

Country Pasture/Forage Resource Profiles

KIRIBATI



by
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CONTENTS

1. INTRODUCTION	5
2. CLIMATE AND AGRO-ECOLOGICAL ZONES	6
3. SOILS AND TOPOGRAPHY	6
4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS	7
5. CONSTRAINTS TO DEVELOPMENT OF PASTURE-BASED LIVESTOCK PRODUCTION SYSTEMS	7
6. THE PASTURE RESOURCE	8
Recent initiatives in forage improvement	8
Weed control	8
7. RESEARCH AND DEVELOPMENT ORGANIZATIONS AND PERSONNEL	8
8. REFERENCES	9
9. CONTACTS	9

1. INTRODUCTION

The Republic of Kiribati in the Central Pacific covers more than 5 000 000 km² of ocean. It consists of 33 low-lying atolls that are formed into three groups, the Gilberts proper; Phoenix; Northern and Southern Line Islands with Ocean Island (see Figure 1). Although the Republic of Kiribati is spread over a large area the actual total landmass of 79 000 ha is very small. The islands range from Mackean Island at 56 ha in the Phoenix group to Christmas Island of 36 365 ha in the Line group. With the exception of Banana, all the islands of Kiribati are low lying atolls built on a submerged volcanic chain and encircled by reefs with one of the biggest atolls (Christmas) in the world. The only island that rises more than 4 m, is Ocean Island, the former phosphate atoll (Lambert, 1982). The capital is Bairiki on Tarawa, the most populous island with around 38 000 inhabitants.

The indigenous population is Micronesian, of which there were 64 883, while Chinese, Indians, Europeans and other Pacific islanders (Tongans and Fijians) make up the remainder. Twenty-one of the atolls are inhabited; these are the 17 islands of the Gilbert group, Canton (with a small caretaker community) of the Phoenix Islands and three in the Line Islands. The Gilbert group hosts 79% of the population, with Tarawa Island the capital having 36.5% of the total population. In 2001 Kiribati's population was approximately 90 000 (Crocombe 2001); according to SPC the mid-year population estimate in 2000 was 90 700 (SPC), but the last census in 2005 indicated 92 533. According to SPC in their latest projections (SPC, 2008) the mid-2008 estimate was 97 231 with a mid-year 2010 population estimate of 100 903 and a 1.9% estimated annual population growth rate for the period 2008–2010. According to the World Factbook the July 2008 estimate is 110 356 (with a population growth rate of 2.235%).

Agriculture in the general sense is not on a large scale in Kiribati. Rural existence is based on the cultivation of the coconut tree for food and housing, with a proportion of the produce being used for a monetary income from the sale of copra. Most protein foods come from the ocean and the lagoons. Apart from coconut and marine life, the other component of the diet is swamp taro or "babai" (*Cyrtosperma chamissonis*) or giant swamp taro which is grown in pits dug to the water table, and into which various forms of compost are added (Ali, 1987). The pits vary in size from a few square metres to a quarter of a hectare or more.



Figure 1. Map of Kiribati

Source: *The World Factbook*

Table 1. Kiribati statistics of ruminant livestock numbers, mutton, milk and beef and veal imports for the period of 1997–2007

Item	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Goat nos. (.000)	n.r	n.r	n.r	n.r	n.r	n.r	n.r	n.r	n.r.	n.r	n.r*
Chicken meat production (Mt)	297	297	297	310	391	442	442	459++	459	470+	480+
Pig meat production (Mt)	672	672	672	744	764	848	848	860	876	880	900
Total meat production (Mt)	969	969	969	1 054	1 155	1 290	1 290	1 319	1 335	1 350	1 380
Mutton imports(Mt)	7	37	34	70	30	39	23	61	86	79	n.r
Milk imports, fresh (Mt)	69	40	20	20	5**	8	8	2	3	4	n.r
Beef & veal imports (Mt)	6	18	20	20	20	8	11***	27	44	870	n.r

* Since 1991 FAO has no record of numbers of goats even though reports from the late 1980s mention goats present.

+ In addition in 2006 and 2007 Kiribati produced 250 and 270 Mt of chicken eggs

++ In addition Kiribati imports large quantities of chicken meat: in 2004, 2005 and 2006 respectively imports were: 923 Mt, 1 347 Mt and 1 008 Mt

** Dried milk is also imported, thus in 2001 there were 120 Mt, in 2004 there were 101 Mt and 369 Mt in 2005

*** Various meats are imported; thus in 2003 meat preparations, sausages, etc. totalled in excess of 700 Mt and total meat imports were in excess of 2 100 Mt. By 2005 total meat imports were 2 900 Mt and in 2006 were 3 787 Mt.

n.r. = no record; No data for 2008

FAO on-line statistics database

Copra is the only exported agricultural product. Efforts are being made to establish breeds of pigs, poultry and goats suitable for local breeding. Table 1 contains information on goat numbers, domestic meat production in Kiribati and various imports.

2. CLIMATE AND AGRO-ECOLOGICAL ZONES

The climate of Kiribati is pleasant from April to October, when the northeasterly winds predominate. During the rest of the year, westerly gales occasionally bring heavy rains. Despite the moderate to heavy rainfall, occasional severe drought does occur and this is attributable primarily to the extremely low elevation of the islands and the soil porosity.

Temperature normally ranges between 23 °C and 34 °C with a mean of 28 °C, although much higher temperatures have been recorded. The average rainfall generally ranges between 1 240 mm in the south to 3 125 mm in the north. However, the rainfall range is from 782 mm per annum on Christmas Island to 3 385 mm on Washington Island.

The northern part of the Republic of Kiribati is on the average 10 °C cooler than those islands in the southern part. Prevailing winds are easterly and hurricanes are unknown. All the islands consist of coral reef formations rising no more than 4 m above sea level, except for Banaba which rises to 81 m and has more fertile soils than other low atolls.

3. SOILS AND TOPOGRAPHY

The soils found in the Republic of Kiribati are formed from calcareous sand consisting mostly of the shells of marine algae and foraminifera and largely made from calcium and magnesium carbonate. The sand contains four main components as listed below in order of decreasing particle size (Barr, 1992).

1. Very coarse sand composed of the white rod-shaped, calcareous algae porolithion.
2. Discoidal white or pink spherical foraminifera, thin in section.
3. Fine sand of orange or pink spherical foraminifera.
4. Fine sand and very fine sand composed of the breakdown products of *Halmieda* algae.

The soils generally encountered in Kiribati may be described as having an AC type profile. The A-horizon consists of sand containing a very variable quantity of humus. It is usually about 25 cm deep, has a pH of 7.6–8.0, and is dark greyish to black in colour. This rapidly gives way to coarse white and pink gravely sand of the C-horizon, which consists almost exclusively of calcium and magnesium carbonates and has a pH of 7.8–8.3. The soil type is one of coral sediment with varying topsoil that is

poor in nutrients. The soil has a high amount of free calcium, locking up most of the necessary nutrients. The soils are very highly permeable and have a low moisture-retaining capacity. The topsoil may have clay-sized particles constituting up to 5% of the volume of soil but such particles are formed by the breakdown of the algae shells by carbonic acid in humus.

Atoll soils are generally low in N and K, and P tends to be fixed. Deficiencies of micro-minerals (nutrients) such as Cu, Zn, Fe and Mn are very common, however, the levels of sodium, boron and molybdenum are adequate, while sulphur may be borderline in some areas.

4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS

The size of Kiribati does not allow for any large-scale ruminant livestock production. Therefore the few livestock kept (monogastrics and ruminants) are largely under the subsistence production system. Pigs and poultry are on free range or extensive system of production.

The livestock unit of the Ministry of Agriculture has what is termed “a nucleus unit” where livestock are improved through a breeding programme. These animals are later sold out at subsidized prices to the outer islands. Thus, the smallholder farmers are those mainly involved in livestock production in Kiribati and there is no commercial production of cattle, goats and sheep.

Goat is (was) the major ruminant animal found in Kiribati. In 1985 there were an estimated 160 goats of which 20 were kept by five smallholder farmers and the remainder kept in “a nucleus unit” (Baraniko, 1985). The goats were distributed to farmers in South Tarawa, but were later re-possessed by the Livestock section of the Ministry of Agriculture. The Agricultural Division is very cautious in the distribution of goats to outer islands because of their destructiveness to young coconut seedlings and babai and also (as with pigs) because of the risk of polluting the freshwater lenses under the atolls.

Reports have proved that goats can survive successfully in Kiribati (Baraniko, 1985; Hussain, 1987). In the 1980s goats were mostly grazed under young coconut plantations established on reclaimed land in Temaiku at the Agricultural Research Station, South Tarawa, where strip grazing (electric fencing was used) and browsing on natural and secondary growth was carried out (Hussain, 1987). Tethering is the major production system available to the smallholder or subsistence farmers.

Of all the shrubs in the atolls goats appear to like *Scaevola sericea* (salt bush) the most and on most atolls they heavily relied on it. In fact, under coconuts *Scaevola sericea* was the only acceptable feed consumed daily by goats (Hussain, 1987). Of the vines and creepers which are also important components of the ground cover of atolls, many were eaten by goats under some circumstances, but the legume *Vigna marina* was the most palatable (Hussain, 1987). Because goats are selective grazers, they are very useful in the control of weeds under coconuts only when the majority of the weeds are accepted by the goats. However, FAOSTAT has no data on the goat population in Kiribati (see Table 1).

5. CONSTRAINTS TO DEVELOPMENT OF PASTURE-BASED LIVESTOCK PRODUCTION SYSTEMS

There are a number of constraints that limit pasture based livestock production systems in Kiribati and these include:

1. The islanders are and always have been mainly fishermen although subsistence farming is done within different communities.
2. It is difficult to get farmers to change from their traditional farming methods.
3. Land shortage appears to be the major problem and people continue to lack land to grow their food crops or raise their livestock.
4. Soil fertility is poor and in most cases soils consist of coral sand surfaced by relatively a thin layer of organic matter.

5. Climatically, the islands at times suffer prolonged droughts. This means that rainfall varies between islands and it has a great effect on the growth and yield of natural vegetation including food crops as well as on poultry and pigs the two main forms of livestock best adapted to atoll conditions.
6. The land use system described as “atoll-agroforestry” (where a wide range of cultivated and protected wild trees and a more limited number of non-tree plants and livestock are raised within a relatively dense and homogenous matrix of the superdominant coconut, Thaman, 1990) is also a constraint.

6. THE PASTURE RESOURCE

The dominant species in the vegetation of Kiribati is the coconut palm (*Cocos nucifera*) which over most of the country forms naturally regenerating open woodland (Barr, 1992). It has been estimated that coconut occupies 80% of the land area of Kiribati (Catala, 1957). The grass, *Lepturus repens* forms an almost complete cover in the better-managed coconut woodland, while on poorer soils the surface vegetation consists largely of *Sida fallax* and *Triumfetta procumbens*. Trees and shrubs grow among coconut palms and, especially in the wetter islands, form dense thickets. These include *Scaevola sericea*, *Messerschmidia argentea*, *Pandanus tectorius*, *Guettarda speciosa*, *Premna obtusifolia* and *Morinda citrifolia*. In Kiribati, the undergrowth varies from almost bare ground to dense bush.

Other common herbaceous plants include *Cassytha filiformis* (a parasitic climber), *Boerhaavia diffusa*, *Vigna marina*, *Portulaca* spp., *Fleurya ruderalis*. The grasses are *Eleusine indica*, *Eragrostis amabilis*, *Stenotaphrum micranthum*, *Thuarea involuta* and *Cenchrus echinatus*. These are of no value in ruminant livestock production systems because they are weeds. Over the years however, several cover crops have been introduced into Kiribati. The following species namely, *Dolichos lab lab*; *Lotononis Bainesii*; *Calopogonium mucunoides*; *Glycine wightii*; *Stylosanthes guyanensis*; *Peuraria phaseoloides*; *Stylosanthes humilis* and *Phaseolus atropurpureus* were introduced (Town, 1977). The only species to cover the ground adequately and to flower and produce viable seed was *P. atropurpureus*. However, this was easily overtaken by the wild *Vigna* and *Canavalia* species. Fodders such as leaves of coconut, breadfruit (*Artocarpus altilis*), *Pipturis*, *Pandanus* and *Moringa oliefera* can be fed to goats if available.

Recent initiatives in forage improvement

There was consideration of the introduction of more multi-purpose trees and shrubby species such as *Crotalaria*, *Flemingia*, *Tephrosia* and *Leucaena* into the island. *Leucaena leucocephala* has been reported to grow well and it seems the obvious one to try in Kiribati (Town, 1977). However, caution should be exercised to avoid detrimental competition with the few existing crops. The most recent initiative is the introduction of agroforestry development into the agricultural systems of Kiribati (Teaira, 2000).

Weed control

Weed control is achieved by slashing of fern and small shrubs found in the coconut plantations. Sometimes they are controlled manually.

7. RESEARCH AND DEVELOPMENT ORGANIZATIONS AND PERSONNEL

None

8. REFERENCES

- Ali, A.** (1987). The agronomy of *Cyrtosperma chamissonis* Schott in Kiribati. *Alafua Agricultural Bulletin* 12(3).
- Baraniko, E.F.** (1985). Smallholder livestock development in Kiribati. *Alafua Agricultural Bulletin*, 11(1): 115–117.
- Barr, J.J.F.** (1992). Technical Report on Coconut Research in Kiribati (1990-1992). Ministry of Environment and Natural Resources Development, Bikenibeu, Tarawa, Kiribati, pp. 1–8.
- Catala** (1957). cited by Barr, J.J.F. (1992) Technical Report on Coconut Research in Kiribati (1990–1992). Ministry of Environment and Natural Resources Development, Bikenibeu, Tarawa, Kiribati, pp. 1–8.
- Crocombe, R.** (2001). The South Pacific Institute of Pacific Studies, The University of the South Pacific, Suva, Fiji, 790 pp.
- Hussian, M.Z.** (1987). Goat development on atolls of the Pacific: Kiribati and Tuvalu experience. *Alafua Agricultural Bulletin*, 12(3): 99–105.
- Lambert, M.** (1982). Kiribati. In: An overview of some Pacific atolls. Regional Technical Meeting on Atoll Cultivation, Papeete, Tahiti, French Polynesia, 14–19 April, 1980. Technical Paper No. 180, South Pacific Commission, Noumea, New Caledonia, February 1982. p.11.
- SPC** (2008). SPC releases latest Pacific population data.
- Teaira, T.** (2000). Agroforestry development. IRETA'S South Pacific Agricultural Bulletin, Vol. 17, No. 5. pp. 1 & 6.
- Thaman, R.** (1990). cited by Barr, J.J.F. (1992) Technical Report on Coconut Research in Kiribati (1990–1992). Ministry of Environment and Natural Resources Development, Bikenibeu, Tarawa, Kiribati, pp. 1–8.
- Town, R.T.** (1977). Report on some agriculture projects (Oct. 1972 – April 1977) Department of Agriculture, Ministry of Environment and Natural Resources Development, Bikenibeu, Tarawa, Kiribati, pp. 29–31.

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