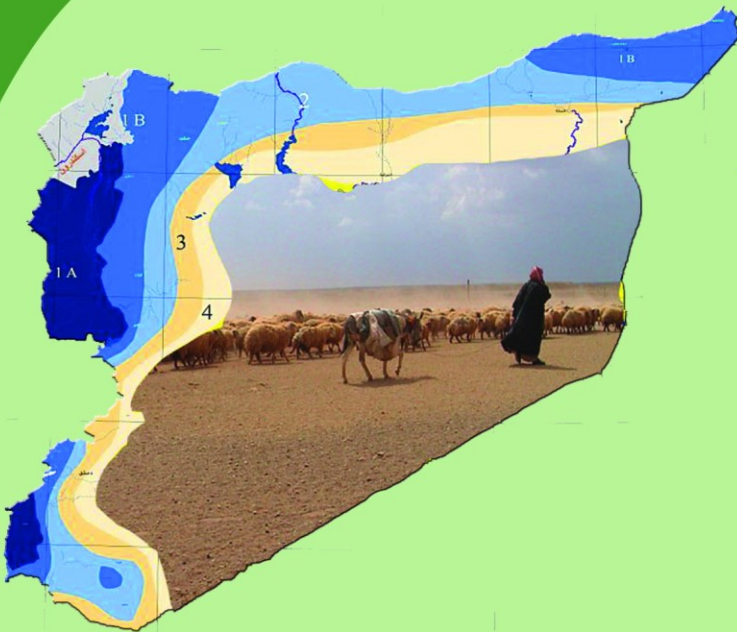


Vulnerability Assessment of Range Sector due to Drought and Climate Changes



Related to the Project Activity

Programs Containing Measures to facilitate Adaptation to Climate Change

Project Title

Enabling activities for preparation of Syria's initial national Communication to the UNFCCC, (Project Nr.00045323).



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Project Title: "Enabling activities for Preparation of Syria's initial National Communication to UNFCCC", (Project Nr. 00045323).

The project implemented in the ministry of local administration and Environment (MLAE)/General Commission of Environmental Affairs (GCEA), in collaboration with Global Environmental Facility (GEF) and United Nation Development Programm (UNDP) in Syria.

Vulnerability Assessment of Range Sector in Syria due to Drought and Climate Change

(INC-SY_V&A_Rangeland -En)

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This report has been approved unanimously by the technical committee, during the Technical Workshop which took place on 24/ 03/ 2009 in the Dedeman Hotel Palmyra.

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1 General information of the Syrian Badia, regarding rangeland and livestock sector.

- **Badia rangeland:** is the extensive range area that cannot sustain any farming cultivation or agricultural settlement due to lack of enough rain. Although the Badia is, a state land but pastoral groups have traditionally enjoyed access to grazing rights.
- **Pastoral groups:** defined as the people who move with their livestock from one place to another all year round searching for pasture and water. Those who move all year round are called pastoral nomads while those who move part of the year are called pastoral transhumant.
- **Area:** 10 280 000 ha and occupies 55.1 of the country total area.
- **Climate:** Rainfall in the Badia is erratic, starting from October and ending in May. The variation in annual average precipitation is great and reaches one to seven. Most of the rain falls from December throughout February. In addition, the variation in monthly average is high. A study of appraisal of drought conditions in the steppe during 1970- 1977 indicated that 2 years out of 8 were very dry, and January is the coldest month while July and August are the hottest. The number of days where maximum temperature reaches above 40 C° ranges from 0 to 40 days, and for above 35 C° from 100 to 160 days. The number of days, where minimum temperature gets less than 10 C° ranges from 160-200 days, and for less than 5 C° is from 80 to 120 days. The highest humidity occurs in January with an average of 70 to 80 %, and then it decreases to reach its minimum 30- 35 % in July and August. The annual rate of evaporation is about 2250 mm.

Also ecologically, the Badia can be divided into three ecological zones. The Badia mountain zone where its altitude lies between 500- 1000 m and catch up most of the Badia rainfall (+200 mm). This mountain range divides Al-Badia into the northern- Western steppe plain where rainfall is \pm 175mm and the southern-Eastern semi-desert plateau where the annual rainfall is less than 125mm. Thus, in fact and as it is expected that the most vulnerable area is the southern-eastern area (Al-Hamad). Vulnerability decreases from south-west to north-west.

- **Major topography:** 46.2 % of the total Badia area lies between 200- 500 m above sea level, while 50 % lies between 500- 1000 m and 3.8 % above 1000 m.
- **Soil:** Soil is an influential factor in plant habitats and growth. Unfortunately, the soil is permanently exposed to severe wind and water erosion. It is hard to see a piece of land not suffering from degradation. Gullies, soil pedestals around plants, gravel pavement and roots exposure are very common. Crust formation on soil top is common, too. The crust decreases rain infiltration but helps against sheet wind erosion. Soils are high in calcium carbonate and active lime, very poor in organic matter, poor in p and fair in k. Most soils are laid on soft calcareous rocks and some on gypsiferous soft rocks. The biggest constituent of the soil is sand and the smallest is clay. The nature of the major parts is loose while crumb formation is rare; such nature makes the soil very fragile to cultivation and irrigation projects. A major part consists of rolling hills or undulating plains of shallow soil covered with gravel.

- **Water resources in the Badia:** The old resources of water in the Badia (before 1950) were mainly ground cisterns surface wells, Khabras (ground depressions) and Fougaras (under ground canals).
Between 1956 and 1959, 26 wells were drilled and the depth ranged from 100 to 250 m. Only 13 bores were acceptable, the rest were either saline or without water.
Between 1959 and 1964 the Soviet Techno Export conducted geological and geophysical survey in 60 % of the Badia. Sixty-two bores were drilled with total depth of 15400 m and average depth of 270m. 36 bores were equipped and installed and the rest failed.
The earth dams activity (1966- 1975) came because of discouraging bores operation. The Ministry of Public Work and Water Resources estimated that the volume of run off in the Badia was 150 millions m³/ year and loss by evaporation and seepage was 30 %. 24 dams were constructed with annual storage of 9 million m³. The recent water capacity is as follow 37 earth dams of 70 mm³, plus 199 bores of 158 m³/ hour with 5 working hours/ day, 34 dug out of each 100000 m³, 28000 licensed and unlicensed wells.
- **Major ecosystems in the Badia:** there are 3 ecosystems in the Syrian steppe:
 - a. The plains and plateaus where vegetation consists of:
 - Anabasis syriaca: Artemesia herba-alba
 - Haloxylon articulatum: Achillea fragrantissima
 - Haloxylon salicornicum: Salsola vermiculata
 - Noaea mucronata: Poa sinaica
 - Herbs
 - b. The mountains where vegetation consists of:
 - Pistacia atlantica: Poa sinaica
 - Rhamnus palaestina: Salsola vermiculata
 - Stipa barbata: Herbs
 - c. Oasis where cultivation takes place.

As for vegetation mapping in Syria it is worth noting the following:

- a. 1957 H. Pabot. FAO ecologist had drawn a plant zones map of Syria.
- b. 1959 L. Rodin, Professor in Leningrads University had drawn a tentative map of plant associations of the major part of the Syrian steppes.
- c. M. N. Sankary of ACSAD had outlined the vegetation map of Syria in the late seventies.
- d. Project GCB/ SYR/ 001/ ITA, Palmyra 1996 by A. Masri had mapped the plant associations of Tallila project, scale 1/ 50000 using Landsat May 1993 scales 1/ 100000.

In general vegetation mapping cannot help much with regard to drought vulnerability as much as if the frozen legislation act number 140 for 1970 to be applied by the P.U i.e. to stop trespass on coops rangeland. Vegetation mapping is useful to follow up changes in vegetation cover.

- ***Socio-economics of the pastoral communities:*** The project of range and establishments of a wild life reserve (GCP/ SYR/ 003/ ITA 19992000) conducted surveys and the findings are:
 - Sheep ownership: 25 % own less than 100 heads, 30 % own from 100- 200 heads, 25 % own from 200 to 300 heads and 20 % own over 300 heads.
 - House type: 61 % use tents, 15 % havehouses, and 24 % have both.
 - Machine ownership (truck, tractor, car): 80% own one kind or more and 20 % own no machines.
 - Occupation: 83 % is occupied in sheep production.
 - Illiteracy: is 85 % in men 96 % in women, 76 % in male children, and 83 % in female children.
 - Awareness for recent government instruction for stopping illegal and legal plowing in AL-Badia: 72 % perceive that the purpose is to improve the range and arrest desertification.
 - People who cultivate in the project area: 63 %, out of which 87 % have rain fed farming (54 % cultivate barley, and declared that they have not harvested or harvested at least one crop during the last ten years).
 - Standard of living: 11 % are poor (shepherds or guards with flock size from 0- 100) and have no machines. 25 % are rich (flock size over 500 + truck + car + house in the city + commercial place + cash + Gulf relationship).
 - Pastoralist presence in AL Badia: 23 % stay for 2- 4 months, 41 % for 5- 7 m, 20 % for 8- 10 m, and 16 % for whole year.
 - Members who have a licensed piece of land for cultivation: 63 %.
- ***The status of pastoral woman:*** The project survey 1999-2000 revealed that:
 - Percentage of women membership in the coops is two.
 - Percentage of illiteracy is 96 %, health knowledge is limited, but she is alert and knowledgeable.
 - Percentage of awareness in family planning: 0 %
 - 49 % own few heads of sheep (3- 6)
 - Most of them marry at an age between 15 and 20.
 - She is burdened with work and apart from the homemaker duties helps in milking, milk processing, hand feeding and fire wood collection.
- ***Improvement of woman status:*** The status can be improved mainly if the rangelands can be improved. The increase in herbage will tend to reduce hand feeding and distant movements as well as more income to buy oil fuel instead of fuel gathering and also to buy equipment for milk processing. Also range development will give the pastoral woman more time for income generation through activities such as embroidery, woven rugs for tourists, medicinal plants and truffle gathering and marketing.

2 Facts on social consideration of pastorals in the Badia till the Second World War (SWW).

- ***Bedouins and nomadic life style:*** Since the dawn of history, man in Syria has settled down and practiced cultivation. This was possible whenever and wherever adequate rain or water was available. However, the major part of Syria (over 55 %) characterized by erratic precipitation creating an arid and semi-arid environment.

Therefore, people have developed a nomadic lifestyle as Bedouins and the grazing of domestic animals as a dominant economic pattern.

Nomads are recognized as the oldest cultural tradition in the Arabian Peninsula and are characterized as the desert fighters and the great herders of camels. Bedouins are proud of the grazing life and settlement never attracted them as long as their herds were well fed. Permanent settlement, cultivation and even sheep rearing are indications to the nomads of defeat or loss in the battle of desert life.

It is very common to find in the old Arab literature poetry and prose rich scenes dignifying the nomad and crowning him with nobility and heroism. Thus, many Arabs are proud in tracing their ancestors to the nomadic tribes.

- **Nomadism and range management:** undoubtedly, nomadism is a well adapted way of desert life that cleverly utilizes the fragile conditions of unstable arid vegetation, and could well be considered the most efficient way to harvest the scarce botanical resources over wide areas with minimum damage. In others, nomadism is a sound form of grazing management that ensures the re-vegetation processes.

In the face of such physical conditions, only an adaptive personality and psychology, knowledge of the desert and the other ingenious methods he has employed, have made it possible for the Bedouins to survive. A highly developed sense of respect for tradition and custom historically produced a controlled distribution of livestock over the available grazing areas. Each group was conscious that it was utilizing a productive resource, which had to be maintained, and thus a simple form of grazing management evolved which tended to maintain a balance between livestock and grazing resources. They are very knowledgeable with regard to plant taxonomy, ecology and livestock nutrition

- **Land tenure:** An Ancient Arab geographer (*Istakhry*, 4th Century Hegri) who surveyed the Arabian Peninsula in a book called *Al Masalik* noted that “Between Iraq, Yemen and Alsham (old Syria, Lebanon and Palestine), all the places that I came across belonged to a group of Arabs who used it for grazing and water, except places between Alyamamah (South of Najd in Saudi Arabia) and Bahrain, where the land had no water, people or pasture. These lands are desert and neither possessed nor inhabited. These uninhabited lands are known as the empty quarter”. It is worth mentioning that up to 1958, the “*Urf*” “unwritten law” and the state had recognized the tribal grazing rights.

- **Boundaries between cultivated land and communities grazing lands:** Records indicate that until 1940-1950 Syrian range lands were in harmony with productive livestock. Settlement of Bedouins before that date used to take place only when there was enough rain or water for sustained crop production.

In other words archaeological documents indicate that there was no rainfed cultivation beyond the 250 -200 mm isohyets before 1940.

- **Bedouin organization and legislation:** In order for Bedouins to adapt themselves to the severe environmental conditions, Bedouin society evolved its own laws, regulations and customs and its own organization of tribes, clans and sub-clans based on blood relationships and common ancestral origin. Each tribe maintained possession of its resources and its rights to grazing (under the names of *Mnazel*, *Al-Dyar* and *Hema*), and negotiated when necessary with other tribes the movement of its herds to more favorable grazing areas during periods of drought.

The *sheikh* (chief) of the tribe is unanimously obeyed and respected by all members. The position of a sheikh is either inherited or acquired, thanks to capability and merits. The sheikh embodies the legislative and executive authority of the group and represents the tribe in relation to the state. He is often the main dispute settler and the main judge,

but this role can also be played by other expert judges (*Arafeh*) in the tribe. Each clan is headed by sub-sheikhs who are the main consultants for the tribal sheikh. The social structure of the tribe is well organized and easy to deal with. The Bedouin organization and legislation had played a good role in natural resources management.

- ***The tribes are the nations and the rangelands are the states:*** Since range vegetation is the primary natural resource providing a living in the arid zones, Bedouins through their tribal social system were responsible for defending their rangelands as if there were no civil administration at all. Any trespassing on their grazing lands without visa or other forms of explicit permission was considered an occupation by force. The existence of the well-adapted famous breeds of horses, camels, and sheep is a witness and proof for the forage availability at that time.
- ***The Bedouins rotational grazing of steppe rangelands:*** before 1940, camels and sheep herds used to move to the steppe area at the onset of the autumn rains when drinking water became available for livestock. Later when the water supply dried up at the end of the rainy season in late spring, the herds moved back to the rainfed area where drinking water, crop residue of barley, wheat, cotton, beet root, fallow and mountain grazing resources were available.

In short, the tribal grazing rotation was the most effective factors for the regeneration of forage plants.

- ***The estimated number of pastoral communities before 1950:*** was less than 0.4 million out of 3 million total population, shepherding 2- 3 million of sheep and 0.5 million of camels. The town merchants were the major partners as capital suppliers.
- ***The investment rate of livestock in the steppe:*** the rate of animal profitability for range livestock was around 35 percent. This figure is provided by livestock merchants in towns who used to invest their money by financing together with their Bedouin partners. The huge rate of investment was due to absence of feed and water cost.
- ***The importance of pastoral communities:*** The pastoral communities in Syria are important not only because they are almost self- sufficient in terms of daily food, but also because they supply the urban areas with a great part of their requirements in animal products.
- ***Wildlife, livestock and plant situation:*** documents indicate that until the Second World War (SWW) flocks of gazelles were seen on the Syrian Badia. The vegetation was composed of climax plants such as; *Salsola vermiculata*, *A. leucoclada*, *A herba-alba*, and *Stipa barbata*. The pastorals with their herds used to move to Al-Badia at the onset of autumn rains when drinking water became available for livestock. Later when water supply dried up at the end of the rainy season in late spring, the herds moved back to rainfed areas where drinking water, stubbles and crop residue, fallow and mountain grazing resources were available. The big interference in the harmony of the Badia ecosystem was limited wheat cultivation for the supply of the allies' armies during the (SWW).

Conclusion:

In short the pastoral Hema system that was supported by the Government tribal law and lack of water in the summer were probably the most effective factors for permitting regeneration of forage plants but on the other hand drought with absence of concentrated feed and quick transportation as emergency and lack of veterinary services used to have a negative impact on livestock but the drought that caused a great vulnerability to the herds had kept the grazing capacity and number of livestock in balance.

3 The current rangeland status or the tragedy of no man's land tenure**3.1 The abolition of the tribal law and the termination of grazing rights**

After (SWWII) the national administration had intended to settle the Bedouins thinking that Al-Badia would sustain dry farming, thus encouraging the sale of rangelands. In the mean time, some political parties have been after pastoral votes had pressed on the administration to free the pastorals from their sheiks institution. Thus, abolishing tribal law in 1958, led into to the absence of grazing rights. It can be concluded that the replacement of allocated grazing lands tenure by no-man's land tenure has opened the door widely for all range degradation symptoms, say, plowing, early and overgrazing, uprooting the shrubs and randomized vehicles treading. The deterioration of *AL-Badia* was accelerated by the coincidence of machine introduction with the open access tenure system.

3.2. The decrease in biomass and the increase of dependency of livestock on concentrate feed and sharp change in the micro climate

Range livestock was almost dependent on range plants till 1958 when the concentrate feeds were introduced for the first time. The rate of feed used increased in magnitude of 25, 50, 75 % in the sixth, seventh and eighth decade respectively, in 1979 *Boykinand* and *Khour* estimated the deficit of 1.156 thousand tons of total digestible nutrients (T.D.N) for range and fattened sheep, in other words feed production from crop, residues, pasture rangeland and other resources would need to increase a total of about 44 % if the current of sheep are to be maintained at adequate nutritional level.

The denudation of plant cover has caused an unfavorable change in microclimate in terms of less shadow, less of seedling protection, more in extreme temperature, moisture, evaporation, run off, soil erosion and lower rate of penetration.

The decrease of range biomass has unfortunately been diagnosed by policy makers as due to lack of rainfall and not to common land tenure and therefore many pseudo projects such as water bores, subsidized feed, and credits were launched for AL-Badia communities, nothing was harvested but desertification.

3.2.1 Role of government in providing feed and the policies applied

The government organizations and policies dealing with feed availability:

The role of the general organization of feed (GOF). Its role is mainly by purchasing the barley crop from the farmers at profitable prices in most of the areas and selling it to livestock owners without profit. Also (GOF) purchases the by-product from the concerned agency. GOF divides the

Available feed resources on livestock number, thus fixing the feed share for different animals. In 2007 the shares for milking cow was 50 kg/ month, for range sheep was

12 kg barley + 12 kg bran + 2 kg cotton cake + 2 kg cotton hulls per season. Livestock is sent either for (GOF) for sales or to the feed revolving fund (FRF) for credit.

The number of livestock is checked by the P.U and (GOF). The number of FRF has been frozen by the Prime Minister due to heavy unpaid debts granted to the coops through the P.U advice. Had the P.U been wise and firm with the coops (i.e. to receive their feed just after the barley harvest and on mutual guarantee, the feed availability will be maintained without black market and it will help a lot in drought combat).

3.2.2 The percentage between crop residue, range (forage) and feed.

It is estimated by *F. Khouri* and *C. Boykin* (US department of Agriculture 1979 in a draft report titled “assessment of range and livestock resources”) that the proportion of sheep feed resources (%) was (in normal year) as follows: grains 15.2 , straw 1.8, stubbles 20.1 residues 5, by products 6.5, pasture 0.9, fallow land 3.4, rangeland 47.1.

FAO estimated in 1998 (drought) that 46 % of coops members used feed concentrate for 3-5 months (m) and 41 % for 6-8m and 7 % 9- 10 m and 4 % for 0 m.

International Center for Agricultural Research in The Dry Areas (ICARDA) assessed that crop residue has dropped by 30 % in the dry year, i.e. from 4797 kg/ ha of wheat straw to 1728 kg/ ha. Thus since the range biomass per ha was estimated as 165 kg/ ha in normal and dropped to 12 kg/ ha in drought year (30mm of rainfall). It is expected that the range resources will drop from 47.1 % in normal year to about 3 % in severe drought.

A study carried in northern Badia of Jordan on the effect of 98- 99 droughts stated the following: Rangeland contribution to the feeding calendar of sheep and goat was 33.9 % and 9.7 % before and during the drought, i.e. Reduction of 59 %.

Thus, since no range management has been applied by the P.U particularly with rangeland tenure, rehabilitation and proper grazing system, it is expected that the biomass contribution will be on the continuous decrease.

3.2.3. Kind and numbers of animal in are most vulnerable to drought or frost as well as possible climate change.

The drought mission 1998 has classified the herd into three classes and estimated the number of their livestock and the impact of drought as follows:

Table (1): Classes of animals in are most Vulnerable to drought

Flock type	Number of heads (million)	Vulnerability of drought
Pastoral flock	10.5	Seriously
Unstable village flock	2.75	Badly
Stable village flock	1.75	hardly

Source: The drought mission 1998

3.3 The socio-economic features as a result of open land tenure:

The practices of no man’s land tenure have resulted in many negative socio- economic features such as:

- a- Reduced potential grazing area through encouraging unsustainable farming that led to a creation of neither sound agricultural community nor pastoral ones in addition to burdening the administration with urban services.
- b- Obliging some tribal men to plough the traditional potential flood plains and share

with merchants in gambling cultivation where the merchants are often the losers and the local Bedouins are always the winners.

- c- The replacement of grazing rights by barley cultivation rights.
- d- The decline in grazing forage has resulted in a low sheep income, thus small sheep herders with no capital for water truck is expected to loose ground in AL-Badia, while big owners of 400+ sheep with trucks, keep roaming in AL-Badia all year round causing eradication of summer new growth of potential shrubs.

3.4 Strength and weakness for sustainable livestock in the Badia Strength:

- Potential for microclimate improvement through range management and rehabilitation.
- Relatively good average rainfall.
- Easy transportation across the Badia.
- Potential for water harvesting and water spreading.
- Opportunities for micro – catchments.

Weakness:

- Land tenure issues.
- Lack of re-vegetation and range improvement initiatives.
- Endangered flora and fauna.

4. Range productivity on different ecological sites in relation to rainfall and under open, managed, and rehabilitated conditions

- *Vanderveen* (FAO, 1966) and (*A. Masri* as counterpart) in a carrying capacity trial from 1963 to 1966 at *Wadi Alazib* station (under management) in the western part of the *Badia* (175 mm of annual rainfall) found that, the dry biomass was 1724 kg/ ha in the valley bottoms and 738 kg/ ha in other places as spring and autumn cuttings. Variation was big from one year to another.
- The Soviet study in the mid eighties estimated the dry biomass by less than 200 kg/ ha in the eastern part of the *Badia*, under open grazing.
- The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) study in (1981) estimated the average spring and autumn biomass for 17 sites west of Palmyra by 194.32 kg/ ha, under open grazing.
- The biomass samples taken in the Talila managed areas of 127 mm of annual rain during July- August 1994 showed:
 - At the sites where *H. salicornicum* shrubs (palatable by camels, but not by sheep) are dominant, Biomass production varied from 875 to 1112 kg/ ha while outside the reserve it varied from 224 to 120 kg/ ha.
 - At flood plain of *A. herba alba* association Biomass production reached 550 kg/ ha.
 - At flood plain of *H. articulaum* and *A. syriaca* (not grazed by livestock except in drought and at winter time) Biomass production was 750 kg/ ha.
 - At *Mouteit* flood plain where it indicated salinity, the main shrubs were *A. syriaca*, *Seidlitzia rosmarinus*, *H. salicornicum* and *Chenolea arabica* and Biomass production reached 620 kg/ ha.
 - On the elevated shrubs plateaus, the biomass of available herbs varied from 20 to 250 and it increased to 800 kg/ ha where *Salsola volkensi* dominates.
 - While in Jordan (*Lajoun* range station) studies estimated a carrying capacity of 0.06 dry ewe per ha under open grazing, and could be increased to 0.45 under

management and even to 0.65 under rehabilitation by planting.

In general: the increase in range biomass was 7.5 folds under management and 10.8 under rehabilitation.

4.1 Sheep sector contribution to the national economy

It was estimated that the number of sheep in 1998 was 14,5 million with the value of production (table 2), but the number of exported live sheep was 134,000.

Table (2): Sheep's Value of Production in 1998

	Milk (in 1000 L)	Meat (in 1000 Ton)
	4.33	113
Value in billion Syrian Pound	9.3- 10.5	16- 19

Table (3): Development of total animal species number 1995- 2006 (thousand/ head)

Year/ Species	1995	2000	2004	2005	2006
Sheep	12079	13998	17900	19651	21380
Camels	6.7	13.3	20.4	23.4	26.7

5. The national plan and activities of range development from 1974 till the recent time

This period is called the return to no man's land tenure or to range degradation by costly projects.

5.1 The national plan objectives:

- Restoration of rangelands through protection and shrubs plantation.
- Provision of Al-Badia inhabitants and livestock with water through well drilling, earth dam construction and excavations.
- Feed reserve policy against drought and feed assistance for livestock herders.
- Prevention of unlicensed cultivation of rangelands.
- Wild life conservation and socio economy of the pastoral communities (P.C).
- Veterinary service support.

For execution of the above mentioned objectives the following were achieved:

- Establishment of 504 coops.
- Establishment of 13 range nurseries.
- Establishment of 68 protected areas of 97000 ha.
- Gazelle and Oryx number in Tallila reserve is totaling 444 and 99 heads respectively.
- Establishment of 4 Oasis of 236 ha.

The number of water bores is 236. The area of protected sites could serve as a safety valve against drought and frost and also it can reduce the feed gap during lack of herbage.

Unfortunately, its role against drought and frost is very limited due to the following facts:

- a. Its small acreage compared with the high number of livestock (20 million).
- b. It is being grazed before the seed formation stage, causing what is known as early or harmful grazing time.

5.2 The annual national plan 2007- 2008

- Production of 15 million seedlings.
- Range seed collection of 100 tons.
- Direct range/ reseeding of 8850 ha.
- Plantation of 30.000 ha.

6. Legislation and policy

Due to the deterioration of rangeland because of open land tenure the Government through Ministry of Agriculture and Agrarian Reform (MAAR) issued legislation act No 140 for 1970, encouraging local pastoral communities to manage their communal rangeland under the umbrella of cooperative system .Fines were stated against trespass and also against plowing the rangeland. Also legislation act No. 62 for 2006 was issued, instead of act No. 140 for 1970. It is mainly concerned with the regulation of *Al-Badia* land authorities and ownership. Fines for trespass on coops, and state protected land where heavily increased. As a state policy, the Government has launched numerous projects say, feed reserve and subsidized feed through the General Organization of Feed, ten years loans for feed stores building and feed credits through the feed revolving fund, establishment of sheep fattening coops, free range rehabilitation, free drinking water for livestock and free veterinary services.

Unfortunately to say, that the launched projects as a state policy were unfruitful, but have led to more desertification due to lack of any official organization to adopt or apply the mentioned legislation.

6.1 Institutional setting.

The national institutions concerned with Al-Badia development are the following:

- *Al-Badia* directorate, established in 1957, and then it was amalgamated with the directorate of animal husbandry till 1970 where it was reestablished.
- The peasant union (P.U) was established in 1974 when all the range and fattening cooperatives were attached to.
- General commission of Al-Badia development (established 2008) is attached to the Prime Minister office.

7. The impact of drought on rangeland

Factors limiting rangeland production:

- Annual precipitation and distribution during the growth season.
- Prevailing temperature during the growth season.
- Topographic, slope- directions
- Chemical and physical soil characters.
- Plant prevailing types.
- Exploitation methods.

Since total annual precipitation and distribution during growth season, as the most effective factors in biomass productivity, an analytical study of the available annual rainfall data and its impact on rangeland was carried out as follow:

- Assessment of the annual rainfall for a period of fifty years (1958-2008) in the three main ecological zones i.e. Tanef station for the southern part, Palmyra for

the midland and Wadi-Alazib for the northern-western part where the average annual precipitation are 101, 135 and 175 for the mentioned meteorological stations respectively.

- Assessment of the monthly precipitation for the period (1980- 2008).
- For assessment of dryness degree or strength, the annual precipitation were classified as follow:
 - a) From 90- 110 mm annual rainfall, the season is considered as dry.
 - b) From 65- 90 mm, the season as very dry.
 - c) Less than 65 mm, the season as disastrous.

Conclusion:

The study is shown in figures from 1 to 9:

- *For Al Tanef Station the number of disastrous seasons was 10 out of 50 years (20%) While the number of very dry seasons were ten.*
- *For Palmyra the number of disastrous seasons were 5 (10 %) while number of very dry season was 5 (10%).*
- *For Wadi Alazib the Disastrous seasons were 2 and very dry seasons were 3.*

Moreover studies and observation have indicated the importance of the autumn rainfall for the biomass productions, especially on the annual forage, while the perennial production was related to the total rainfall. Therefor studies should be carried out on the effect of rainfall as total, distribution, season and intensity on biomass production. Such studies are useful for drought management and for an early warning system.

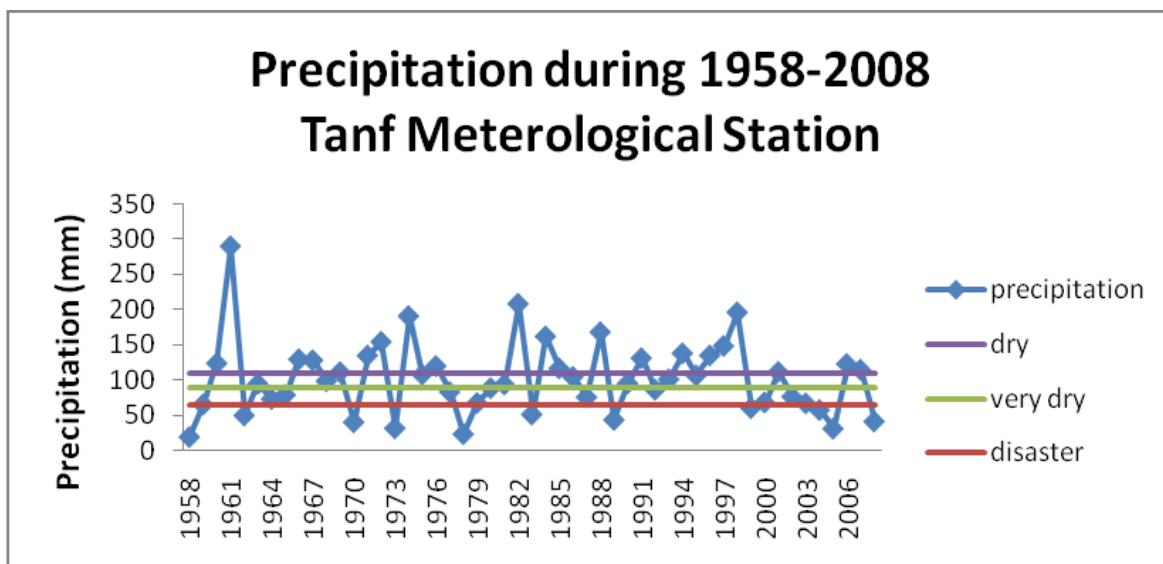


Fig. (1): Precipitation during 1958- 2008- *Tanf* Meteorological Station

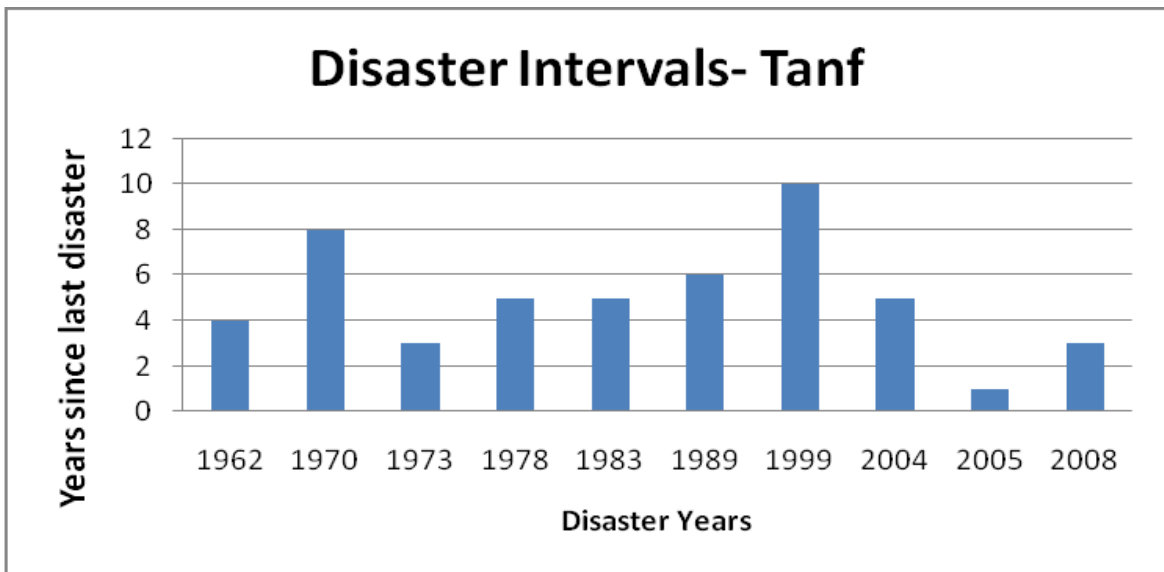


Fig. (2): Disaster Intervals- Tanf

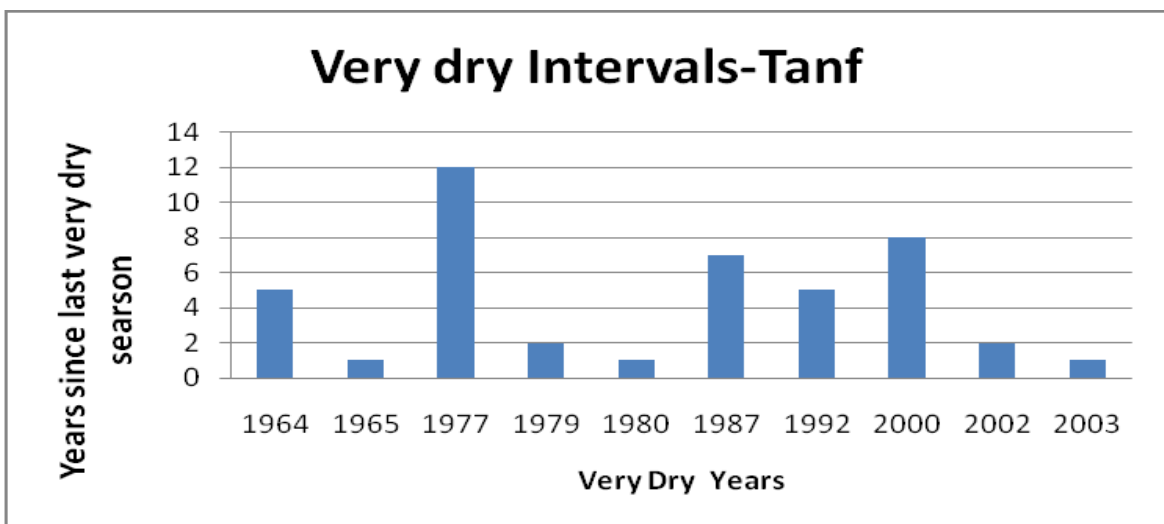


Fig. (3): Very Dry Intervals- Tanf

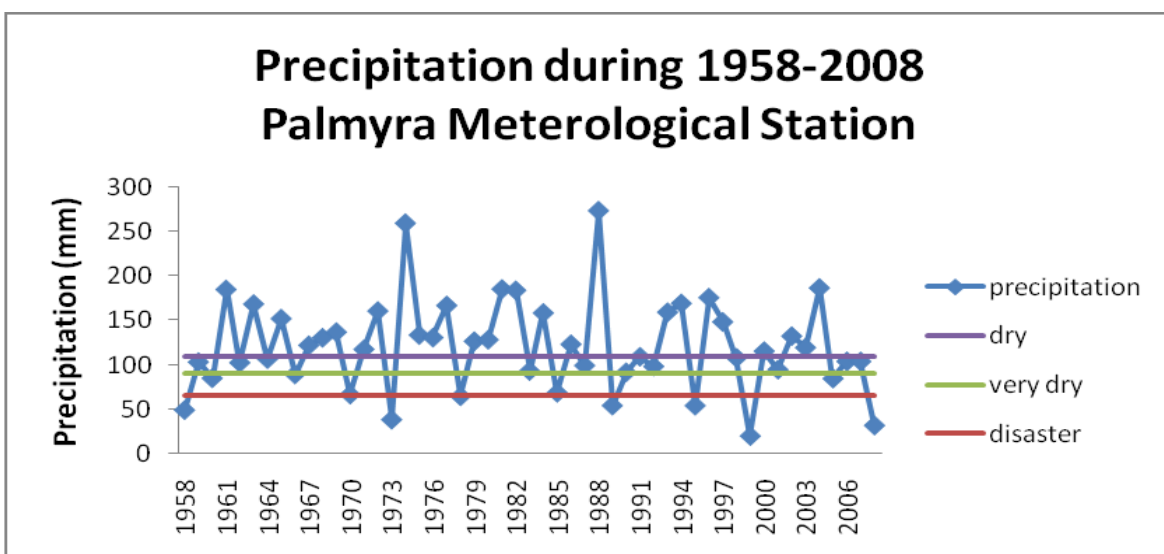


Fig. (4): Precipitation during 1958- 2008- Palmyra Meteorological Station

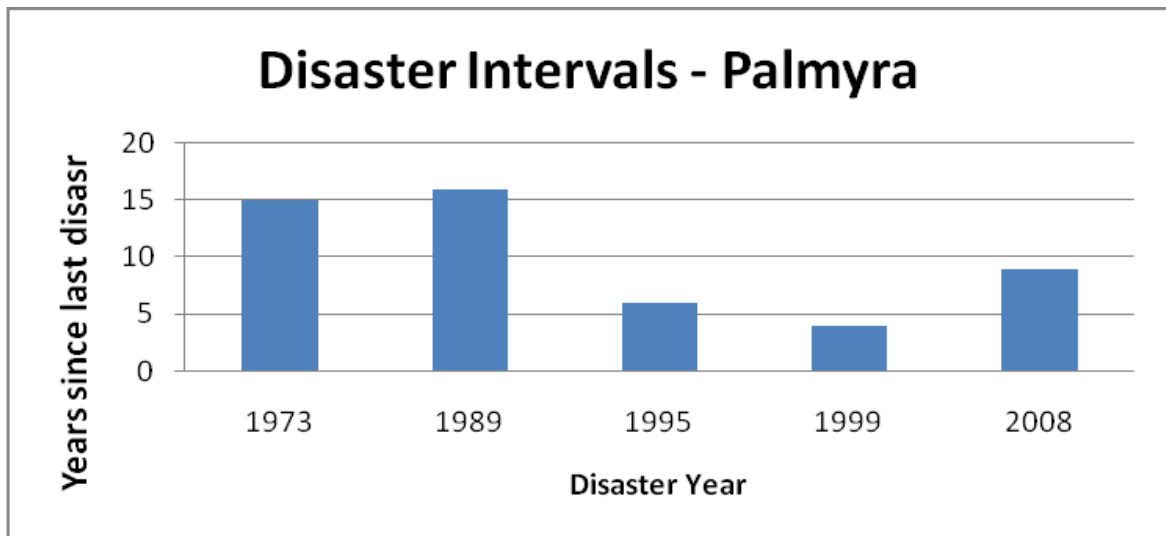


Fig. (5): Disaster Intervals- Palmyra

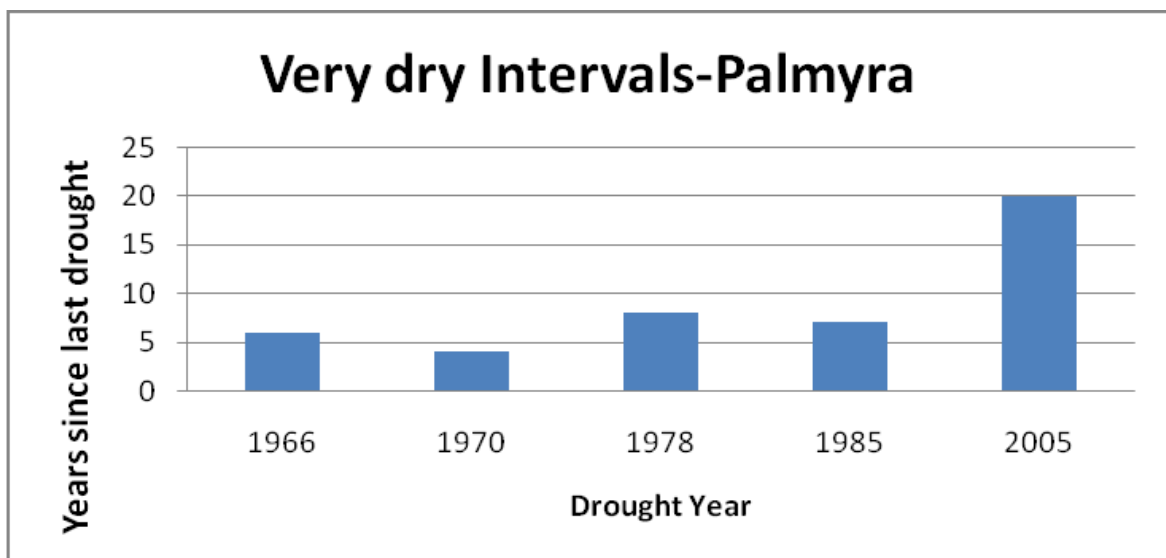


Fig. (6): Very dry Intervals- Palmyra

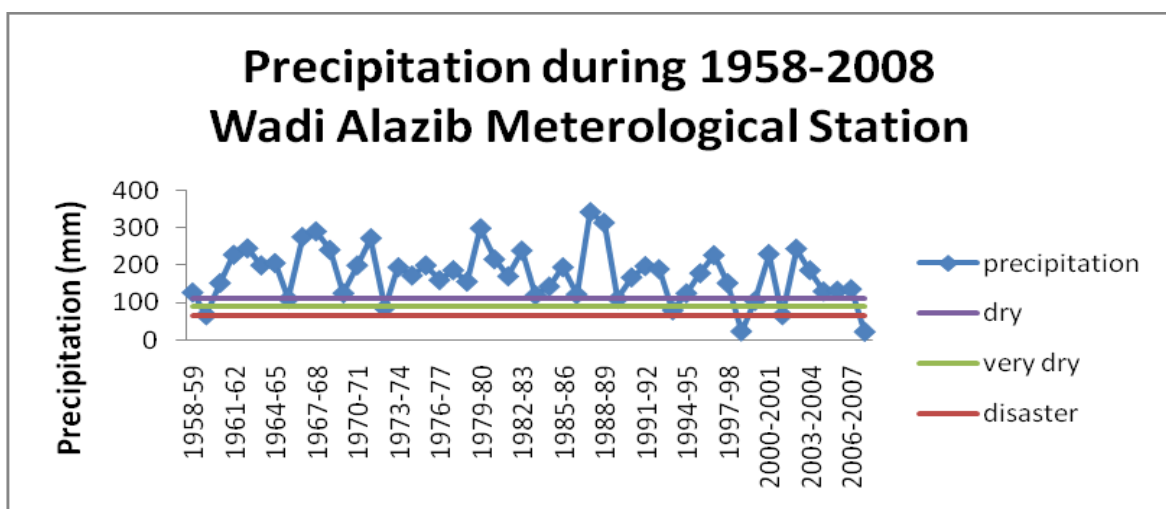


Fig. (7): Precipitation during 1958- 2008- Wadi Alazib Meteorological Station

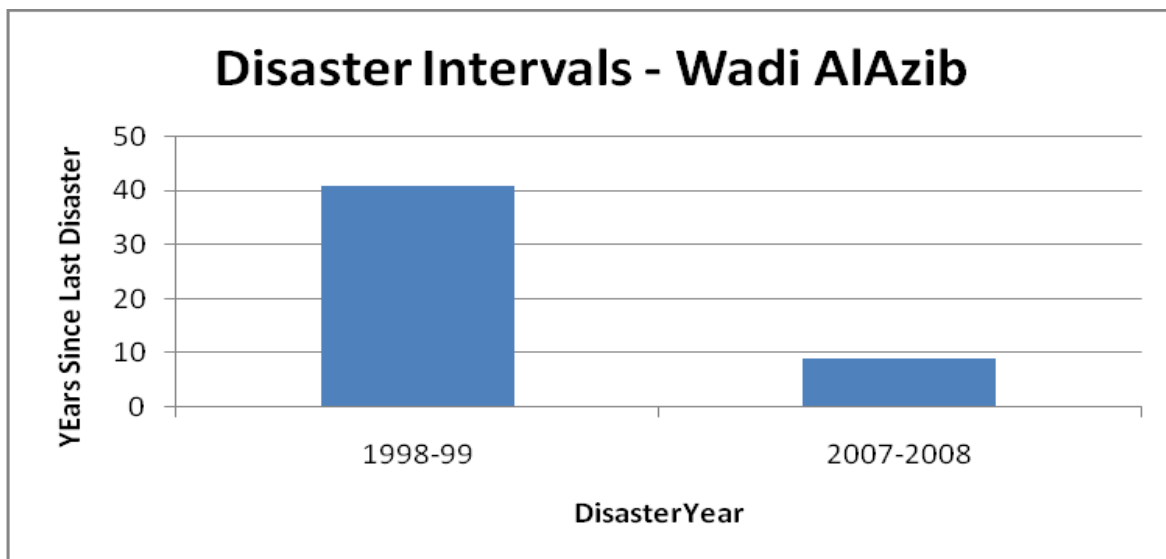


Fig. (8): Disaster Intervals- Wadi Alazib

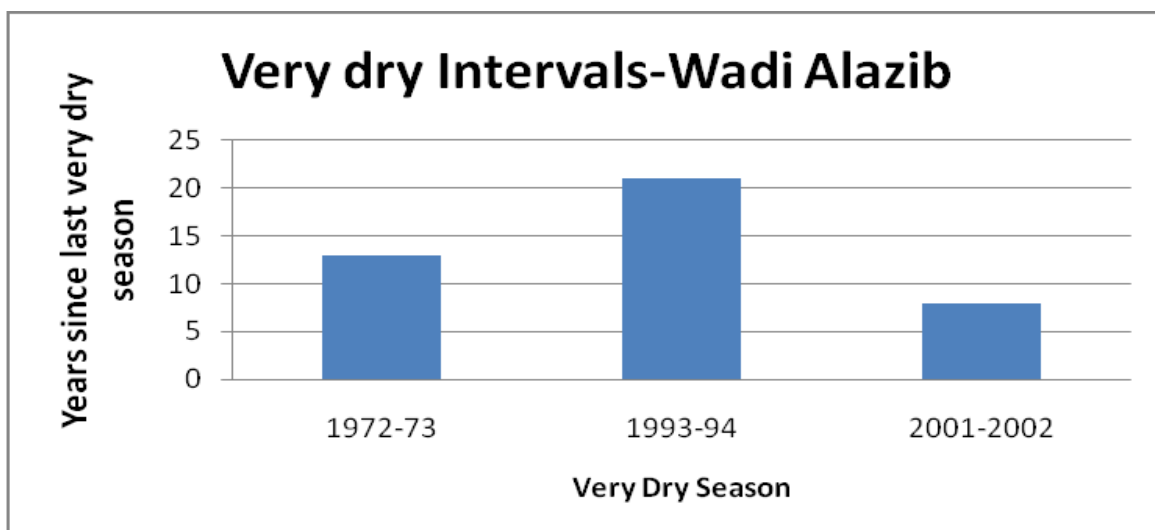


Fig. (9): Very dry Intervals- Wadi Alazib

7. The impact of drought on rangeland.

7.1 An analytical study of 89/ 99 drought in the Badia

Definition of drought; Drought is defined as an extended period of exceptional aridity beyond that which can reasonably be allowed for in normal management planning and practice.

The drought phenomenon in season 98/ 99

Drought is a complex phenomenon which considered as one of the environmental problems affecting Syria. The impact of drought could be seen in all agricultural activities with various degrees.

The main impacts of drought on agricultural activities:

- Considering that 75 % of the cultivated areas are rain fed, any shortage of rain will definitely affect all rain fed crops.

- Livestock is clearly affected by drought especially sheep because they graze basically on rangelands, barley which is the main source of concentrate feeds and on crop residues. Drought affects rangelands as well as feeds barley production because most pastures are in settlement zone V and barley is grown in areas with low rainfalls.

The agricultural season 98/99 was characterized by the following:

- Annual rainfalls dropped in most parts of the country to a level that was unprecedented for more than 25 years.
- The rainy season was short. Rain started late by more than a month and stopped early in most areas.
- Rainfalls varied from one area to another where rain shortage was extremely noticeable in the northeastern, eastern and southern regions. For example, rainfall of settlement zone I was higher in the north than in the midland and the southern regions.

The effect of drought on rangelands for the season 98/ 99

In order to analyze the rainfall situation for the season 98/ 99 the average rainfall data for the two periods 1980/ 1998, 1998/ 2008 were monitored in the following geographical areas:

- The northern part of the *Badia (Wadi Al Azib)*
- the middle part of the *Badia (Palmyra)*
- The southern part of the *Badia (Tanf)*

Table (4): average rainfall data for the two periods 1980/ 1998 and 1998/ 2008 in The Northern region

Settlement zone	Monitoring station	The average for the period 80/81-97/98	The season 98-99	The season 07-08	The percentage of the season 98-99 to the average of the 80/81-97/98 %	The percentage of the season 07-08 to the average of the 80/81-97/98 %
5	<i>Wadi Alazib</i>	201	25	23.5	12.4	11.7

Table (5): average rainfall data for the two periods 1980/ 1998 and 1998/ 2008 in The Southern region

Settlement zone	Monitoring station	The average for the period 80/81-97/98	The season 98-99	The season 07-08	The percentage of the season 98-99 to the average of the 80/81-97/98 %	The percentage of the season 07-08 to the average of the 80/81-97/98 %
5	<i>Tanf</i>	115	46	42	40	37

Table (6): average rainfall data for the two periods 1980/ 1998 and 1998/ 2008 in The Midland region

Settlement zone	Monitoring station	The average for the period 80/81-97/98	The season 98-99	The season 07-08	The percentage of the season 98-99 to the average of the 80/81-97/98 %	The percentage of the season 07-08 to the average of the 80/81-97/98 %
5	<i>Palmyra</i>	135	29	36	21	27

The data mentioned above indicate the following:

- All geographic areas especially the northeastern, the southern and the midland regions are affected by drought. However, the drought effect was less in the northern western region (*Wadi Alazzib*)
- Settlement zone V (the area of rangelands) where the most badly hit by drought. Precipitation recorded by Palmyra meteorological station in 1997, 1998, 1999 and 2000 was 198, 181, 27, and 71 mm, respectively. The corresponding forage production for the same years was 2019, 2369, 178, and 144 kg DM/ ha, respectively.
- In general, the drought wave which hit Syria in the season 98/ 99 was the worst in more than 20 years.

The Government measures for drought alleviation:

The government tried to help through distributing amounts of loan-feeds to herder. It also provided free veterinary medicines and vaccines. However, the overall picture is grim for the herds and their productivity, and herders incurred huge losses which they might not be able to recover for several seasons to come.

The effect of drought on the livestock and sheep owners:

Primary estimations carried out by the Badia Directorate in Syria indicated that sheep mortality rate both in the original herd and the new born animals was high this year and was many folds more than the average rate for ordinary years.

Sheep prices deteriorated as a result of high supply due to the selling of sheep even ewes for slaughter, in order to ease the burden of finding feed for them and to generate some income to cover for the household expenses and to provide feed for the rest of the herd.

Milk production also deteriorated and was about 15 kg per a milking ewe, even though the average in ordinary years ranges between 60-70 kg. All those losses are to be added to the huge losses resulting from buying feeds all year round for at least a full year, which would lead to the depletion of the capitals of most herders and live- stock owners.

The following is a summary of the main direct herders' losses:.

1. Death of Newborns: Number of sheep was 15 million of which the productive sheep was 65 % i.e. 9.75 million. The death of newborn composed 80% from the productive sheep.

$$9.75 \text{ million} \times 80\% \text{ from productive sheep} = 7.8 \text{ million newborn}$$

Average mortality is 5 % in normal cases, but in the current season, particularly in the fall birth rate reached 35 % with an increase of 30 %.the weight estimated at sale is 35 kg at 70 SP/ Kg.

$$7.8 \text{ million} \times 30\% \times 35 \text{ kg} \times 70 \text{ SP} = \text{Sp } 5.7 \text{ billion.}$$

2. Mature sheep mortality: Sheep population in this category was 9.75 million with an average mortality rate of 2 % in normal circumstances. During this season it reached 12% i with an increase of 10 % on the normal average at a weight of 45 kg/ head at a cost of 60 SP kg.

$$9.75 \text{ million heads} \times 10\% \times 45\text{kg/head} \times 60 \text{ SP/kg} = \text{Sp } 2.6 \text{ billion.}$$

3. Milk losses:

Productive sheep were 7.8 million each produced 60 kgs in normal circumstance. During this season, production reached 15 kg/head with a decline of 45 kg at a cost of 20 SP/kg.

$$7.8 \text{ million heads} \times 45\text{kg/head} \times 20 \text{ sp/kg} = \text{SP } 7 \text{ billion.}$$

4. Wool production losses:

Average production per head is 2.5 kg in normal circumstances. During this season it declined by 1.5 kg. at a cost of 40 Sp/ kg.

$$9 \text{ million heads} / 1.5 \text{ kg} \times 40 \text{ SP/kg} = \text{Sp } 540 \text{ million.}$$

5. Losses due to increased fodder consumption:

Each head requires 360 fodder units out of which 180 fodder units are provided free from natural grazing in normal years and the rest is provided in the form of concentrates and crops residues. During this season 360 fodder units were provided, i.e at an increase of 180 fodder unit per head at a cost of 8.5 SP for each fodder unit including transport fees.

$$15 \text{ million heads} \times 180 \text{ fodder units} \times 8.5 \text{ SP/fodder unit} = \text{SP } 22.9 \text{ billion.}$$

Therefore, a total direct loss incurred by Syrian herders was 38.7 billion Syrian pounds. Indirect losses included decline sheep prices to less than 50 % from the normal prices, decrease in sheep weight and fertility, and increase of mobility and migration cost which are difficult to estimate directly.

In general, the socio economic situation of herders is very difficult as a result of continuing drought and the agonies they faced from constant movement, fodder acquisition and low productivity in addition to absence of markets to sell their sheep favorably.

The size and number of sheep flocks have increased substantially over the last three decades with corresponding greater pressure on the range resources from both livestock and human population. The increased availability of water tankers and trucks for transport of animals has allowed even more effective and in many cases destructive utilization of the range resources.

Impact and Implications of Recent Drought for Drought Policy

By February 2000, some of the impact of the drought included:

1. Increased indebtedness of the livestock producers.
2. Decreased size and value of producers' herds and flocks.
3. Increased number of non-viable family livestock enterprises particularly amongst sheep producing families.
4. Substantially decreased livestock family incomes.
5. Overgrazed, depleted and less productive Badia, and
6. Decreased productivity potential of the national herd and flock.

Government programs to alleviate impact of the drought include:

1. Providing extra rations to sheep producers on a subsidized and deferred payment basis.
2. Providing extra financial resources to feed the Fodder Fund and price support.
3. Increasing credits from the Cooperative Agricultural Bank for in-kind loans, through Farmer Cooperatives, for feed and fodder.
4. Authorizing the General Establishment for Cereals Trade and Processing to import additional barley to meet local demand, but the Establishment did not import barely because imports were made by the private sector covered the local demand.
5. Authorizing grazing of conservation areas in the Badia.

6. Allowing the private sector to import feed, particularly barely.
7. Allowing the Farmers Association and the General Establishment of Meat to export Awassi sheep to the Gulf with exemptions to the two for one sheep import export requirement.

Several key factors need to be considered in developing a drought policy which makes the most efficient use of government support while ensuring such support is delivered equitably. A drought policy would be expected to have the possible aim to encourage farmers to manage droughts and difficult seasons (periods of unusually low rainfall) from their own resources, just as they do for other livestock production activities. Traditionally livestock producers, without government intervention, adjusted livestock numbers, sought alternative grazing areas in difficult periods and/or purchased more feed for their animals. A drought policy would ideally encourage greater self reliance or greater financial self sufficiency. The current approach is encouraging greater dependency on the government with a number of adverse effects.

Interest Subsidies:

Generally, interest subsidies indirectly penalize more successful farmers who make provisions for droughts through building up cash or other reserves. They also encourage higher levels of debt for the less prepared, making their livestock business more vulnerable to failure. However, most of the livestock producers are small holders who can hardly keep a reserve for drought.

Entitlements to benefits from interest subsidies or to repayment moratoria are assessed on the number of sheep owned by a livestock producer. Hence, as confirmed through informal discussions in the field, a major share of the government drought relief support is being received by the larger and more financially able livestock producers.

Conclusions and Recommendations

To be able to meet the future demand for livestock products, Syria's livestock productions will need to improve substantially in terms of per-animal yield, increasing flock and herd populations which is the alternative, will lead to lower per-animal yields due to lower levels of nutrition per productive animal.

The strategy for improving Syria's livestock feed deficit involves:

- Increased integration of crop and livestock production systems.
- Improved management of common grazing lands, including introduction of appropriate forms of land tenure for common grazing land users.
- Integrated and multi-disciplinary approaches to improving the production and utilization of feed and fodders.
- Elimination of unnecessary restrictions on the trade of feed and fodders.

8. National drought policy and strategy.

As for the national drought policy and strategy, there were many attempts to draw the plans and policies. One was under the project of early warning system for drought. The project has planted a number of meteorological stations in the Badia for rainfall and temperature data collection. Mr. *Jim Sweet* as (FAO) expert in the project has planned a national drought policy and strategy. It is worth going through it:

The national drought strategy has three overall goals:

- ✓ Reduction vulnerability to drought.
- ✓ Minimize the impacts of drought.
- ✓ Facilitate post- drought recovery.

Specific objectives

- ✓ Distinguish between aridity and drought.
- ✓ Collect, analyses and disseminate drought related information in a timely and systematic manner.
- ✓ Identify and priorities the most vulnerable zones , production systems and population groups.
- ✓ Identify appropriate interventions to reduce vulnerabilities and drought impacts.
- ✓ Maintain household food security.
- ✓ Preserve reproductive capacity of flocks and herds in drought affected areas.
- ✓ Ensure adequate water supplies.
- ✓ Minimize degradation.
- ✓ Re- Establish crops and flocks after drought.
- ✓ Finance drought relief programs.

Key principles

- ✓ Drought cannot be avoided but its impacts can be reduced by timely and effective intervention.
- ✓ The determination of drought condition will be based upon objective climatic, agricultural, hydrological, and socio- economic criteria.
- ✓ Conditions must be beyond normal range of dryness to trigger relief measures.
- ✓ The government responses to drought will be according to severity
- ✓ Government assistance for dealing with drought will be prioritized to the most vulnerable population groups.

Meteorological drought: A meteorological drought will be declared in a particular location when the cumulative rainfall to date in the current season is less than determined percentage of the long term average for the same period in that location. e.g rainfall to date is less than the 10 % probability value or less than 50 % of the long term mean.

Drought index: The cumulative rainfall deficit will be expressed as a drought index to enable comparisons between areas of different rainfalls, as well as monitoring over time.

Identifying drought: Early warning system

- Identify drought-related stress areas and population groups.
- Assess the stage, scale and extent of drought stress.
- Alert authorities and local population.

Indicators; Provide information:

- Availability of grazing and water.
- Crop and livestock productivity.
- Trends in marketing and economics.
- Household food security and nutritional status.

Drought stages

- **Normal**- Indicators remain generally within expected seasonal ranges.
- **Alert**- Environmental indicators markedly below normal.
- **Alarm**- Environmental and rural economy indicators markedly below normal.
- **Emergency**- Environmental, rural economy and human welfare indicators markedly below normal.

However, the whole program should be geared to avoid reaching the emergency stage, which would mean that the strategy had failed.

Responses to drought: Government assistance and strategies in time of drought should be based on four distinct programs:

- Food security and human health.
- Assistance to livestock owners.
- Assistance to crop farmers.
- Emergency water supply.

Contingency plans to be prepared by the (NDTF; The National Disaster Task Force) become action plans when drought declared

Food security and human health

Drought stage/ Intervention possibility:

- **Alert**: food for work, cash for work
- **Alarm**: as above, food vouchers, school feeding programs
- **Emergency**: as above, food distribution, emergency healthcare

Assistance to livestock owners

The principle strategy in assisting livestock keepers should be to facilitate and encourage the sale of livestock before they lose too much condition to command a reasonable price, or become too weak to walk to market.

Drought stage/ Intervention possibility

- **Alert**: open reserves and protected areas, subsidies, credit or loans for feed
- **Alarm**: as above Incentives to sell livestock, Fodder distribution, assist movement of L.S, feed or water.
- **Emergency**: as above, Mobile slaughter facilities.

Assistance to crop farmer

- Generally limited to post-drought recovery measures.
- Crop loss compensation considered.

Emergency water supply

Drought stage/ Intervention possibility

- **Alert**: No response
- **Alarm**: assessment of water supply and demand
- **Emergency**: water transport, Emergency water development or reticulation.

Post-drought recovery

Assist farmers back to self-sufficiency

- Credit, loans, subsidies or vouchers to purchase essential inputs.
- Provision of essential inputs.

Assistance to livestock keepers: Main requirement is stock replacement

- Credit or loans to buy replacements.
- Restocking.

Assistance to crop farmers

Main requirement is seed or seedlings

- Credit or loans to buy inputs.
- Vouchers.

Reducing vulnerability

- Promote drought mitigating technologies and practices.
- Conduct drought related research.
- Create a favorable socio- economic climate for responsible Build up.
- Built up reserves.

Drought Mitigation practices

- Use adapted crops and livestock.
- Early maturing, low water demand crop varieties.
- Improved irrigation efficiency and water harvesting.
- Sustainable range management.
- Fodder reserve.

Drought related research and extension

- Drought mitigation technologies & practices.
- Livestock hardiness & Water requirement.
- Rainfall/ drought forecasting.
- Remote Sensing (RS) and (GIS) Geological Information System for mapping & monitoring.
- Post-drought evaluations.

Favorable for sound management practices

- Incentives for sound management practices.
- Disincentives for unsustainable ones.
- Policies on land tenure, land use, water use, subsidies, marketing and taxation e.g. open access of rangelands.
- Future policy oriented away from subsidies and towards livestock ownership carrying a realistic cost.

Strategic reserves

- Reserves of essential commodities or the fund to purchase them.
- Financial reserves also needed for recovery.
- Build up strategic reserves at national, district and household level.
- Establish a national drought fund.
- Promote improved storage.
- Farmers accept more responsibility drought planning.

Implementation of the Policy & Strategy

- Establish inter- ministerial National Drought Steering Committee.
- Establish a National Drought Task Force.
- Criteria for drought relief and recovery assistance.
- Contingency plans for each stage of drought alert.
- Guidelines on assistance for drought recovery.
- Recommendations on reducing drought vulnerability.
- Lines of responsibility for implementing drought relief.

Funding procedures

- Establish a National Drought Fund.
- Technical committee to make recommendations.

Links to other institutions

The Government recognizes that: Technologies are evolving over time

- drought are regional
- various institutes & agencies have experience relevant to managing drought in Syria

Reporter comments:

- 1- Mirreh (FAO, 2000) in a report dealing with towards formulation of drought management policies and strategies mentioned that the available meteorological data were not sufficient to prepare an early warning system for drought declaration but permitted to define which year should be considered dry: with an average of 127 mm of annual rainfall, dry years will have less than 110 mm and more than 90, very dry years will have less than 90 mm and more than 65. Years with less than 65 mm of rain fall are to be considered disaster years: such disastrous years have been recorded 1 in 6 years out of the 42 years examined.
- 2- It is hard to combat drought, climate and microclimate changes without security grazing rights for the pastoral communities and also without convincing the herders to receive their feed shares from (GOF) directly after the barley harvest.

9. MAAR plan for range rehabilitation that minimize drought effect on pastoral communities and their livestock:

Just after the issue of the legislative act NO-140 for 1970, MAAR had outlined the plan for range management and stabilization of nomadic sheep husbandry.

The steps of plan were effectively and smoothly applied by the Directorate of *Al-Badia* (D.B) till 1974 when the P.U established. The steps were as follow:

- Establishment of coops based on homogeneity of members.
- Coops Hema boundaries were mapped and demarcated on the ground. The borders were announced in an administrative decree.
- Coops boards were mainly elected from among the sheiks and arafeh (dispute settlers) of the tribe.
- Formulation of grazing committee (GC) representing the different clans, followed by an appointment of distinguished guard through the GC.
- Livestock should quit the Badia in May and return in late autumn because the

continuous grazing of the perennial in summer will exhaust plants by depleting the plant feed storage. Such grazing will eradicate plants and will leave nothing for grazing in late autumn and winter, thus forcing the range users to graze the grass of *Poa sinaica* and annual herbs right after the rain, which will cause another harmful early grazing. It seems that Al-Badiyah plants have been adapted to the traditional grazing rotation since the late geological era, and it can easily be practiced since most of the range users have cultivated lands in the rain fed area where they can improve their family income in beet root and cotton harvest. It should be known that the present all year round grazing might have a negative impact on the fragile ecosystem of Al-Badiyah. Thus the practice of traditional grazing rotation will release grazing pressure, enhance sharply summer range development, and cut sharply on the cost of sheep summer drinking water.

- Since the range vegetation types are mainly divided into three major types: the perennial shrubs, plains of *Poa sinaica* grasses and annual herbs. It was recommended that grazing should not start before the fruiting period of the dominated graze able plants in the vegetation community, and therefore feed should be supplemented when the plants are not ready for grazing. Since feed availability is an important companion for range management operation, a plan for storing feed is necessary. The Feed Revolving fund at MAAR was established for this purpose.
- Grazing can start in late autumn where the perennial shrubs are ripe and then flocks can move to the field which was reserved in the previous season. The perennial grasses plains and annual spring herbs are expected to be ready for grazing round February where flocks can move from one mature field to another and go back if rain conditions allow.

In short it was easy for the Government to tackle most of the difficult problems in the Badia rangelands via the grazing committees based on the following rules:

- The problem of illegal plowhing: The (GC) are the most knowledgeable people to know the trespassers. The legal plowers can continue provided not to exceed the licensed acreage. The illegal plower should have a loan to buy livestock in case he has no other income and then he has to stop plowing.
- The problem of the unlicensed drilled wells for irrigation: They can be treated as the illegal cultivation.
- The early and overgrazing issue: The practice of leaving the Badia rangelands from May till late autumn and the use of hand feed when the dominant range plants are not mature; will guarantee a system of proper grazing.
- The issue of shrub uprooting: Since the shrubs are the feed of the livestock which is the main source of living of the coop members. It was not difficult for the GC to convince the well off members to use oil and for the very few needy people to use farmyard manure, which is an old practice of the Bedouins where shrubs are not available.
- Assessment of water requirement: Bedouins are smart in estimating water resources, and through them the Government could assess the real water requirement and save a lot of water and money.
- Trespass on the Hema: The guard could advice the trespassers to quit, if not, he can contact the police station to report to the court according to the Act 140. But when the trespassers intend not to carry their (ID's), a sheep confiscation equal to the grazed forage (cost of 1 kg of barley /sheep/ day) can do the job. The income from the confiscated sheep is deposited in the coop fund.

In 1974 the Peasants Union was established and the coops were attached to but unfortunately was not serious on the grazing rights and in 1992 has cancelled the

concerned article in the Act and thus back to no man's land tenure, and the MAAR plan had collapsed.

The reasons for the unstable land tenure system are conflicts in conceptions between technicians and policy makers on rangeland development issue.

10. Summary

General information of the Syrian *Badia* regarding rangeland, livestock, soil, climate, major ecosystems and socioeconomic of the pastoral communities were explained as well as land tenure and Bedouin organization and legislation.

As it is expected, population growth combined with low income will lead to depletion of natural resources and increasing drought effect. But this trend can be reversed through changing the no man's land tenure into an allocated one as used to be since the dawn of history, where the grazing lands were managed under the allocated land tenure system called Hema, where man, flora, and fauna were surviving in harmony.

Unfortunately in 1958: due to political reasons, the system was abolished and it put the *Badia* resources under open land tenure. The open land tenure had prevented the tribes from protecting their traditional grazing lands.

As a result, many deteriorating factors started to be practiced such as over grazing, early grazing, plowing the range lands, reluctance in moving to the rainfed areas, uprooting the shrubs for sale to town people, replacement of camels by motor transportation for the sake of quick movement for new pasture and also for transporting water for livestock from distant places, vehicle trampling at random on the range plants and soil, overstocking, unlicensed well drilling, heavy competition between livestock owners on grazing that led the rich with big transportation vehicles to remain while the poor to quit, and in others words continuous decrease in biomass and continuous increase in concentrate feed, apart from sudden change from organized tribal system to non organized communities that made the water, feed, veterinary, health and literacy services difficult and unfruitful.

In 1970 technicians were able to issue the legislative Act No. 140 that gave the pastoral communities rights of grazing on their lands under a cooperative system, according to MAAR plan for range management and rehabilitation.

Thus the revival of *Hema* started, through reallocation of tribal grazing lands under range/ sheep cooperative units. Homogeneity of coops members was observed. The *Hema* boundaries were mapped and demarcated on the ground.

The boards of coops were elected from among dispute settlers. A management plan for grazing resources was formulated with consultation with the boards of the coops.

The plan included a grazing rotation between the *Badia* and rainfed areas. Grazing is allowed only at early fruiting stage of the dominant herbage otherwise concentrate feed to be used such measures were able to encounter the practice of early and over grazing.

The cooperative communities expressed desire in using Butane gas as fuel instead of uprooting the shrubs. Through participatory approach, it was not difficult to estimate the size of feed, water and other services.

Feed were stored in the coops stores in summer and distributed when needed. Rehabilitation plan was practiced at very cheap costs. Range reserve within the coops land was practiced. Fattening coops played good role in absorbing sheep from the market in drought years ensuring stabilization in nomadic livestock production.

These measures used to be known as the Syrian program or the revival of the *Hema* system. The system was practiced between 1970 and 1974 such measures would minimize ***the impact of vulnerability by drought.***

In 1974 the Peasant Union was established and the coops were attached to it but

unfortunately was not serious on the grazing right ,and in 1992 has cancelled the concerned article in the act and thus back to no man's land tenure and the MAAR plan had collapsed.

The reasons for the unstable land tenure system are conflicts in conceptions between technicians and policy makers on rangeland development issue.

Many biomass measurements under different ecological conditions were recorded. One indicated that the increase in biomass between open, managed and rehabilitated range was 7.5 folds under management and 10.8 under rehabilitation. An analytical study of 89/ 99 drought in the Badia showed the following:

The (%) of drought years is 25. Sheep prices deteriorated due to high price of feeds, milk production dropped from 60- 70 kg/ year to 15. Mortality in newborn increased from 5 % to 35 % while loss in mature sheep increased from 2 to 12 %. The estimated total direct loss in sheep sector is around 38.7 billion S.P.

In general herders' situation was very hard and austere. The Government through (GOF) tried to assist them in feed on credit basis, but the assistance was too late due to the (P.U) reluctance as not to direct the livestock coop to receive their feed share in the summer. Thus the impact of drought has increased and the feed black market was activated. An analytical study for 50 years of annual precipitation were carried out for three ecological zones of AlBadia have showed that (%) of disasters seasons were 20, 10 and 2 in the southern, midland and northern-western zones respectively while (%) of very dry years were 10, 10 and 2, respectively.

Also an (FAO) expert in the project of early warning system for drought has drawn a national drought policies and strategy.

The aims of the strategy are:

- Reduction of vulnerability to drought.
- Minimize the impact of drought.
- Facilitate post drought recovery.

11. Recommendations

Executive recommendations or proposed actions to be taken before the execution of the national plan for the development of sustainable renewable *Badia* rangelands that lead to decrease the danger of drought or the vulnerability on livestock where the cost of feed in the market is doubled while the price of dry ewes as ½.

It should be clear that the already identified constraints in livestock production, feed status and the current desertification of the Badia have appeared as a result of the absence of grazing rights. Therefore there is only one constraint to deal with the following options may help in dealing with this major constraint:

Option 1: The range and fattening coops should be administrated by MAAR as prior to the establishment of the PU in 1974, due to the fact that the (PU) is a political institution and not technical .If not, the picture of the Badia will be more austere.

Option 2: By convincing the top-level decision-makers like the chief of the Regional Peasant Office by the importance of grazing rights protection and also to cooperate with range coops.

Option 3: is through short training courses for the low level concerned personnel as an awareness promotion.

Option 4: Is through the international organizations. Had (IFAD; International Fund for Agricultural Development) who credited \$ 105 million for rangeland development

followed the following steps before the loan being issued; the expected austere picture may not have occurred:

By assessing the current and previous range projects, they will conclude that the lack of serious protection to grazing rights according to the legislative Act is the main reason for failure, and so they can then go on to the next step which is the dealing of with grazing rights issue with high level decision makers, and when they make sure by monitoring the current range projects, that there is serious grazing rights protection, then the project should be assisted.

Unfortunately, the current way of development will ensure without doubt the execution of all project infrastructures, but it will speed up the deterioration of range vegetation for which the project is meant.

The projects in Syria will continue to be fragile and research findings will remain frozen and can fruit ***only after changing the current situation of no man's rangelands into allocated lands as stated in the Act 140 for 1970.*** Blame should not only be oriented to local non-technical policy makers but also to **the technical International Organizations** who recommended establishing fragile projects.

In summary, the national plan of action for grazing resources development can only be fruitful through serious recognition of grazing rights by the Peasants Union as issued by the legislative Act No.140 for 1970.

In other words, the only single constraint against range rehabilitation is the lack of grazing rights for the coops that desire to manage its traditional grazing lands by application of grazing rights when all symptoms of desertification or lack of biomass and the vulnerability impact of drought can be cured.

It should be known that all components for range renovation such as infrastructure, technicians and capital are available in Syria except grazing rights.

As for alleviating the effects of drought the (P.U) can contribute positively by protecting the grazing right for the pastoral coops and through e application of MAAR plan with regard range rehabilitation and feed reserve. If not the vulnerability of drought is expected to be maximized toward harmful orientation.

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