Country Pasture/Forage Resource Profiles

VANUATU

by
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1. INTRODUCTION

Vanuatu is a Melanesian island republic in the south-west Pacific, consisting of 80 islands spanning 850 km from 13°S to 22°S and covering 12 200 km^2 (Anon. 1994) (see Figure 1). The country had a population of 186 000–200 000 (Loughman, 2001, SPC), with the 1999 census indicating a population of 186 678. Recent SPC estimates (SPC, 2008) were for a mid-2008 population of 233 026 and a mid-2010 estimate of 245 224 (and a 2008–2010 estimated growth rate of 2.6%). According to the World Factbook the July 2008 population estimate is 215 446 with a 2008 growth rate estimate of 1.434%. This is concentrated on 3 of the major islands, and a total land mass of 1.2 M ha of which 41% is arable (Anon., 1994). In 1990, the agricultural sector contributed 23% of GDP and national exports continue to be dominated by agricultural commodities, primarily copra and beef and to a lesser extent cocoa and timber (Anon., 1994). Subsistence agriculture accounts for 43% of agricultural production and 80% of working age ni-Vanuatu (indigenous citizens) cultivate their own land for their livelihoods. The livestock sector is dominated by beef cattle production and contributes 12% to GDP and 22% to national exports. A national goat herd of 12 000 is reported but this figure may be significantly overestimated.

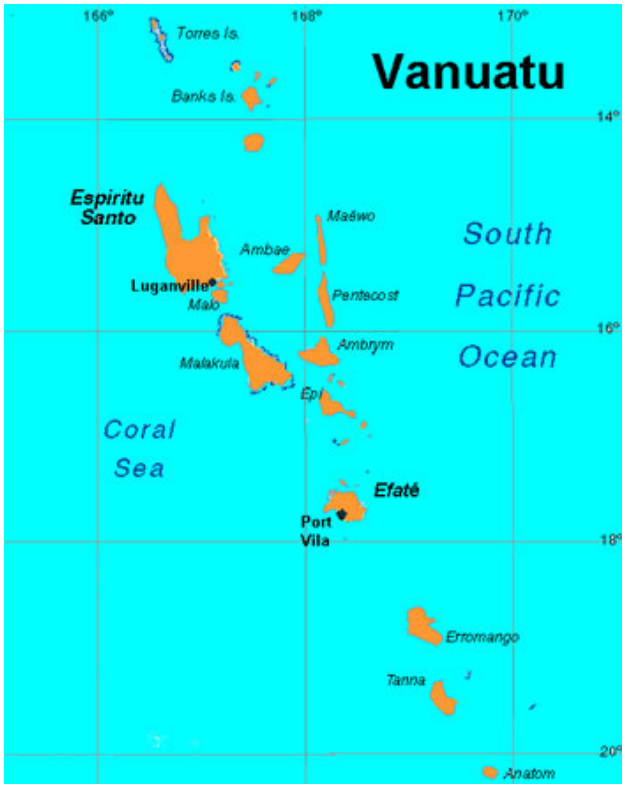

Figure 1. Map of Vanuatu

The national cattle herd is estimated to be approximately 140 000–150 000 of which 77 000 are owned by the smallholder sector (Macfarlane 1998) and the remainder by the plantation or large holding sector (>100 head of cattle) which includes both ni-Vanuatu and expatriate graziers. Larger holdings are concentrated on the islands of Efate and Espiritu Santo whereas smallholder cattle are widely dispersed but more prevalent on Espiritu Santo, Malo and Epi. The average ni-Vanuatu household owns 9 cattle, increasing to 13 on Espiritu Santo (Anon. 1994). Vanuatu has 2 export standard abbatoirs, based on Efate

Table 1. Vanuatu statistics for livestock numbers, beef and veal, pig meat and milk production, beef exports, cattle and lamb and beef imports for the period 1997–2007

Item	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Cattle nos. (,000)	151	151	151	151	151	(140*) 151	152	150	152	155	156
Goat nos (,000)	12	12	12	12	12	12	12	12	12	12	12.2
Pig nos (,000)	61	62	62	62	62	62	62	62	62	62	63
Beef & veal prod. (,000 mt)	3.8	3.6	3.9	3.8	3.0	2.5	3.1	3.0	3.2	2.7	2.75
Pig meat prod. (,000Mt)	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.9	2.8	2.8	2.85**
Milk prod. (,000 mt)	2.9	2.9	3.0	3.0	2.9	2.9	3.0	3.0	3.0	3.1	3.2
Beef and Veal Exports (mt)	1 898	1 298	1 577	1 361	815	684	1 021	927	947	1 049	n.r
Cattle imports	n.r	n.r	n.r	n.r	n.r	n.r.	n.r	n.r	n.r	n.r	n.r
Fresh milk imports (mt)	320	310	340	350***	380	350	346	387	328	484***	n.r
Mutton and lamb imports (mt)	10	10	10	20	20	11	4	6	7	17	n.r
Chicken meat imports (mt)	360	560	610	740	800	822	773	735	715	1 037+	n.r

Source: FAO Database 2009; n.r. = no record; no data for 2008

** During a visit to Vanuatu in September 2002 S.G. Reynolds was informed that cattle numbers may have decreased to below 140 000 head, although the exact number is uncertain. Loughman (2001) indicates "approximately 140 000 head" and "approximately 135 000" in the same paper.*

*** Total meat production from 2000 to 2007 ranged from 6 047 to 7 094 Mt (including beef, chicken, goat, horse and pig meat)*

**** Milk equivalent imports in 2000 were 2,186 mt and in 2006 were 2 641 Mt.*

+ in addition more than 300 Mt of various prepared meats were imported in 2006

and Espiritu Santo, and exported 1 200 tonnes of beef in 1992, primarily to Japan, Papua New Guinea and Solomon Islands. Exports in 1999 and 2000 respectively were 1 577 and 1 361 tonnes to Japan, Solomon Islands and Papa New Guinea and following a trade arrangement in 1999, also to Fiji. 684 Mt in 2002, but rose again to 1 021 Mt in 2003 and 1 049 Mt in 2006. Approximately 20% of slaughtered cattle are sourced from ni-Vanuatu producers. Quite a number of cattle are sold by subsistence farmers to regional butcheries or to villagers for traditional ceremonies and feasts (Anon. 1994). Loughman (2001) indicates that around 16 000 head of cattle are slaughtered annually with approximately 7 000 to 8 000 being killed in rural areas for consumption.

2. SOILS AND TOPOGRAPHY

The topography of the island chain is dominated by low mountain ranges oriented roughly in a north-south direction. Highest peaks generally range from 800–1 200 m a.s.l. but increase to 1 800 m a.s.l. on Espiritu Santo. These mountain ranges greatly influence weather patterns in Vanuatu by trapping rain from the moisture-bearing south-east winds. The leeward side of the ranges typically experience extended dry seasons and substantially lower annual rainfall in comparison to the windward regions. Low plateaux perched at 100–400 m a.s.l. occur on the larger islands.

Soils in Vanuatu are derived from volcanic rock and ash, coral limestone and sedimentary deposition (Macfarlane and Shelton 1986). Soils of agricultural importance in Vanuatu consist of 4 major types:-

- Shallow coastal soils overlying recently uplifted coral (inceptisols)
- Interior soils of varying geological age and volcanic ash input overlying uplifted calcareous parent material (alfisols/ultisols)
- Volcanic ash soils of recent origin (entisols)
- Alluvial soils (entisols)
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3. CLIMATE AND AGRO-ECOLOGICAL ZONES

Agro-ecological zones are determined by rainfall and soil type, and to a lesser extent temperature. The southern and eastern regions and plateaux of most islands are strongly differentiated from western and northern regions by rainfall. A dry season occurs from May to October but its severity and duration varies greatly between climatic zones. The dry season coincides with the cool season and the occurrence of south-east trade winds.

High rainfall regions

High rainfall regions, receiving 1 800–4 000 mm annual rainfall, occur predominantly on the windward side of the mountain ranges. Dry seasons are generally not severe and span a maximum period of 3 months. Mean monthly day/night temperatures range from 30/23 °C in the wet season to 25/19 °C in the dry season. The bulk of pasture, root crop and small crop production occurs in these areas.

Low rainfall regions

Regions in the lee of mountain ranges vary in rainfall from 1 200–1 800 mm annually and can experience severe dry seasons of up to 6 months duration. For example, the White grass region on north-west Tanna and the Tontar on north Malekula receive 1 200 and 1 400 mm rainfall annually, respectively. These areas can be subjected to annual burning which helps to control woody weed problems.

Coastal belt

The free draining calcareous soils of the narrow coastal belt on the southern and eastern regions of most islands are utilised primarily for the production of coconuts. These regions include small, low altitude islands adjoining the larger islands. A sharp rainfall gradient is generally present at the escarpment

between the lower rainfall coastal belts and the plateaux. Annual rainfall ranges from 1 500–2 000 mm and the duration of the dry season is significantly longer than the adjoining plateau regions.

Tanna Middle Bush region

The Tanna White grass region deserves special mention because of its subtropical climate. At latitude 19°30'S and altitude of 400–600 m a.s.l. the region experiences average monthly cool season minima of 11–12 °C. Middle Bush receives 3 500 mm rainfall annually and is occasionally subjected to acid rain from the Yasur volcano. Subtropical and temperate crops are produced seasonally in Middle Bush.

4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS

Both smallholder and plantation graziers in Vanuatu predominantly utilise free-grazing systems. Tethering of animals occurs only occasionally and stall-feeding is not practised. The feeding system in both sectors is entirely pasture based and no supplements or conserved feeds are used.

Cattle under coconuts

The cattle industry in Vanuatu began in the early 1900's with the introduction of cattle to control growth of understory vegetation in coconut plantations (Weightman, 1989). Today nearly all smallholder and plantation graziers graze at least part of their herds under coconuts. As copra prices continue to decline in real terms, the importance of the cattle in the cattle/coconut farming system has increased. In general, daily liveweight gains of steers grazing under coconuts is below that of animals on open pastures due to the reduced quality of shaded pastures (Macfarlane, 1993). Reduction in liveweight gains are exacerbated by dense plantings of coconuts (>150 palms/ha) that occur on some smallholder farms. However, high quality veal is produced by specialist graziers grazing cows and calves under coconuts on Efate and Santo. (See also Reynolds, 1995)

Cattle grazing open pastures

The bulk of plantation sector cattle production occurs on open pastures on the islands of Espiritu Santo and Efate. In well managed operations, cattle are grazed at 1.5–3.0 AU/ha, depending on agro-ecological region, and turn-off slaughter weight cattle (280–300 kg carcass) at 24–36 months. Over the past 20 years, an increasing number of commercial smallholder graziers have been developing open, improved pastures. The rapid increase in stockyard infrastructures on smallholder farms over the past 10 years has improved stock management. Production per hectare from the best smallholder farms is now equivalent to that from the best plantations.

Health status

Vanuatu is recognized internationally as being free of all major animal disease and beef exports could recieve a boost if production is certified as meeting organic standards.

5. THE PASTURE RESOURCE

The plantation sector grazes 58 000 ha, of which 16 000 ha is under coconuts. The pasture resource is 21 000 ha of improved grass pastures, 7 500 ha of naturalized buffalo grass (*Stenotaphrum secundatum*), 7 000 ha of carpet grass (*Axonopus compressus*) and T-grass (*Paspalum conjugatum*), and the balance is partly cleared bush (Macfarlane *et al*. 1994a). The productivity of the various pasture systems is dependent on edapho-climatic conditions, the presence or absence of a legume component, and the degree of weed invasion. Considerable pasture rehabilitation and development was stimulated by the activities of the recent AusAID Vanuatu Pasture Improvement Project 1988–1993 (Macfarlane *et al*., 1994b).

Table 2. Liveweight gains for cattle grazing various pasture types in Vanuatu

Pasture type	Average stocking rate (AU/ha)	Average liveweight gains		Site
		(kg/hd/day)	(kg/ha/yr)	
Guinea+twining legumes	2.0	0.60	439	Eton, Efate
Guinea+twining legumes	2.5	0.57	520	Eton, Efate
Guinea+twining legumes	2.5	0.65	594	East Santo plateau
Guinea+twining legumes	3.5	0.51*	651	East Santo plateau
Koronivia+twining legumes	2.5	0.56	505	East Santo plateau
Para+twining legumes	2.5	0.68	621	IRHO Santo plateau
Signal+twining legumes	2.0	0.69	504	Eton, Efate
Signal+twining legumes	2.5	0.62	566	Eton, Efate
Buffalo+twining legumes	2.0	0.52	380	East Santo plateau
Buffalo+naturalised legumes	1.5	0.32	175	coastal Malekula
Carpet+ naturalised legumes	2.0	0.35	255	East Santo plateau
Carpet+ naturalised legumes	2.5	0.29*	265	East Santo plateau

** not sustainable*

Native/naturalized pastures

Carpet grass and T-grass dominate the native/naturalised pastures of the high rainfall regions in combination with the naturalized legumes *Mimosa pudica*, *Desmodium canum*, and *Desmodium triflorum*. In low rainfall regions, *Dicanthium*, *Bothriochloa* and *Heteropogon spp*. dominate (Evans *et al*., 1992). Herbaceous and woody weeds seriously reduce the productivity of native pastures throughout Vanuatu (Mullen *et al*., 1993).

Open pasture systems

The principal improved pasture system in Vanuatu is signal grass (*Brachiaria decumbens*). Over 16 000 ha of signal grass has been planted, predominantly on expatriate plantations on relatively fertile interior soils in full sun (Evans *et al*., 1992). Liveweight gains of 0.4 kg/ha/day are common from cattle grazing legume-deficient signal grass and 0.5 kg/ha/day is readily achieved when a significant legume component is included (Macfarlane, 1993).

A significant research effort was invested in identifying legumes that would persist in vigorous signal grass swards (Macfarlane *et al*., 1994a). Puero (*Pueraria phaseoloides*), Amarillo peanut (*Arachis pintoi*) and to a lesser exent centro (*Centrosema pubescens*) and Glenn and Lee joint vetch (*Aeschynomene americana*) were found to persist well. Some problems with puero dominance of pastures were experienced but this was controlled by short-term heavy grazing once puero dry matter reached a composition of 40% of the pasture.

Other pasture grasses well suited to the high rainfall areas are para grass (*Brachiaria mutica*), koronivia (*Brachiaria humidicola*), hamil, green panic and embu (*Panicum maximum*) (Table 2). Pasture mixtures of signal and Hamil guinea are compatible with twining legumes and have been highly productive.

In low rainfall regions, sabi grass (*Urochloa mozambicensis*) and *Bothriochloa pertusa* proved to be valuable grasses in combination with Seca stylo (*Stylosanthes scabra*), siratro (*Macroptylium atropurpureum*) and leucaena (*Leucaena leucocephala*). In the subtropical environment of Middle Bush, Tanna, kikuyu (*Pennisetum clandestinum*) combines productively with Shaw vigna (*Vigna parkeri*) and Safari white clover (*Trifolium semipilosum*). Stocking rates in Vanuatu range from 1.5 hd/ha in less fertile, lower rainfall sites (<1 500 mm/yr) up to 3.0 hd/ha on fertile interior soils with >2 200 mm rainfall.

Pastures under coconuts

The preferred pasture species for coconuts planted at 8–10 m spacings is buffalo grass. Buffalo grass is extremely tolerant of high grazing pressure and tolerates the lower rainfall coastal environments where coconuts are typically grown (Mullen and Shelton 1996). Where coconuts are mature and light transmission is >70%, grasses such as sabi grass and signal grass can be grown. The alkalinity of the coastal soils reduces the range of suitable companion legumes. Glenn and Lee joint vetch (*Aeshynomene americana*), *Desmanthus virgatus* and siratro (*Macroptilium atropurpureum*) have all proved to be well

adapted to coastal coralline pastures but none are as persistent, productive or as high quality as *Leucaena leucocephala*.

New introductions

In 2003 a plot of Mulato grass (Brachiaria hybrid cv Mulato; produced at CIAT as the result of 14 years of research, being a cross between *Brachiaria brizantha* cv Marandu and *B.ruziziensis* 44-6; see <Grupo Papalotla>) was established for evaluation and multiplication on the Government Farm. Vegetative cuttings are being used to establish additional areas.

In 2004 a small area of Hybrid Napier (*Pennisetum purpureum* cv. Hawaiian Hybrid) was established (with canes from Tonga) for evaluation and multiplication for cut-and-carry feed for dairy animals.

6. CONSTRAINTS TO DEVELOPMENT OF PASTURE-BASED LIVESTOCK SYSTEMS

Soil-pasture limitations

Nitrogen is the most limiting nutrient for pasture production throughout Vanuatu. Regionally, low availability of phosphorus (Erromango, Whitegrass Tanna, south Santo plateaux and Middle Bush Santo, Montmarte Efate), potassium and sulphur (most coastal coralline soils) also limit pasture growth.

Animal production from pastures in Vanuatu is limited nationally by low crude protein levels and regionally by low levels of sodium (interior pastures), copper (Montmarte and coastal pastures) and phosphorus (Evans *et al*., 1992).

Stock water

Only 31% of smallholder cattle in Vanuatu have access to drinking water. The effect of this on livestock production varies between agroe-cological zones, but it is likely to be substantial in low rainfall regions.

Pasture weeds

Weeds pose a serious threat to pasture productivity and sustainability in Vanuatu (Mullen and Banga, 1993). Weeds of significance in coastal and interior pastures include *Cassia tora*, *Solanum torvum*, *Cuphea carthagenensis* and *Sida acuta.* Other weeds which occur in coastal pastures include *Psidium guajava*, *Annona muricata*, *Stachytarpheta urticifolia* and *Urena lobata*; or in interior pastures include *Amaranthus spinosus* and *Mikania micrantha* (Mullen *et al*., 1993). The combination of correct pasture species and appropriate grazing management will usually be sufficient to prevent serious weed invasion. Grazing management strategies should aim to maintain minimum pasture heights (Table 3). Rehabilitation strategies range from replanting with vigorous improved pasture species to strategic herbicide usage combined with appropriate grazing management (Mullen and Banga, 1993).

Table 3. Optimal grazing heights of some common pasture types in Vanuatu

Pasture type	Optimum grazed pasture height
Carpet/T-grass	10-15 cm
Buffalo grass	10-15 cm
Hamil/guinea grass	40-50 cm
Signal grass	15-20 cm

Marketing constraints

Large-scale commercial development of livestock production is limited to islands with a reliable marketing infrastructure, and specifically, access to the export abattoirs. Small-scale commercial livestock farms can be developed on other islands where village butcheries, feast markets and cattle barging services are established. On islands where these services are not developed, pasture development for commercial cattle production is unlikely to progress.

Presently more than 50% of smallholders use native pastures with little or no legume content. The challange for Vanuatu, with its considerable potential for expansion of the beef industry, is how to increase the area of productive, legume-based pastures in order to increase carrying capacity and offtake.

7. ORGANIZATIONS AND PERSONNEL INVOLVED IN PASTURE RESEARCH AND DEVELOPMENT

There is no recurrent pasture research activity in the Vanuatu Department of Livestock or within the various research institutions. However, a considerable amount of pasture research activity was undertaken during the early 80s through the Vanuatu Pasture Improvement Project with AusAID support. Technical reports, technical bulletins and other materials published form the basis of the current research knowledge (Macfarlane and Shelton, 1986, Macfarlane *et al*., 1994a and 1994b, Evans *et al*., 1992, Mullen *et al*., 1993, Mullen and Macfarlane, 1998, Macfarlane, 1998). The following Department of Livestock personnel have considerable practical knowledge of pasture research and development in Vanuatu:

Department of Agriculture and Rural Development, Animal Production Section, Ministry of Agriculture, Forestry and Fisheries (2002)
Senior Livestock Officer Edwin Garaehangavalu
Pasture Officer (Efate) Mr Michael Karo
Pasture Officer (Santo) Mr Stevenson Boe
Livestock Officer (Malekula) Mr Apia Albert
Livestock Officer (Tanna) Mr Thomas Yaru

Vanuatu Quarantine Inspection Service (VQIS)
Director Bennel Tarilongi
Chief Veterinary Officer Mr Gavin Struthers
Senior Vet. Officer (South) Mr Dale Hamilton
Senior Vet. Officer (North) Mr Peter Hoyle

The Syndicat Agricole is a farmer organization comprised primarily of plantation owners/managers. The Syndicat provides discounted farm supplies to members and has the ability to lobby the Vanuatu government on agricultural issues.
Syndicat Agricole (2002)
President Mr Charles Rogers
Vice-President Mr Thomas Bangalini
Member Mr Joe Ernst

The Farm Support Association is a non-government organisation with a client base of commercial ni-Vanuatu farmers. The Association provides technical assistance and promotes farming innovations to its members. Advisers and technical staff have developed a considerable knowledge of pasture systems through close cooperation with the Vanuatu Pasture Improvement Project.
Farm Support Association (2002)
Adviser (Efate) Mr Charles Rogers
Technical Officer (Santo) Mr Peter Kau

The French Government funded Oil Crops Research Institute (IRHO) at Saraoutu, Espiritu Santo has previously been involved in pasture evaluation and pasture based animal production research, and evaluating the suitability of various cattle breeds for Vanuatu. It has now been taken over by the Government of Vanuatu and renamed VARTC.

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Vanuatu website

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