

RANGELANDS AND THEIR USE IN THE NEAR EAST REGION

THE INTERNATIONAL CENTER FOR AGRICULTURAL RESEARCH IN THE DRY AREAS (ICARDA)

FORAGE TRAINING COURSE 1979

LECTURE NOTES
ON
RANGELAND AND THEIR USE IN THE NEAR EAST REGION

BY
M.D. KERNICK

FAO PASTURE SPECIALIST

THE INTERNATIONAL CENTER FOR AGRICULTURAL
RESEARCH IN THE DRY AREAS
(ICARDA)

&

FAO ECOLOGICAL MANAGEMENT OF ARID AND SEMI
ARID RANGELAND PROGRAMME
(FAO-EMASAR)

FORAGE TRAINING COURSE
1979

TABLE OF CONTENTS

	<u>Page</u>
I. RANGELAND OF THE NEAR EAST	
A. Definition of Range Management and its importance in in the Near East	1
1. What is range management?	1
2. What is rangeland?	1
3. Definition of the term rangeland	1
4. Importance of the rangelands to the Near East	2
5. Value of animal products from the rangeland of the Near East	3
B. Rangelands of the region, their characteristics, use and major problems	3
1. Characteristics of the ranges	3
2. Other grazing resources	5
3. Traditional use of the range resources	5
4. Problems of the rangelands in the region	7
5. Overgrazing of rangelands	7
6. Expansion of dry farming into marginal areas including former rangelands	8
7. Fuel gathering from rangelands	8
8. Water development for livestock	9
9. Supplemental feeding on rangelands	9
10. Communal grazing areas	10
11. Shortage of trained personnel	10
C. Individual country range problems and development needs	11
- Afghanistan	11
- Iran	13
- Iraq	14
- Jordan	16
- Turkey	17

I. Rangelands of the Near East

A. Definition of range management and its importance in the Near East.

1) What is range management?

Range management may be defined as the science and art of managing and developing rangeland for sustained economic animal production while at the same time ensuring the stability of the range resource including the vegetation, soil and water. Animal production may also include wildlife as well as domestic stock.

2) What is rangeland?

The term rangeland describes most categories of land not under forest or cultivation and especially those that sustain grazing or browsing animals on an extensive basis. The bulk of the arid and semi-arid lands of the Near East fall into the general category of rangelands since although some of these lands have potential for cropping, the precipitation is too low or erratic to support forestry or permanent cultivation on the majority of lands without the aid of irrigation. Usually the mean annual rainfall is less than 600mm with a lower limit of 50-100mm covering vast desert areas.

3) Definition of the term rangeland

The term range was first used in the United States to describe vast areas of grazing lands in the Prairies and southern states that were used on an extensive basis by ranchers for grazing their cattle and sheep flocks and it has now become an accepted term in other parts of the world such as the Near East and Africa to describe the vast grazing lands used by nomadic and transhumant pastoralists and their livestock.

Rangeland as defined by the American Society of Range Management is land on which native vegetation is predominantly

composed of grasses, legumes, herbs and shrubs suitable for grazing or browsing including also lands revegetated naturally and artificially to provide a forage cover that is managed as native vegetation. A good example of the latter is the extensive areas of denuded range in the prairies which has been reseeded with crested wheat grass Agropyron cristatum.

4) Importance of the rangelands to the Near East.

The importance of the rangelands to this region are very great since they constitute the largest renewable natural resource. It has been estimated by FAO that the range and pasture lands of the Near East comprise some 190 million hectares with forests making up some 140 million hectares, much of which is also grazed to a greater or lesser extent depending on its state and composition. To these lands may be added a further 800 million hectares which is classed as waste lands or rough grazing which for the most part is seasonally grazed.

Of course the greatest importance of the rangelands lies in the forage they produce and it has been estimated again by FAO that the percentage of total forage produced by rangelands for livestock is 90% in Iraq, 80-90% in Jordan, Lebanon and Iran and 70-80% in Syria. The rangelands of the Near East thus provide the bulk of the feed consumed by the regions' approximately 300 million head of livestock.

However the water harvested by rangeland may also be considered of equal importance to the forage they produce. The extent of siltation the dependability of stream flow, underground water and recharge, and the total water yields depends upon the kind of vegetation that occurs and the kind of management it receives. Nowhere is this more important than on the major watersheds in the region which are the source of all the important rivers and streams and thus are vital for

providing water for irrigated crop production in the lowlands.

5) Value of animal products from the rangelands of the Near East.

It is known that the regions approximately 300 million head of livestock produce some 1½ to 2 million tons of meat annually valued at 1,500 to 2,000 million dollars. To this must be added the annual contribution of milk, wool, hair and hides which is also very substantial. In countries like Afghanistan and Somalia the value of livestock exports as a percentage of total agricultural exports is as high as 60%. In both these countries livestock husbandry largely supported on rangelands constitutes a way of life for about 80% of the population in Afghanistan and at least 70% in Somalia.

B. Rangelands of the region - their characteristics, use and major problems.

1) Characteristics of the ranges

The rangelands of the Near East are characterised by the presence of various types of natural vegetation the nature of which is dependent chiefly upon the amount of rainfall the type and texture of the soil, the elevation and the topography.

In broad terms the rangelands of the Near East may be usefully divided into mountain, steppe, desert and littoral ranges. These divisions generally reflect a sharp change in climate particularly with regard to rainfall, temperature and humidity which together with the soil conditions exert a dominant influence on the type of vegetation that prevails.

Mountain ranges with annual rainfall above 500mm. which is usually well distributed, generally exhibit a close herbaceous cover of natural perennial grasses, legumes and herbs especially in alpine meadows but there may be an invasion of tragacanth or

spiny, shrubby vegetation under heavy grazing use. Good examples of such ranges exist in the central mountains of Lebanon the mountains of N.W. Iraq the Elburz and Zagros Mts. of Iran and the Karakom Mts. bordering Afghanistan and Pakistan.

Steppic ranges generally do not rise above 1000mm elevation and the annual rainfall varies between 200-500mm. The vegetation is more open with an intermittent cover of perennial shrubs, grasses, legumes and herbs with the former often dominant. The perennial plants are generally spaced at least 1-2 meters apart, but because of the generally sufficient rainfall in winter and spring there is usually a good cover of annual plants in between the perennial plants. Steppe ranges are very extensive in Northern Syria, Northern Iraq, Northern Iran and in the Central Hindukush region of Afghanistan. Such ranges can also occur near rainfed cereal lands. These cereal lands cover extensive areas with 200-350mm of annual rainfall.

There is generally not a sharp distinction between steppe and desert ranges where the annual rainfall begins to fall below 150mm. Because of insufficient rainfall the perennial cover is often restricted to the most favourable habitats such as depressions or wadis and there is an incomplete vegetation cover over the surface area generally. The cover of annual plants may be extensive on sandy areas. Shrubs are normally the most dominant perennial cover and only the most drought resistant perennial grasses and legumes with a strong rooting habit survive here and there. Desert ranges are extensive in Jordan, Southern Syria and Iraq, Arabia, and the southern region of Afghanistan and probably compose the largest area of the total rangelands with an annual rainfall mostly ranging from 50-100mm.

Littoral ranges which are found in coastal areas around

the Arabian Gulf and bordering the Red Sea and Indian Ocean generally receive an annual rainfall of only 100-200mm. but because of the proximity to the sea the relative humidity is higher, particularly in summer, and this aids the growth of the vegetation which is principally composed of deep rooting shrubs and grasses. On the deep sands prevalent in these areas the growth of such vegetation also often benefits from the presence of a relatively shallow water table. Extensive saline areas covered with saltbush vegetation are also a common feature of littoral ranges and good examples may be found along the Red Sea Coasts of Saudi Arabia, the Yemen and along the Gulf Coast of Iraq, Kuwait, the Trucial States and Iran.

2) Other grazing resources

The above delineation of the broad range resource of the region does not however fully indicate the extent of the total grazing resources available. Extensive forest areas in the mountains support in many cases an understory of herbaceous vegetation which together with dwarf tree vegetation provides substantial forage for grazing livestock. Substantial forest areas of this type exist in N. Iraq in northern Iran, and in Afghanistan and N.W. Pakistan.

There are also extensive areas of allows in the rainfed cereal lands of the steppe areas of Lebanon, Jordan, Syria, Iraq, Iran and Afghanistan which probably amount to as much 10-12 million hectares which provide substantial early winter and spring grazing for range livestock. Substantial summers stubble grazing is also provided by the rainfed cereal lands themselves after the cereal crop (barley or wheat) has been harvested.

3) Traditional use of the range resources

The seasonal availability of forage on ranges and the

wide variability in amount and distribution of rainfall, as well as recurring periods of drought have dictated the present long established traditional range use pattern adopted by nomadic and transhumant pastoralists.

True nomadism is the regular movement of people involving whole families with livestock in search of grazing and water and this is characteristic of the bedouin tribes in Saudi Arabia, Iraq and Afghanistan.

Transhumance refers to the seasonal movement of the people and their livestock along established migration routes between winter quarters in the valleys and plains to summer grazing areas usually in the mountains. Such tribal movements that are undertaken from a permanent base such as camp, village settlement or farm where agriculture is practised are found particularly in Jordan, Syria, N.Iraq, Iran's Zagros Mts., Afghanistan and in Baluchistan and the N.W. Frontier province in Pakistan.

There are also transhumant sheep and goat breeders that operate in the steppe areas lying between the true deserts and the settled cultivated areas with which they are often closely associated since they own rainfed cereal lands there. These tribal groups are common in Syria, Jordan, Iraq and Iran.

It has been estimated by FAO that there are some 14 million cattle and 90 million sheep permanently on seasonally involved in nomadic or transhumant migration movements on the rangelands.

In the true desert areas of the region and also in the lower steppe areas abutting on to them sedentary sheep and camel owning tribes are found who operate from village oases and who may, as in Iraq and Syria, cultivate riverside lands on the upper Euphrates or lower Tigris Rivers.

4) Problems of the rangelands in the region

With few exceptions the rangelands of the Near East suffer a number of deficiencies from the standpoint of supporting the grazing animal. Due to unfavourable climate in the form of highly variable precipitation they normally exhibit great fluctuations in both the quantity and quality of forage produced. In addition severe droughts both seasonal and over several years can reduce plant growth to virtually nil over considerable periods of time. This leads to heavy death losses of livestock with wide fluctuations in animal weights, delayed maturity and reduced reproduction rates.

Because of this situation livestock owners keep livestock numbers high in good rainfall years to compensate for the high death losses expected in drought years. The improved animal disease control practised in many countries now has also increased livestock numbers. This has meant animal numbers have not been kept in balance with forage production on the ranges and this has led to serious overgrazing which has been particularly severe around wells and settlements. This is not to say that the nomadic and transhumant grazing system is not ideally suited to the utilization of the highly variable forage production that occurs on the ranges but rather that the system breaks down when livestock numbers increase far beyond the grazing capacity of the ranges.

5) Overgrazing of rangelands

Statistics clearly show that livestock numbers in the region have greatly increased within recent decades. In countries such as Pakistan and Turkey large increases amounting to 30-50% have been recorded. This livestock increase which is in fact common to most countries in the region has meant that the present stocking rate on rangelands in the Near East is far in excess of the carrying capacity, in some cases being as much as 5-6 times what the ranges can properly carry.

This situation is reflected in the decreasing animal productively and the disappearance of valuable perennial forage species which have turned many rangelands into annual type ranges. Thus has greatly reduced the protective vegetative cover on the soil, leaving it subject to accelerated erosion and in the drier environments, initiates a process of desertification.

6) Expansion of dry farming into marginal areas including former rangelands

Increasing demand for food grains in many countries in the region has led to a rapid expansion of rainfed cereal cropping particularly in steppic areas where climate and soils permit only sub-marginal farming. Usually economic crops are harvested only once every 5 years and this has led to many areas being abandoned, while the soil stripped of its original vegetation is laid open to erosion hazards and the invasion of often many unpalatable plants which has meant a serious net loss to the total grazing area. In many areas the use of tractors has increased the speed by which the natural vegetation has been destroyed. In the final analysis the increase of dry farming in sub-marginal steppic areas has multiplied the effects of overstocking through a shrinkage of the formerly existing rangelands. An example can be given from Turkey where in 1940 each 100 ha of rangeland carried 140 head of livestock but by 1967 this had risen to 254 head as a result of a 27% increase in animals coupled with a 30 percent decrease in the range areas.

7) Fuel gathering from rangelands

Over the years the rangelands of the Near East have and still are, providing much of the fuel for domestic use. This is particularly true around villages and smaller settlements but occurs also in range areas used by nomadic and transhumant pastoralists. It has been estimated by FAO that close to 180 million

fodder shrubs are annually uprooted in Jordan 400 million and in Syria some 540 million acacia trees are also destroyed annually in the Sudan to provide fuel for cooking. Uprooting is not only restricted to woody plants, although these are preferred but in some countries such as Afghanistan perennial grasses are also uprooted for fuel. Clearance of the perennial vegetative cover in this way has led together with evergrazing, to a rapid desertification of large rangeland areas.

8) Water development for livestock

Water for livestock is a necessary adjunct to utilisation of rangeland and a valuable tool for ensuring proper grazing distribution and management but most water development programme in the region have over the years been considered as a means in themselves with no relation to overall land management. This has meant that too many new wells have been established in order to obtain fuller utilisation of the range resources and in the absence of control of livestock numbers and satisfactory range management practices this has led to rapidly spreading destitution of the vegetation and a critical reduction of the productive capacity of the range has ensured. Range areas which formerly received some relief from grazing in the dry season when water was not available have become subject to continuous grazing use during the dry season and range plants never have the opportunity to recover. The hauling of water by motorized transport has also multiplied such misuse of range areas.

9) Supplemental feeding on rangelands

Supplementary feeding is recongnized as a necessary measure in giving stability to the livestock industry by filling the gaps in the range forage supplies during periods of severe shortage and for improving the quality of the animals diet. However in practice supplemental feeding has in many

cases been used merely to keep animals alive and by keeping livestock on the rangelands when they should be removed has led to further range deterioration.

10) Communal grazing areas

In most countries of the region village and tribal grazing lands are commonally owned and used, and because of this there is no real incentive for improvement of the rangelands themselves. In a number of countries too land traditionally owned by the tribes has been declared "state land". This has further reduced the incentive for the range users to exercise even minimum control over the range resource. It is the continuing use of uncontrolled communal grazing lands that lies at the heart of the problem of affecting improved range use. It is not an exaggeration to say that without the right form of land tenure rangeland improvement cannot be effectively applied to the vast areas of arid and semi-arid rangelands and this also applies to livestock improvement.

11) Shortage of trained personnel

One of the major deficiencies hampering the proper utilisation development and management of the regions rangelands for sustained production is the extreme of trained and experienced personnel. The greatest need is for people capable of mobilizing technical knowledge from the several special fields of knowledge included in range management and synthesising this information in such a manner that it can be used to solve the complex problems involved. Most of the countries of the region have very few range management specialists and partially none with adequate experience to apply the information to their own rangeland environment in an adequate manner. One result of the shortage trained personnel is the almost total lack of attention paid to the enormous task of educating

pastoralists in the principles of improved husbandry on rangelands. Basic to halting, destruction or rangelands and improving their productivity is an understanding on the part of pastoralists that forage plants are living organisms requiring as much attention as their animals. Certainly many years of range extension work will be required to alter the traditional idea that range forage is a gift of nature free for use by all without control. The human element is therefore the most critical in the content of range improvement in the region at the present time and the changing of attitudes and influencing the behaviour of the pastoralists is more important initially than any physical or technical improvement which cannot be realized without the participation of the range users themselves.

C. Individual Country Range Problems and Development Needs

Afghanistan

The country consists of vast mountain ranges and desolate waste lands in which relatively small, irrigated valleys containing small agricultural countries are linked together by a maze of criss-crossing livestock trails.

Precipitation is low unevenly distributed throughout the year and depends on elevation. At the lower altitudes it may be 150-250mm rising to 400mm at the higher elevations (1,800 - 2000m) where much of it falls as snow.

Major migrations annually occur as sheep flocks are moved from lowland winter grazing areas to highland summer ranges. Grazing lands for livestock are represented by some 80% of the total country and provide the only all year round source of forage.

During recent years increasing pressure of population has led to some of the best grazing areas being taken out of

use and put down to wheat. Overgrazing and lack of any controlled management of the remainder has led to serious erosion in many areas. Much rainfed land in the drier areas has also been abandoned over the years because of persistent crop failures.

Fundamentally the most important single problem is the low plane of nutrition, especially in winter under which livestock have to persist. There is an almost complete absence of feed reserves - very-little winter feed is conserved and stored, so that stock are subjected to marked stress factors such as severe climatic conditions, parasites and disease. Very little forage is produced on cultivated land except in the valleys where a rainfed local alfalfa variety is commonly planted on sloping land at the edge of the irrigated areas. This provides local grazing and harvested forage for the livestock of the small settlements there.

Elsewhere catastrophic livestock losses frequently occur from lack of feed, parasites and freezing cold. Average losses are now estimated at 20% and occasionally they may rise to 40-50% on account of extreme feed and climatic emergency.

While the problem of inadequate feed is basic to any improvement in husbandry and production, the system of land tenure, the difficult and rugged nature of the terrain and the nomadic and transhumant way of life of the livestock owning population makes it very difficult to effect improvements in the field of range management.

The first essential is to gain the confidence of the pastoralists through the provision of better animal health services allied to annual production including the associated fields of hides, skins wool and pelt improvement.

The rehabilitation, conservation, and development of the arid and semi-arid rangelands of the country will be immensely difficult to implement and will depend in the first instance

on the cooperation of the pastoralists. Initially efforts will need to be directed to improving the ranges in summer and winter homelands of the tribes with relevant water development and improved feed supply through planted forages and improved marketing facilities to increase stock off take from the range.

Iran

The native rangelands cover about 100 million hectares of the countries 165 million hectares which supports over 80 million sheep units at the present time. Only about one third of the total area is relatively good grazing land usually located in the mountains. The rest consists largely of stubble in fallow fields, scanty vegetation along semi desert margins and forested rangelands. Almost all the range-land that offered enough hope for successful rainfed wheat or barley production in the central plateau region of the country has been ploughed at one time or another. When not actually supporting a crop these areas may be grazed only in occasional years of above average precipitation. For this reason the total grazing area available is constantly changing.

Out of the 100 million hectares of existing rangeland it has been estimated that good to fair ranges occupy 19 million hectares, fair to poor ranges 2.5 million hectares and poor to very poor ranges 56 million hectares.

On the basis that 300 forage units are needed for one sheep unit per year only 38 million out of the 80 million sheep units can be fed on the natural rangelands each year. It has been estimated that the carrying capacity of the usable range amounts to about 20 million, sheep units which is 4 times the grazing capacity. Thus situation has and is continuing to cause serious overgrazing and depletion of the range resources.

In addition fuel gathering is another destructive force on the country's ranges and this ancient practice has proliferated

with the recent increases in population and industrialization.

In recent years ploughing has become the most destructive force of all and in 1963 it was estimated that there were 10 million hectares of formerly cultivated wastelands in the country. In the sub-steppie zone 200-400mm annual rainfall probably some 15 million hectares have soils topography and climate that will permit and justify re-seeding of adapted range species with present knowledge and techniques while perhaps 20 million hectares of the rangelands will respond to reduced stocking and better range management if grazing can be controlled.

For controlling grazing on ranges the issuance of grazing permits shows promise for regulating season of use and live-stock numbers on specific range areas. Somewhat less than 40 out of the 100 million hectares of grazing lands are now covered by formal grazing permits. Good results have also been achieved in re-seeding depleted rangelands in the steppic and sub-steppie zones of the country with 200-400mm annual rainfall using adapted perennial grasses, legumes and shrubs. The use of contour pitting and furrowing has also improved rainfall infiltration and moisture conservation.

Iraq

Nearly 50% of the country consists of arid and semi-arid rangelands which although containing some excellent fodder plants have suffered a steady deterioration due to overstocking and overgrazing. In drought years catastrophic livestock losses have occurred and in the severe drought of 1974 more than 50% death-losses were recorded in the national sheep flock.

Much good rangeland in the northern steppe region has been lost through ploughing in recent years. This very widespread cultivation of cereal grains now occupies vast areas of the moist foothill steppe region and is also invading the mountains where soil and topography are unsuited for cultivation and as a result

severe erosion is now present. In the Jezeira region good dry steppe ranges have also been ploughed for cereal cultivation and here only one economic crop of barley is harvested in every 5 year period.

The range resources of Iraq cover some 20-30 million hectares and the predominant range areas are found in the southern and western deserts and in the Jezeira. Forage deficits occur during winter and early spring in the northern region and during the summer in the central and southern regions. About half of the sheep population is owned by nomadic or transhumant tribes and the other half by farmers and merchants.

Migration of nomadic and transhumant livestock starts in winter. In the north nomads tend to leave the valleys for the steppe rangelands shortly after the rainy season begins in the autumn, and this is often detrimental to the range plants since they are just commencing their growth. The same situation occurs in the spring when flocks move out of the cultivated areas to the ranges in February or early March before the range plants are well established.

The problem of overgrazing and depletion of the range resource through ploughing is well recognized and the Government has initiated some actions to overcome this problem. To alleviate the effects of drought feed stores have been set up in the Jezeira and western desert to provide barley to sheep flocks in the summer and autumn in times of forage scarcity. Attempts are also being made to stabilize the range area by preventing further ploughing in the Jezeira steppe by the establishment of a plough line below which no further cultivation of rainfed farming is permitted. However the rehabilitation of the ploughed marginal cereal lands through the introduction of suitable forage crops including shrubs still remains to be tackled.

Overgrazing of desert ranges is also being approached by trying to introduce a system of rest-rotation grazing on a 2 year cycle basis under government control. This is involving consider-

able expenditure in fencing and its major disadvantage is that it does not as yet involved the pastoralists, who in any case must be compensated for such loss of grazing land, while it is being rested, through the prevision of supplementary feed. Controlled development and use of underground water for livestock is also an urgent need in the southern range areas whereby wells may be shut down periodically to enforce limited or rotational grazing use.

Jordan

The rangelands of the country cover more than 90% of the total land areas. The cultivated areas including irrigated or rainfed cover no more than 5% and 4% respectively. The bulk of feed requirements for the 1½ million livestock population of goats, sheep and camels comes from the grazing resource which supplies 70% of the feed for the sheep and goats flocks and almost all the feed for the camel herds. A bedouin population of not less than 100,000 are directly or indirectly engaged in grazing and/or animal husbandry enterprises.

The country is generally mountainous except for vast stretches of desert which form its eastern part. The mountain ranges in the Mediterranean area receive about 400mm annual precipitation. The semi-arid and Middle region bordering the mountain ranges to the east recovers rainfall varying from 250-650mm per annum while the and desert region gets only 150mm annual rainfall most in winter thunderstorms.

The low, erratic and uncertain rainfall and periodic droughts together with extension of dry farming, overgrazing and uprooting of shrubs has seriously depleted the range resource and heavy livestock losses one also usually encountered in drought years.

Evatranspiration is high in spring and the soil moisture is rapidly depleted.

Previous traditional grazing rights have also been cancelled with no compensation being given. Lack of banking and credit facilities for assisting pastoralists is also a serious drawback.

The Government is now given serious consideration to the adaption of the Syrian System of sheep and Range Co-operatives for tackling their range problems. Water development which has in recent years received considerable Government attention through the establishment of new wells is now realized to have increased the denudation of plant cover through overgrazing and cutting of shrubs for firewood and that in future it must be revised and integrated within a national range management policy.

The possibilities of integrating livestock into the farming system by raising forage crops on rainfed land also needs attention. However in the cereal fallow rotation adopted in the drier areas further development work is needed to find the best varieties of Vicia, Lathyrus and Medicago that could best be utilized by farmers to give a reliable yield in most years. In the higher rainfall zone intensive crop rotations are already being practised but the harvesting costs of summer vegetables and pulses may dictate that mechanically harvested forage crops could prove more suitable in the future.

Turkey

There are about 22.4 million hectares under cultivation in the country with some 64.6 million hectares classed as forest or open rangelands. Much forest land is used for grazing and livestock production is the major commercial use for many marginal forests. The area of rangelands has in fact decreased over the past 20-25 years from 33 million to 22 million hectares.

Basically the country falls into three regions, a relatively mild zone along the Mediterranean and Black Sea coasts and drier areas with great extremes of temperature in the central

plateau and eastern regions. The rangelands consist of grass and dwarf shrub. Communities in the interior plateau and eastern sections with forest and Mediterranean shrub types (Maquis) in the coastal areas.

The general land use problems in the country are in fact similar to other countries in the Near East and involve questions of land tenure misuse of marginal lands, soil depletion and erosion overstocking and poor development of the grazing resource. Most of these problems have been aggravated by a rapid increase in the human population in recent years.

In regard to land tenure the uncontrolled right of villages to free grazing on the rangelands and the absence of any corresponding obligations on their part to maintain these ranges in satisfactory condition have been two of the main factors which have caused serious depletion of native ranges.

Cultivation of marginal lands has been most common in the interior plateau but has also occurred on shallow stony slopes in the Aegean area. The bad effects of this marginal use include soil erosion and depletion poor economic returns and the withdrawal of large areas from range use.

Lack of integration of cultivated agriculture with livestock production is also the normal pattern. As in other countries in the region excessive amounts of land are in unproductive fallow.

The Government has however realized the need for a major effort in the range and fodder crop field and good research work has been carried out to find suitable species for reseeding depleted ranges and for introducing forage crops on fallow lands. The introduction of Sainfoin in rotation with rainfed cereal crops in the Anatolian plateau has been especially successful and native alfalfa's and wheatgrasses have been developed in the eastern region for re-seeding ranges.

Results have been especially impressive in Eskishehir Province where seed multiplication of selected strains of wheatgrasses have been undertaken on a village basis.

However for the improved use and protection of existing ranges steps are needed to involve villages in farming groups or associations that will be responsible for controlling the time of grazing and stocking on communal grazing lands as well as promoting the cultivation of forage crops on adjacent fallow land.

II. Range Management Assistance Programmes in the Near East

1) Major role of FAO in the past 25 years

Although the USAID and other organizations have been active in assisting and promoting range development in the region it can be safely said that for the past 25 years FAO has provided the bulk of technical assistance in this important field.

In the early phase of the Expanded Technical Assistance Programme FAO responded to Government requests for assistance by providing single experts in specific such as range ecology, range improvement, range management and fodder crop development.

In the field of range ecology valuable work on a continuing basis was done by French ecologist working for FAO in delineating the major bio-climatic zones and their vegetation in Afghanistan, Iran, Lebanon and Syria, and seeds of valuable indigenous forage plants were also collected and multiplied. Similar work has also been carried out by FAO Range Ecologists in Jordan, Kuwait, Iraq and Saudi Arabia. In Saudi Arabia a very useful range site unit map on a scale of 1:2000,000 has been drawn up showing the major occurrence of the specific landforms and their representative vegetation as well as other notes on the climate and elevation. Similar range reconnaissance survey maps on a scale of 1:500,000 or 1:1,000,000 have also been prepared in Kuwait and Iraq and in some cases

range carrying capacities have been indicated for the various major vegetation types. Such maps form a useful basis of range use planning and development and show in simplified form the major range resources of a country.

French ecologists working through FAO have also done major work on mapping the vegetation of North Africa particularly in Algeria, Morocco and Tunisia as well as devising a steppe ranges in these countries.

In the field of fodder crops development FAO also launched in the 1950's a major effort for the regional testing of native and exotic forage plants through its uniform Mediterranean Nurseries Programme. This effort led to increased interest in developing improved forage crops for rainfed and irrigated land, particularly in such countries as Cyprus, Syria and Tunisia.

During this period considerable efforts were also extended to find suitable perennial range grasses for re-seeding depleted rangelands, while in the field of range improvement a number of range exclosures were set up to demonstrate the improved vegetation cover that could ensue from resting ranges from continuous grazing.

In the field of range management a major factor of importance was also the discovery by an FAO Range Management Specialist from Egypt that a system of HEMA protected ranges has been in use for many years in certain areas of the Near East particularly in Saudi Arabia and Syria and that this could be extended to other range areas for applying more effective grazing land management.

In the early 1960's the emergence of the United Nations Special Fund Programme led to the introduction of multidisciplinary projects which were staffed by a number of international specialists in closely related fields. Examples of Special Fund Projects that have given major assistance to Governments in range, pasture and fodder crop development in

recent years include Pasture and Fodder Crops Investigations in Iran (1965-70). The Development of Pastures and Fodder Crops in the High Plateau of Algeria (1968-72). The Rainfed Development of Mixed Farming in Cyprus (1963-69). The Development of Livestock Production in Northern Iraq (1973-76). Range Management and Fodder Crop Cultivation in Central Tunisia (1965-71), and Development of a National Range and Fodder Development Programme in Syria (1967-76). The Creation of a Crop Research and Plant Introduction Centre at Izmir in Turkey (1966-76) also greatly assisted the collection of native ecotypes of forages species in that country and also in other countries in the Near East.

2) Examples of current or recently planned FAO range projects in the region.

Syria

One of the most important FAO range projects now still in operation is SYR/68/001 which is concerned with Range and Fodder Crop Development in the Steppe Region of Syria. This project which was initiated in 1967 for range improvement feeding and finishing of range sheep and also for the promotion of animal and crop husbandry has successfully revived the old Hema system of range use in the form of sheep and range co-operative with fixed range grazing areas and facilities for fattening sheep with supplementary feed available at a fixed price. Improvement of rangeland is being effected through the planting of Atriplex shrubs which are being raised in nurseries and then transplanted to the field. Vetches such as Vicia dasycarpa and V. villosa are also being grown on fallow land for hay production in the region of Aleppo and Kamishli and yields have been as high as 9 tons/ha. As a result of the project activities so far the Syrian Arab Republic is now feeding and finishing enough sheep to meet her domestic mutton consumption demands,

losses of sheep in drought years have been prevented and range deterioration is being halted. The net return per hectare from the introduction of legumes and sheep into the farming system is also reported to be three times as high as that from the traditional cereal fallow system.

An important factor in this project is that the spectacular results have been achieved without a big input of international expertise. Only two FAO Range Management experts have been involved with the programme, one of whom Dr. Draz is still giving continued consultant assistance to the project. This is an excellent example of a project which has mobilized the full support of local counterpart personnel as well as also fully involving the pastoralists in the development programme.

Jordan

As a result of an awareness of the impact of the Syrian range improvement programme and the visit of Dr. Draz to Jordan as an FAO Range Management Consultant the Government of Jordan has recently requested FAO assistance in the field of range management and the stabilization of Nomadic Sheep Husbandry. A project outline has therefore been formulated for UNDP financing. The project will involve developing demonstration and extension work at Government Range and Sheep Centers in the field of grazing land management and utilization forage crop development, establishment of nurseries fodder shrubs and soil and water conservation works. The project will also assist in studies and plans for the integration of nomadic husbandry into the agricultural system as well as in the formulation of specialized co-operatives. FAO will provide the services of a Range Management expert for 5 years, as well as Associate Experts and UN Volunteers to assist the field programme.

Libya

FAO assisted grazing land development projects are presently underway in Tripolitania. These have been established to provide technical advice and to give direction to the Governments range development plans in the Jeffara Plain and Gulf of Sirte regions. As a result of a large scale range survey completed by a French consultant company in Tripolitania the Government of Libya agreed to dividing up large range areas in holding of some 250 ha. each, on which to settle eventually bedouin families and their sheep and goat ~~hands~~ of some 80-90 head each. The programme involved fencing of the rangeland, afforestation and fodder shrub planting, development of fodder crops, range survey and range management plans, improved sheep husbandry and development of co-operatives. FAO has therefore supplied for each region a multidisciplinary team of experts covering all the fields mentioned. The job of each team is to guide the work of sub-contractors in the fencing and shrub tree and forage planting programmes and to survey new range areas for development as well as setting up pilot demonstration range areas where an integrated management system can be properly developed. The preparation of management plans involves preparing an annual feed calender with a programme for supplementing the range forage at various levels of expected deficit utilizing fodder shrubs and trees and barley grain. Biomass measurements on the range are also an important component of the work programme in order that stocking rate and feed deficits can be properly calculated.

Somalia

Recently the Government of Somalia has requested the assistance of FAO in developing their Northern Rangelands which had earlier been assisted by a first phase FAO project. that had to be terminated in 1974 because of the UNDP financial

crisis. Somalia suffered severe losses of livestock in the drought year of 1974-76 and they are anxious to improve their rangelands through the setting up of large drought and rotation range resources in strategic locations. The participation and education of the nomadic pastoralist population is a major objective of the present project which is already underway. A team of FAO experts including a range management specialist a range ecologist and several range training extension specialists with also one farm machinery specialist will be located soon in the Northern province. Range survey and management plans for the setting up and operation of specific range reserves will be discussed with the pastoralists and major attention will be given to in service training programmes for the pastoralists. Shrub planting and soil and water conservation measures to utilize run off water to increase range and forage crop production will also receive attention. The possibilities of setting up pastoralist grazing association based on specific range reserves will also be explored.

3) The role of the World Food Programme(WFP) in assisting
FAO Range Improvement Programmes

The role of WFP has and is continuing to be a vital and crucial element in ensuring the success of FAO assisted range and fodder crop development programmes by providing loans and subsidies to farmers and pastoralists for applying new technical innovations.

In Syria the WFP has provided loans for sheep fattening and grazing co-operatives, for building feed stores, animal health centres, providing seeds of forage crops and seedlings of fodder shrubs and for purchasing stock and financing and fattening of sheep. As a result of these activities a National Revolving Fund has now been established to extend the programme to new areas on a self perpetuating basis.

In the mixed farming project in Cyprus which aimed to substitute mixed cereal/fodder production for the predominantly cereal/fallow rotation the programme was initially given momentum by WFP grain which was given to farmers as compensation for loss of grain in the early stages of the change over to the mixed cereal fodder production system. A revolving credit scheme has now been established, farmer training in milk production techniques introduced, milk recording, testing and marketing programmes established re-seeding fertilizer and fencing subsidies offered and improved breeds of livestock made available. Paralled measures one now also being taken to increase productivity of the range including removal of free-range goats, re-seeding and fertilizer use.

In central Turkey the WFP is also assisting range improvement in forest grazing areas by providing compensation in the form of grain to village livestock farmers who plant forage crops principally sainfoin on their fallow land thus providing extra forage and taking grazing pressure of the forest ranges early in the spring. Spectacular improvements to the growth of the native vegetation on the ranges has ensued.

In Somalia the WFP has and will continue to play a key role in assisting the setting up of drought and rotation range reserves throughout the country by providing food for range guards who will establish and police these range reserves. In the first stage of this WFP project which was completed in 1977 a generally good experience and acceptance by the nomadic pastoralists of the range reserve system was achieved. It is expected that the next phase of the programme will move into a self-help phase whereby the nomadic pastoralists will be more involved in the programme which will include shrub planting and certain soil and water conservation activities.

In the new range development project proposed in Jordan

the WFP is also scheduled to provide substantial financial contribution for the provision of credits for range co-operatives, feed stores, shrub planting and other activities.

4) Programme for the Ecological Management of Arid and Semi-Arid Rangelands (EMASAR)

The EMASAR programme was established as a result of a conference held in Rome in 1975 in which more than 35 countries from Near East and Africa attended. This conference was sponsored by FAO and UNEP and was designed to mobilize resources for the development of an international rangeland programme. At this conference the report and findings of an expert consultation held in some in May 1974 were also discussed. This expert consultation analysed the range situation in the region and proposed guidelines for range development. As a result of the 1978 EMASAR conference an EMASAR secretariat was also set up in the Plant Production and Protection division, FAO, Rome which was responsible for further direction of the programme towards stimulating requests for assistance in range development particularly in the Near East and North Africa.

An EMASAR Phase II project was launched by FAO and UNEP in 1976 which was charged with developing strategies and plans of action in the fields of grazing land management, forage plant development and education and training. This project which was completed in 1978 produced a number of technical documents one of which was volume IV, "Indigenous and arid and semi-arid forage plants of North Africa, the Near and Middle East". Grassland training reports have also been prepared for Afghanistan, Iran and Pakistan in one volume, for Iraq, Syria, Jordan, PDYR, Kuwait and Saudi Arabia in another volume, and for Egypt, Tunisia, Morocco and Algeria in another volume.

A forage plant development programme has also been initiated in Libya for the collectioned evaluation of indigenous

forage plants including grasses, legumes and shrubs. In 1978 more than 2,200 lines mostly of annual medics were collected in Triolitenia and Cyrenanca and the first agronomic evaluation of 75% of Cyrenanca collection is now taking place near Benghazi. In early 1979 emphasis was transferred to the collection of seeds of important native shrubs including Artemisia, Atriplex, Periploca and other useful genera.

It is expected that an ENASAR Phase III project in co-operation with UNEP will be formulated shortly after further evaluation of the EMASAR Phase II project. Shortage of funds has proved a limiting factor in the present EMASAR programme and for this reason Governments have probably been slow to seek assistance from the programme.

EMASAR has however, played a useful role in promoting the concept of integrated development of grazing lands in arid and semi-arid areas and it is expected that the programme will continue to provide a focal point for drawing attention to the need for concerted action to prevent further desertification of rangelands and to catalyse the formulation and development of appropriate grazing land management programmes that will stabilize and improve rangeland production.

III. Integrating the Rangeland and Crop Production and need for national land use policies

Because of the difficulties involved in achieving a rapid increase in animal production off the range increasing emphasis needs to be given to raising fodder production on both irrigated and rainfed land as well as on the greatly increased use of agricultural crop residues and agricultural by-products. If the rising prices for livestock products continues giving a higher return to the producer fodder crop production will become increasingly more attractive in comparison with annual cash crops on irrigated lands.

However at present the greatest potential for increased fodder production lies on the fallow lands in both the 350-450mm rainfall and also the 200-300mm rainfall zones that cover large areas in the Near East. In areas with 300-400mm of annual rainfall the successful cultivation of vetches such as Vicia dasycarpa and V. villosa on the traditional fallow lands in both Cyprus and Syria have demonstrated the high potential that exists for raising forage production on rainfed land and in the drier areas with 200-300 annual rainfall trials are underway with both native and introduced medics to see if these self-seeding annual legumes can be used to produce more forage and raise the soil fertility.

There has for many years been a close connection between the livestock that use the adjacent ranges and the cultivated rainfed crop lands which are used by the some livestock for fallow and stubble grazing. The nomadic or transhumant sheep flocks owners generally pay grazing fees to the owners of the rainfed, or in some cases irrigated lands, for spring fallow and summer cereal stubble grazing.

This system has proved beneficial to adjacent ranges, providing no other sedentary range sheep trespass on them, because it affords a summer rest period to the range before the flocks return to graze them in the autumn.

However if more forage was raised on the rainfed fallow lands as hay, this could provide a better income to the farmer as well as providing supplementary feed for range flocks for use in the autumn and winter thus preventing them grazing the ranges too heavily at this time when new growth is beginning. The same situation also applies in the spring when too early grazing of the ranges can damage new growth and establishment of range plants.

The problem with the annual medics is that they do not provide forage in autumn and early winter, or again early

winter, or again early enough in the spring to meet this need of delayed use of the ranges. To a certain extent rainfed barley can meet this need through the development of varieties that can be grazed once in the autumn and again in the spring without detriment to the grain yield.

Medics if they do prove successful are likely to prove most useful for fattening lambs and thus preventing these lambs going to the range to graze which is the customary practice at this time. Nevertheless medic pastures need very careful management to avoid increased weed development in the successive cereal crop and medic pastures may need mowing to control weeds.

There remains, however, still the argument as to the whether medics are really suited to the lower rainfall zone of 200mm or less where much marginal cereal cultivation is still practised. In view of the wide fluctuations in annual rainfall and the high occurrence of years with poor cereal crops a gradual change over to planting these areas with perennial range shrubs and grasses may in the long term be most desirable. Shrubs such as Atriplex, Salsola and Artemesia can all be established in these zones using appropriate techniques and it remains only to demonstrate that such a programme can rebuild these lands and stabilise the forage production to be expected from them.

There are also other marginal lands in the region which are too steep or rocky and which are serious erosion hazards under continuous cultivation. Proper consideration must therefore be given to the advisability of returning these lands to permanent pasture so as to ensure a wiser and sometimes more productive use of the land.

The need for proper survey of the marginal lands in the region as to their suitability for crop or pasture production highlights the urgent necessity for countries to develop

sound land use policies which aim to properly assess land capability based on soils, topography and rainfall so that adequate measures can be taken to bring about desirable changes in the present land use systems that will produce sustained production and protect arid and semi-arid lands from erosion and desertification.

IV. Role of Range Management in Desertification Control and Rehabilitation

Desertification may be described as the development of desert like landscapes in areas which were once green and supported substantial vegetation. Desertification is a process involving environmental and not just social change.

However evidence of desertification must be supported from the ranges themselves. Range enclosures are good reference points but surveys provide more valid information through monitoring of range condition and trend.

In North Africa surveys carried out between 1957 and 1974 reveal widescale range degradation as do other surveys in Iran and the Sudan. Plant indicator species are important in indicating the process of degradation. The disappearance of three species such as Juniperus excelsior Pistachia atlantica and Quercus brantii over wide areas in the semi-arid zones are the beginning of such a process.

Distinct changes in hydrology due to overgrazing on watersheds increased frequency of floods, loss of top soil through run off and wind erosion, falling well levels due to less infiltration of rainfall as well as increased trampling of the surface soil by livestock are also other important indicators in the process of desertification.

Throughout the region, therefore, a common pattern of desertification emerges which is that misuse of the land may go undetected or even unremarked upon over a period of above average rainfall but is accelerated and made evident by a

prolonged period of drought. For example in the Sudan desertification in the arid zones of the north is estimated to be advancing at the rate of 6Km/year and this situation has undoubtedly been accelerated by the recent and prolonged Sahelian drought.

Because the degree and nature of the vegetation cover on ranges plays such a vital role in preventing and controlling desertification it is clear that range management must play the key role in reversing the process of desertification and helping or rebuild the desert.

Nowhere is this more evident than in depleted range areas in arid and semi-arid areas where successful replantings have been made with arid zone shrubs. Outstanding examples of such rebuilding of the desert may be sited from Iran and Syria where extensive areas of denuded lands have been stabilized by replanting with adapted perennial shrubs.

In N.W. Iran in an area with 150-200mm annual rainfall menaced by shifting sand dunes which in some cases have covered whole villages, thousands of hectares have been rehabilitated by planting the land with seeds and seedlings of shrubs as Atriplex, Calligonum and Haloxylon. In the Syrian steppe too with 120-180mm of annual rainfall the large scale planting of seedlings of Atriplex and Salsola shrubs is permitting the revegetation of large areas of range previously destroyed by ploughing, overgrazing and fuel gathering and as a result of these plantings a resurgence of the native vegetation is also beginning to occur.

Range management has also proved to be the key to successful regeneration of the native vegetation on important watersheds and in depleted forest areas in semi-arid mountain areas in the region.

In selected watersheds in the Elburz and Zagros Mts. in Iran and on depleted ranges in the Caspian Forests of Iran

and the Central Anatolian Plateau of Turkey deferred grazing particularly in spring has produced a spectacular recovery in the growth and vigour of the native vegetation. Where this gain has been consolidated by reduction in the numbers of livestock grazing these areas through, for instance, increased production of forage from adjacent cultivated lands the momentum of this improvement can be maintained.

The reconstruction and maintenance of an adequate perennial vegetation cover on denuded and threatened ranges must therefore be considered as a primary goal in the fight against desertification and effective range management is the principle tool by which this goal may be achieved.