1986 – 1987

Abdulle, AM & AS Aden 1986 ***Characterization of initial stages of secondary succession on a cleared pasture near Afgoi, Somalia.*** Somali J. Range Sci. 1: 17-18.

SW of Afgoi. An area of *Dichrostachys cinerea* cleared by bulldozer. Study began c3 mo after clearing. List of spp in initial stages of secondary succession.

Buuh, BB, MJ Gahair & JR Barker 1986 ***Response of four native grasses to clipping***. Somali J. Range Sci. 1: 19-22.

Analysis of Dactyloctenium aegyptiacum, Cenchrus ciliaris, Urochloa panicoides, Leptothrium senegalensis.

FAO 1986 ***Technical assistance to the Northern Rangelands Project, Somalia: Project findings and recommendations***. AG: UTFN/SOM/022/SOM, FAO, Rome, 24p. (abst. in Bowen & Bird 1988)

A 3 ha plot of Cordeauxia was planted at Quoita in N Somalia. Initial growth was good but seedlings suffered severe squirrel damage.

Various fodder trees were raised successfully but it was calculated that fodder crop production was not cost-effective. I suspect this came from either of 2 repts:

Okafo, AA 1984 Final report on forestry

Richards, DMV 1984 Report on fodder crops

Widespread deterioration of northern rangelands through overgrazing and drought. Urgent need to balance stock numbers vs. available fodder and forage resources. This would mean abandoning traditional uncontrolled grazing and introducing a rest-rotation system.

Hassan, Abdisalam Sheikh & Jerry R Barker 1986 ***Vegetal structure and composition of the Bulo Burte ecological monitoring site.*** Somali J. Range Sci. 1: 23-25.

2 ha site, just N of town. 10 100m transects, circle plots of r=20 m. Counts of all shrubs, crown diam. Pt-frame for herb layer.

Woody 4.3% cover, grass 3.4%, forbs 4.8%, plant litter 19.4%, bare ground 72.4%. This was a stand P.Kuchar used to calibrate his cover estimates, though the cover was so low that it was not a particularly useful exercise. But it's a useful list, particularly as it also treats herbs.

Hemming, Christopher F 1986 ***Interim report on vegetation survey of the Jubba Valley***. JESS Rep. 9 (see Deshmukh 1990).

Herlocker, Dennis & Ahmed Musa Ahmed 1986 ***The vegetation of the coastal plains, Central Somalia.*** Somali J. Range Sci. 1: 34-58.

A narrow (c10-35 km) strip of perennial grassland extends c800 km from Mogadishu northward along the coast of C Som. Sand-dune fields parallel this coastal plain along parts of the interior side. Soils are sand to sandy loam. Rainfall near Mogadishu is c300-400 mm, declining to <150 mm at the north end of the coastal grassland. Windspeeds increase northward and in the dry season may average 30 km/hr.

In Ceel Dhere Dist, 65 (or 79) x 10 m transects with 1000 pts, measuring basal cover and at each 2 or 3 measuring foliage [± canopy] cover. The species classed as increaser, decreaser, invader. Range condition classification. Assessed relative abundance in terms of soil-based, and both soil and vegetative-based condition classes.

Range condition appears related to distance from permanent water. Very poor-condition areas arise from overgrazing around wells, or from mobile sand dunes.

Mean plant basal cover 4.7%, foliage cover 19.5%. They insist it's a true grassland though dominated by a dS and sedge; note that half the basal cover is grasses.

Ibrahim MA & Barker JR 1986 ***Pattern of Acacia distribution at the Artificial Insemination Center, Afgoi, Somalia.*** Somali J. Range Sci. 1: 26-29.

Analyses of 5 acacias.

Kidar MM & Barker JR 1986 ***Cenchrus ciliaris plant height-weight relationship***. Somali J. Range Sci. 1: 30-33.

They note the lack of info on ht-wt & ht-offtake relationships for Somali plants, & its value in quick appraisal of offtake in N.Am.

Kuchar, Peter 1986a ***The status and significance of yicib (Cordeauxia edulis) in the Central Rangelands*** p.78-83 *in*RG Wieland, ed., Future range/livestock development strategies for the Central Rangelands of Somalia, Proc. Seminar & Workshop, March 24-27, NRA/CRDP, Mogadishu.

(Abst.) Yicib is an evergreen shrub endemic to certain areas of central Somali and the Ogaden. It is a unique phenomenon because it can be a dominant in characteristically strongly deciduous bushlands, and has played an important role in the past as a wild food of the nomads. It is also an outstanding dry-season browse and for this reason has, within the last century, apparently been eliminated from much of its former range. Field studies in eastern Bulo Burte District have found thriving populations in those areas at least 25 km from permanent water, but deteriorating or gone from areas closer to water points. Because it is the main dry-season food of the large camel and goat herds, it is being overbrowsed and progressively eliminated. The obvious solution in preservation of this invaluable resource may be establishment of dry-season reserves, but much

overdue research on all aspects of its ecology may indicate other promising avenues of management.

Kuchar, P 1986b ***The significance of browse in the livestock economy of Central Somalia***, 8p *in* V Vecchio, AN Giama & MF Shirdon, eds., Produzione foraggera in Somalia, Seminar held in Mogadiscio, 1-2 Nov 1986, Somali Nat. Univ., Faculty of Agr.

The livelihood base for virtually all rural residents of Central Somalia is livestock. Large populations of camel and goat, and lesser numbers of cattle and sheep, thrive throughout the 150,000 km^2 of the Central Rangelands. Aside from a relatively narrow band of coastal grassland and some patches of perennial grass here and there through the interior, the rangelands are overwhelmingly dominated by woody cover. (Palatable) shrubs and dwarf trees of many species make up virtually all aboveground biomass and at least 90% of primary production. The top genera in zonal bushlands, all deciduous, include Acacia, Boswellia, Caesalpinia, Commiphora, Cordia, Crotalaria, Dalbergia, Dichrostachys, Duosperma, Euphorbia, Grewia, Hildebrandtia, Indigofera, Ipomoea, Sesamothamnus, Tephrosia and Terminalia. The chief evergreens include Cordeauxia, Balanites and the capparid genera Boscia, Cadaba and Maerua. On gypsum plains and salt flats, the outstanding genera include Atriplex, Suaeda and Limonium.

Zonal bushlands have 20-50% woody cover and rarely >1% grass cover, and even for the grazers (cattle, sheep) browsing constitutes a vital activity. Since deciduous bushlands represent the natural expression of the climate and soils, and since browsers (camel, goat) are superbly adapted and highly accepted forms of livelihood and wealth among the pastoralists, attempts to transform bushland into grassland may involve a whole set of ecological as well as sociological upheavals whose ultimate viability is not at all assured. The main management thrust in the bushlands should be to (1) prevent loss of palatable browse species, and (2) examine ways of increasing the dry-season food supply.

Madgwick, Jane 1986 ***Ecology of riverine forest in the Jubba Valley***, p.23-51 *in* J Madgwick, ed., *Somalia research project: an ecological study of the remaining areas of riverine forest in the Jubba Valley, southern Somalia,* Univ. College London, 172p.

Much selective logging in the past, and forest clearing for agric. Riverine F is being lost along the Jubba at 500 ha/yr due to agric. expansion. As many as 20 bird spp could be lost from Somalia if the remaining forests are destroyed. "These forests support some of the biggest concentrations of large mammals in Somalia and many, such as the blue monkey, greater bushbaby and red forest duiker [are these large?] may be lost if the forests are further degraded or destroyed."

"All forest found in the river valleys of Somalia is sustained by groundwater from the river since rainfall will support only bushland and deciduous woodland." Which means, to me, that forests along the Shabelle could never have been very wide, certainly not along the broad floodplain in general. Though note that it can be up to a km wide along the Jubba. Acc to Pichi Sermolli 1967, riverine forest once clothed the Shabelle riverbanks. Only fragments remain now, almost entirely displaced by settled agriculture

Studied 17 plots each 20x20m in Jubba riverine forests. TWINSPAN & DECORANA, classification. Strong rel between veg types and position on floodplain. Comparison with Tana R forests. Profile diagrams.

Recommend. to conserve the forests as a national monument.

Lots of the nuts & bolts of this expedition are detailed; this depth of logistical analysis is very rare in the ecol. lit., & a useful gauge of potential problems & methods.

Levee forest vegetation (note lack of a nomenclature, just site-indexed; what a miserable structure):

- River edge - Ficus sycomorus, F. scassellatii, Kigelia africana, dense understory of Hunteria zeylanica and Camptolepis ramiflora. Also, Thespesia danis, Diospyros cornii.
- River edge - Ficus, Afzelia, Thespesia and Acacia are the main canopy species, Lecaniodiscus fraxinifolius and Hunteria form bulk of understory. Acridocarpus common in shrub layer. Also, Lawsonia inermis.
- Mid-levee - Big Acacias, Thespesia, Afzelia dominate overstory. Dense understory of Hunteria and Thespesia. Also, Mimusops fruticosa.
- Mid-levee - Acacia, Afzelia, like preceding but broken canopy due to selective felling.
- Dhesheeg edge - Few tall trees. Mostly Lawsonia, Thespesia, Excoecaria, Garcinia livingstonei, Trichilia emetica, Mimusops, Acacia.
- River edge - Typical overstory but Thespesia, Acacia and Sorindeia most frequent. Dense understory of Camptolepis and Hunteria. Hyphaene and Phoenix palms.
- Edge of pediplain forest - Forest/woodland edge. Overstory dominated by Hyphaene and Newtonia erlangeri with dense understory of small trees and undershrubs. Also, Lecaniodiscus.

Trump, EC 1986 ***Somalia Forestry Project Energy Planning Study – Inventory Section: report of vegetation ecologist***. ODA, London, 15p. (report in Herlocker website)

(Abst by Bowen & Bird 1988: Only Acacia bussei currently exploited for charcoal production in Bay Region & the woodlands are under ever-increasing pressure. Little natural coppicing occurs though young trees are plentiful. Great value attached to the multiple uses of the tree by local people: rope, twine, camel harness and mats, sleeping mats, woven sacks, bandages, bows, clubs, grainstore tops, well revetments, housing hoops. Wood termite-resistant. Leaf, fruit and flower all provide good forage. The flowers, appearing before the leaves at end of the long dry season, are said to form an important part of camel diet.)

Young, SA 1986 ***Research for improvement of Somalia's central rangelands***, p.89-95 *in* JT O'Rourke, ed., Proceedings of the 1986 Int. Rangeland Devel. Symposium, Society for Range Management and Winrock Int. Institute for Agr. Devel., 146p.

Careless - e.g. 'Lewis Berger', 'Commifera'. Implication of lots of wild ungulates in the rangelands which is not the case: only dikdiks are abundant. Naively simplistic supposition of hunter-gatherers and nomadism. Lots of 'facts' about pastoralism and range in Somalia, totally

unsupported. Here's quite a statement, which he attributes to 'expatriate ecologists': in last 2 yrs, reduction of grazing land by 10% due to increase in farmland. I would be surprised if it were as high as 1%. And anyway, how could it be that they reduce grazing land? These patches are worked for 3-5 yrs, then abandoned (goffs) for 25-30 yrs.

Then talks about R&D in CRs, esp. by CRDP. Suggests research topics.

Abdisalam Sheikh Hassan Nuh 1987(?) ***Vegetational analysis of the riverine floodplain communities*.** Thesis of deg., Fac. Agr., Somali Nat. Univ., 49p.

(I don't seem to have anything on the veg…)

Exclosure site N of Buulo Burte. Soil analysis, 4 samples per depth. Sandy loam (or loam). Low electrical conductivity indicates that soluble salts will not inhibit plant growth.

DEPTH (cm)	pH	CONDUC.	TEXTURE (%)		
		mmoh/cm	SAND	SILT	CLAY
17	8.04	0.11	56	38	6
45	8.21	0.12	45	44	11
96	8.21	0.19	64	27	9

Coulter J & Coppen J 1987 ***Market study for frankincense and myrrh from Somalia.*** Eu. Assoc. for Coop., Contract service rept. C0026, 37p. [in Bowen & Bird 1988]

Frankincense tapped from wild stands of Boswellia trees in mountainous areas of NE Somalia, belonging to extended families. "Although subsidiary to herding, collection is a vital mainstay to the local economy in a very poor region, and for many collectors is the principal source of income."

Commiphora tapped for gum-resins such as myrrh, opoponax, haggar in Som, Eth & Kenya are common property and predominantly exploited by nomadic herdsmen as a subsidiary source of income.

Incense gums are important to the Somali economy, & rank 3rd in export revenue after livestock and bananas. "Estimation of the volume and value of exports is difficult due to contraband and underinvoicing."

The bulk of the export value from maydi, chewing incense of B. freereana; c1000 T/yr, of which 80-90% exported; mainly consumed by Saudi Arabia where demand has increased greatly since the early 1970s following the boom in oil prices.

Beeyo, or Somali-type olibanum from B. sacra: 300 T/yr, half exported, China the principal market, also to Eu for processing into ingredients for manufacture of perfumes, soaps & detergents.

Commiphora gums c1000 T/yr exported, but much of this collected in Ethiopia. *(for all this, ...qb Bowen & Bird 1988)*

Deshmukh, I 1987 ***JESS interim report: riverine forests of the Jubba Valley, issues and recommendations for conservation.*** Associates in Rural Devel., Inc., Burlington VT, JESS rep. no. 17, 19p.

Simple (skimpy?) exposition of the rapid decline of riverine forests of the Jubba Valley. Enormous loss in the last few years & decades, & may all be lost within in a few months or yrs. High conservation value: the only such forests in Somalia & have some unique species. Unremarkable in size or biological diversity, but the point is that they are the only such forest in Somalia, and the N limit of coastal forest types of eastern Africa. "Within the Somali national context, the biological value of these forests is very high." Some points on use of forest, tsetse fly, the Baardheere Dam, conservation recommendations.

Douglas-Hamilton I 1987 ***African elephants: population trends and their causes***. Oryx 21: 11-24.

Somalia. "Elephant poaching in Somalia was almost eliminated between 1971 and 1976. The elephants appeared to be expanding northwards [in S Somalia] due to effective protection, but some elephants may also have immigrated to escape from poaching in Kenya at that time. An aerial survey in 1976 found the highest density of elephant carcasses along the Kenya border (Bunderson, Abel, questionnaire replies). Then, in 1977, poaching for ivory got under way at a much higher rate and the country was believed to have lost over half its elephants by 1981 (Omar, 1981). According to R. M. Watson (pers.comm.) the elephants have now largely been eliminated."

Then a discussion of factors affecting elephant trends. In the 1960s, "elephants compressed into many African national parks caused extensive woodland destruction." Examples are Murchison Falls NP in Uganda and Tsavo NP in Kenya.

In the 1970s the value of ivory in real terms increased significantly, and at the same time many African countries "entered into an explosive arms race, accompanied by civil disturbances, wars and guerilla campaigns." From 1971-1980 the value of arms imports to Africa increased in real terms from $500M to $4500M. The increased availability of automatic weapons on elephant population dynamics should be taken into account.

"The Somalis built up their army with the policy of extending their boundaries to include the Somali communities living in Ethiopia, French Somaliland and Northern Kenya. Somali 'shifta' were responsible from 1970 to 1975 for reduced elephant populations along the Tana River and in the Lamu Garissa region of Kenya."

"In the 1977 Ogaden war, Somali insurgents developed a trail across Northern Kenya in the Mandera area. Inevitably some of these guerillas, who were probably not well disciplined, deserted or sold or lent their arms to others. The spin-off was that more loose guns wound up in the hands of the nomads."

"It was not until this point that elephant poaching in Somalia itself got under way. Formerly, it had been reported that poaching had been virtually eliminated in the country. Elephant poaching suddenly increased with the easy availability of automatic weapons associated with the war between the Western Somalia Liberation Front and Ethiopia."

Douthwaite, Robert J 1987 ***Lowland forest resources and their conservation in southern Somalia***. Envir. Conserv. 14: 29-35.

Starts off pessimistically: "The survival of primary forest on the coastal lowlands of eastern Africa is now seriously in doubt despite widespread recognition of its importance for Nature conservation." Mostly by farming & logging, locally by mining & water development.

Forest that may exist in S Somalia: <700 ha along the Shabeelle, <2000 ha along the Jubba, c50,000 ha in the Holawajir depression (the S corner across from Boni). Surviving forest patches much disturbed. Many stretches threatened by overcutting for timber, coppice, fuelwood, browse. Short table of species & uses presented.

Dominants of gallery forest along the Jubba & Shabeelle: Mimusops degan, Garcinia livingstonei, Acacia stenocarpa, Terminalia brevipes, Tamarindus indica, Ficus spp., Diospyros mespiliformis (incl. Picci-Sermolli 57). The flora resembles that of lower Tana R. forests in Kenya but lacks the species typical of the Zanzibar-Inhambane region. Emergents 15-25 m; lower storeys dense. Width c10 m, rarely >50 m on Shabeelle, to 100 m on Jubba.

Hunting became illegal in Somalia on 13 Oct 1971 (Law No. 65). Poaching is widespread. A survey to assess importance of bush meat. It was expected that questions on hunting would be viewed with suspicion but the response was good throughout the Shabeelle valley, but people in the Jubba valley tended to be reluctant to answer questions. 242 men in 30 villages along the Shabeelle were interviewed. Presumably they were selected at random in the villages. Hunting was admitted to by only 5% of respondents in villages of upper valley (Buulobarde), 29% for Jalalaqsi-Jowhar area, and 74% for Balcad-Afgooye area. In the Shabeelle Valley, hunting & eating game meat were therefore clearly more prevalent in areas with gallery forest. The proportion of each respective geographic population that ate game was 31, 71 and 85%. Overall one in 5 respondents admitted to hunting during the previous year, and almost half to eating game, though only about once every two months.

Main quarry in Hiiraan: gerenuk, Soemmering's gazelle, dikdik. Further downstream the main quarry were lesser kudu, dikdik, bushbuck, waterbuck. Bushbuck and waterbuck are restricted to riverine bushlands. (I would expect most hunting in Hiiraan as a whole to be for dikdik, since most larger game is virtually extinct.) No mention how game were secured.

Percentage composition of quarry in riverine villages in Hiiraan (or at least Buulobarde): gerenuk 36%, Soemmering's gazelle 29%, dikdik 29%, birds 7%, none other mentioned. The composition was very different for Jalalaqsi-Jowhar: lesser kudu 46%, bushbuck 14%, dikdik 14%, waterbuck 12%, Soemmering's gazelle 5%, dibatag 5%, gerenuk 3%. Along the lower Shabelle (below Muqdisho) the main game were lesser kudu 39%, dikdik 28%. Notable 3% giraffe, rising to 7% along the Jubba, where lesser kudu formed 64% of responses and dikdik not even mentioned.

Fagotto, Flavio 1987 ***Sand-dune fixation in Somalia***. Envir. Conserv. 14: 157-163.

Mostly based on work at Marka. Very little data proffered, & it's a case of having to believe most of the opinions & recommendations. Fagotto was UNDP Proj. Mgr for dune fixation projects in S Somalia.

Starts by stating that despite considerable int'l-mediated efforts to combat desertification in Somalia, "such efforts are still inadequate to cope with the actual situation" of large desert areas with much more becoming vulnerable to desertification. Drought & overuse of vegetation affect these dry lands, which are shifting toward an ecological equilibrium of decreased production, increased erosion, & drastically reduced macrofauna.

Much on characteristics of dune pioneer plants and many species successfully planted in windbreak-protected areas though not on shifting dunes. Also, description of fixation techniques.

The regional dominant of coast is *Acacia tortilis* woodland, though fragmented now. “This woodland represents the climax vegetation of these coastlands.” Together with the associated shrubs and trees, may be regarded as residues of a primordial woodland which centuries ago presumably covered most of the land down the coastline. Human pressure through overchopping and overgrazing has degraded this vegetation.

"Sandy environments in Somali are not as arid as they seem; the sands hold some humidity at lower depths, which vary from a few centimetres in the 'cemented' sands to more than one metre in the shifting dunes. This is well known and depends on the fact that rainfall, which infiltrates the sand, cannot come to the surface and disperse in the air through capillary action, the sandy particles being much too large for such action to be effective."

Handulle, Abdulkadir A & Charles W Gay 1987 ***Development and traditional pastoralism in Somalia***. Nomadic Peoples No. 24: 36-43.

Handulle was Director of Forestry, NRA; wasn’t he my former counterpart? And unhappy with the strategies and methods of CRDP. Gay was Acting Head, Range Sci Dep, Utah State Univ. [while Handulle had an M.Sc. from U State].

Begins with generalities on pastoralism in Somalia, a subsistence herding strategy, the importance of mobility. It is the principal economic activity in the country, accounting for c50% of GDP and >80% of export revenue. About 80% of the Somali population is engaged in stock raising of one sort or another, while c55% is engaged in nomadic pastoralism. During the last 3

decades pastoralism has begun to have detrimental effects on local range resources primarily due to overstocking and overgrazing. They blame most of this, as causing or exacerbating, by "poorly designed and highly erratic development schemes and policies that were imposed on nomadic pastoralists. Previously, traditional pastoralism maintained human and animal populations in ecological balance with each other and the land by 'natural control mechanisms' that included scarce and variable rainfall, drought and disease. But recent changes viz. water development and disease control, aimed at alleviating constraints and limits to livestock production, have created ecological imbalance. Many development planners *(who?)* viewed these as ends in themselves rather than part of an overall management strategy. Since independence (1960), 6 development plans were launched. Several aimed to increase stock production by creating additional productive capacity especially through animal health improvement by better vet services, and increased water supply to open new grazing lands.

Water development is the overwhelmingly most sought form of development by pastoralists, and enthusiasm for new water development remains strong. Water is a continuing obsession of herders. Range management thus becomes a question of water availability and management. Thus, one of the gov development plans included the drilling of 300 deep wells. There is no doubt that development of water points is crucial for the well-being of nomads and their stock but, unless accompanied by a well-thought-out grazing management plan, this 'solution' not only fails to solve immediate problems but exacerbates the pastoralists' situation. "The resulting long-term destruction of the environment may outweigh its immediate benefits."

The CRDP (in 1986) noted that in villages it is impossible to differentiate between water for humans and stock, and further, that since bore hole construction there has been a significant increase in availability of dry-season water at the expense of vegetation in the area surrounding the bore hole. Many bore holes have been drilled in many parts of the country both by donor agencies and the Water Development Agency, and many *berkeds* built privately. A 1979 survey found a proliferation of WPs, mostly wells, which in the CR increased from 9,437 to 42,211.

When new permanent water sources appear, stock concentrations increase and remain past the normal grazing period. Range degradation often occurs within a 10 km radius of the water point (WP). Box (1982) mentioned range deterioration following range 'improvement', especially due to bore holes. The result of water development programs, well intentioned though they be, has been to spread the destruction of grazing resources into formerly seasonal pastures, areas like the Hawd (which traditionally were seasonal only, due to lack of year-round water).

The other main improvement, greatly appreciated by stock owners, is livestock disease control, and veterinary intervention has often led to dramatic increases in animal numbers. "Such intervention has been disastrous. Decreased livestock mortality exacerbates problems of overgrazing." *(So it appears that water development and disease control work synergistically, amplifying the degrading effect on the range resource.)* "Just as water development had no accompanied grazing management program, so disease control had no complementary marketing program to accommodate excessive stock numbers on the rangeland." Stock population estimates indicate a big increase between 1979 and 1985 for all 4 stock classes in the CR, the biggest % increase being for camels whose numbers rose from 640,000 to 880,000.

By the late 1970s range degradation in Somalia was perceived to be widespread. This paper recommends a research program aimed at understanding the local pastoral ecosystem and the collecting of an ecological baseline. *Are they suggesting this for purposes of monitoring, a timeline of range condition? It certainly looks so: they further recommend a study of areas before and after completion of wells or other WPs. The results would presumably indicate the likelihood and degree of impact on the range. A well-written piece.*

Hemming, Christopher F 1987 ***Vegetation survey of Baardheere Reservoir Zone***. JESS Rep. 23 (see Deshmukh 1990).

Herlocker, Dennis, Ahmed M Ahmed & Thomas L Thurow 1987a ***Response of vegetation of the Acacia reficiens/Dichrostachys sp. shrubland range site to land use intensity, Ceel Dhere District, Somalia.*** Somali J. Range Sci. 2: 10-24. [also in v3:1-11]

(This is D. kirkii) This range site [CT] starts around Galcade and goes SW to Middle Shabelle Region, note it catches Aadan Yabaal. At 40-60 km from coast. I've changed 'shrubland' to 'bushland'. Distribution patterns, local uses, behavior under grazing regime described notably its presence and abundance with increasing distance from waterpoint (village). Specifically, circular plots at sampling stations along all major vehicle tracks within the range site. Intervals 0.2-3 km. Shrubs and dwarf shrubs sampled with 100 m square and 10 m square plots, respectively. For each individual in plot, plant height, crown diameter. Composition and foliage cover of herb veg with 10 m point transect of 1000 points at each sampling station.

Herlocker, Dennis, Ahmed Muse Ahmed, Bashir Barre Buh, Mohamed Osman Aden, Abdulkadir Mohamed Ibrahim & Abdi Mohamed Haji Duale 1987b ***Range/vegetation survey of Ceel Dhere District, Galgaduud Region, Somalia. Parts I and II***. CRDP Tech. Rep. Ser., Mogadishu, 28p.

8000 km^2. Three physiographic regions: coastal plain 15-20 km wide, central ridge 30-40 km wide, W part a plain. Note dune fields in mostly NE. Based on stabilized sand dunes, over limestone. Range condition very poor on dunes, poor along a fairly narrow coastal strip, fair over most of rest and fair/good or good along much of central ridge and locally (centrally) on coastal plain. Rainfall c280 mm, lower in W and N.

Grassland on coastal plain. Most of District is shrubland [i.e. bushland, to 5 m but seldom >2.5 m; they use the P&G veg classif which has S 0.7-6 m and B 2-10 m, but that's way too much overlap and I don't think I have used a S class in the last 20 yrs except maybe for a layer 1-2 m; another thing is that Herlocker et al. use 'shrub' for both nominal shrubs and trees. Woody cover 36% in bushland, 16% in shrub grassland. Dwarf shrubs 5% in bushland, 1% in shrub grassland. Herb cover 3% in bushland, 4% in shrub grassland, 19% in grassland. Annuals unimportant. Evergreens only 0.7% cover or 2% of all woody cover.

No methods. Presumably as in the 2 publications in Som J Range Sci, which indicate circular plots. (Or is it transects?) Twelve range sites. Mean 58 spp per range site, max 102. Part II tabulates and discusses each of the range sites. For woody layer, columns for % cover, % relative

cover, density, some palat & hedging. I have summarized the cover in a table. Anything <0.01% is indicated as 0.01. f=forb, g=graminoid. Underlined RS names are my suggestions.

NOTE Indigofera intricata amended to sparteola.

RS1 Acacia horrida-Commiphora chiovendana bushland; /Blepharis B on sand over limestone. Westernmost part of Dist. 660 km2. S&T density 1700/ha. dS 1300/ha. Herb cover 0.2% (basal), 3.3% (foliar). Heavy/very heavy hedging of 27-31% of woody plants in 0.5-1.5 ht, much lower (4%) at 2 m height, progressively lower (0.6-2.4%) between 2.5-4 m height.

RS2 Tephrosia obbiadensis/Indigofera ruspolii/Aristida sieberiana shrubland; low shrubland [bushland?] on sand over limestone. W part of Dist. 870 km2. Reddish termitaria to 4 m. Most woody cover at 0.5-2 m, with scattered emergents to 3.5 m. Evergreen shrubs 1% of cover. S&T density 4945, dS 6140 (all Indigofera ruspolii). (note Ac oerfota based on measure of 1 plant!)

RS3 Acacia reficiens-Dichrostachys kirkii/Indigofera ruspolii/Leptothrium B on sand over limestone. Westernmost part of Dist. 456 km2. Only 1.7% of relative cover is evergreens.

RS4 Acacia nilotica-Dichrostachys kirkii/Indigofera ruspolii B on stabilized dunes. N to S centrally. 2050 km2. Only 2% of relative cover is evergreens. S&T density 1715, dS 6800. Progressively declining % of shrubs/trees heavily/very heavily hedged with height from 35% at 0.5 m to 9% at 2 m.

RS5 Vachellia (Acacia) spp-Commiphora spp/Indigofera ruspolii dense B on stabilized dunes. Deep soil. Centrally in Dist. 1145 km2. S&T density 3520, dS 8300. Has c12 spp Commiphora but 7 are indet. And another 23 indet woody spp.

RS6 Vachellia (Acacia) spp/Indigofera ruspolii B on stabilized dunes. Central, 225 km2. Evergreen plants 3% relative cover. S&T density 2060, dS (I.ruspolii) 10,110 plants/ha.

RS7 Acacia senegal-Cordia monoica/Heteropogon BG on stabilized sand(-dune) footslopes. In SE part of Dist, 82 km2. Percent of S/T heavily/very heavily hedged is 55-75% at 0.5-1.5 m height, drops to c10-20% at 2+ m.

RS8 Unkn whitebark shrub/ Indigofera ruspolii shrub grassland on stabilized sand(-dune) footslopes; some soils are heavier. A strip in SE part of Dist. 39 km2.

RS9 Terminalia spinosa/Indigofera sparteola shrub grassland on stabilized sand(-dune) footslopes. E part of Dist. 39 km2.

RS10 Indigofera sparteola/Leptothrium senegalense dwarf-shrub grassland on silty clay loam slopes of E flank of central ridge. 667 km2.

RS11 Indigofera sparteola/Cyperus chordorrhizus-Cenchrus ciliaris dwarf-shrub grassland on coastal plain of stabilized dunes. 2035 km2.

RS12 Mobile sand dunes. 370 km2.

	hb	limest soils		stabilized dunes				dune footslopes			Dw-shr G	
RANGE SITE		1	2	3	4	5	6	7	8	9	10	11
TOTAL woody		23.2	39.9	37.3	34.5	69.0	39.8	20.3	14.0	18.5	2.8	7.0
TOTAL forb		1.6	0.4	2.4	1.2	0.9	0.5	0.6	0.8	1.0	0.6	0.4
TOTAL gram		1.6	1.5	3.1	2.0	2.2	0.9	2.8	3.0	2.0	1.6	16.8
(Dirrow) (evergreen)								0.02	0.01			
(Geydarabe)			1.3									
(Guduudmadume)						0.2						
(Murudhac)		0.01										
(Qantable)		0.01										
(White bark shrub)									2.3	1.1		
(Linear leaf)									0.6			
(Recumbent shrub)											0.6	
Abutilon hirtum					0.1					0.1		
Abutilon						0.2	0.1					
Acacia edgeworthii			0.01					0.3		0.01		
Acacia horrida		4.5		2.9	2.1	9.0	1.4	0.04		0.01		
Acacia mellifera			0.1	0.2	2.0	1.7	0.8					
Acacia nilotica			0.2	2.9	8.8	5.6	4.4	0.7	0.1	0.01		
Acacia oerfota		0.01	3.6			0.4	2.0	0.01	0.2	1.1		
Acacia reficiens			0.4	10.7	2.5	4.5	3.7					
Acacia senegal		0.8	0.2	0.6	0.5		0.1	7.4	0.1			
Acacia zanzibarica?						0.9		0.15	0.3	1.5		
Acacia tortilis		0.5	0.3	0.02				1.1				
Adenium obesum							0.04	0.01	0.02			
Aerva javanica					0.1			0.1				
Albizia anthelmintica			0.3									
Albizia obbiadensis					0.5	0.1						
Allophylus rubifolius						0.5						
Anisotes trisulcus			2.3									
Asparagus		0.1				0.04						
Balanites				0.1	0.25	0.15						
Boscia coriacea			0.04	0.01	0.01							
Boscia minimifolia			0.2	0.2								
Boswellia neglecta		0.05						1.3	0.03			
Boswellia rivae?			2.5				0.02					

Cadaba longifolia		0.1	0.04	0.4	0.1	0.4	0.1	0.3	0.1		
Cadaba mirabilis								0.3			
Cadaba								0.02			
Capparis cartilaginea?						0.2					
Cissus		0.1	0.2								
Coffea rhamnifolia					0.1	0.8	0.1	0.1			
Combretum contractum			1.1	1.2							
Commiphora africana (tubuk)								0.5			
Commiphora ancistrophora					3.4		0.01	0.03			
Commiphora bruceae								0.1			
Commiphora chiovendana	4.4										
Commiphora gileadensis?(Dhasayl	0.3										
Commiphora ellenbeckii? (Dhirindhir madas)	0.01										
Commiphora gracilispina? (Dhirindhir xaws)	0.1										
Commiphora erythraea					2.1		0.3	0.02			
Commiphora gurreh	2.0	2.4	0.01	0.05							
Commiphora hildebrandtii	1.3				0.7						
Commiphora hodai	0.5										
Commiphora incisa	0.3	0.05	0.3	1.0	6.5	3.1	0.5	0.7	0.7		
Commiphora kua	0.01										
Commiphora rostrata	0.01										
Commiphora sennii					0.9						
Commiphora truncata	1.3	0.03	0.1								
Commiphora sec. Opobalsameae? (Dudus)			0.2	0.3							
Commiphora spp		0.5			1.6	0.3			0.3		
Cordia monoica (incl. Jaqaqle)			0.01		0.24	2.4	4.4	1.4	0.01		
Cordia suckertii		0.01	0.3	0.1	0.02	0.3	1.2	0.2			
Cordia somalensis					0.04		0.3		0.8		
Dalbergia uarandensis		0.5	0.1	1.0	3.3	2.0					
Dichrostachys kirkii		0.5	5.5	3.7	5.7	0.9		0.02	0.01		
Elaeodendron aquifolium			0.05	0.01	0.02		0.04	0.02			
Erythrina melanacantha								0.02			
Euphorbia cuneata	1.2	2.4	1.5	0.1	1.3			0.1		0.5	0.02
Euphorbia matabelensis		2.6	0.7								
Euphorbia somalensis	1.9	0.01									
Flueggea? (Lafay)							0.1	0.04			

Gardenia fiorii		0.01	0.04	0.3		0.1			0.7			
Gossypium somalense			0.9	0.04			0.7		0.2			
Grewia cerasifera	dS							0.1	0.1	0.25		
Grewia erythraea?		0.03	1.3	0.2	0.04	0.5	0.3	0.1	0.5	0.3		
Grewiapannosisepala?						0.7	0.8		0.1	0.5		
Grewia penicillata		0.6	1.6		0.01	0.2	1.0	0.04	0.1			
Grewia tenax		0.15	0.05			0.2		0.1	0.01	1.5		
Grewia villosa				0.04								
Hildebrandtia africana						1.2						
Hildebrandtia sepalosa							0.2					
Hildebrandtia			0.05	0.1	0.1				0.2			
Indigofera sparteola	dS								0.2	1.0	0.9	5.2
Indigofera ruspolii	dS	1.0	5.1	4.2	4.3	6.2	7.0	0.03	2.0	0.5		
Indigofera spinosa	dS							0.1				
Indigofera (dS)	dS				0.02							
Ipomoea donaldsonii		1.4	0.7		0.7		0.8		0.8			
Ipomoea						0.2						
Jatropha (small)			0.2	0.2	0.01				0.01			
Kelleronia gillettiae						0.1						
Lannea cotoneaster		0.6										
Lippia carviodora						0.02	0.6		0.2			
Lycium shawii										0.01		
Maerua angolensis? (Lamalooshe)			1.0	0.02		0.01						
Maerua subcordata						1.5	0.8					
Maytenus obbiadensis (incl Suruur	dS							0.02			0.5	1.8
Momordica spinosa									0.1			
Parkinsonia scioana					0.05	3.0	2.9					
Premna resinosa									0.02			
Senna ellisiae				0.4	1.1	0.3						
Sesamothamnus busseanus		0.1		0.5	0.01							
Sesamothamnus			0.4			0.01						
Solanum jubae			0.4	2.9	2.8	2.9	0.5	0.4	0.1	0.8		
Solanum			0.1	0.01				0.1				
Tephrosia obbiadensis			6.8	0.2	0.4			0.01	0.2			
Terminalia spinosa					0.01	0.3		1.1	0.9	7.1		
Triumfetta					0.1							
Turraea retusa? (Dhumay)			0.1	0.03								
Uvaria denhardtiana						0.1	0.2	0.01	0.01	0.03		

Ximenia?						0.1						
2-6 indet forbs	F	0.2	0.2	1.0		0.2	0.1	0.3	0.2	0.6	0.6	0.4
28 indet forbs	F				0.4							
Aerva	F			0.05	0.01		0.01					
Barleria	F		0.15									
Blepharis	F			0.3		0.03						
Blepharis edulis	F	0.6	0.02		0.5							
Commelina	F								0.1			
Corchorus	F			0.1								
Crotalaria dumosa	F			0.3		0.05	0.2					
Endostemon	F	0.2			0.02							
Euphorbia	F	0.03										
Gutenbergia	F			0.1	0.1	0.5	0.2	0.05	0.4	0.2		
Heliotropium (incl cinerascens)	F			0.02		0.03	0.01		0.03	0.1		
Hypoestes forskaolii?(Ged warabe)	F			0.1								
Indigofera	F	0.1		0.03	0.01		0.01	0.2		0.1		
Malvaceae	F	0.3										
Pavonia	F	0.01			0.04	0.1	0.01	0.02	0.01	0.04		
Pavonia arabica	F			0.02								
Sida	F				0.1					0.03		
Tephrosia	F			0.2		0.03		0.02		0.03		
Tribulus terrestris	F	0.1		0.01				0.01				
Afrotrichloris hyaloptera	G		0.1	0.1	0.01	0.2	0.2					
Afrotrichloris martinii	G							0.02	0.1		0.1	0.8
Aristida adscensionis	G	0.1			0.02		0.01					
Aristida kelleri	G							0.1		0.2	0.2	1.0
Aristida sieberiana	G		1.1	1.0	0.9	0.3	0.1					
Aristida	G											0.4
Cenchrus biflorus	G		0.01	0.01								
Cenchrus ciliaris	G		0.01	0.01	0.3	0.2	0.1	0.3	0.9	0.5	0.3	3.0
Coelachyrum stoloniferum	G				0.01	0.01	0.01	0.1	0.04	0.04		0.1
Cymbopogon commutatus	G											0.3
Cynodon dactylon	G			0.01				0.02				
Cyperus chordorrhizus	G							0.1			0.02	4.5
Dactyloctenium aristatum (ann)	G	0.1										
Dactyloctenium scindicum	G		0.1	0.6	0.1	0.2	0.1	0.01	0.4			

Digitaria nodosa	G								0.01		0.02	0.8
Dignathia gracilis	G	0.1	0.03										
Enneapogon cenchroides	G				0.02	0.4	0.02	0.01					
Enneapogon schimperianus	G										0.02	0.2	
Eragrostis (ann)	G			0.1						0.1			
Eragrostis (per)	G					0.1							
Eragrostis ciliaris	G	0.04							0.01				
Heteropogon contortus	G							1.1	0.3	0.1	0.1	0.9	
Hyparrhenia hirta	G								0.1				
Leptothrium senegalense	G	0.5	0.2	1.3	0.6	0.6	0.15	0.5	0.4	0.8	0.7	1.6	
Panicum coloratum	G					0.02		0.3					
Panicum pinifolium	G							0.1	0.1		0.1	1.8	
Panicum	G									0.1			
Sporobolus brockmanii	G						0.1	0.1	0.04	0.1	0.01	0.05	
Sporobolus somalensis	G								0.6				
Sporobolus	G				0.01								
Tetrapogon tenellus	G	0.04				0.01							
Tragus berteronianus	G	0.4											
Unkn grass (per)	G	0.01											
Unkn sedge	G	0.4			0.02	0.02	0.01	0.1	0.03	0.02	0.1	1.1	

Hussein, MA 1987 ***Traditional practices of camel husbandry and management in Somalia***. Camel Forum (Somali Acad. Sci. Arts) Work. Pap. No. 19, 15p.

A generalized but useful map of seasonal camel movements in Somalia (p.9). Note that in Hiiraan the movements are approx. E-W, with one set on E side of Shabelle R. & one on W side.

Kuchar, Peter 1987 ***Dry-season forage survey in eastern Hiraan Region, central Somalia.*** Somali J. Range Sci. 2: 28-62.

Arid regions like Somalia have a history of recurring droughts with concomitant stock losses. For example, an estimated 25% of all livestock in the country perished as a result of the 1973/4 drought (Clark 1985). Losses are expected, indeed the pastoral system of maximizing herd size is aimed directly at famine management: a nomad's correct reasoning is that the more animals he has going into a drought, the more he should have left at the end of it (Lundholm 1976, Perevolotsky 1986). Although recognized as part of the system, such stock losses are naturally not desired. Reduction in herd size and condition add to the economic burden of pastoralists' households: supplementary sources of income disappear, the increasingly more disease-prone animals need more care and capital, some must be sold so that emergency feed can be purchased, and the people may have to migrate long distances.

In parts of central Somalia the Gu season (April-May) rains failed in 1986, the Dayr rains (October-November) also failed in some areas, and drought conditions developed through late 1986 and early 1987. There was talk of famine conditions, and of the urgent need to find sources of feed and water.

In late January CRDP staff assessed drought conditions in the Central Rangelands (CR) and identified possible sources of feed and water for famished stock. My aim in this activity was to survey Hiraan Region for fodder availability. I managed to complete most of the eastern half of the district, covering 12,500 km^2. Based on field surveys and supplemented by a preexisting plant data base, natural feed sources and stocking rates were calculated for droughts of given lengths.

LANDFORM AND COVER

Deep stable sandplains are the chief landform. In the south, stable dunes predominate, and there are a few relatively small active dunes. The eastern edge of the Region has shallow limestone soils, and the western side of the Shabelle Valley has a series of limestone hills and plateaux. The rest of the valley has sandy soils and an alluvial plain with silts and clays. Agriculture is the predominant land use on the alluvial and basaltic plains. Nomadic pastoralism prevails through the rest of the region, based mostly on camel and goat.

Based on landform maps and descriptions by the Central Rangeland Survey (RMR 1979) and on CRDP range surveys (Kuchar et al. 1985 and reports in prep.), 10 major Landform Types (LTs) were delineated and biomass calculations based on each LT.

The climactic and, in most places, the current vegetation is deciduous thornbush dominated by Acacia and Commiphora species. Stands generally have 20-50% cover of 20-40(60) species of shrubs and small trees, 90-95% of these deciduous. The top layer is 2-6 m high with emergents to 10-12 m. Sizeable tracts have 1-2 m high shrubland. The major community in the largest range site, the hawd (deep infertile stable sands supporting bushland with grass patches), is codominated in most stands by Cordeauxia edulis, Acacia especially A. edgeworthii, and Commiphora especially C. horrida. Indigofera ruspolii is the top dominant in the dwarf-shrub layer. Boswellia microphylla is a locally abundant tree, and Caesalpinia trothae is a canopy dominant toward the southern end of the hawd.

Except in small shallow bowls and in patches of alluvium the herb layer is poorly developed, and about 50% of the land has <1% crown cover of perennial grasses. In places, particularly on heavy soils, better-quality grasses can be abundant but the predominant forms are stemmy species of Aristida. In response to good rains a conspicuous but ephemeral layer of annual grasses and herbs may develop. As a feed it is probably low both in quality and quantity.

FEED SOURCES

A drought implies extended shortfalls of either or both of water and feed. As in the case of this particular drought, the two are often interrelated: water may be adequate but feed scanty in traditional grazing areas, while lack of water in areas with adequate feed prevents their

utilization. In January water was already being trucked to parts of the drought-stricken zone particularly Abudwak District to the north, and the assumption in our work is that water sources would be developed or trucked into areas of good feed.

Feed sources can include:

(1) concentrates

(2) bulk feed, e.g. sorghum stover, trucked in from other regions

(3) bulk feed from local sources, chiefly farms in the same district or region; as stover, stubble or silage

(4) natural rangeland within the drought zone

(5) natural rangeland in another geographic area, to which starving stock would be trucked or trailed.

The aim in this particular exercise was to quantify feed distribution and abundance for no.5. Some herds had already been moved into the study area from the drought zone, and recommendations were voiced on shifting more stock into those parts of Hiraan Region capable of supporting the animals.

Dry-season feed sources in natural semi-arid bushland include:

(1) evergreen woody plants

(2) deciduous trees and shrubs which have not yet dropped their leaves

(3) fallen leaves and fruit

(4) dry twigs

(5) dry grass

(6) fresh green biomass in riparian, seepage and shallow-groundwater areas.

In this study I have emphasized evergreen woody plants which are the main potential source of high-quality feed. I have attempted rough biomass estimates for the other components but it is my contention that, for reasons of access and quality, these are poor feed sources. Evergreen browse, on the other hand, is amply represented over large parts of the hawd by yicib (*Cordeauxia edulis*), with other evergreens adding marginally to the total available palatable feed. Source no.6 is virtually nonexistent in the study area.

METHODS Steps in preparing diet biomass maps:

1. Along major tracks and cutlines, estimates at selected stops for % canopy cover and % available to camel (ht <3 m) of palatable evergreens and deciduous woody plants. Palatability information was taken from the literature and ratings collected over several years by CRDP staff (Herlocker & Kuchar 1985).

2. Percent cover, mean height, mean clone diameter, and hedging rating of yicib whenever encountered at a stop.

3. Basal cover of perennial-grass layer. Basal cover is a parameter relatively insensitive to seasonality, hence estimates or measurements from any season can be compared. Translating grass cover to biomass must consider offtake and growing-season effect on crown development. Standing crop estimates are therefore best made by correlating cover data and biomass data from the same time-periods and sites. Our data do not meet these criteria, but I believe that the estimate of 187 kg/ha of dry leaf, integrated over different areas, is an acceptable first approximation. This estimate was made by areally prorating biomass polygons hand-plotted using mapped stand data on grass cover transformed to biomass.

4. Compile information from 1984-86 surveys on yicib distribution, cover of other palatable evergreens, and grass cover. Due to an excellent grid of seismic lines, the stands represent a fairly uniform coverage of the area with an average of 1 stand per 15.6 km^2 of hawd.

5. Using results of dimension analysis, compile a yicib biomass map by substituting biomass values for cover and dimension estimates that were taken in the field. The yicib biomass regressions are based on a sample of 50 plants representing a range of clone sizes, leaf sizes and hedging classes. Best fit was realized from the power curve relating leaf biomass to the ratio of crown area to hedging rating. A scatter diagram of leaf size vs. clone biomass did not appear to show any relationship. Scatter diagrams of leaf biomass per unit area vs. (1) crown area and (2) crown volume appeared to show a weak relationship, but linear nominal and power regressions failed to give an r^2 better than -0.16.

6. Using double-sampling data and regressions from earlier and current surveys, a biomass map was compiled for other evergreen browse, grass, green deciduous component, and leaf litter. Leaf litter in the study area adds up to 275,000 T, which is comparable to perennial grass standing crop. The accessible portion of litter averages 162 kg/ha. Litter forms the largest category of available feed at 47%.

I was confident that with these data a reasonably reliable regional picture of dry-season biomass obtains, despite often large stand-to-stand differences. Based on all 496 stands with yicib, mean yicib leaf biomass per stand was 100±3 kg/ha ($p<.05$). No error estimate was attempted for other feed components. Having a feed map, the next step was to use standard intake values to generate stocking estimates for various combinations of duration and offtake rate. Finally, recommendations were made on utilization of E Hiraan available biomass.

The study area is calculated to have 200,867 TLUs, but other population estimates suggest higher TLU, thus a value of 250,000 TLUs was accepted. At an intake rate of 2.5%/day, one TLU requires 6.25 kg/day, thus the whole stock population would need 1560 T of feed per day. A

proper-use factor of 25% for evergreen leaf would reduce total accessible feed to 321,688 T. Given adequate water sources, resident stock could easily weather a 3-month drought but might be reaching the limit of feed availability after 6 months.

Yicib is an acceptable and palatable dry-season browse particularly for camel and goat. It represented the largest component of high-quality dry-season food, viz. 17% of all available feed and c85% of good-quality feed. On a per unit area basis, yicib bushes in good condition have 300-600 g of leaf/m^2 of canopy. Thus for example, a good stand of 10% yicib cover supports a permanent supply of c500 kg of high-quality browse.

Madany, Michael H 1987 ***Important woody plants of Middle Jubba Region***. Somali Ecological Society, Muqdisho, 6p.

A compact but information-packed little paper on economic significance of woody plants in an area of S Somalia. All data apparently original. The abbreviated species names in the table would have been much more convenient in their normal expanded form.

Moggi, Guido 1987 ***Researches on the coast of Somalia. The shore and the dune of Sar Uanle. 41. The vegetation.*** Monit. Zool. Ital. (n.s.) Suppl. 22: 291-330.

Coast 18 km SW of Kismayo. Calls it part of the low Juba region.

Z-M (B-B) releves. *I compliment the presentation of releve tables for each veg type. T*wo main substrates, the level sandy coast and the dunes, also a littoral strip without vegetation but rich in beached seagrasses, and also with seeds and hypocotyls of some coastal trees. The level coast has psammophyte pioneer vegetation dominated by *Ipomoea pescaprae*.

The dunes have 5 CTs based on different physical aspects of the dunes.

1. Pioneer Panicum pinifolium CT nearest the shore on mobile substrate.

2. Sporobolus virginicus CT on small sandy terraces.

3. Dune Neuracanthus ?ovalifolius (‘aff.capitatus’)-Echiochilon arenarium CT.

4. Retro-dunal low scrub with Cordia somalensis.

5. Grassy areas with Dactyloctenium scindicum and Cenchrus pennisetiformis.

Cyperus chordorrhizus is an important component of beach vegetation. Ubiquitous and subdominant in Panicum pinifolium-Justicia flava CT on mobile coastal dunes as well as in Sporobolus virginicus-Justicia flava grassland on sandy coastal terraces. Sparse to codominant with Cenchrus pennisetiformis in herb layer of Cordia somalensisshrubland on coastal dunes. Locally very abundant in Cenchrus pennisetiformis-Dactyloctenium scindicum grassland on landward base of dunes. Ubiquitous and strongly dominant in grassland on seaward slope of

stable dunes, and this is the most characteristic form of vegetation of stable sand dunes on at least parts of the Somali coast.

Musse, Hawa Guled 1987 ***National Range Agency in Somalia: a case study***. M.Sc., U.S. Int. University – Africa, Nairobi, Kenya, 72p.

Livestock raising is Somalia's most important economic activity, accounting for c50% of GDP and >80% of export revenue. Hence the gov has paid due attention to develop production opportunities in the livestock industry and the preservation and development of rangeland resources. Fifteen projects run by NRA are listed, including CRDP funded by Int. Fund for Agr. Devel., WB, USAID, Federal Republic of Germany, Gov of Somalia.

ABSTRACT A case study on NRA as a whole, viz. Background Information, Organizational Structure, Personnel and Finance.

NRA was created in 1976 as a parastatal. Formally it goes under Min. Livestock, Range and Forestry. It was designed to carry out the following objectives:

- To develop and improve the environment particularly range management.
- To set up grazing systems and drought, famine reserves.
- To improve economy in terms of livestock production.
- To promote organization for guiding and educating livestock owners.
- To attempt to settle the nomadic people in order to avoid overgrazing which results in soil erosion and drought.
- To construct and rehabilitate wells in order to get water for people and livestock aspects of range management, forestry conservation and forestry development. NRA comprises five functional departments operating through eighteen regional offices.

The five departments are:

1. Administration and finance
2. Forestry with anti-desertification
3. Range management
4. Wildlife
5. Planning, training and research, and in addition exercising its own day-to-day responsibilityes, NRA controls a number of projects.

This agency is designed to implement the government objectives on range development and animal production. The problem is the difference between plans and implementation. The agency has many constraints which hinder the implementation of the plans, these includes financial, personnel, communication and structure.

The implementation record of NRA is not as good as it should be. It is suggested that the agency should improve the actual implementation efforts considering financial availability, personnel performance and technical knowledge. If it is to do so it needs to improve planning among other things.

This case study is helpful to the agency or other agencies which have the same problem.

U.S.Dep.Interior 1987 ***Juba Valley, Analytic studies, lands and water resources, main rept***. Min. Juba Valley Devel., Somali Democratic Republic, 131p.

A table listing 17 Jubba Valley soil and land classification surveys from 1961 to 1987. Geology, water (river) data, irri