.13
Poor fleece	241	26.17	6.40
Dwarves	22	2.39	0.58
Horns	103	11.18	2.74
TOTALS	921	100.00	24.48

Table 2   **Reasons for culling and numbers of rams culled in the selection programme**

REASONS CULLED	NUMBER CULLED	PERCENT OF CULL	PERCENT OF RAMS
Reproductive problems	22	24.18	12.29
Broken mouth	9	9.89	5.03
Poor teeth	2	2.20	1.12
Sickly	2	2.20	1.12
Poor fleece	56	61.54	31.28
TOTALS	91	100.00	50.84

mouths, 2 with poor teeth, and 2 appeared to be acutely ill) and incapable of meeting their required nutritional needs for reproduction. 56 rams (31% of the rams examined) were eliminated because of poor fleece quality (a spinning count of less than 48 or a kemp/hair rating of 5 or 6).

Wool graded on the basis of spinning count, and industry standard, ranged from 40 to 60 (Tables 3 and 4). The majority of the fleeces of the ewes (95%) and rams (92%) fell between the grades of 44 and 50. Kemp was present in the fleece of 73% of the ewes and 65% of the rams.

The Moroccan technician in charge of the programme in the Safi area has indicated in recent conversion that many of the producers, both large and small, have removed the culled animals from their flocks. Many of the small producers simply consumed their problem animals. Some producers did indeed purchase improved rams in an attempt to improve the genetic quality of their flocks. Unfortunately, there is no data on the numbers of producers or animals involved.

Long-term payoffs

This programme could be of high value to Morocco for meeting the protein requirements of a human population expanding at more than 3% annually. If a national programme was formed to assist producers with the identification and removal of undesirable sheep (15% of the animals identified as incapable of breeding in this trial) the monetary savings would be substantial. With an estimated national breeding flock of 12 million ewes, this study indicated that there are about 1.8 million unproductive ewes in the country. These animals contribute to the consumption of a limited forage resource with little or no return. On average, the monthly energy requirement of a mature ewe in Morocco is estimated to be approximately 30 kg of barley or its forage equivalent (Banner and Gay 1987). In order to support these unproductive animals on a national scale, over one billion dirhams worth of feed is required annually. A selection programme established country wide could quickly reduce the number of poor quality animals and greatly improve herd performance. Further, wool quality, a highly heritable trait, could be improved through the same programme and generate additional income for the livestock producers and provide a valuable domestic resource for Morocco.

This type of extension activity is of high value especially in a development setting. In addition to the introduction of technology that can fulfil the goals of the project to increase the productive efficiency of sheep flocks in Morocco, technical staff received additional training and were allowed to sharpen their skills. It immediately created credibility with the

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Table 3   Ewe wool quality and presence of kemp encountered in the selection programme (0 is no kemp, and 6 is abundant)

Table 4   Ram wool quality and presence of kemp encountered in the selection programme (0 is no kemp, and 6 is abundant)

producers and gave the technicians and producers common ground that allowed discussion to begin about more esoteric and long-term activities such as pasture and range programmes which are now in the planning stage. Present activity in this programme indicates that the interest exists at the producer, technician and administrative levels for continuation and expansion. This type of programme could be implemented on a national basis with relatively little investment in terms of training, equipment and operating expense, especially given the financial impact in the short-term that such a programme can produce.

Experience has shown that rangeland owned in common is very difficult to manage for sustained production if the animals are managed as individual herds. The El Fath Cooperative has demonstrated that a collective herd managed by the share holders as a business can result in financial and environmental success. The programme of regular selection has removed unproductive animals thereby increasing efficiency, improving quality, and increasing production through improved nutrition as a result of improving forage availability. Neighbouring tribes are petitioning the Moroccan Government to begin similar activities involving their communal land and livestock herds.

Those herds grazing primarily on private lands have enjoyed similar success as a result of the selection activity. The need to retain excess numbers as a hedge against catastrophe such drought is diminished because the selection process removes weak (which would die during drought) and unproductive animals, leaving the strong with a greater resource base to support them, whether it be range or supplemental feed.

A future range project should build upon this foundation. It will generate quick interest in those concerned, create credibility that will allow the technician to expand the programme into other topics, and will produce immediate financial rewards that can easily be quantified. Both credit and government rehabilitation programmes can easily be made contingent on cooperative herd management and selection programmes on communal land, and selection programmes for livestock herds based on private land. Recent communication with the Direction de l'Élevage indicates that a new programme in the eastern region of Morocco is soon to be implemented with funds from the World Bank.

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