Prosopis Juliflora In Asals Of Kenya: A Friend Or A Foe Plant?

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***Abstract*- *Prosopis juliflora*, popularly known as Mathenge in Kenya, is an invasive short shrub spread in drylands of Africa, Asia, Australia and in other parts of the world. The shrub was introduced in Kenya in the 1970s with an aim of afforesting the arid and semi-arid areas to curb desertification. In the formative stages, the results were positive but this did not last for long. It spread so rapidly becoming a menace to ASAL pastoralists prompting its declaration as a harmful weed in Kenya under the Suppression of Noxious Weeds Act (CAP 325) in 2008. Well, in some parts of the world, the shrub is cultivated. The study sought to examine the usefulness *of P. juliflora* (referred to as *Prosopis* in this study) in Kenyan ASALs and to determine whether it is a friend or a foe plant? Interviews were conducted to fifty (50) pastoralist respondents who were selected using simple random sampling method from Garissa Sub County. Secondary sources were also reviewed. The study established that the economy of ASALs revolves around livestock rearing, which in turn depends on the water and pasture. *Prosopis* had colonized the grazing land reducing the carrying capacity of the ASAL rangelands. Cases of ulceration of livestock teeth and mouth, serious injuries on both livestock and humans associated with *Prosopis* thorns, and loss of livestock were reported. On the other hand, various uses of *Prosopis* were identified and included: provision of fuelwood and charcoal, keeping of bees, control of soil erosion by wind and water. In addition, *Prosopis* was used in formulation of livestock fodder, making of drinking juices and cakes, production of biomass energy in Kenya. Negative attitude towards *Prosopis* by the pastoralists was identified as a hindrance to its use. The study established that with suitable management, capacity building and attitude change of the pastoralists on utilization of the shrub, *Prosopis* can be harnessed as a useful resource in the ASALs.**

***Index Terms*-** *Prosopis juliflora*, noxious weed, resource, pastoralism, ASALs

I. Introduction

Prosopis has different local names depending on its geographical location. In Kenya, it is known as Mathenge. In English it is known as ironwood, honey mesquite, mesquite and mesquite bean; kikwajukwaju in Swahili and Aligaroob in Somali language [1]. It is an evergreen short shrub with very sharp thorns and grows to a height of 5-10m. It produces non-scent pods with hard, dark brown oval seeds [2]. It is a hardy and invasive species with the ability to tolerate droughts, waterlogged soils, low nutrient and saline or alkaline soils [3]. Thus, it is highly invasive and once established it is hard to control [4].

P. juliflora-pallida is found across a wide geographical region. In America, it covers regions between latitudes 22-25 degrees north and 18-20 degrees south. In Africa, the *Prosopis* species is said to have been introduced in Senegal, South Africa, and Egypt in the early to late 19th century. Records show that *Prosopis* species were introduced in Kenya in 1973 in coastal regions for the rehabilitation of quarries. Later in 1980s, it was later introduced to Baringo, Tana River and Turkana districts (now counties) largely for curbing desertification and overexploitation of the existing natural vegetation [5]. Today, these counties have the largest biomass of *Prosopis* in Kenya. *Prosopis* is also found in other counties such as Wajir, Kajiado, Samburu, Isiolo, Taveta, Malindi, Migori, Mandera and Marsabit [6]. To a large extent, the inhabitants of these counties call *Prosopis* an evil plant. According [7] this is attributed to the negative effect they have on the ecosystem, rangelands and animal and human health. Actually, in 2008 the perceived negative effects made *Prosopis* declared as a noxious weed under the Suppression of Noxious Weeds Act (CAP 325) [8]. However, [5] observe that the usefulness or adversity of *Prosopis* as perceived by the community depends on three factors: whether and how the species meet their economic needs; income levels and main livelihood occupations; and how destructive the species is to property and natural ecosystems. Other factors that influence the people's perception of *Prosopis* include the opinions of elite in the society, the costs of managing the species, how media portrays the species and whether or not the species is physically appealing.

II. The Objective of the Study

The general objective of the study was to examine the extent of usefulness or adversity of *Prosopis* as perceived by the inhabitants of Garissa County. Hence establish whether it is a friend or a foe plant to the inhabitants.

III. Study Area and Methodology

The study was carried out in Garissa County that lies between latitude 1° 58'N and 2° 1' S and longitude 38° 34'E and 41° 32'E covering an area of 43,259 km^2. The County lies in the arid and semiarid lands (ASALs) of Northern Kenya that is characterized by low, erratic and unreliable rainfall averaging at 275 mm per year and temperature ranging from 20°C to 38°C with the average of 36°C [9]. The main economic activity is pastoralism which is a source of livelihood to 90% of the inhabitants. The rangelands of the county are largely cover with *Prosopis*. A study by [10] shows that between 2000 and 2006 about 440 km^2 of the rangelands were newly colonized by *Prosopis*. This was a rate of 73 km^2 per year. Garissa County had a population of about 849,457 in 2017 of whom the majority are of ethnic Somalis

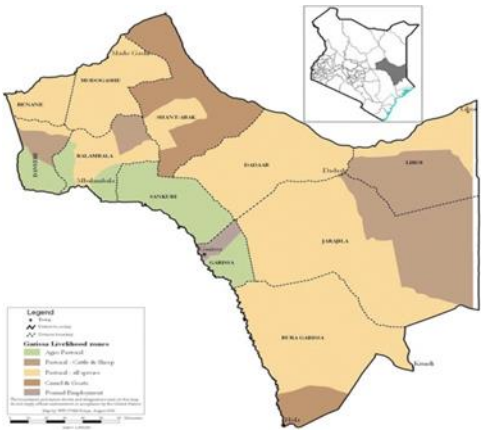

Figure 1: Map and location of Garissa County

Whereas data for the study was largely from secondary sources, fifty (50) pastoralist respondents from Garissa Sub County were randomly selected and interviewed. Selection of the respondents was carried out during the Garissa animal market day which serves Garissa County and other neighbouring counties. This was to ensure that pastoralists arriving from the whole Sub-county. The sample comprised of 40 men and 10 women. Interview schedules were used in data collection.

IV. RESULTS AND DISCUSSION

Prosopis juliflora in Garissa County

Aligaroob, a Somali name for *Prosopis juliflora* is a common name not only in Garissa County but in entire Northern Kenya. Pastoralists claimed that *Prosopis* shrub emerged in the County in 1980's after it was introduced by the government. It was introduced as a forestry tree majorly to rehabilitate the degraded environment, ensure self-sufficiency in fuelwood and conservation of the existing natural plants against human destruction. It was obvious from the respondents' answers that the extent of rangeland colonization by the species was increasing. This was attributed to animal feeding on seeds and dispersing them as they graze. [11] observes that *Prosopis* is spread through its seeds where a mature plant produces between 630,000 and 980,000 seeds in a year. The seeds are highly productive and are dispersed by animals feeding on the pods. As [10] observes animals, and particularly goats, plays a key role in spreading of *Prosopis* (what he calls the goat factor). The goats eat mature seed pods which are later dropped together with the faeces away from the parent plants. This way the volume of *Prosopis* in Garissa Sub County had increased due to assembly of livestock during the main livestock market located in Garissa town. In addition to spreading by animals, river flows and floods were identified as other methods in which *Prosopis* have spread. Essentially, dense thickets of *Prosopis* were found along the roads and migration pathways, rivers or watering points, irrigation schemes and near settlements with relatively low volumes in open grasslands.

Uses of *P. juliflora* in Garissa County

During the introduction of *Prosopis* in the 1980 and early 1990s, pastoralists embraced the shrub because of its perceived benefits. These included reduced desertification, provision of shade for animals and provision of fuelwood. This assertion confirms [5] observation that the perception of the people on *Prosopis* depended on whether the species meet their needs.

Production of Biomass Electricity and Gas

The large amount of biomass produced by *Prosopis* makes is a valuable resource for electricity generation. Although no working electricity generating plant using *Prosopis* in Kenya, efforts to establish one has been put in Baringo County by Cummins Cogeneration Kenya Ltd. Garissa County Government had also entered into partnership with Sweden-based VR Holding AB, and Finnish company WOIMA Ecosystem with an aim of using *Prosopis* with the purpose of generating electricity and gas [12]. In India, between 30 and 40 projects in Andra Pradesh, Tamil Nadu and Gujarat have been authorized to generate electricity using *Prosopis* [13]

Ethnomedicine

The use of *Prosopis* as a form of medicine was reported by the respondents. Although not a common practice, *Prosopis* leaves were used to treat ailments such as cuts, scratches etc. *Prosopis* fresh green leaves are rubbed against the scratches or squeezed on cuts. [14] notes that *Prosopis* has been used in healing wounds and other ailments such as cold, flu, diarrhoea, dysentery, excrescences, inflammation, measles and sore throat. On livestock, *Prosopis* pods were used as a dewormer. Free-ranging livestock that fed on *Prosopis* pods were not dewormed routinely. Although the use of *Prosopis* processed livestock feeds was not common in Garissa County, a study by [15] revealed that feeds fortified with *Prosopis* or non-fortified *Prosopis* feeds controlled gastro-intestinal nematode parasites and gut nematodes respectively.

Livestock feeds

There were two methods in which *Prosopis* pods were used as livestock in Garissa County. The most common method was direct feeding of livestock with the pods during drought. Free-ranging animals eat the pods directly from the shrubs or the pods are collected and fed to animals. During drought, the *Prosopis* pods are sold as livestock feeds in the markets in Garissa County (Figure 2).

Figure 2: Harvested *Prosopis* pods ready for market in Garissa Town

The second method involved the use of *Prosopis* pods as raw material for processing livestock feeds. Concentrate of *Prosopis* pods has been used in feed production. For instance, Peru, Chile, Argentina and Uruguay concentrate rations have of 40-60% have been used for dairy cows. In Brazil, studies have shown that up to 60% of wheat flour in rations for lactating cows could be replaced with *Prosopis* pods. In Mexico, the live weight in sheep increased up to 45% after sorghum flour was replaced with *Prosopis* pod flour [16]

Source of Fuelwood

Prosopis was the main source of fuelwood in Garissa County. In rural areas, it was the only source since it was readily available and at no cost except harvesting labour which was provided by women and children. Although charcoal from *Prosopis* shrub was unpopular, to a large extent the species was used in the production of charcoal for domestic use.

Source of Construction Materials

Construction materials obtained from *Prosopis* included building and fencing poles, rafters and twigs. They are mostly used in the construction of temporary houses which are very common in rural, peri-urban and urban areas of Garissa County. These structures and houses were made of *Prosopis* poles and twigs (Figure 3 and 4).

Figure 3: Construction poles from *Prosopis*

Figure 4: A makeshift houses made from *Prosopis* poles in Garissa County

The reasons for the semi-permanent houses were threefold: the transhumance way of life of the pastoralists, their cultural buildings and also for controlling the high day and night temperatures. The *Prosopis* poles and twigs were preferred because they were resistant to termites and also they were locally available and affordable. The best quality poles and twigs were obtained from Bangale Division since the area had the oldest *Prosopis* shrubs. The old *Prosopis* were resistant to termites and seasoning from harsh weather. Sale of *Prosopis* poles and twigs earned traders some income.

Negative effects of *Prosopis* in Garissa County

The perceived benefits of *Prosopis* during the initial years of its introduction in the county made the pastoralists embraced the shrub. However, this did not last for long after the perceived benefits were dwarfed by unexpected threats caused by *Prosopis*. This scenario was not unique in Garissa County only but in many other parts of the country and elsewhere in the world over. A similar case, for instance, was reported in the Indian province of Rajasthan where people adopted the species but their perception changed after the negative effects of the invasion [11]. Pastoralists indicated that of all plants in the Sub County, *Prosopis* has become the most unpopular because of its negative effects on both physical and human environments. Pastoralists regarded it as the evil plant.

Whereas some of its uses were acknowledged, the negative effects outweighed its usefulness. Some of major threats associated directly with increase and the spread of *Prosopis* in the County were: loss of pasture, injuries to humans and livestock, poor livestock health due to consumption of *Prosopis* and blocked main pathways and migration routes.

Loss of pasture

Typically, the main livestock feed resource in Garissa County are browse, natural grasses and palatable shrubs and trees. Observations from the pastoralists that the rapid spread of and colonization by *Prosopis* has greatly reduced pasture and browse in the County agree with [5] assertion on the effects of the species on pasture. Although, in their understanding, pastoralists argued that *Prosopis* "eat grass", research points out reduction in native pasture results from its ability to outcompete for moisture from pasture land, denying grass enough light for photosynthesis due to shade created by its canopy and the allelopathic effects on other surrounding vegetation [11].

Poor Health on Humans and Livestock

The common direct effect of *Prosopis* on human health was injuries caused by thorns. Respondents argued that the injuries cause severe inflammation that lasts for several days. If left untreated, it has on several occasions led to severe infection that result in amputation of limbs. Several cases of leg amputations alleged to have been caused by injuries from the *Prosopis* thorns were cited. Two indirect causes identified included: (i) increased in malaria diseases, and (ii) poor nutrition due to strained livelihoods. The dense *Prosopis* thickets provided favourable habitat for mosquitoes. A large number of mosquitoes invading household has been attributed to close proximity of the thickets near the homesteads resulting in high malaria prevalence. Poor nutrition was associated with suppression of pasture near the homesteads suitable for the core herd usually left behind to provide the food to the family after the larger herd migrates. Supressed pasture resulted in low livestock production which in turn caused food shortage.

Just like in humans, cases of injuries from *Prosopis* thorns were common. The most notable conditions associated with such injuries included body scratches, wounded and limping animals and eye cataracts in pricked eyes. Cases of the disfiguration of goats' jaws and teeth decay were reported. The disfiguration of goats' jaws was caused by the inflammation emanating from the hard *Prosopis* seeds lodging in between the gums and the teeth. The decay of teeth was caused by consumption of unripe *Prosopis* pods which has high sugar content.

Blocked migration routes

Prosopis seeds are largely dispersed through animal dropping. As large herds of livestock migrate, huge thickets develop along the migratory routes due to the enormous amount of livestock droppings. Over time, some important migratory routes have been completely blocked compelling pastoralists to use longer or unsafe routes to get to desired destinations. In Baringo County, for example, migration that used to take two hours to Loruk now takes up to eight hours Mwangi and Swallow, 2005).

So, What Do We Do with *Prosopis*?

The double-edged nature of *Prosopis*, being useful and harmful at the same time, makes [11] argue of uncertainty on the role of *Prosopis* in community development. So, is *Prosopis* a friend or a foe plant? Whereas *Prosopis* has some benefits, they are far much overshadowed by miseries it causes. Thus, from the lens of a pastoralist in Garissa County, *Prosopis* is a menace that should be eradicated. On the other hand, researchers argue that *Prosopis* is a gem in ASALs. Taking cognizant that *Prosopis* has already colonized the rangelands of Garissa County and other ASALs in the country and it cannot be eradicated [7], the only viable option is to make good use of it. [17] argue that *Prosopis* can only be controlled turning the weed into a valuable resource through utilization of tree products and by improved management.

From the literature reviewed, the study established that the potential for *Prosopis* is largely not exploited. Uses such as making sweets from sweet gum on the trunk, production of refreshing drink and beer (if fermented) from powdered pods, raw material for production of paper, paperboard and hardboard and commercial production of medicine remains untapped in Kenya. Well! If these uses remain untapped, *Prosopis* will continue being a foe but if tapped, it will be a friend and an important resource in ASALs. This can be achieved through (i) conducting adequate research on *Prosopis*, (ii) investing in production of *Prosopis* products, (iii) proper management of the existing *Prosopis*. The outcome of actualizing these three activities will be a change in pastoralists' perceptions and attitudes towards *Prosopis* which will result in acceptance and adoption of species.

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