www.ajlifesciences.com / ISSN: 2663-1040 *AJ Life Sci. 2021, 4 (1): 136-144*

Research Article

Abasyn Journal of Life Sciences

Open Access

DOI: 10.34091/AJLS.4.1.16

# Vegetation conditions in various plant communities and their performance in district Tharparkar, Sindh, Pakistan

Muhammad Waseem Kalroo*[1], Attaullah Khan Pathan**[1], Sarfaraz Ahmed[2], Muhammad Siddique Depar[1], Imran Ali Rajput***[1], Behari Lal Meghwar[1], Arsalan Memon[1], Abdul Mubeen Lodhi[3], Arif Ali[4], Muhammad Bello Ibrahim[5]

[1]*PARC-Arid Zone Research Institute, Umerkot, Sindh Pakistan*
[2]*Natural Resource Division, Pakistan Agricultural Research Council (PARC), Islamabad, Pakistan*
[3]*Department of Plant protection, Faculty of Crop Protection, Sindh Agriculture University, Tandojam, Sindh*
[4]*Department of Entomology, Lasbela University of Agriculture, Water & Marine Sciences, Uthal, Baluchistan*
[5]*Department of Geography, University of Maiduguri-Nigeria*

## Abstract

Six villages were registered for the experimental purpose/plantation where more than 25,000 plants were planted to develop range forest. These plants were developed at Marvi nursery PARC-Arid Zone Research Institute, Umerkot and some were purchased from private nursery situated at Mirpurkhas. Results revealed that maximum plants mortality rate was found at village Ratnore and lowest mortality of plants was observed at Mithrio Charan. Plants damaged due to unknown reason (natural), termite attack and diseases. In various locations most of plants were affected by termites than others biotic and abiotic factors. The most influenced plant was *Prosopis cinerera.* Maximum plants survived numbers of grafted ber was found at village Ratnore, the biomass production of green and dry grasses was taken after harvesting. A highest green grass weight 21812.58 kg and dry 3439.83 kg were observed from elephant grass stock and lowest green weight 5001.92 kg from Gatten grass and dry weight 477.57 kg per acre were recorded from Rhode grass 1 (Sabri). Gatten grass and Rhode grass 1 (Sabri) were found lower weight. All these seven grasses showed excellent performance except Elephant grass and Gatten grass. These two grasses needed more water as compared to remaining five species. These grasses when fed by goats their milk production was increased and goats like to feed these grasses. The pictures of these grasses showed their appearance and health irrigated by underground brackish water with more than 2200 ppm.

**Key words:** grown, plants, performance, Tharparkar.

***Article Info:***
*Received:*
*February 25, 2021*
*Received Revised:*
*August 18, 2021*
*Accepted:*
*August 18, 2021*
*Available online:*
*September 11, 2021*

*Corresponding Author:
ranaimran234@gmail.com
&
attaullahg@gmail.com

## 1. INTRODUCTION

Pakistan largely contains arid and semi-arid land including Thar Desert which has been resulted from Geo-tectonic and climatic changes since a long time ago[1]. The degradation and loss of natural habitats have been occurring for thousands of years, but the process has been accelerated in the last few decades due to

rapid development activities and population expansion[2]. Recently, with the development of the canal system, an extensive area in the Indus plains has come under the cultivation of agricultural crops after the clearing of forests (including the riverine forests of Punjab and Sindh). The protection of forest land and establishment of rangeland in the Thar Desert is the need of the hour to protect the natural ecosystem[3]. However, the knowledge of the present rangeland system and effect of human activity as well as the environment (i.e., global warming, rain fall pattern etc.) is the prerequisite to design a comprehensive rangeland and grasses system in the Thar Desert for a sustainable ecosystem[4].

It has been observed that in Thar, the native plant species have disappeared due to extensive grazing and cutting of trees for fire and sale in the market. *Acacia senegal* (L.) is the most important native tree of Thar[5]. The Gum Arabic can be harvested from these trees for income generation as well as the tree provides fodder for livestock. The livestock has died due to starvation during the drought conditions[6, 7, 8,9,10]. This scenario demands immediate attention to resolve the issue. Therefore, the present study was designed to develop the packages for Thar, utilizing different techniques, like nursery establishment, introduction of newly adopted plants, rehabilitating native grasses, developing exclosures for control grazing and its impact on the climate and desertification. This is multi layered pilot study and will not only assess the current status of Thar area but will also provide a workable strategy to utilize all doable methods to grow native grasses, plants and control open grazing for the dry mass production and control desertification with agro forestry and silvopasture interventions. The capacity building program will also be assessed through which farmer's skills are enhanced.

## 2. MATERIALS AND METHODS

The six suitable sites were selected for the plantation of trees with the help of district government and local NGOs. For these sessions, the 25 farmers were registered at each selected villages i.e. Kerlo Rahimoon, Maroohar, Ratnore, Nasarullah Sand, Nooro je Dhani, Mithrio Charan, where 24 training sessions for awareness were perused. More than 25000 plants of different species were planted at these villages. The training sessions were conducted related to benefits of trees, grasses, arid fruit plants, control grazing, benefits of exclosure, environmental changes and its impact on our environment, importance of trees and grasses, their economic values, role of fodder for animal health and production. Permanent exclosure was developed at PARC- Arid Zone Research Institute (AZRI), Umerkot to have better control and to conduct ecological recovery studies over time. Plantation of trees preferably *A. senegal* for Gum Arabic production. The demonstrations of gum harvesting were made on existing trees at local vicinity and at PARC-AZRI Umerkot. *Prosopis ceneria* (Kandi) planted at selected villages and at permanent exclosure for feeding of livestock during drought conditions and to control desertification. Farmers of selected villages were trained during the different session round the year. The sessions were carried out with monthly interval. 10,000 to 20,000 more trees of different species (including Kandi, *A. Senegal*) were planted at newly selected villages of Umerkot to control desertification and climate change. The data of the plants at six villages were recorded for their development and phenology under harsh conditions. Various grasses varieties were also planted at AZRI farm for monitoring their performance on underground brackish water. All these grasses were harvested for fodder to livestock after every two months interval.

### *2.1 Establishment of exclosure*

The exclosure was fenced by local hedge Barbed wire and angle iron. This exclosure was divided in two halves one for dry mass production fed to livestock during drought conditions and half used for manually grazing; when grasses matured or when seed matured, about 07-10 small ruminants were released in 100x50 square meter grass exclosure for 24 hrs for feeding as well as they crushed the grasses with their hoes and leave dung and urine over these grasses. This activity was conducted to observe the effect of grass litter on the soil temperature and broken soil crust with the help of hoes absorbs more water and stop water runoff, which ultimately help for growing of plants and to mitigate climate change effect. This 100x50 meter exclosure were labelled as control grazing block. As the ruminants stay over there for 24 hrs they fed the seeds of grasses and these seeds deposited on soil with their dung. The germination of these seeds and soil fertility improved. Microclimate Blocks (MCB) was designed at AZRI farm where temperature data were collected and compared with necked/barren soil.

### *2.2 Silvopasture study*

The study on silvopasture was carried out on planting trees, shrubs and grasses. This activity may prove helpful for livestock during drought conditions (fodder banks) and beneficial for the climate change and desertification. Other studies like wind breaks/shelter belts and live fences were also be studied.

### *2.3 Registration of farmers for capacity building programs*

150 farmers of six selected villages were registered for capacity building program. More than 24 training programs were conducted in the six selected villages. These farmers imparted with season long demonstration and training on control grazing, benefits of plantation and desertification.

## 3. RESULTS AND DISCUSSIONS

The results shown in Figure 1 the mortality of plants in different villages. Results revealed that a maximum plants mortality percent of 3054 was found at village Nasarullah Sand and minimum in village Mithrio Charan (2706). The higher mortality numbers were found in *P. cinerera* plants as compared to other plantation at different sites. The highest plant survival rate was found in village Mithrio Charan as compared to other villages. The maximum plants survived, grafted ber at village Ratnore, *Conocorpus* at village Marohar, *Pithecellobium dulce* at village Kerlo Rahimoon and village Noro je Dhani, *Acacia sanegal* and *Pithecellobium dulce* at village Nasarullah Sand, and *Acacia sanegal* village Mithrio Charan.

The mortality of plants found from different villages due to pests, diseases and unknown causes vary significantly difference between the locations. The lowest plants mortality % was found due to climatic conditions and the highest mortality was recorded due to attack of termites in Fig 2. These findings were in confirmation with[11] several factors are responsible for economic losses to groundnut crop such as variable rainfall, low soil fertility, crop management practices, pests and diseases. [12]reported positive correlation among termite workers and damage in plants. Termites are social insects, attack on the tap root, feed out all contents ultimately replacing it with mud[13]. In case of sever attack, termite can cause 5 to 45 percent mortality of plants and 46 percent damages to pod[14, 15].

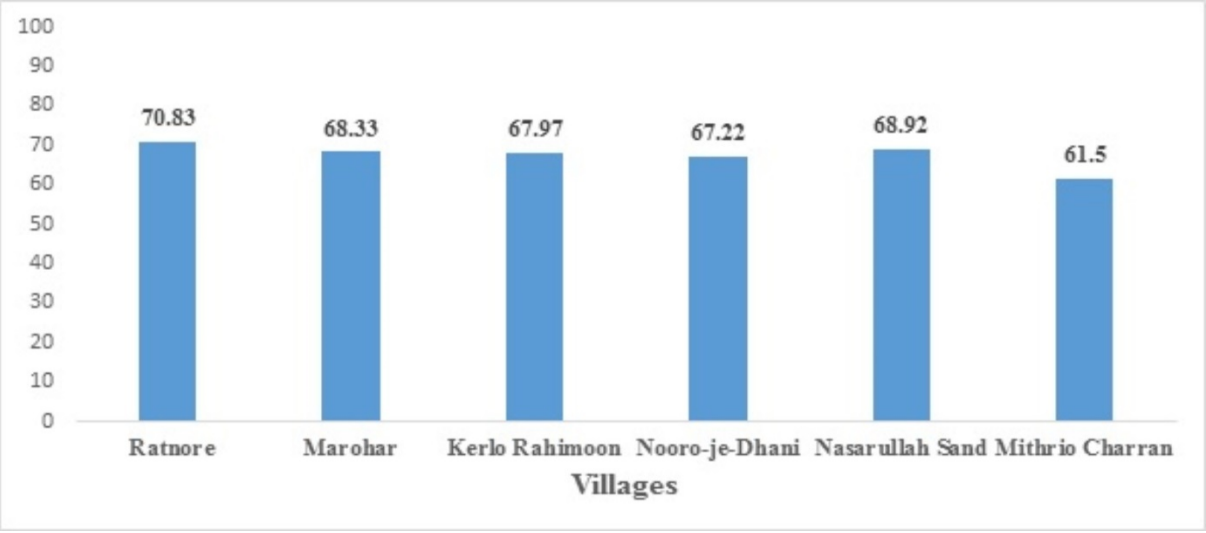


**Fig. 1.** Plant mortality percentages at different villages

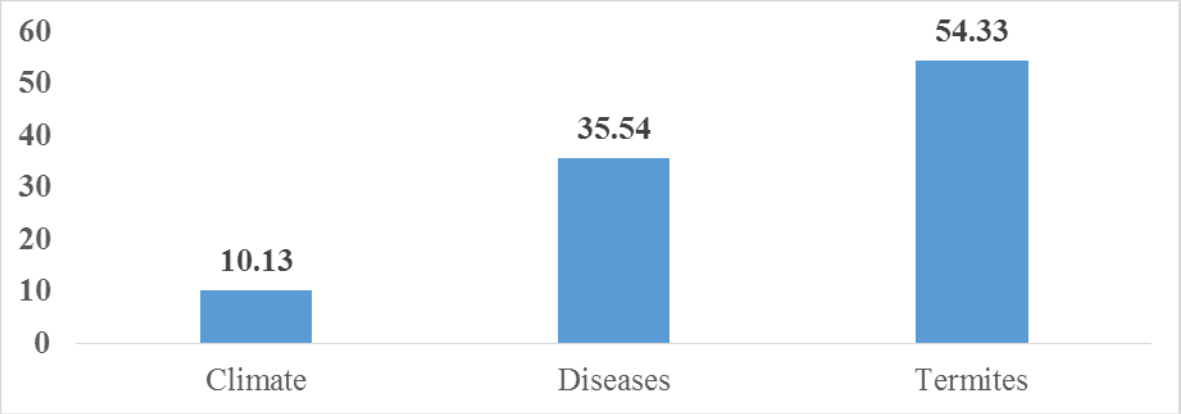


**Fig. 2.** Plant mortality percentage due to different causes.

The biomass production of green and dry grasses was taken after harvesting (Table 1). The highest green grass weight of 21812.58 kg and dry 3439.83 kg were observed from elephant grass stock and the lowest green weight 5001.92 kg from Gatten grass and dry weight 477.57 kg per acre were recorded from Rhode grass 1 (Sabri). Gatten grass and Rhode grass 1 (Sabri) were found lowest in weight than other grasses. All these seven grasses showed excellent performance except Elephant grass and Gatten grass. These two grasses needed more water as compared to remaining five species. These grasses when fed to goats, their milk production also increased, and goats like to feed these grasses. The pictures of these grasses showed their appearance and health irrigated by underground brackish water with more than 2200 ppm (Fig. 3). The data shown in Fig 4 and 5 indicated that comparative fresh bio-mass (gram) before and open grazing block. The results observed maximum numbers of fresh and dry weight were observed in after grazing block than open grazing block.

**Table 1.** Biomass production of different introduced grasses after harvesting at PARC-AZRI

| S. No. | Grasses | Green weight kg/Acre | Dry weight kg/ Acre |
|---|---|---|---|
| 1 | Panicum Tanzania | 6903.92 | 2670.93 |
| 2 | Elephant grass | 21812.58 | 3439.83 |
| 3 | Gatten grass | 5001.92 | 1343.56 |
| 4 | Panicum maximum | 13111.83 | 3338.66 |
| 5 | Rhode grass 1 (Sabri) | 5876.06 | 477.57 |
| 6 | Rhode grass 2 (Kambro) | 6839.19 | 2063.89 |
| 7 | Para grass | 5236.64 | 1416.40 |


**Fig. 3.** Different grasses at PARC-AZRI, Umerkot

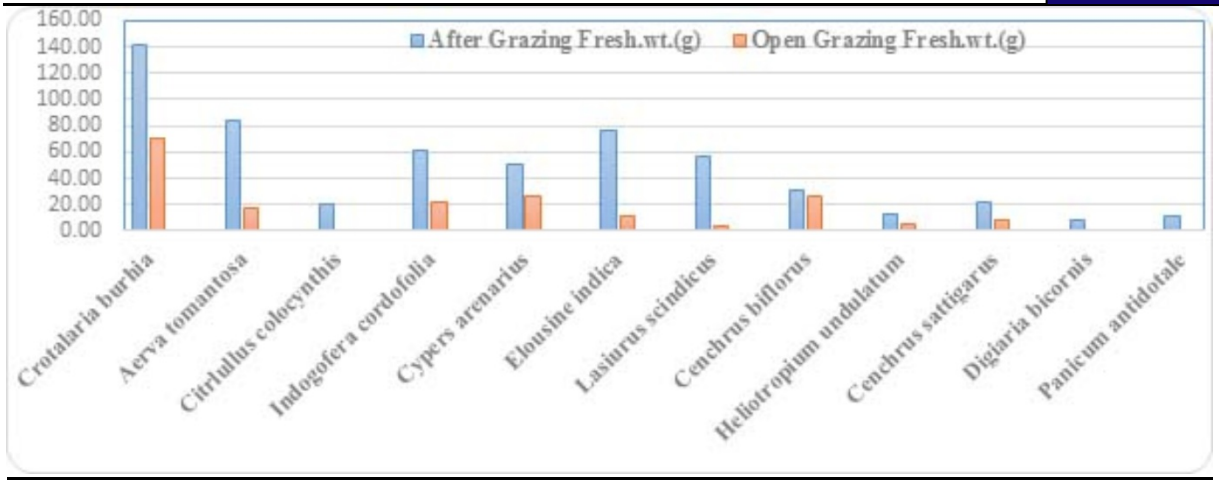


**Fig. 4.** Comparative dry bio-mass (Grms) after and open Grazing Block

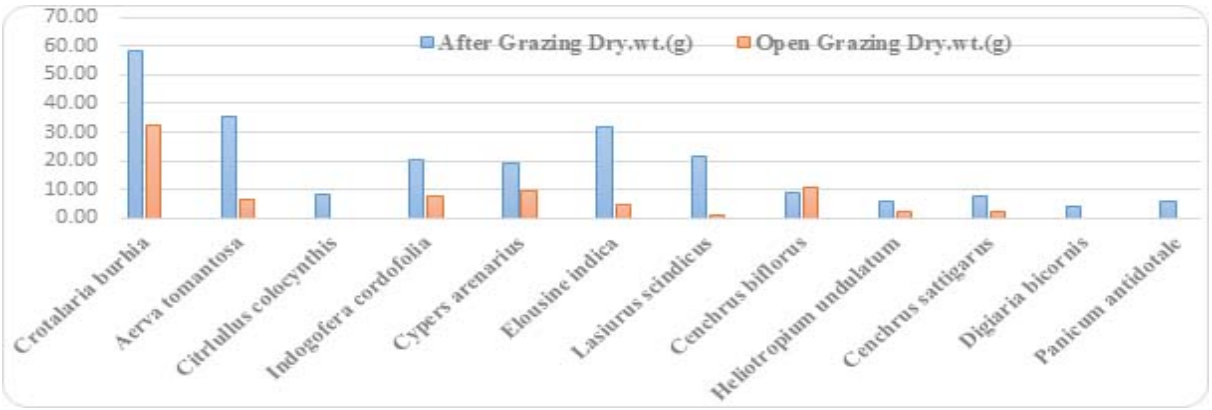


**Fig 5.** Comparative dry bio-mass (Grms) after and open Grazing Block

Micro Climate Blocks (MCB) was designed at PARC-AZRI farm where temperature data has been collected and compared with necked/barren soil. During this study it was observed that soil temperature decrees approximately 1 centigrade to 7 centigrade. The data revealed that this activity if expand to mass level will be helpful in environment improvement. The detailed data is presented in graphs below figure 6 to 11.

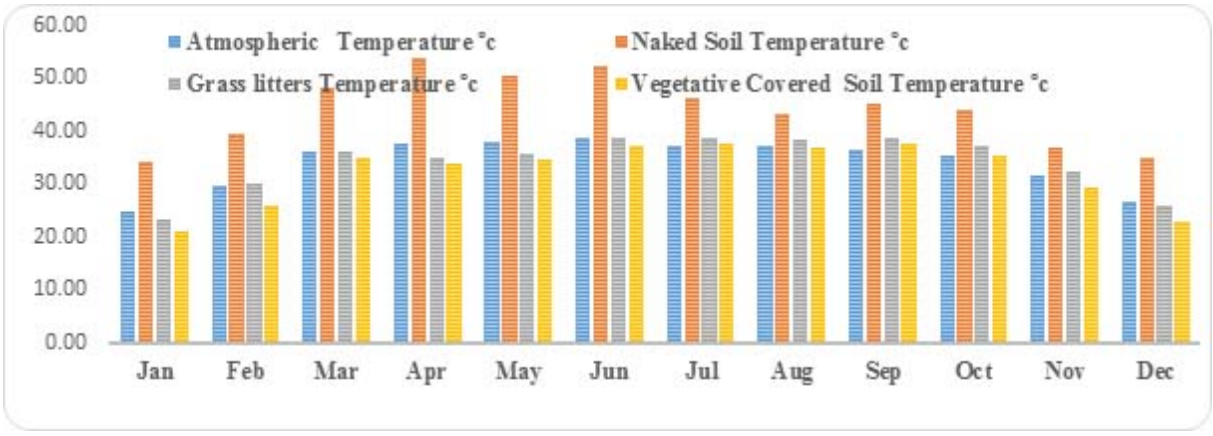


**Fig 6**. Temperature $^{0}$C data from (MCB) Blocks during Year 2015

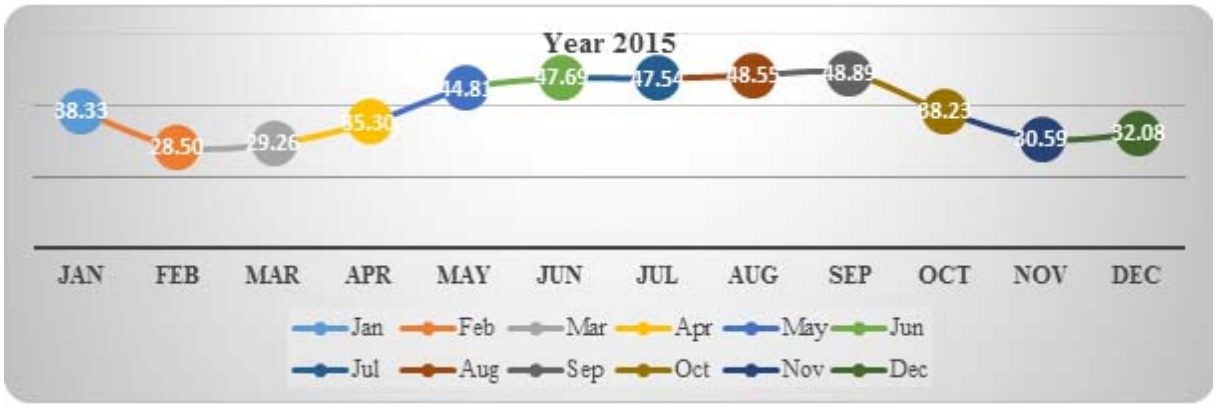


**Fig 7.** Data Relative Humidity for the year 2015

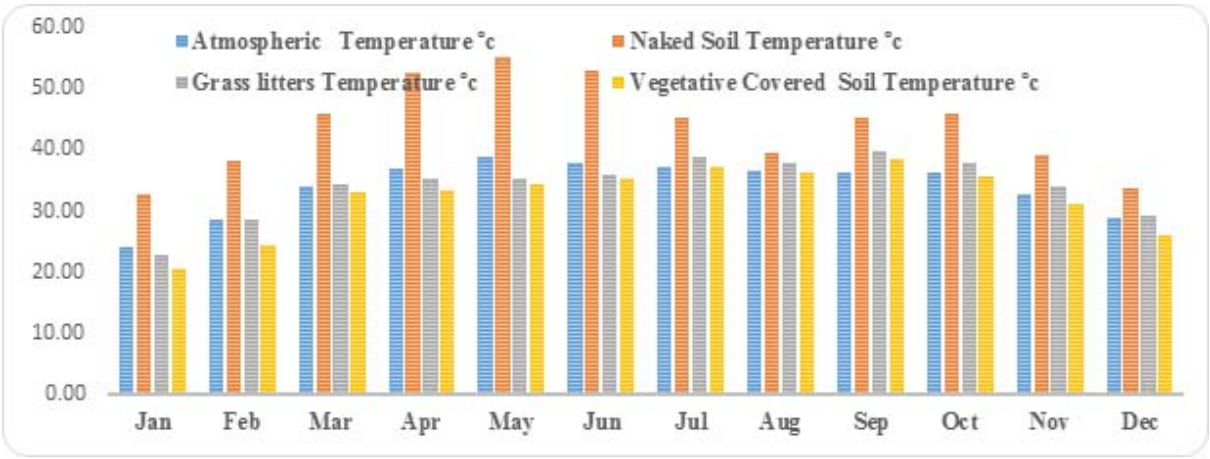


**Fig 8**. Temperature $^{0}$C data from (MCB) Blocks during Year 2016

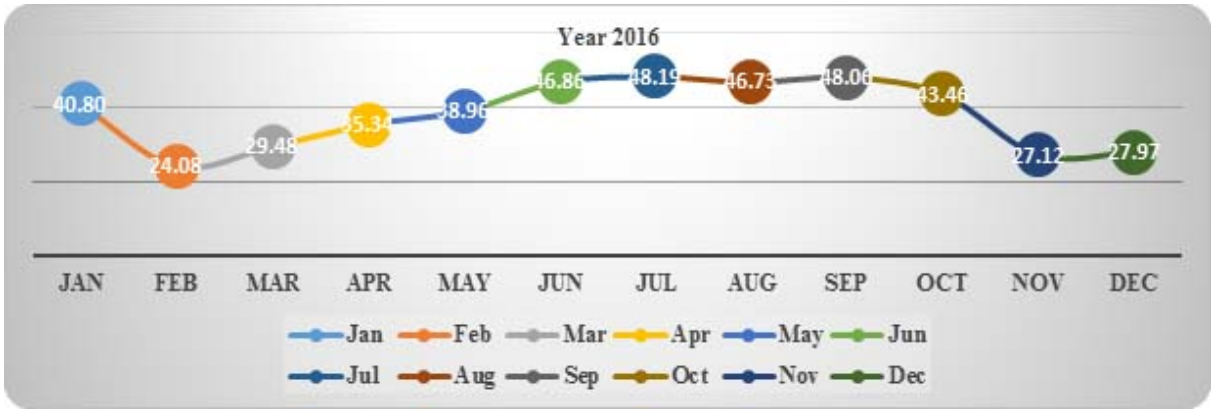


**Fig 9.** Data Relative Humidity for the year 2016

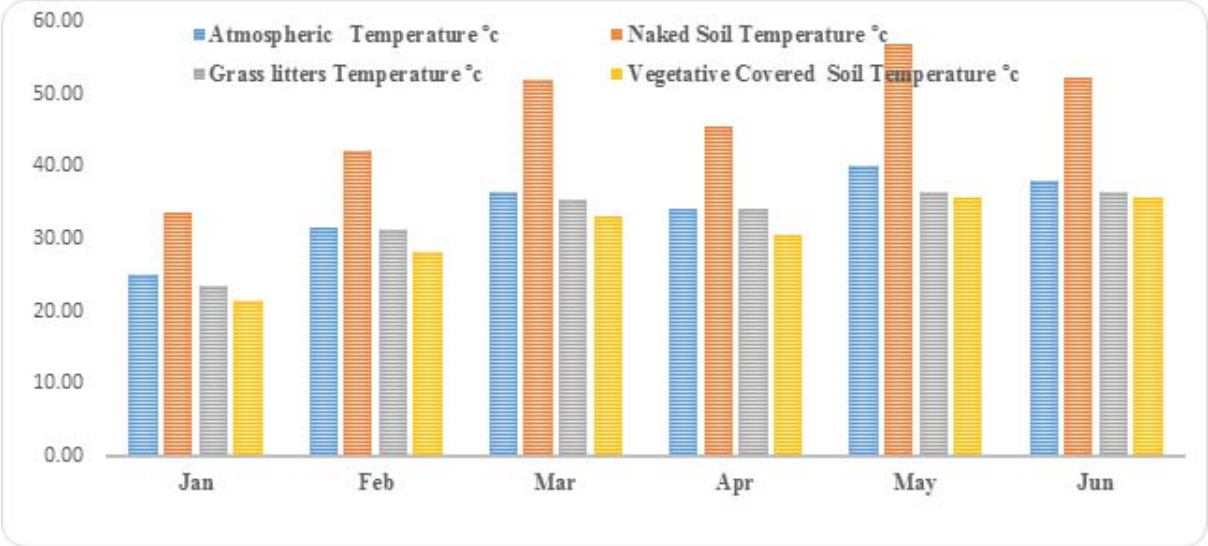


**Fig 10**. Temperature $^{0}$C data from (MCB) Blocks during Year 2017

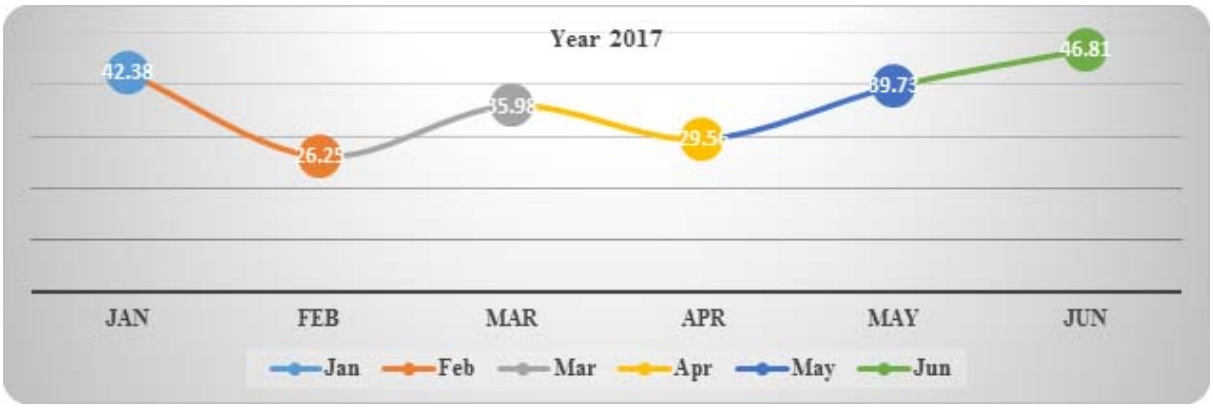


**Fig 11.** Data Relative Humidity for the year 2017

## 4. CONCLUSIONS

Microclimate Blocks (MCB) at PARC-Arid Zone Research Institute, Umerkot proved that temperature can be reduced with covered soil up to 7 degree. The control grazing at exclosures and releasing of small ruminates for grazing who stayed for 24 hrs where they deposit dung and urine improved the soil fertility and grass germination. Rehabilitation and introduction of the trees, grasses and shrubs are growing well and improved the environment as well as the health of the animals. The 150 local farmers of the area were trained, and they established their grafted Ber orchard at their fields. Blocks of different grasses were established on brackish water at Thar Desert. The Gum Arabic production technology has been introduced and farmers are getting benefits. The technology of Ber cultivation has been multiplied by the local farmer after observing the benefits at farmer's field. Trees survived 37-40% at farmer's villages that will be benefitted for the community in future as well as will improve the environment of the area. The model of Salvopasturing at PARC-AZRI farm proved that the grasses and trees plantation have more benefits to maintain soil moisture and improve soil fertility.

## ACKNOWLEDGMENT

This work is part of the RADP Project. All the authors are thankful and acknowledge Pakistan Agricultural Research Council and Research for Agricultural Development Program (RADP) for providing funds and other facilities to the completion of this project.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## REFERENCES


1. Ahmed E. Origin and geomorphology of the Thar Desert. Annual Arid Zone 1969; (8):171-180.
2. Gibson DJ. Grasses and grassland ecology. New York: Oxford University Press. 2009.
3. Gunin PD, Vostokova EA, Dorofeyuk NI, Tarasov PE, Black CC. Vegetation Dynamics of Mongolia. Kluwer Academic Publishers, London. 1999.
4. Hilbig W. The Vegetation of Mongolia. SPB Academic Publishing, Amsterdam. 1995.
5. Narmandakh A, Nyamdorj G, Munguntogos B, Batchuluun D, Bayarmaa B. The Report of Land Information of the Darkhan-Uul Province. 2012. URL http://www.info.e-darkhan.com/images/hyanalt/GHBHBG.pdf [accessed on 11 September 2013] 2012.
6. Roberts TJ. The Mammals of Pakistan (Revised Edi.). Oxford Uni. Press. Karachi pp. 525. 1997.
7. Sala O, Paruelo J. Ecosystem services in grasslands. In nature's services: Societal dependence on natural ecosystems, ed. G.C. Daily. 1997. 237–251.
8. Sala, O.E., W.J. Parton, L.A. Joyce & W.K. Lauenroth. Primary production of the central grassland region of the United States. Ecology. 1998. (69):40–50.
9. Sergelenkhuu J, Nachinshonhor U, Takashi O, Yoshihiro Y, Undarmaa J, Keiji J, Ken Y. Effect of Grazing Pressure on the Structure of Rangeland Plant Community in Mongolia. Arid Land Studies. 2012. (22):235-238.
10. Wadia DN. The post glacial desiccation of Central Asia. Monogr. Natural Insect Science India. 1960 (88): 545-553.
11. Naab JB, Singh P, Boote KJ, Jones JW, Marfo KO. Using the CROPGRO-Peanut Model to Quantify Yield Gaps of Peanut in the Guinean Savanna Zone of Ghana. Agrononomy Journal of America. 2004. 96: 1231–1242
12. Bhanot JP, Verma AN, Kashyap RK. Population dynamics of termites in barley fields and correlation between termite population and termite damage. Entomological Society. 2009. (98):234– 238.
13. Rawat RR. Deshpande, P.K. Kaushal. Comparative efficacy of different modern insecticides and their method of application for control of termites, *Odontotermes obesus*. Madras Agriculture Journal. 1970. (57): 83–87.
14. Salihah Z, Shah M, Sattar A. Survey of sugarcane termites of Nowshera and Charsada tehsils. Proceeding of 8th Pakistan congress of Zoology. 1988. (8):289–297.
15. Pathan AK, Depar MS, Kalroo MW, Rajput IA, Ahmed R. Response and acclimatization of introduced jujube (*Ziziphus mauritiana*) variety for the uplift of socio-economic conditions at desert area of Tharparkar, Sindh, Pakistan. Pakistan Journal of Agriculture Agricultural Engineering & Veterinary Sciences. 2020. 36(1):21-26.