

# Range Management in Iraq— Findings, Plan and Accomplishment

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Invitations to advise Iraq in grazing matters were accepted with misgivings. Iraq is a new country established on an old site under British mandate after World War I. It is now an autonomous kingdom. It is the land of the Caliphs romantically described in the Arabian Nights; Mesopotamia of the Greek and Romans; Babylonia of Old Testament days; Sumeria of Abraham's time, and, according to local tradition, the site of the Garden of Eden. The recorded history of the land covers more than 5,000 years. Still older cultures are being found below great ruins which indicate more ancient peoples.

Range men from a land where livestock grazing is only from 100 to 400 years old might be advising the descendants of those who domesticated the horse, cow, sheep, goat and donkey. The prospect was challenging. The Iraqi leaders had asked that their country be shown how to care better for the many and necessary livestock and still protect a limited and hard pressed grazing resource.

The welcome to Iraq was as warm as the weather. The Iraqi ministries are manned by educated and energetic men who are using income from taxes and oil to build facilities for health, education, improved agriculture and other advantages for the people. Such works were very limited until recently when the discovery of oil gave the

*1. Information for this paper was obtained while the authors were employed in Iraq with the Foreign Operations Administration, now the International Cooperation Administration.*

wherewithal for public expenditures.

Full cooperation was provided by the Ministry of Agriculture in the form of office space, young Iraqi counterparts and means of travel. Field trips were designed to see sample areas of all Iraq at the appropriate season or seasons of the year. The trips were usually joint ventures of the American technicians and their trainee-counterparts. The balance were individual efforts but always with alert, local men.

Administratively, Iraq is made up of 14 provinces called Liwas, and smaller subdivisions. There are also two "desert" Liwas in western Iraq. In each Liwa is a representative of the Crown and agents of many ministries including Agriculture. On the first expedition into each area the political leader was visited. The agricultural agents were our hosts. They are not extension agents but administrative officers who help collect the taxes levied in the form of a percentage of crops. These men devoted their time and interest to our work and, when other accommodations were lacking, entertained in their offices and homes.

## Land Forms

Iraq is roughly the size of Montana, but is much drier. The Tigris and Euphrates rivers enter from the north and join before flowing into the Persian Gulf (Fig. 1). Iraq is chiefly the delta of the rivers which are the lifeblood of the area. The land is flat; Baghdad is 300 miles from salt water but has an elevation of only 110 feet. Half of Iraq is less than 600 feet above

sea level. The uplands from 600 to 1,600 feet occupy the remaining half except for the northern fringe of mountains which are less than 1/16 of the total area of the country. The mountains, which are the home of the Kurdish people, enjoy a much greater interest than their area justifies.

The rivers are large, like the lower Snake and the middle Colorado rivers of this country. Their sources are in the mountainous areas of Turkey. Their chief tributaries in Iraq cut through the mountain ridges where they are being dammed for flood protection and irrigation. At the foot of the mountains, whose peaks rise to 10,000 and 11,000 feet, are broad upland benches which are dry farmed to winter crops of wheat and barley. These upland benches are bounded by parallel ridges of foothills under which oil reserves have been located and brought into production.

The land between the rivers (Mesopotamia or Jezira) is flat and in part overflowed when floods are excessive. A relatively small part is irrigated. The part of the Jezira north of Baghdad produces scant to fair natural vegetation. The portion south of Baghdad supports little or no vegetation except in the swamps, rice lands, and palm gardens which are relatively large and richly vegetated. This part of Iraq is chiefly responsible for Iraq's date crop which is claimed to be 70 percent of the world's commercial crop.

In western Iraq is an area which rises slowly from the Euphrates and is bounded by low-lying hills and mesas which occupy the vague boundary between Iraq and its westerly neighbors Syria, Jordan and Saudi Arabia. This is the Open Country (Badiyah), the home of the bedouins who graze their flocks and camels north and south and to some extent east and west without regard to national boundaries. Flood water runs in just a few wadis in western Iraq. The situation is very different from that on the adjacent border of Jordan

where bare rocks of old lava flows shed water to start flood waters in westerly courses.

The flatness of most of Iraq is a great protection from water erosion. The rains are usually gentle but are heavy on occasion. The hills and lower mountains generally present rounded slopes of old topography even where farming has extended almost to their tops in what is called "shifting cultivation." The high ridges of the mountains are generally steep.

There are some badlands and dissected country. The chief local sources of sediment in the Tigris are the hills and cultivated lands in the Shatt (River) Al-Adhaim drainage. Water spreading among the dry farms might conserve run-off water and decrease the silt which muddied the drinking water of Baghdad in January 1953.

Dust storms occur in Iraq and dust is common in towns and villages. Blowing damage is reduced by the deltaic nature of the soils which are clays generally suitable for brickmaking.

### Livestock

Livestock are everywhere; no land is left ungrazed. The official estimate of the number of livestock in Iraq represents a greater number of animal units than have ever been claimed by any State except Texas. The callings of shepherd and camel driver are in favor with much of the population.

Grazing persists after all grazable vegetation appears to have been consumed. The ranges have a swept appearance. In many instances they are literally swept as women, who have the burden of providing fuel, gather leaves, twigs, grass and manure in their search for something with which to cook. They also dig up bushes or shrubs in the open country and on irrigated lands. Fuel is at a premium in this land of few trees.

The livestock, whether cattle, sheep, goats, camels or water buffalo, are maintained primarily for their milk. Secondary products are power, meat, fiber, hides, etc. There are many owners. It is estimated

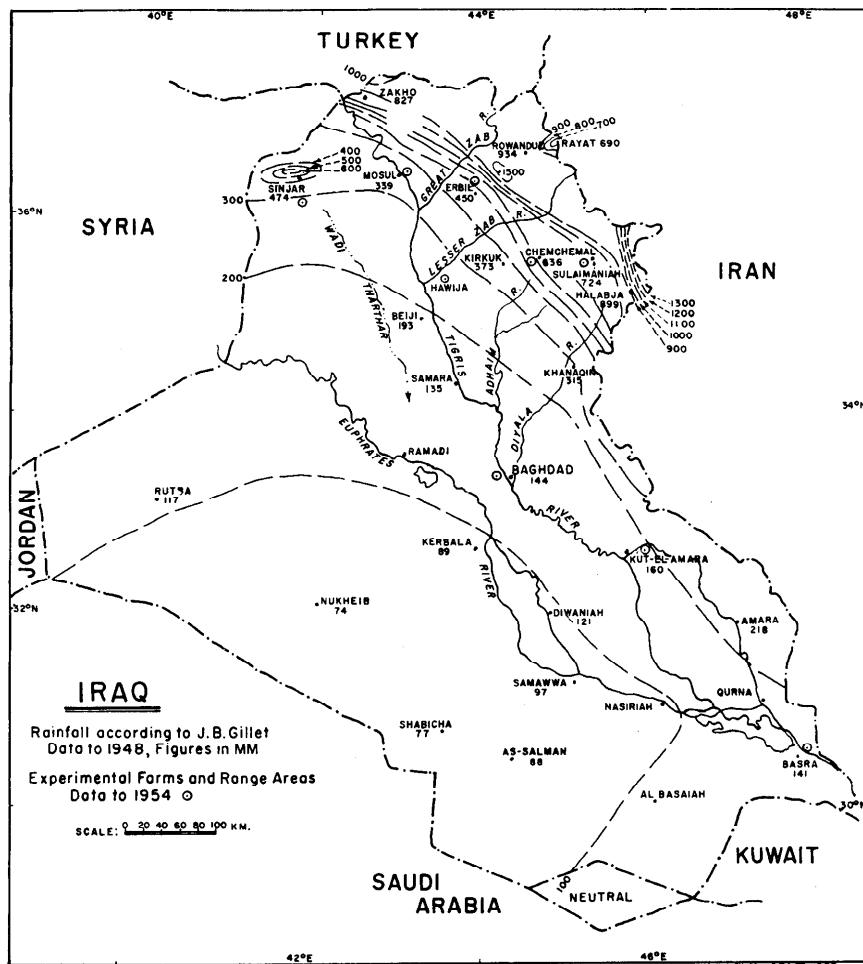


FIGURE 1. Map of Iraq, showing annual rainfall (in mms.) and location of experimental farms and range areas.

that one out of each five persons is the owner of one or more animals. Livestock are the principal possession and livelihood of the bedouin. They provide power and secondary food for the farmers (fellaheen) who live principally on cereals, milk, and tea, and enjoy meat only rarely. There are grazing game, gazelle and other antelope-like animals, wild pigs, wild goats and sheep, and upland and water fowl. The great numbers of these animals indicate that the people cannot afford to shoot their precious firearms.

The Arabian horse provides great satisfaction to the people. The donkey is a patient and efficient servant. Donkeys, mules favored by the Kurds, and horses are lightly fed, heavily laden and roughly treated. All grazing livestock are under constant herd by day and

protected at night, inside tents and dwellings if necessary. During parts of the year the village sheep and goats are bedded on the range. Women and girls assist in herding only during lambing season.

It is apparent that the returns from livestock operations are unnecessarily low. The quality of the stock is not admirable except that they have shown themselves able to live, procreate and produce milk under difficult conditions. The fat-tailed sheep are good examples. This breed stores fat in its tail as the camel develops its hump to tide it over the periods of little feed.

### Forage

The forage or fodder which supports the livestock comes primarily from the cultivated land as aftermath, cereal straw, volunteer

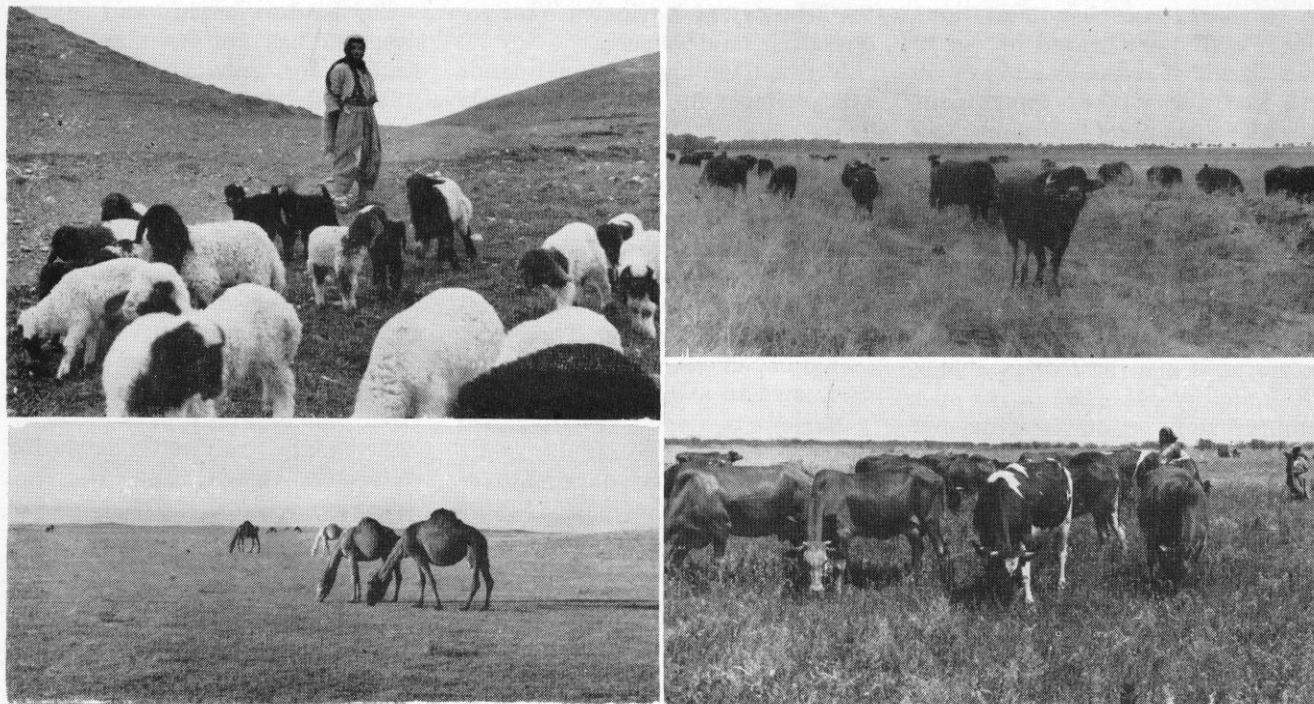


FIGURE 2. Livestock in Iraq. *Upper.* Lambs and Kurdish boy in mountains of north Iraq; water buffalo in neglected field in s. central Iraq. *Lower.* Camel in Jezira, nw. Iraq; dairy herd on irrigated pasture in central Iraq.

growth on fallow land, and from ditch banks and salty, abandoned land. There is great production per unit of land in the irrigated belt as growth is virtually yearlong. The irrigation water produces forage in summer by seepage to low lands. In winter it is helped by rains and dew. On dry-farmed land, production is lighter but the areas are large. In the north the mountains provide abundant forage in season, and in the south an equal area of rice paddies and swamps provides for water buffalo, cattle and sheep.

Native forage on untilled lands is chiefly annual forage produced in winter. Except in the mountains, the winters are propitious, with few days of freezing weather in the north and none in the south. The rainfall is light, reported to range from 4 to 15 inches outside the mountains. In the higher mountains there is snow and total precipitation up to 30 inches, with temperatures forbidding winter growth. During three or four months of winter and early spring most of Iraq becomes green. There are, however, large barren areas which do not produce even in the best years.

Summer comes with six months of no clouds and maximum temperatures uniformly above 100 degrees and reaching 125 degrees. The ripe annual forage dries up entirely and sometimes disappears, but not to the degree that annual vegetation vanishes in southern Arizona. The livestock which were grazing on the winter feed which furnished both feed and water, now gather around the permanent wells in the open country or near the streams or ditches in the farmed belt. There the aftermath and the fallow lands serve well for a while. Then comes a long wait till winter rains provide a new crop.

In the mountains there is a different situation. Near certain villages the livestock remain the year round, getting by when there is snow, with straw (tibben) and oak branches which are gathered green in the fall and brought home to feed the livestock and to provide fuel after the leaves are consumed. In the lower mountains this works well as the green comes in winter, often as a velvety blanket everywhere. Where it is too cold for winter growth there is poor provision for livestock and consider-

able death losses occur. There are also semi-nomadic herds which come out of the mountains in the fall, enjoy winter-grown forage in the lower foothills, and climb the mountains again as summer comes. At the top of the mountains there is excellent summer range along the Iranian border above the oak zone, more than a mile above sea level. The foresters have mapped the 500,000 acres of this treeless, choice range on each side of the border. In addition to a good selection of grasses and browse there are choice forbs including legumes among which is a prostate alfalfa growing rankly in its native haunt.

### Range Use

The average degree of use of the forage is beyond anything expected on U. S. ranges except on heavily-used driveways. The difference in Iraq is that the forage is largely annual. The long dry summers in the delta area almost preclude perennial forage except where extra moisture is available through irrigation, seepage, overflow, etc. In the western open country, in the upper Jezira and near the Iranian border there is a growth of shrubs

at somewhat higher elevations. These plants are grazed by one or more kinds of livestock and are cut for fuel. How they have maintained themselves through the years can only be explained by lack of stock water which has protected some areas. Near the established waters shrubs only rarely persist.

When the first clouds appear in the autumn sky the black tents are readied and the families prepare to move. When the first rain falls, stock and people move to the open country and remain until the forage or the last vestiges of it are so dry that water is required and cannot be reached from any available source.

The same or more pressure is put on the grazing lands near rivers. With delay in winter forage, livestock losses are reported to be as great as 30 percent of the total livestock.

Local students of conservation say that it is incredible that grazing use could have been maintained for many years at the present level. Prior to the establishment of the current central government, tribal wars reduced numbers, there were more camels and horses and fewer sheep and goats, and there was more movement of livestock into what is now Turkey and Iran.

### Farming Helps

Farming makes possible the large numbers of livestock in Iraq. The chief crops are the winter cereals raised on lands which surround the villages but belong to the villagers only in rare cases. Irrigation is expanding through public works and by privately-financed pumping operations. The ratios of dry farm land and irrigated lands to the total land area are greater than such percentages in Utah. Farming operations are either by the crude Middle East wooden plow with its steel point and without the use of a wheeled implement or vehicle, or by modern motorized equipment including big plows and combines of U. S. or Canadian manufacture. A number of power outfits are owned and operated by

the Ministry of Agriculture for co-operating land owners.

The fallow and cropped lands are available for use by livestock. These may be the village herd or herds, or the landlord's or tribal herds. Sometimes the landlord rents his lands to livestock men in the non-farming season. Some bedouins depend upon irrigated lands and adjacent range to provide part-time for their livestock. Those contacted hoped to secure croplands of their own to avoid complications.

Barley is commonly planted using more than the regular quota of seed, to make pasturage for rental to livestock owners. If there is no rental the heavy seeding reduces the grain crop. Fields near Abu Ghraib were watched as they were pastured. Where the use was restrained and irrigation was timely the result was propitious. Otherwise the grain crop suffered. In each case the livestock did well.

The limited supply of water for summer irrigation is generally devoted to date palms, under which are grown other fruits, mainly citrus. Rice and cotton are grown and, near towns and cities, alfalfa. The alfalfa is harvested green and fed daily while still fresh. Practically no crops were encountered except experimental pastures that were planted solely for the grazing of livestock. In a land where legumes are native and abundant none were seen planted to be grazed nor as part of the agricultural rotation for the good of the soil.

### Land Control

It is generally believed that there are 5 million people in Iraq of whom more than 800,000 live in Baghdad. Although higher figures are sometimes quoted, a conservative estimate for livestock of all kinds is 12,000,000 head. No firm figure can be established for a number of years as the nomads move their stock from country to country seeking pasturage. Such movements to and from Iran and Turkey are now quite limited. The order of relative numbers of kinds of stock is: sheep, goats, cattle, donkeys, camels, waterbuffalo and mules.

The land ownership and control situation has not been as closely studied for grazing land as for cultivated land. In both there are questions of tribal, personal and governmental ownership. Time did not permit even fair understanding of the many phases of land ownership and their effects on grazing.

Local rules and customs govern the movement of village or river and bedouin flocks. Severe penalties are threatened or inflicted when the range rules are broken. Each tent or group of tents is an armed camp ready to do battle for its leader (shiek).

### Grazing Research

The term "Grazing" was widely understood but there was no reasonable translation of "range." The Ministry of Agriculture put grazing research under grazing management. The office of Grazing was established in the Library at the Abu Ghraib Experimental Farm, 15 miles west of Baghdad. This arrangement allowed study of the records and review of the collected native vegetation with the curator of the Abu Ghraib herbarium. Grazing research was housed in the same building in the Field Crops Division.

Well trained leaders in agriculture had foreseen their problems, established experimental farms, and initiated studies. Trained assistants were few. An Agricultural College had been established at Abu Ghraib to train young Iraqis. Four American professors arrived to help in advancing the college to bachelor level. Agricultural extensionists were being trained.

The Ministry of Development had been shown the problems of agriculture. That far sighted group, trying to assist the rural people, appropriated 100,000 dinars (1 dinar equals \$2.80) for agricultural research and 1 million dinars for livestock improvement. The funds are available for carefully planned projects approved by both the Ministries of Agriculture and Development.

Grazing and forage research was initiated after the experimen-



FIGURE 3. Upper left. New forage in Jezira (Jaff, Springfield, Sa'adun and bedouin). Upper rt. Range seeding trials near Sinjar. Lower left. Hart of FAO, Bryan, Rawi, Sa'adun, Agricultural Agent, Jaff and hosts in bedouin tent. Lower rt. Smooth brome, tall fescue and tall wheatgrass in forage trials at Abu Ghraib.

tal farms were visited and after a review of their sporadic efforts to study forage. It was found that only at Abu Ghraib was there knowledge of the adaptability and productivity of a few forage plants. There were row-trials of some range and pasture grass and several plantings of alfalfa varieties and berseem (*Trifolium alexandrinum*). Almost no work had been done on the distribution and abundance of natural vegetation. Papers by observers, chiefly botanists, were helpful in making the acquaintance of a rich vegetation new to the Grazing staff but fairly well known to farmers and shepherds. An agricultural bulletin by Evan Guest, 1933, was helpful as it listed many plants by Arabic, English and scientific names, with descriptive material.

Vegetational types were roughly delineated and tentatively classified in preliminary examinations of grazing lands. The principal species were listed, specimens collected for the herbarium, and notes taken concerning their importance for grazing.

One result was the preparation of a tentative list of "*The 100 plants most important to Iraq's livestock*," including plants from the high mountains and dry farmed steppes to the open country and the irrigated lands and swamps of the lower rivers. Perennial plants are less common than annuals and the flora is rich in legumes.

Collection of seed of native grasses and legumes was started in March 1953. It developed into a long-term project and has since continued on a larger scale. Seeds are distributed to: (1) the forage crop section at Abu Ghraib for seed-increase plantings; (2) the range management section for observational tests at experimental range sites; and (3) the Division of Plant Exploration and Introduction, U. S. Department of Agriculture, to repay in part the seed sent to Iraq for experimental purposes.

Long-term plans were developed and initiated for measuring range vegetation at representative sites to provide a basis for sounder evalua-

tion of range conditions and potentials.

The first range reseeding tests were made in March 1953. Forty different species of legumes and grasses were planted in randomized blocks at three sites in northern Iraq. Only a few species, including a few alfalfa varieties, lived through a hot dry summer. The tests, nevertheless, furnished some information about the adaptability of species and showed that another season would be a better time for range reseeding.

A 5-year plan was prepared for the Director-General of Research providing for the selection and fencing of two or more exclosures in each major range type and at least one in each Liwa. Within each exclosure permanent line transects are to be installed and measured at stated intervals. Observational rows of forage species also are to be planted within some exclosures.

The research program for cultivated forage and irrigated pastures progressed rapidly during the first year because there were Iraqis at

Abu Ghraib with training in agronomy and interest in forage plants. A start had been made in 1948-9 by Iraqi technicians with single row plantings of several introduced forage plants. Organized research on cultivated forage began in April 1952 when several well-designed experiments were installed under the direction of an F.O.A. agronomist and his Iraqi counterpart. The long-term research program and plantings were made in part to train in the planning and conduct of experiments along project lines. Planting designs and schedules were set up for a series of plot tests of varieties of alfalfa, berseem, soybeans, sorghum, millet and sudan grass. Observational rows of many other pasture and hay species were planted using local and exotic seed.

Six 1-donum (.6 acre) irrigated pastures were seeded to three legume-grass mixtures, in cooperation with Animal Husbandry. The plantings were grazed at different intervals by sheep or cattle and stocking and utilization records kept. The information obtained provided the basis for recommending mixtures for a 40-donum irrigated pasture which was seeded in October 1953 and for a 200-donum pasture in 1954.

It was demonstrated that grazing research could keep at least a year ahead of range and farm planting programs. The program and personnel requirements were set up on this basis, and excellent talent enlisted for counterpart-training. It appeared impossible adequately to train and inspire the young Iraqis in range management in a land devoid of grazing control. Three young assistant specialists were sent to the States by F.O.A. (I.C.A.) for training and two have gone subsequently on their own initiative and financing but with full official encouragement in their proposed studies. In their places other young men were recruited in the Ministry.

#### Plan for Range Management

The plan resulting from observations, study of former work on

vegetation, and consultations with men of the Ministry and with fellow-technicians, as submitted to the Iraqi government, included the following proposals:

1. To form a Grazing organization in the Ministry of Agriculture to continue examination of range, range research and operations in grazing directed toward grazing management. An organization was suggested that would be on the same footing as Forestry and Veterinary Service.

2. To train personnel in Iraq to the full extent that American technicians could guide them. It was proposed that selected Iraqis be sent to the U. S. for a year of special training or for shorter periods. U. S. training had been given impetus by the attendance of two prominent members of the Ministry at the 6th International Grassland Congress.

3. To continue and enlarge the research program with work in more areas and with more trained Iraqis. In furtherance of the program laboratory equipment, seed, scales for field work, and various materials were ordered from the U. S. using F.O.A. funds.

4. To enlarge the trial plantings of species showing promise on dry and irrigated lands so that Iraqi leaders might be shown the advantages of land planted to forage crops. The means for better planting in areas lacking motor-drawn equipment were provided by ordering from the U. S. horse-drawn bottom plows, harrows, reapers, and necessary harness, collars and single and double trees. A total of \$5,000 was approved as the F.O.A. purchase budget for Grazing in 1952-53.

5. To establish structures and works for the further study of vegetation; to improve the native forage crop by pitting, sandtrapping and water spreading; to establish hay producing farms using new land and water; to build shelters for livestock and store crops; to drill stock watering wells in certain strategic locations in cooperation with the Ministry of Finance; and to do other public works.

6. To introduce legumes into Iraq's crop rotation. The rotation is presently cereal-fallow, cereal-fallow. The Ministry approved initial plantings on experimental farms. The farms proceeded enthusiastically. The plan is to make trial plantings in each Liwa and to establish forage producing farms on new lands in the manner of S.A.R. developments in North Africa. The bases of the suggestion of this revolutionary change are:

- (a) The current use of grazing lands is greater than can be sustained and there is very great dependence of the people and the national economy on livestock and livestock products. There are current measures to increase irrigation. It is therefore more feasible to increase forage supplies than to reduce the livestock.

- (b) The farmland is being deprived of humus and fertilization through lack of return of organic matter to the soil. The production of cereals will be increased rather than diminished by the introduction of legumes, of which several varieties are awaiting planting.

- (c) The legumes will supply a quality feed to protect livestock in drouth periods, increase their production, and avoid the necessity of feeding costly and needed grain. One woman exclaimed, "We must give *our* food to the sheep or they will die."

- (d) Hay is virtually unknown in Iraq and the word has no suitable equivalent in Arabic. Hay will protect livestock in the bad years when winter feed is late. Abuse of grazing lands by early use each year will be lessened. The use of stored feed and pastured aftermath in the farm belt will so improve livestock and living conditions that legume culture will become common and later may be made a requisite for grazing the Crown and tribal lands. In a similar manner, privately produced forage is required in the U. S. to qualify for permits to use Federally-owned range lands. The use of crops produced by the government will be allowed only to those who register their livestock numbers, thus pay-

ing the way for control of numbers.

(e) The added quality in the livestock's ration and its timely use will increase the quantity and quality of production. Greater production can be had from fewer livestock and so effect further protection of the grazing lands. It will open the way for improvement of livestock and greater returns from better breeds and crossbreeds.

### Initial Plantings

Plantings in the fall of 1953 to begin the introduction of legumes into crop rotations were largely successful. Attempts to make hay of the planted crops showed that Iraqis have no concept of hay. Only at one center was good quality hay made and stored on the first trial. Valuable lessons were learned in cutting, handling, and curing various crops. Later attempts were more successful resulting in small forage reserves on each farm available for distribution in 1954. The size of plantings was increased to include at least 40 donums of alfalfa at each center.

The progress in planting and use of forage at the various centers and experimental areas for 1952-54 is shown in Table 1.

### Further Experimentation

Range and forage investigations are underway in experimental forage plots at eight sites. More are planned for the future. The Chemehemal pasture of 16,000 donums, established by Forestry and Animal Husbandry, is to be divided into several pastures for grazing experiments. More irrigated trials were installed at Abu Ghraib and at five branch stations. Dry land tests were put in at two of these stations. Reseedings were made at two experimental range areas. An irrigated forage trial was installed at Basra, near the Persian Gulf, in cooperation with Iraqi and American extension specialists.

A uniform nursery, sponsored by the United Nations Food and Agriculture Organization, was established near Erbil. Seed for this nursery was supplied by member countries of the Mediterranean Working Party on Pasture and

**Table 1. Forage plantings on the experimental farms and range areas. A donum is approximately .6 acre.**

Name of Farm or Enclosure	Location	Approx. Gross Area	Area of Forage Crops & Irrigated Pastures Planted in 1952-53	Area of Forage Crops & Irrigated Pastures in 1954	Number of Exp. Forage Plots 1952-54	Kinds of Livestock Grazed
Abu Ghraib Farm	Central, near Baghdad	donums	donums	donums		
Exp. Station and College		9,000	180	320	625	Dairy cattle and sheep
Hawija Farm	Northern, dry farm belt	5,000	20	100	128	Cattle, sheep, and horses
Bakrajo Farm	Northeast, lower mountains	6,000	20	50	280	Cattle, sheep, goats, and mules
Ninevah Farm	Northwest, wheat belt	800	30	40	48	Cattle, horses, sheep, and goats
Erbil Forest Nursery	North-central wheat belt	100	3	2	349	None
Sinjar Experimental Range Area	Northwest Jezira, marginal farming	80	1	3	150	None
Chemehemal Experimental Farm and Range	Northeast, foothill grassland	16,000	1/2	1	60	Sheep, goats, cattle, and horses
Basra Nursery	Southern, date palm area	200	1	1	80	Dairy cattle and horses

**Fodder Development.** The Director General of Research approved expenditures of special funds of 100 dinars for labor, materials and equipment needed to establish and maintain this nursery during the first year.

Winter months were spent in training Iraqi specialists in analyzing, interpreting and writing up reports of the results of the first year's experiments. Copies of the reports were distributed to Extension, Land Development and other Divisions of the Ministry of Agriculture. Plans were written by team work. In many instances the Iraqi technicians seized the initiative. The plans were prepared in both English and Arabic, using the following outline:

Name of experiment

Names of leaders, assistants, and advisers

Date started and estimated date of completion

Objectives

Procedures

Experimental design

Data to be collected and analysis of results

Estimated costs and land, equipment and materials needed

Long term plans for range management and research developed during the two years included: classification and mapping of the vegetation or inventory of the range resources, range reseeding trials and investigations of the native forage plants, including the collection and production of seed, and plant ecological studies with permanent line transects and photos.

Irrigated forage research was concentrated at the Abu Ghraib Experiment Station, representative

of the irrigated lands of central Iraq. Solving forage production problems on the irrigated lands will go far toward solving the National problem of balancing forage supplies and livestock needs.

Staff requirements for the research program were outlined for a 5-year period to aid the Ministry of Agriculture in the placement of its personnel. Two more botanists and three range management specialists with training in agronomy will be required.

Preliminary data obtained by sampling range forage in June, 1954, following an abnormally wet spring, showed that terracing and other water conservation practices may bring about substantial increases in range forage production. Research plans provide for further tests of various water conservation practices including contour furrows, pitting, range terraces and water spreading in the dry steppe and open country.

#### Budget Approval

Range and forage programs were stimulated in May, 1954 when the initial budget for Development funds, submitted in the summer of 1953, was approved in full in

Further indication of financial backing by the Ministry of Agriculture is the purchase of seed from the United States and England on recommendation of the forage specialist. The amount involved was 500 dinars. The seed are sufficient for the planting programs for 1954 and 1955.

The forage production centers are timely proposals for use of Ministry of Development funds. Land and water allocations are being favorably considered by the Ministry of Development under irrigation projects now building. Other centers will be made possible in the future as the great dams of the mountain area are completed. Placement of the centers will obviate hauling of forage or trailing of livestock.

The 5-year budget for the range management program was prepared and submitted in January 1954. Funds for capital expenditure requested are shown in Table 2.

The range and research programs were reviewed on three separate occasions by other than local technicians. In May 1953, Dr. O. S. Aamodt, technical consultant of the

able for waterspreading, briefed the Iraqi range specialists in the principles and procedures for installing water-spreading systems, and encouraged action on proposals that had been made in that field.

#### Prospects

In another four years with continued support on the current basis, many of the preliminary investigations should be near completion. In the range program, the classification and mapping of the vegetation should be well along. Enough information should accumulate about range reseeding to permit large scale seeding operations where these prove feasible. The collection and production of seeds of native forage plants should be on a relatively large scale. On the other hand, only a small beginning can be expected on the grazing experiments and ecological studies since these by nature require time.

In the spring of 1953 at a meeting of leaders of agriculture in Iraq and American specialists, the question was asked, "How soon can the Iraqi grazing staff carry on the entire program leading toward the development and proper use of the grazing lands of Iraq?" In the language of F.O.A., "When will Grazing in Iraq be institutionalized?" The answer was "A generation." A year later, after training of Iraqis in their own country and in the United States, the counterparts appear more ready to assume responsibilities than was contemplated. Technicians in range management and research have arrived to guide even a larger group of Iraqi specialists.

It can well be estimated that with continued help by the Ministries of Agriculture and Development, and with further leadership by technicians, the time to establish a firm Grazing organization may be reduced to ten years. To accomplish the objectives of developed and conserved grazing lands will require at least half a century. That is the period the United States required to grasp and forward the concept of range conservation.

Table 2. 5-year budget for range management program, exclusive of professional salaries and expenses. Amounts are in dinars

Item	1954	1955	1956	1957	1958
Range and planting program.....	18,160	19,500	21,950	28,670	32,670
Research program .....	1,341	4,973	3,678	4,053	2,753
Forage production centers .....	22,000	50,100	18,000	18,000	18,000

amount of 10,360 dinars (\$29,008). The items enumerated in this budget have been mentioned in the plan.

With the funds, equipment and materials were purchased for planting and research programs. The largest expenditure was for fencing materials. Purchase of a two-ton truck with trailer, disc plow, tandem disc harrow, tiller, drill, scoop and blade terracer enabled the program to move forward faster and independently. Funds were also obligated for the construction of sheds to be built at four centers for storing hay and for protection of livestock.

Agricultural Research Service, helped in reorienting research to put greater emphasis on the legumes and grasses of Iraq. In April 1954, Dr. R. O. Whyte of F.A.O. reviewed the programs and helped lay the groundwork for the Near East Working Party on Pasture and Forage Development. An organizational meeting was scheduled in Baghdad in November 1954. Floyd D. Larson, Bureau of Land Management, and then-president of the American Society of Range Management, examined part of the dry-farmed and rolling grassland areas, just after the flood in April 1954. He pointed out areas suit-