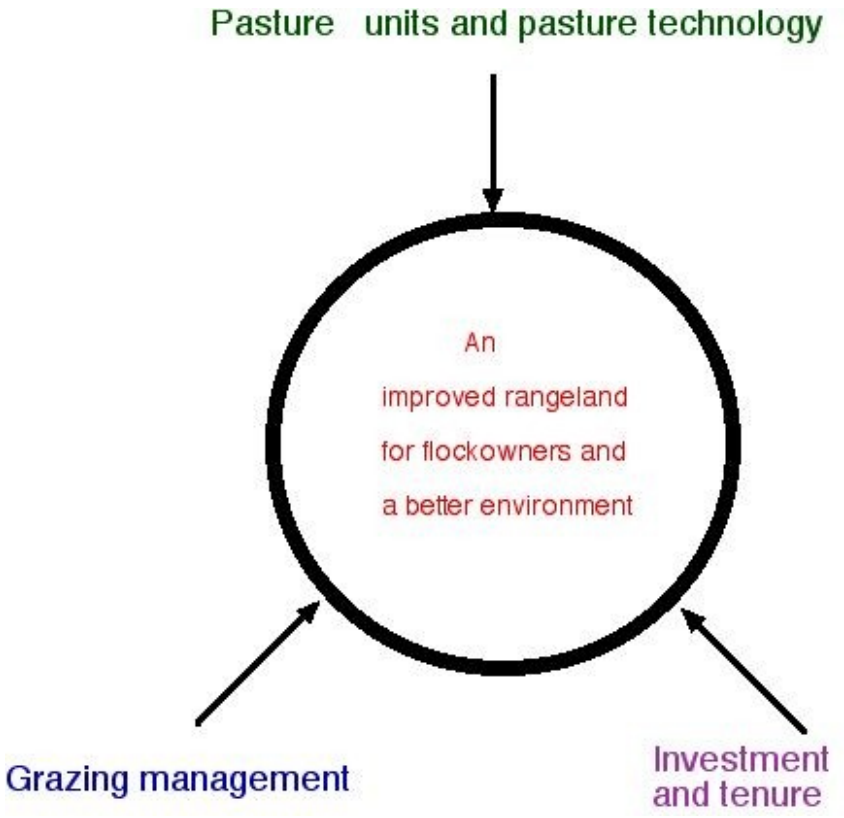
THE RANGELAND

Action plan for flockowners



Sheep grazing on a typical rangeland area.

Sheep being fed hay and grain in the rangeland. This provides the energy to graze. In fact often the grazing provides less energy to the sheep than iis spent harvesting the rangeland pasture.

Where do we start?

The simple answer is everywhere.

Unlike other farming zones it is not possible to tackle one problem at a time.

For example in the Cereal Zone it is possible to improve the efficiency of harvesting cereals as a single program.

Improving the yield or controlling weeds in cereal crops can be dealt with separately.

The parcour can be improved without a whole string of other changes.

In the rangeland the old balance that existed half a century ago has broken down.

Restoring it is totally unrealistic as it depended on high death rates among livestock in dry seasons. (see Rangeland overview).

This is wasteful and unacceptable in the present day. A new regime is needed which is based on an interaction between the pasture, the livestock and the tenure.

Many projects have ignored this interaction and tried to solve each problem separately.

We will show that each problem/solution feeds back to the other. They cannot be solve separately in a linear progression but must be tackled simultaneously.

What are pasture units?

* Present models for pasture units.

Australia and USA have simple pasture units.

They are fenced areas of rangeland (called ranches in USA and stations in Australia). They belong to individual or corporate owners. They are owned on various types of freehold or leasehold title. They are

bought and sold.

Over the last fifty years of rangeland development in the WANA region these Australian and USA concepts have provided the dominant model.

In the early phase (the 1960's and 1970's) the units were called grazing cooperatives. While their legal status and ideological justification were quite different from US ranches they looked exactly the same on the ground.

Algeria for example established hundreds of fenced CEPRA holdings as part of their rangeland development program in the 1970s.

A CEPRA was identical to a ranch except that it was cooperatively owned.

The area was fences and it was hoped that all the livestock would remain on the holding for the whole year.

That phase has now passed.

We now have another ideology sweeping through the corridors of development where "cooperative" is considered to be an old fashioned word of the Left.

The "new" idea is grazing associations.

"Association" is supposed to be a politically neutral word with implications of community without active sharing. It is associated with golf courses and other recreational activities that are considered ideologically harmless.

These associations are supposed to solve the grazing management problems of the rangeland but on the ground they appear to be another form of ranch or the old grazing cooperative under another guise.

Imposing ranches on the rangeland has not been a success over the last fifty years.

It is unlikely that changing the name to reflect a new ideology will make any significant difference to what happens on the ground.

Of course it is possible that there will be a social revolution in the future but so far the movement of flocks through the rangeland has absorbed new technology (mechanised transport in particular) rather than changing radically.

Policy planners can work towards a complete change or try to work within the present system.

* A totally new model.

We propose that the pasture units for rangeland development should be GRAZING PATHS.

A grazing path is the path taken by a flock of sheep (there are usually some camels and goats but sheep are the dominant livestock) over a year.

It is a concept that is readily comprehensible to a nomadic flockowners as it is what they do every year but completely alien to people from cities or farming zones who have different ideas about boundaries.

The ranch is an extension of farms into the rangeland.

It is just a large holding.

It has some tenure differences but appears on the ground as a very large farm.

In both Australia and USA it is understandable that this form of pasture unit should be formed as the colonists came from a farming background.

Flockowners in the rangeland of the WANA region move their flocks in and out of the rangeland.

They follow a grazing path.

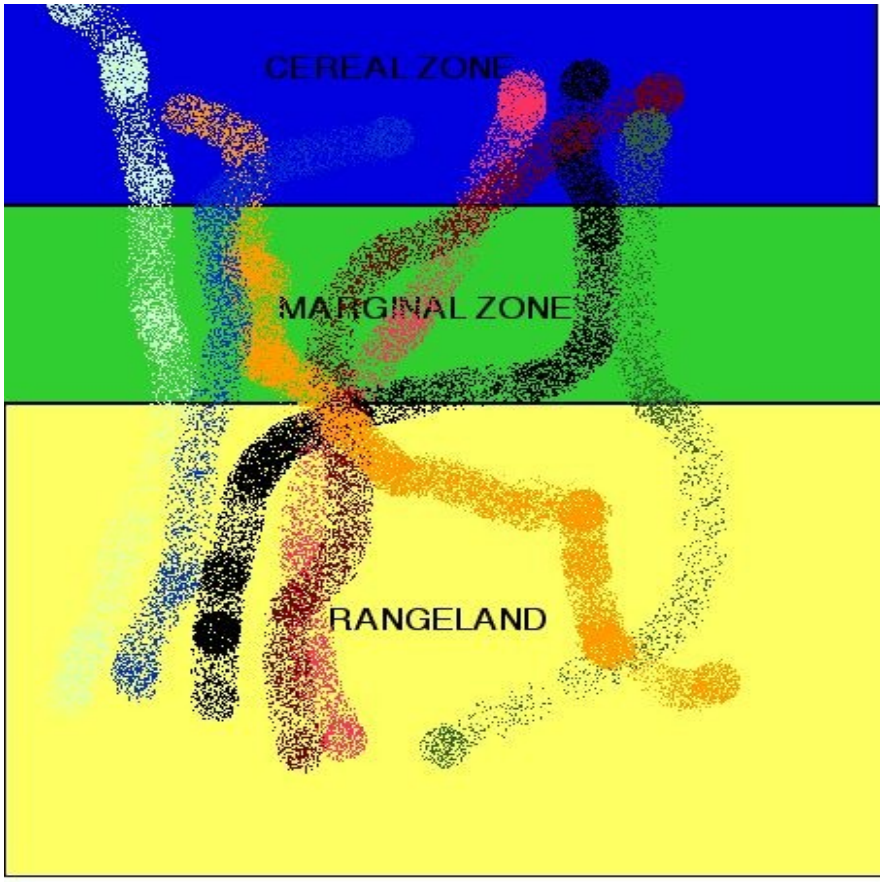
This path is a very difficult concept to describe in conventional tenure terms.

It consist mainly of use rights for the rangeland and cereal stubbles.

The paths of individual tribal or family groups are partly exclusive and partly shared.

FIGURE 2.

Figure 2 shows in diagrammatic form some grazing paths as they cross the various zones.



Some characteristics of grazing paths:

* Some areas provide exclusive grazing to one group of flockowners.

* Some areas are shared between two groups. This can be where paths cross over or where they are parallel.

* Some areas are shares between many groups.

* Flocks do not move down grazing paths at a uniform speed. They move according to the availability of gazing.

* Using grazing paths as a pasture unit.

Rangeland projects in the past have approached the problem from the viewpoint of the farmer or the city dweller.

They have taken administrative areas within the Rangeland or Marginal Zone and then within these attempted to establish ranches (called various names according to current fashion) with improved pasture and grazing management.

Even if these ranches are used by a single group of flockowners they represent only a small part of the total grazing path.

We suggest that the grazing path should be the unit of development.

This is of course difficult as it will cross many administrative boundaries.

Development should take place along the bulk of the grazing path.

In the the above Figure 2 the snaking paths become the pasture units rather than boxes drawn in various

zones that cross many paths.

* Exchanging grazing rights.

Projects at Ma'in in Jordan and J'Ravi in Iraq have already shown that it is possible to exchange grazing areas and grazing rights.

Two groups of flocks that share part of their grazing paths can make agreements to remain exclusively within the core of their paths rather than merge at the boundaries.

Where more than two groups share a grazing path such agreements are complex and can be left to one side as "neutral zones."

From this it is possible to develop by agreement a grazing path that consists of a band used exclusively by one group of flockowners.

Along the grazing path there will be some neutral areas that are grazed on a common basis by many group.

Experience in Jordan showed that the development of exclusive grazing paths depended on the leadership of the flock owning groups. Some were interested in change others resistant.

* Is it possible to have agreements with flockowners?

Many people with experience in rangeland development will be sceptical about grazing agreements made by flockowners.

Throughout the region there are rangeland projects that are fighting an almost constant war against poaching of pastures by nomadic flockowners.

Fences are cut and the developed areas are grazed unless they are constantly guarded by government inspectors.

These areas have been imposed on the rangeland without consultation of the flockowners.

The flockowners have not participated in their development and have received little from the new pasture.

They see the government authorities as remote and do not see why they should respect the arbitrary removal of large areas of their traditional grazing path from their continued use.

On the other side of the coin flockowners in Algeria have for generations sown barley in shallow depressions in the rangeland as they move south on their annual migration. These areas are then left to grow. Other flockowners pass by but do not graze the green barley. Later the original flockowners return. They harvest the barley and feed the straw to their flocks.

Agreements made between flockowners are totally different to those made with outsiders and have considerable force.

The other factor that makes agreements between flockowners a feasible concept is if the agreements lead to something positive. Just to separate the grazing paths for the sake of some vague ideas on better grazing management will provide little incentive to flockowners. If however the paths are separated and a pasture improvement program follows which lifts production substantially there is a considerable incentive to make the agreement work.

It is another example of how the social, economic and technical interlock within the rangeland.

* Pasture units on the ground.

Reality is never as clear cut as the theory.

The CEPRA grazing cooperative in Algeria were an example of pure ranches.

The government attempted to divide the rangeland with fences and establish groups of nomadic flockowners on these areas permanently. They were even accompanied by the most incredible sheep shelters built with French aid that resembled bomb proof bunkers in the strength of their reinforced

concrete. When we inspected them in 1979 the majority of CEPRAs had collapsed and only 1 or 2% remained in existence. Nothing had been done to improve the rangeland pasture.

A system of rotational grazing had been introduced but without reseeding or fertiliser the rate of improvement was slow. The flockowners were denied their traditional grazing in other parts of the rangeland and the cereal stubbles. They could not sustain their flocks and returned to their former grazing paths.

At Ma'in in Jordan and J'Ravi in Iraq the pasture units were of sufficient scale to make a substantial impact on the total feed available on the grazing path. The pasture units were improved through the use of sown pastures and fertiliser.There was no attempt to confine the flocks to the improved areas. They utilised the rest of the grazing path on the usual seasonal basis. Exchanges were arrange so the new pasture areas could be used by one group exclusively. They provided the foundations for a full grazing path development but changes in policy and the war prevented further development in Iraq.

Elsewhere rangeland development has not progressed as far.

The improved areas are small ranches but used as part of the grazing path without any long term policy of joining areas together to make a substantial impact on the grazing path.

They remain honey pots constantly under threat of destruction from hordes of starving sheep.

Quantum leaps in production

In the Cereal Zone we described how many of the problems of grazing management could be solved if there was a rough balance between the pasture and the livestock from the outset. (see Stocking a medic pasture)

We explained that grazing management is often virtually impossible because there is either a shortage of sheep and the pasture is under-grazed or the livestock number are so high in relation to the medic pasture that over-grazing is almost inevitable.

In the Cereal Zone the farmer does have the option of purchasing additional sheep.

In the rangeland the problem is more acute as flocks cannot be adjusted in the short term. The families that make up a group act together and will not split up their flocks. As far as we are aware this has not been considered in the planning of projects.

Projects are land based not livestock based (or at least not in this sense. There are livestock based projects but they are for animal health and breeding).

Planners select sites based on topography, soils and rainfall. No where in the planning process is an assessment of the livestock numbers in the flocks that pass over the site. If the pasture can make a substantial increase in the feed available to a flock then many of the grazing management problems are solved. If the rough balance exists then grazing management only needs to fine tune it.

If the extremes of over-stocking or under-stocking exist grazing management will be difficult for even the most expert practitioner.

What is need is a quantum leap in pasture production that will make a substantial difference to the feed available to the flock for a major segment of the year.

There are three factors that need to be considered as a measure of the quantum leap.

* Area of pasture improved.

This is the most obvious. If a large area can be developed quickly there will be a dramatic effect on production.

The area is linked to the pasture technology. Sowing medic with seed or pods can be done rapidly. In Libya and Iraq areas of 5,000 to 10,000 ha were sown in a single season as individual pasture units.

* Time taken to come into production.

This is of equal importance. Fodder shrubs may produce large amounts of feed in the long run and achieve a balance between livestock and pasture but achieving the balance in the first few decades is going to be difficult.

Medics on the other hand are ready to graze within weeks of sowing.

Fodder shrubs need years to establish.

* Concentration on a few grazing paths.

Even where large areas of rangeland have been developed rapidly they have not been planned in relation to grazing paths. In the above Figure 2 the development areas have been strips across zones (left to right) rather than up and down in the general direction of the grazing paths.

The result is that major increases in production have been dissipated by cutting across many grazing paths and have had little impact on any single one. There is a need to make a quantum leap in production on a few grazing paths rather than a small impact on all of them.

Once these have been improved the project can move on to others but spreading resources thinly will lead to failure.

If a large area is sown with annual species on just few grazing paths it is possible to make a quantum leap in production to a level where livestock and pasture are in rough balance and the finer points of grazing management can be developed in a more leisurely fashion.

Pasture technology

* Fodder shrubs.

This has been the most popular means of rangeland improvement. Millions and millions of dollars or Euros have been spent on planting fodder shrubs. In the rangeland they have been mostly Atriplex and spineless cactus but other species such as Acacia and lucerne shrubs have been used.

Planting Atriplex seedlings in Libya. The seedling have been grown for a year in a nursery. The land was ripped with a bulldozer and the seedlings are being planted into holes dug by hand. Note the width of the rows and the spacing in the rows.

The Atrilex seedling planted. Note large rocks displaced by bulldozer.

Watering the Atriplex seedlings. Again note planting distances.

Fodder shrubs are now sometimes direct seeded which reduces the cost and increases the plant density

A spineless cactus plantation in Tunisia.

Fodder shrubs have been an expensive pasture development option. They have been a top-down technology advocated by technical experts. These experts see the fodder shrubs as the best option as they provide a permanent plant cover to the rangeland. They have not realised that second best options are often more practical and provide better cost/benefit ratios.

The technical experts have also learnt their pasture science in northern universities where pastures are based on perennial grasses (and, before the era of cheap subsidised nitrogen fertiliser, perennial legumes). As these experts seek pasture plants for more and more arid regions they look first for drought resistant grasses and then in the extremely arid rangeland zone drought resistant fodder shrubs.

These technical experts have a deep seated culture of perennial pasture plants. If they had been trained in the culture of southern Australia they would have realised that drought evasion is just as important in arid areas as drought resistance.

Annual plants are most effective in drought areas but have been ignored.

A good example of this occurred in the central Algerian rangeland around Ksar Chellala. The Algerians employed a Russian team of botanists in the late 1960s and early 1970s to carry out a complete ecological survey. They listed every shrub and tree but dismissed all the locally adapted medics in a group of "ephemerals" that were not worth naming individually.

The lack of palatibility of fodder shrubs has been well documented over many decades in Australia and is now being confirmed by ICARDA in Syria. In their Annual Report 2005 on page 67 ICARDA states as the headline to a story on their rangeland research "Sheep prefer rangeland shrubs." The story below and the table of results then shows the opposite. The last paragraph states:-

"The sheep grazed the very dry, brown and over-mature native plants and palatable leguminous species first. They only began to graze non-leguminous shrubs after the fifth week, once most of the native plants had been eaten (Table 4). Even then, they spent more time walking than grazing these shrubs."

These research results seem to have no influence on research policy which follows the headline rather than the facts. All effort is put into the development of the shrubs rather than the annual grasses and legumes that the sheep actually prefer.

+ Advantages of fodder shrubs.

Fodder shrubs provide a permanent cover to the rangeland. This protects the soil and helps to reduce erosion.

Fodder shrubs represent many years of growth. They provide a more stable feed supply to livestock. The animals can survive during drought on the accumulated growth of previous years.

+ Disadvantages of fodder shrubs.

The overwhelming disadvantage is cost. They are expensive to establish. The old method of planting seedlings that were grown in nurseries was unbelievably expensive in terms of a cost benefit ratios (see photos above). The seedlings were transplanted by hand and usually provided with water. The water was carted in trucks and applied by hand two or three times in the first year.

The development of direct seeding methods without hand watering has reduced the cost very considerably but fodder shrubs are still expensive because the cost are incurred in the first year and the benefits are not obtained for a least five years. Many people have ignored this aspect of cost but any realistic assessment a fodder shrub development must include the original establishment cost plus the accumulated interest charges plus the opportunity cost of not utilising that piece of land. The combination of high cost and the long establishment period make the idea of a quantum leap in production expensive and difficult.

We showed that a quantum leap in production reduces grazing management problems by creating a rough balance between livestock and pasture in one or two years.

While fodder shrubs offer a more stable supply of fodder through a drought they are more difficult to graze. The fodder on offer represents many years growth.

If it is all eaten in a single feeding frenzy the plants will die.

To develop a sustainable grazing management system for fodder shrubs is difficult.

The emphasis for fodder shrubs has been on drought resistance not on their suitability as a fodder.

With the exception of the lucerne shrub the common species are not good fodder for livestock.

Atriplex contains too much salt.

Spineless cactus causes digestive trouble.

Fodder shrubs survive in arid regions at low plant densities.

If they are planted at high densities they will produce more fodder more rapidly but over time many plants will die through inter plant competition. They generally have deep extensive root systems. To adapt to long periods of water stress they do not utilise all the moisture near the surface (this would require a higher density of plants).

The moisture not used by the fodder shrubs is used by annuals.

Over time the so called fodder shrub pasture will accumulate a collection of annual pasture plants that contribute more than half of the feed for livestock.

It does not seem like this. The fodder shrubs have a large accumulation of growth but this represents many years and the annuals have all grown in a few weeks. It seems strange that experts have ignored this annual pasture. It would seem logical if it is providing so much feed to put some effort into its improvement.

Finally the major fodder shrub species (Atriplex and spineless cactus) provide no nitrogen to the soil.

Soil fertility is just as important in the rangeland as elsewhere. If plants are to utilise the available soil moisture they must be supplied with nutrients.

The two major nutrients needed nitrogen and phosphate.

A good pasture for the rangeland must contain some legumes.

* Natural regeneration.

The next most popular method of development has been natural regeneration.

When economists have looked at the poor cost benefit ratios for fodder shrubs (particularly the hand planted seedlings) they have turned instead to natural regeneration. The rangeland area is simply rested

and over time many of the species that have been pushed to the edge of extinction by over grazing will return.

+ The advantages of natural regeneration.

Low initial cost is the major advantage. There is no intervention in pasture improvement. The cost relates to the waiting period and loss of grazing. This varies from rangeland areas to area and depends on the state of degradation.

+ The disadvantages of natural regeneration.

The slow recovery of some rangeland can reduce the cost benefit ratio.

Land and pasture degradation usually follows steps where the most palatable and nutritious plants are grazed most heavily and eliminated first. Those with thorns and other forms of protection often survive.

Natural regeneration can lead to these survivors becoming dominant in the early stages of recovery. Natural regeneration does not tackle the nitrogen and phosphate problem directly. Hopefully legumes will return but it is a matter of luck.

* Medic - seed

Medic pasture has been sown in the rangeland with great success in Libya and Iraq.

Some of these projects were fringe or marginal cereal projects such as the development at Adjulat in western Libya where an area with about 150 mm was sown to medic for a medic cereal rotation. It was soon realised that grazing was the best land use and cereal farming was abandoned. In the eastern part of Libya large areas were sown on the Benghazi plain between Benghazi and the Jebel al Akhdar and on the southern side of the Jebel at Wadi al bab and at Wadi karuba.

In Iraq similar large scale medic pastures development took place at J'Ravi.

+ The advantages of medic pasture

The cost is low. Obviously the initial cost is higher than natural regeneration but this is off set by the rapid improvement in output.

The pasture is grazed within weeks. Under the best possible circumstances natural regenerating rangeland cannot be grazed for the first season. Usually it takes a number of seasons to restore the supply of seed.

The sowing of medic seed does this immediately. The low cost and the use of large machinery allows large areas to be sown quickly. As we explained above a quantum leap in production solves many of the grazing management difficulties.

The sowing of seed can be combined with the application of phosphate fertiliser.

Medic pasture is comparatively easy to manage.

There are some critical periods in the year such as flowering and pod production when severe over-grazing can cause damage but at other periods over-grazing is not the optimum grazing strategy but does no long term harm. Even the destruction of pods production is not lethal, except in the first year, if there are reserves of pods in the soil. The dry pods can also be harvested by sheep but as they become sparse they become more and more difficult to harvest.

Provided the sheep are not given energy pep pills in the form of supplementary grain sheep will find it difficult to collect the last 10 or 15% of the pods required for future regeneration.

Medics are not only legumes but vigourous legumes that produce large quantities of nitrogen. Acacias are also legumes but do not produce anything like the quantities of nitrogen.

The medic is not just a high protein feed both green and dry but provides fertility for other annual and perennial rangeland plants.

+ The disadvantages of medic pasture

The major technical barrier is that the medic cultivars used are those selected for the low rainfall Cereal Zone. While they have done well in the projects mentioned above there is a need for a greater range of medics for the rangeland. These certainly exists but the production of seed through the present seed multiplication industry is impossible. The only people currently capable of doing the work are the Australian seed growers but they will not do so without firm market contracts.

There is no one in the WANA region with the authority and confidence to grant such contracts.

Another administrative barrier is that the techniques used for sowing are those used for cereals.

As the Rangeland merges into the Marginal Zone the cultivation of the land for cereals has been seen (quite rightly) as the major cause of land degradation. Project planners are opposed to cultivation. They are determined to discourage or forbid nomads from cultivating the land. These are all worthwhile aims but there is an enormous difference between cultivating the land every year for a cereal crop that usually fails and is grazed and a medic pasture which will be sown once or twice only over a decade.

Some administrators have also said to me that the rangeland is too rough, too steep and too stony to be sown with heavy duty cereal seeders. This varies from rangeland to rangeland but even where the greater proportion of the rangeland is not suitable there still remain tens of millions of hectares that can be sown. Where the rangeland cannot be sown with heavy duty cereals seeder it may be possible to use disc pitters. These were developed thirty or forty years ago in Australia and have been used in the WANA region over the last decade or so. At first they were used for passive natural regeneration. They created pits in which water and seeds accumulated. The pasture gradually spread from the bases in the pits. More recently seeder have been added to the pitters.

* Medic - pods

+ The advantages of medic pods.

Pods are a much better means of establishing a pasture in the rangeland.

The pods are resistant to ants and other insect predation.

The pod provides a better environment for germination.

If the pasture fails in the first year due to a drought in the spring there will be more seed to germinate in future years.

Pods could be harvested locally and thus overcome the lack of seed for species and cultivars better adapted to the rangeland.

+ The disadvantages of medic pods

There is currently no machine to sow pods.

They are broadcast by hand in the Cereals Zone but in the rangeland a simple machine is required.

* Fertiliser

The lack of fertiliser is one of the most perverse mental blocks in the technology of rangeland development in the WANA region. There are two main reason as far as I can see for the refusal to consider fertilisers.

Firstly fertiliser is not applied in USA and Australia. The economic conditions are completely different and the use of fertilisers is not justified. In the WANA region the price of sheep is many time higher both in real terms and in relation to average income. Fertiliser becomes a possibility. It is time many of the planners in the WANA region discarded their training in USA and opened their minds to the use of fertiliser.

Secondly the response to fertiliser comes through legumes and their ability to fix nitrogen. Applying

phosphate to Atriplex or spineless cactus is a futile exercise. Once legumes are accepted as an important part of the pasture whether it is annual or perennial it makes sense to see if they can be encouraged with small quantities of additional phosphate.

Grazing management

* On ranches

In Australia and USA the ranches are fenced around the boundary and then fenced again into grazing areas. Each area has its own watering point and is grazed by a flock of sheep (in Australia) or cattle (in USA and Australia) for the whole year.

The stocking rate is low because the productivity of the rangeland is low.

The grazing pressure is also low. In spite of this over-grazing can occur particularly around watering points. The perennial rangeland plants are lightly browsed. It is possible to observes changes as they take place slowly. Even with this relatively easy management system over-grazing takes places and there is considerable concern about long term degradation of the vegetation.

For example:

A rangeland area might be grazed at a stocking rate of 1 sheep to 10 ha

= 0.1 sheep/ha.

The sheep would be grazed for 365 days per year. The grazing pressure would therefore be the same = 0.1 sheep/ha

* On grazing paths

In the WANA region the existing pasture unit is the grazing path. The grazing path is not fenced and not exclusive to one group over all of its length.

Stocking rates are low because the production of the rangeland is low. At present lower than either Australia or USA because of low plant density and lack of fertility.

Grazing pressure is high because flocks are on the move. They do not graze the whole path all the time but move up and down it.

For example:

Let us say that the rangeland sector of a grazing path might be stocked at the rate of 1 sheep to 10 ha.

= 0.1 sheep per ha.

The area grazed from a camp site on the grazing path (comparable to a division of the Australian or US ranch) is not grazed for the whole year but perhaps 35 days a year. Typically it would be twice in the year - once on the autumn move out to the rangeland and once on the way back. The grazing pressure during these grazing bouts is 1 sheep per ha (1 sheep per ha X 35 days = 0.1 sheep X 350 days or roughly the same per year as the example above on ranches in Australia or USA)

The grazing pressure is ten times the grazing pressure during the bouts of grazing on an Australian or US ranch but the stocking rate is the same. For the remaining 330 days the area is not grazed.

* Does high grazing pressure matter?

The high grazing pressure makes over-grazing extremely easy.

In the above example each extra week of grazing results in a 20% increase in stocking rate.

In Australia or USA a 20% increase in stocking rate would require 20% more stock to be placed in the pasture area.

In the WANA region on a grazing path it is simply a matter of lingering in one spot rather than moving

on.

As there is no firm pattern of movement along the grazing path such lingering occurs frequently.

If a small part of the grazing path is improved with fodder shrubs or other pasture there is a "honey pot" effect. The flockowners linger around the improved area rather than move on. They are like bees around a honey pot.

The solution is:

+ To impose strict controls.

This has been the most common response to over-grazing. Flockowner have been supervised by government officials (Pastoral Commissars) and told to move on after a fixed period. The flockowners have not always cooperated. This is hardly surprising. It is like showing a feast to a starving man and allowing him to eat a little and then saying "come back next year for another snack." Controls may work as a short term solution during a pasture improvement program but in the long term is not a sustainable solution to grazing management.

+ Expand pasture production.

As we outlined above a quantum leap in production should make a substantial improvement quickly.

In the above example rather than 35 days of feed with a 20% increase in stocking rate for every week they linger the objective should be to provide say 100 days of grazing. In such an example an extra week would mean a 7% increase in stocking rate.

* Other pasture and feed options

The grazing paths cross a number of farming zones not just the rangeland. They cross the Marginal Zone and enter the Cereal Zone in the summer. Flockowners have traditionally grazed the cereal stubbles and failed cereal crops in these regions. They pay a fee to the land owners for these grazing rights. Improvement of the pasture in the farming zones offers considerable potential and could take the pressure off the grazing paths where they are in the rangeland.

Flockowners are often forced to linger in the Rangeland or Marginal Zone when pastures have been eaten out because the cereals crops have not been harvested and the stubbles are not ready for grazing. If the flockowners were able to rent surplus pasture from farmers as well as cereal stubbles they could move into the Cereal Zone earlier. In countries such as Algeria where much of the cereal zone is at high altitude and suffer from cold winter this could be the best way of utilising the pasture. The farmers in the zone could increase their sheep number if medic was sown on the fallow but the winter production would be limited due to the cold weather. In spring there is a burst of production and part of this could be rented to flocks from the rangeland.

Medic pasture on the fallow and parcour could provide surplus pasture. There would be benefits on both sides.

Farmers could sell pasture rather than buy additional sheep to utilise the higher production.

There would be a more rapid return from investment in pasture with less risk.

Farmers in the High Plateau country of Algeria and Morocco or the cold regions of northern Iraq and Syria could benefit even more as keeping their own sheep through the cold winter can be expensive. The sale of their spring pasture surplus could make good economic sense rather than making hay, storing it and keeping more of their own sheep through the difficult winters.The development of medic pastures in the cereal zone will lead to farmers concentrating their sheep on these pastures as they are much better quality than cereal stubble. Cereal stubbles will no longer be such an important source of summer feed for local farmers. It may be possible to develop the utilisation by nomadic flocks from the rangeland beyond their present grazing pattern. If straw and chaff could be stored (and later fed with urea or urea treatment) it would provide addition feed for these rangeland flocks and would be particularly useful in time of

drought.

* Pasture "on offer" and feeding the livestock

This is the essence of grazing management in every zone.

We have describe the situation in the Cereals Zone (see Grazing green medic and Grazing medic pods) where farmers should limit the consumption of the green medic pasture in order to let the plants grow and produce more later in the season. We have called it "building a photosynthetic factory." They should also prevent the sheep from eating all the dry pods as the carry over of some pods is essential for regeneration of the pasture. Eating everything in the summer prevents future regeneration. Exactly the same balance applies in the rangeland and flockowners will need to learn to balance the current requirements for food and the longer term production of the pasture.

This will not be easy because it is different from the existing grazing tradition. The existing system is founded on shared grazing paths where others would eat the pasture if your sheep did not eat it first. Lack of water in the past also encouraged flockowners to eat as much of the pasture as possible before they had to withdraw their flocks to the proximity of wells and other water supplies.

Finally over-grazing was controlled by a high death rate among sheep during periods of drought.

With a more stable system a grazing balance must be managed by the flockowners.

For annual pastures the rules are simple. Try to get complete plant cover in winter to intercept light and ensuring a good carry over of seed for future years are the basic rules. Production is over an annual cycle and easy to measure with the sampling disc (see Measuring pods).

For fodder shrubs the problem is much more difficult and the consequences of failure more severe. The on-offer feed from fodder shrubs represent many years of growth. If all this is eaten the shrubs will die and need to be planted again. The flockowners must try and manage their flocks so they only browse 10% or 20% of the growth in any one year. Flockowners have observed the pasture plants and the pastures for years and will no doubt acquire these skills but in the short term they are being asked to go from one extreme of vacuum cleaner grazing to a finely tuned system with little scope for error.

The annual pasture provides an intermediate option where grazing management does not have to be so precise.

* Fences

It is not only the Australians that are obsessed with fences.

The 1970s CEPRA cooperative ranches in Algeria had fences.

Many other projects have used fences in an attempt to control nomadic flocks.

Each generation of experts from Australia or the northern countries seem to arrived with preconceived opinions on the necessity for fences. They gradually learn the reality of the WANA region but ten year later the process starts again with another generation. The previous experience is forgotten and fences are discussed again.

There is a fundamental misunderstanding of what fences do. They are merely mechanical shepherds. If the Australians could remember their own farming history they would realise that fences were introduce because the shepherds left to search for gold in the mid 19th century.

They do not represent grazing management.

In the WANA region if the nomadic flock owners respect the fence there is no need for it. The flock owners are quite capable of controlling their flocks and where they graze to a limit of ± 10 m. in the rangeland (In the farming zones flocks are smaller and grazing is more precise. We have observed a boundary of ± 2 m).

They do not need a fence. A line of stones marking the boundary is sufficient. If the nomadic flockowners do not respect the fence, that is they feel it has been impose without their consent and prevents them grazing a traditional pasture they will cut it and let their sheep through. It will need to be guarded

constantly.

Either way the fence is no more than an expensive symbol as shepherds actually control the grazing of the flocks. Perhaps in the future sheep may be left to roam free without a shepherd. In that case fences would be needed but there are few signs of this at present and shepherds have remained the means of grazing control in the WANA region.

The CEPRAs in Algeria were fenced in the early 1970s. When we inspected the one or two that had survived by 1979 the fences were in ruins. The boundaries still existed as other nomads respected them. The fences were a symbol that were broken and not sheep proof.

In Iraq the J'Ravi project in the 1980s used Western Australian contractors to sow thousands of hectares of medic pasture in a region with less than 200 mm of rainfall. In true Australian style they immediately put up hundreds of kilometres of fences but agreements were negotiated between groups of flockowners for the exchange of pasture and the fences were redundant.

They were in fact not even useful as a symbol and were dismantled. The pastures were grazed by one group who had exchanged their rights over other areas. The flocks on the other areas passed over the medic pastures but agreed not to stay and graze them. The fences were not need once agreements were in place and in fact had to be cut to allow the passage of the other flocks through the area. It was decided that they should be removed altogether.

* Limits to flocks.

Fifty years ago before cereals grain became so cheap and before motor transport was so readily available the flocks were controlled by high death rates. During droughts large numbers of animals died because they were too weak to walk out of the rangeland. They died through lack of food and/or water. The perfectly reasonable response from the flockowners was to try to build flock numbers again to the highest possible level as quickly as possible. They could then exploit the good seasons.

Now the flocks survive and there is a need to develop a sustainable balance between flocks and pasture.

In the short term a quantum leap in pasture production from the current low levels can achieve as rough balance over substantial periods of the year. Grazing management is reasonably simple. It is a matter of fine tuning a system that is already in approximate balance.

In the long term flock numbers will rise and over grazing will return. There is a need to educate flockowners on the advantages of flock efficiency. It is not a question of imposing controls on flock numbers but showing them that returns are actually higher from a lesser number of sheep feed a better diet than the maximum number fed a poor diet. Well fed sheep will have more lambs. They will grow faster and can be sold at a heavier weight. There is less risk.

* Feeding grain.

Feeding grain to livestock while they are grazing the rangeland is one of the major causes of pasture and land degradation. Livestock are being sustained by an external source of energy. Without the energy boost provided by the grain they would be losing weight and would eventually die. Most countries in the WANA region are trying to reduce the consumption of grain because it is often provided at subsidised prices.

Grain feeding in this manner is highly inefficient.

Flockowner should be encourage to reserve their grain feeding for feed lotting confined animals. They may find it useful for growing lambs or pregnant ewes during periods of shortage but fed alone to confined animals. When fed as a boost to grazing animals on the rangeland most is wasted when animals walk long distances.

* Investment and tenure

In a separate chapter we will discuss the link between investment and tenure. At this stage we want to describe the type of investment.

* Is investment justified?

Pasture improvement in zones with higher rainfall will produce greater returns with less risk but that does not exclude the rangeland. Worthwhile returns can be obtained.

The social benefit to nomads is considerable.

The nomads are often the poorest sector of the agricultural community.

If the development of pasture is linked to tourism of other activities that allow the nomads to sell their animals direct to the consumer the returns from sheep for meat in the rangeland or camels for riding could be very high indeed.

* What type of investment?

If we look at USA or Australia which seem to exert an excessive amount of influence over rangeland development concepts the investment there is in labour saving equipment such as fences or piped water. Returns from wool in Australia and store cattle in USA can be very low and greater labour productivity is considered the best investment opportunity.

This rarely applies in the WANA region.

Fences have already been shown to be unnecessary and piped water rather than carted water is a marginal improvement.

Pasture improvement and fertilisers receive little attention in the Australian or US rangeland but should be the first priority in the WANA region.