

# Country Pasture/Forage Resource Profiles

## SOLOMON ISLANDS



by

**Eroarome Martin Aregheore**



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## 1. INTRODUCTION

The Solomon Islands comprise many individual islands (some 992 islands of which 347 are inhabited) in a scattered archipelago with a combined land area of about 28 450 km<sup>2</sup>. The territory of the archipelago extends 1 770 km southeast from Bougainville between latitude 4°45' and 12°30' S and longitudes 155°30' and 170°30' E. There are six major islands or groups of islands with numerous small islands and atolls. The major islands are Guadalcanal, Malaita, Choiseul, Santa Isabel, New Georgia and San Cristobal (see Figure 1). These vary in length from 145 to 190 km and in width from 35 to 50 km. The largest of the islands, Guadalcanal has a land area of 5 120 km<sup>2</sup> (Gutteridge and Whiteman, 1978). In 1993, the human population was estimated at 400 000 with an annual growth rate of 3.45% per annum (Wahananiu *et al.*, 1993). The last census in 1999 gave the population as 409 042, while in 2001 the population of the Solomon Islands was estimated at 446 000 by Crocombe (2001), and 447 900 in mid-2000 by SPC. The most recent SPC population data (SPC, 2008) estimate the mid-2008 population as 517 455 and the mid-2010 population at 545 095 (with a growth rate 2008–2010 of 2.6%). According to the World Factbook the July 2008 population estimate is 581 318 with a 2008 growth rate of 2.467%.

The main industries are copra, timber, palm oil, fish, cocoa and to an extent beef cattle. Main exports are timber, fish, copra, cocoa and palm oil/kernel. Agriculture including forestry, livestock and fisheries account for about 70% of the GDP (Wahananiu *et al.*, 1993). For an overview of development in the Solomon Islands see the ADB reports on economic development and trends and prospects and the World Bank report on Stakeholder Participation in Development. Ruminant livestock production plays a declining role in the economy of the Solomon Islands, but Government has made plans to increase local production. Table 1 gives statistics of ruminant livestock numbers, beef and milk production and imports for the period of 1997–2007 in Solomon Islands.



Figure 1. Map of Solomon Islands

**Table 1. Solomon Islands statistics of livestock numbers, beef, milk and pig meat production and imports for the period 1997–2007**

Item	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Cattle nos. (.000)	13	13	13	13	13	13	13	13.5	13.5	13.5	13.6
Pig nos. (.000)	57	57	58	50	51	51	51	52	53	53	54
Beef & veal prod. (mt)	610	610	610	610	592	647	647	740	740	750	750
Pig meat prod (mt)	1 920	1 920	1 960	2 100	2 200	2 240	2 240	2 280	2 320	2 300	2 300*
Milk prod. (.000 Mt)	1.3	1.3	1.3	1.3	1.3	1.3	1.37	1.37	1.37	1.40	1.40
Cattle imports (head)	800	20	-	-	-	-	-	-	-	-	n.r
Beef and veal imports (mt)**	20	-	-	-	-	17	19	16	16	16	n.r
Milk equivalent imports (Mt)	2 307	2 725	2 085	2 207	1 149	1 494	940	970	925	974	n.r
Meat, total imports (Mt)	871	151	151	139	109	305	265	336	321	602***	n.r

\* Total meat production (beef, pig and chicken meat) increased from 2 650 Mt in 1995 to 3 350 Mt in 2007

\*\* Various beef preparations are also imported, declining from 788 Mt in 1996 to 27 Mt in 2006.

n.r-no record; no data for 2008 \*\*\* including 548 Mt of chicken meat

Sources: FAO on-line statistics (2009)

## 2. CLIMATE AND AGRO-ECOLOGICAL ZONES

The climate of the Solomon Islands is moist tropical. Seasonal and daily temperatures vary little throughout the year and in coastal regions maximum temperatures seldom exceed 32 °C with minimums rarely below 23 °C. Relative humidity fluctuates between 60 and 92 %. Evaporation rates are low averaging 5 mm a day (Wall and Hansell, 1974; Gutteridge and Whiteman, 1978). Generally rainfall is high and seasonal distribution patterns are not marked except on the Guadalcanal plains where from April to October rainfall is relatively low.

Rainfall is evenly distributed throughout the year with most areas receiving between 2 500 to 4 500 mm. All the large islands are well watered by rivers, with steep courses over most of their length and many have a significant energy potential.

## 3. SOILS AND TOPOGRAPHY

The main islands have steeply dissected mountainous interiors which rise to over 1 000 m, and on Guadalcanal to 2 330 m. The major rocks types are Mesozoic metamorphics, and Tertiary intrusives (gabbro, diorites and ultramafics), volcanics (andesites and basalts), and calcareous and non-calcareous sediments. There are also areas of Pleistocene reef limestone and recent sediments (organic accumulations and alluvium).

Most agricultural activity is confined to the more favourable topography of the coastal areas where the climate is hot and wet, and vegetation is lowland rainforest (Chase *et al.*, 1986). Based on the report of Chase *et al* (1986) five types soils are found:

- (1) alluvial soils with seasonal rainfall (mean annual c. 2 000 mm);
- (2) moderately weathered clay soils derived from uplifted coral and fine grained calcareous sediments with rainfall of about 3 500 mm;
- (3) colluvial soils derived from basaltic volcanics with high rainfall (c.5 000 mm);
- (4) clay soils on uplifted coral with recent additions of andesitic ash, with rainfall of about 4 500 mm, and
- (5) strongly weathered clay soils derived from basaltic volcanics with rainfall of about 3 500 mm.

The alluvial terrace at the western end of Guadalcanal Plains has the greatest potential for commercial agricultural development (Hansell and Wall, 1974). The plains occupy an area of 340 km<sup>2</sup>, and lie in the rain shadow area of north Guadalcanal. In uncultivated areas vegetation consists of mixed deciduous forest along rivers and stream channels. The soils on the alluvial terraces were classified as Ustropepts (Wall *et al.*, 1979). The main crops grown are oil palm, coconut, cocoa, vegetables and root crops.

In the western part of Santa Cruz, the soils are generally rich in bases and are well-drained being formed on uplifted coral limestone. This area also has considerable potential for agricultural development. Most Solomon Islands soils have an udic moisture regime, i.e., the soil moisture is not dry in any part for as long as 90 days (cumulative). Most of the soils in the Solomon Islands are high in calcium and magnesium; phosphorus is moderate but potassium can be marginal in some soils (Watson and Whiteman, 1981a).

The main islands are rugged and mountainous, the highest named peak Mt Makarakombou (2 447 m) is on Guadalcanal. Most islands are of igneous and metamorphic rocks, overlaid with considerable layers of marine sediments. The only extensively coastal plains are on the north-east coast of Guadalcanal. Many outer islands are coral atolls and raised coral reef.

## 4. RUMINANT LIVESTOCK PRODUCTION SYSTEMS

Ruminant production is very important and plays a vital role in the Solomon Islands. The two ruminant species that the Livestock Division is particularly concerned with in terms of their development as an industry are cattle and goats.

Cattle were first introduced by missions in the 1800s, chiefly for milk. Levers imported about 1 000 head from New South Wales between 1910–1915, which included Shorthorn, Hereford, Redpoll, Jersey, Durham and in 1921 Zebu (Wahananiu *et al.*, 1993). In 1941, the estimated herd was 16 000 head, half of which were owned by Levers. The numbers fell to a 1 500 head feral herd during WWII, but by 1960 the number had doubled to 3 000. At this time a small government herd was started, but later disbanded due to poor management. In 1965, some 610 head of Shorthorn, Hereford and second cross Santa Gertrudis were imported and in 1968 a shipment of 402 head were imported for smallholders.

In 1970, the cattle population was around 12 000 head and this led the Government to start programmes to promote cattle development in the smallholder sector. Under the 6<sup>th</sup> Development Plan (DP6) subsidies were given to the cattle industry and during the period 1979–1987 about 4 900 head were imported and given to smallholders and the Government breeding herds. By 1977 the total herd size was said to be 22 700 head (25 000 according to Wate, 1995).

In 1974 a project was identified to develop the beef industry based on the success of the Ministry of Agriculture and Lands (MAL) with herds on the Guadalcanal Plains. The project was designed to enable the country to reach self-sufficiency and possibly to export and it was expected that cattle numbers would increase to 52 000 by 1984, and allow an annual off take of 6 280 over the period 1982–1984. The ADB-funded project started in 1977 and extended over 5 years. A cattle development authority (CDA, and later called Livestock Development Authority (LDA) in 1983) was created to provide handling, processing and marketing of cattle and to assist smallholder farmers. The programme included subsidies for pasture development and fencing.

In 1984 the loan was closed and at the end of the project in 1985, the national herd had declined to 20 000, well short of the projected 52 000; therefore the annual offtake never reached the predicted figure, being only 1 532 head. Since 1984, the cattle population has declined to 9,700 head in 1991 (Wahananiu *et al.*, 1993) and has remained around 10 000 head up to 1994 but FAOSTAT data suggests numbers have increased to 13 500 by 2004.

The two ruminant species that the Livestock Division is concerned with in terms of development as an industry are cattle and goats. In 1993 it was estimated that there were 8 406 beef cattle, 20 dairy cattle and 1 000 goats. Table 2 provides figures for the distribution of cattle by province and sector in 1991 (Wahananiu *et al.*, 1993).

In 1991 the cattle population was estimated at 9 718 head including a breeding herd of about 2 800 (see Table 2). LDA is the largest owner of cattle in the country and currently owns about 40% of the national herd and 50% of the breeding herd. Only LDA herds can supply breeding stock to the provinces. In 1993 it was estimated that LDA owned 3 404 head and was capable of off loading 600–700 mixed head annually. [Wate (1995) suggests that in 1995 cattle numbers were around 9 500 head, while FAOSTAT data suggests 13 000].

Cattle numbers in the Western Province in 1991 were 1350, the production base being 1000 head from LDA and 300 head from the smallholder sector. The local commercial production in 1992 for the Solomon Islands was 22 tonnes of beef (Wahananiu *et al.*, 1993), but much more is produced and absorbed by the local non-commercial market.

Since the beginning of the war in the Solomon Islands the local commercial beef production has declined considerably to less than 78% of the previous production level. Figures for the

**Table 2. Distribution of cattle by province and sector in 1991**

Province/Sector	No. of producers	No. of cattle
<b>1. Guadalcanal</b>		
Smallholder	51	529
LDA	3	1 300
Mission	6	200
Plantation	2	200
Total	62	2 229
<b>2. Central</b>		
Smallholder	20	7
Levers	1	2 000
Total	21	2 007
<b>3. Temotu</b>		
Smallholder	17	156
<b>4. Makira</b>		
Smallholder	42	1 096
Mission	2	60
Total	44	1 156
<b>5. Isabel</b>		
Smallholder	17	300
<b>6. Western</b>		
Smallholder	50	300
LDA	2	1000
Mission	4	50
Total	56	1 350
<b>7. Malaita</b>		
Smallholder	86	2 500
Mission	3	120
Total	89	2 620
<b>Total - Solomon Islands</b>	<b>390</b>	<b>9 718</b>

(Wahananiu *et al.*, 1993).

national importation, local production and consumption of beef from 1978–1990 are given in Table 3.

#### 4.1 Beef cattle

Over 56% of the cattle are in the Central district, 20% in Western district, 16% in Malaita and 8% in the Eastern district (Wahananiu *et al.*, 1993). In the Solomon Islands, three production systems are recognised for beef production (Kama, 1999), and these are (1) Small holder sub-sector; (2) Intermediate communal sub-sector, and (3) Large-scale commercial/government sub-sector.

##### **Smallholder sub-sector:**

This is oriented towards subsistence and cash income. This production system is aimed at the utilization of land that is unsuitable for other uses. It makes use of excess family labour. The numbers of cattle owned in this system are often 10 or less per household. Often, the animals are tethered around backyards or around the villages to graze. The system provides some meat for the family, a source of immediate income and to meet other social obligations that may require a beast. The land holding of the smallholder sector comprises small farms of 5–50 ha. Pasture species common in the smallholder sector are koronivia grass (*Brachiaria humdicola*), signal grass (*Brachiaria decumbens*), para grass (*Brachiaria mutica*), batiki grass (*Ischaemum aristatum* var. *indicum*), *Pueraria phaseoloides* (Pueru) and *Centrosema pubescens* (Centro).

##### **Intermediate communal sub-sector:**

This is made up of commercial agricultural enterprise and administered by established communal groups on alienated and customary land. Herds of cattle often consists of 10–25 cattle and they make use of excess community or tribal labour. The system utilizes community or tribal land that is unsuitable for other uses. Just as in the small holder sub-sector the beasts in this system are slaughtered to provide animal protein for communal gatherings and other ceremonial activities. The land holding of the smallholder sector comprises small farms of 50–200 ha. Pasture species common in the smallholder sector are koronivia grass (*Brachiaria humdicola*), signal grass (*Brachiaria decumbens*), para grass (*Brachiaria mutica*), batiki grass (*Ischaemum aristatum* var. *indicum*), *Pueraria phaseoloides* (Pueru) and *Centrosema pubescens* (Centro).

##### **Large-scale commercial sub-sector:**

This is made up of large commercial companies or government farms, e.g. Levers Solomon Limited, missions and the Livestock Development Authority (LDA). Levers Solomon Limited, Central Province, used to hold their cattle under coconuts on 3 000–4 000 ha on the Russell Islands [now LDA/SIG (Solomon Islands Government)] with 2 000 ha on Yandina. Cattle are kept as “sweepers” to graze the native pasture. Highly skilled labour is used and cattle herd number range from 75 upwards in a herd. The large-scale commercial sector grazes animals in open pasture that are improved and this system is largely used by the LDA for farms located at Lungga, Tenuvatu, Koli and 6 Mile. The indigenous legumes found in the plantations are *Desmodium canum* and *D. heterophyllum*. Patches of Siratro (*Macroptilium atropurpureum*), *Pueraria phaseoloides* (Pueru) and *Centrosema pubescens* (Centro) also occur in some areas.

#### 4.2 Dairy cattle

In 1987 a dairy cow known as the Australian Milking Zebu (AMZ), especially developed for tropical climates, was introduced to encourage milk production. The AMZ has a high milk capacity, heat tolerance and is tick resistant. It was anticipated that with artificial insemination, the AMZ would be crossbred with Friesians already present in the Solomon Islands (Douglas and Douglas, 1989), however, this did not materialise.

**Table 3. National imports, local production and consumption of beef as kg carcasses from 1978–1990**

Years	1978	1982	1987	1990*
Population	210 437	240 000	313 693	344 237
Imports	463 775	36 772	30 577	24 855
Local Production	488 000	377 000	31 000	150 000
Consumption (kg/hd)	4.52	1.72	1.13	0.60

\*By 2006 the population is estimated to have reached 552 438 (The World Factbook)

Source: (Wahananiu *et al.*, 1993)

The dairy industry in the Solomon Islands is not as efficient as the beef sector. The production systems available however, are: (1) smallholder sector (2) commercial/government and (3) the communal (women interest groups).

Some years ago, a herd of 40 cows was established by the government to supply the milk requirement of Honiara, the capital of the Solomon Islands (Freeman, 1981). The dairy industry developed slowly in the early days because at that time few Solomon Islanders drank fresh milk. This slow development persisted to the mid-1990s. Thus in 1995 (Wate, 1995) mentioned that one of the local schools owned a small dairy herd of 26 cows. However, he noted that an important development was the creation of a 150 cow commercial herd at Tenavatu and the development of 52 satellite herds within the surrounding areas through provincial women interest groups. It was intended that a processing company would be established to collect milk from local producers on a daily basis and pay smallholder groups at least weekly for their milk. At that time all milk and milk by-products were imported from either New Zealand or Australia (Wate, 1995). No information is available on subsequent developments. [Perhaps surprising is that the FAO Statistics database has dairy cattle numbers of between 1 700 and 2 000 head and total milk production figures of between 1 300 and 1 365 Mt for the period 1995–2005.]

The major dairy animals are temperate breeds such as Holstein, Jersey and others. The animals under the smallholder farmers are tethered or zero grazed or fenced in small blocks of land. However, in the Commercial/Government and the communal systems animals are confined and rotationally grazed on improved pastures. The traditional system of grazing under coconut palms is also used. Sometimes the animals receive supplements such as palm kernel meal, coconut by-products and root crops.

#### 4.3 Goats

The development of the goat industry compared to beef cattle is very slow in spite of the fact that goats were introduced long ago (Freeman, 1981). Goat meat is not very popular amongst the population and there is very little market for it. However, the government in subsequent years has continued to encourage the introduction of goats as a part of a diversification programme in the subsistence sector.

As far back as 1981, there were 300 goats in the islands and of these about 60 were found in the Government herd at Tenavatu. This herd was built from local purchase of about 6 goats and the importation of 3 Anglo-Nubians from Australia.

At present most goats are on government properties and selected promotion farms in the provinces. In 1993 there was at Tenavatu Government farm a goat herd stabilized at 250 does and followers (Wahananiu *et al.*, 1993). From this farm goats were being introduced to provinces via rural development centres and provincial livestock offices. Little information is available with regard to present goat numbers.

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

1. Most pastures are overgrazed and lack vigour;
2. Lack of legumes in most pastures (there should be at least 20% legume content in a pasture);
3. Some grass pastures are under utilized due to insufficient cattle numbers;
4. Customary land ownership that militates against the use of land for pasture development (land tenure systems);
5. Lack of capital for starting and maintenance of farms;
6. Social pressure for providing beasts for social occasions such as feasting, marriage and death;
7. At present investment in cattle has stopped because further ADB and possible bilateral aid funding to restructure and rehabilitate the industry are not forthcoming;
8. Decline in national beef production from 488 tonnes in 1978 to 180 tonnes in 1991.
9. Reduction in the incentives earlier given to smallholder farmers by the government;
10. Shortage of breeding bulls in the LDA herds. Most cows in the herds are not served.

## 6. THE PASTURE RESOURCE

Grazing areas range from open pasture that consists of native grasses and legumes such as *Macroptilium atropurpureum* cv. Siratro (Siratro), *Pueraria phaseoloides* (Puer), *Centrosema pubescens* (Centro) under extensive grazing to pastures under plantations and those in the smallholder sector (Wahananiu et al, 1993). The larger open pastures are owned by the Livestock Development Authority (LDA) which previously operated five farms on Guadalcanal and four in the Western Province. Pasture areas and cattle numbers and main pasture species on LDA farms are shown in Table 4.

Under the different holding systems the distribution of pasture development as a consequence of the Sixth Development Plan (DP6) introduced in 1970–1984 were as follows; smallholder (6 441 ha); LUD projects (3 943 ha); holding grounds (442 ha); LDA fattening (760 ha) and Government (2 060 ha). By 1991, it was estimated that 9 000 ha would revert to bush while in some areas available pastures would be under-grazed.

Lever Solomons Limited previously held their cattle under coconuts on 3 000–4 000 ha in the Russell Islands (now LDA/SIG) with 2 000 ha on Yandina. Cattle are kept as “sweepers” to graze on native pasture. Indigenous legumes are *Desmodium canum* and *D. heterophyllum* with patches of Sirato (*Macroptilium atropurpureum*), *Pueraria phaseoloides* (Puer) and *Centrosema pubescens* (Centro) in some areas.

In the smallholder sectors are small farms of 5 – 50 ha to 50–200+ ha in group/joint ventures. Pasture species common in the smallholder sector are Koronivia, signal, para, batiki, puero and centro. For clarity, Macfarlane (1996) reported that the overall pasture resources for ruminant livestock production in the Solomon Islands could be categorized into open pastures, pastures under coconuts and pastures under trees.

### 6.1 Improved pasture grass varieties

Commercial pasture development in the Solomon Islands has been based on the replacement of *Themeda australis*-*Pennisetum polystachyon* natural grassland with a minor contribution from ferns/weeds such as *Schizoloma ensifolium*, *Gleichenia linearis* (staghorn fern), *Cyperus aromaticus* by the cultivation and planting of improved pasture grass varieties. The improved grass varieties of significance found are Para grass (*Brachiaria mutica*); signal grass (*Brachiaria decumbens* cv. Basilisk); green panic (*Panicum maximum* var. *trichoglume* cv. Petrie); batiki grass (*Ischaemum ciliare* syn. *I. aristatum*); koronivia (*Brachiaria humidicola*) and Nadi blue (*Dichanthium caricosum*) (Steel and Whiteman, 1980; Watson and Whiteman, 1981b).

### 6.2 Improved legume varieties

In order to improve the nutrient content and palatability of the improved grass varieties, it became imperative to have grass/legume mixtures. To achieve this, various improved legumes were introduced

**Table 4. Areas and types of pasture 1991–1992 (1993 estimate)**

Property	Area (ha)	Total cattle	Available pasture
Lungga	800	729 (1 363)	Koronivia ( <i>Brachiaria humidicola</i> ), para ( <i>Brachiaria mutica</i> ), Nadi blue ( <i>Dichanthium caricosum</i> ), <i>Centrosema pubescens</i> (Centro), <i>Pueraria phaseoloides</i> (Puer), <i>Macroptilium atropurpureum</i> cv. Sirato (Siratro), <i>Stylosanthes guianensis</i> cv. Endeavour (Stylo)
Konga/Tenuvatu	360	705 (1 034)	Koronivia ( <i>Brachiaria humidicola</i> ), Para ( <i>Brachiaria mutica</i> ), Signal ( <i>Brachiaria decumbens</i> ), Koronivia ( <i>Brachiaria humidicola</i> ), <i>Stylosanthes guianensis</i> cv. Endeavour (Stylo)
Koli	240	561	Para ( <i>Brachiaria mutica</i> ), Koronivia ( <i>Brachiaria humidicola</i> ), <i>Pueraria phaseoloides</i> (Puer), <i>Macroptilium atropurpureum</i> cv. Sirato (Siratro) Guinea ( <i>Panicum maximum</i> ), Signal ( <i>Brachiaria decumbens</i> ), <i>Centrosema pubescens</i> (Centro).
Burns Creek	150	262 (292)	Koronivia ( <i>Brachiaria humidicola</i> ), <i>Centrosema pubescens</i> (Centro), <i>Pueraria phaseoloides</i> (Puer), Batiki ( <i>Ischaemum ciliare</i> syn. <i>I. aristatum</i> ), <i>Stylosanthes guianensis</i> cv. Endeavour (Stylo), <i>Desmodium heterophyllum</i> (Hetero).
6 Mile/Gizo: Open pasture under trees	35/165	224 (715)	Native grasses, <i>Macroptilium atropurpureum</i> cv. Sirato (Siratro), <i>Pueraria phaseoloides</i> (Puer), <i>Centrosema pubescens</i> (Centro).
Levers	2 000	?	Para ( <i>Brachiaria mutica</i> ), Koronivia ( <i>Brachiaria humidicola</i> ), Signal ( <i>Brachiaria decumbens</i> ), Batiki ( <i>Ischaemum ciliare</i> syn. <i>I. aristatum</i> ), <i>Pueraria phaseoloides</i> (Puer), <i>Centrosema pubescens</i> (Centro).

Source: Wahananiu et al, (1993).

to replace the native *Mimosa pudica* and *Mimosa invisa* that are generally regarded as weeds in an improved grass/legume mixture (even though Reynolds, 1982 found that when grown in mixtures with Cori grass (*Brachiaria miliiformis*) and tall Guinea (*Panicum maximum*), *M. pudica* fixed and transferred significant amounts of nitrogen to the associated grass). The improved legume varieties found presently in the Solomon Islands are *Centrosema pubescens* cv. Common (Centro); *Pueraria phaseoloides* (Pueru), *Stylosanthes guianensis* cv. Endeavour (Stylo); *Vigna luteola* (Vigna); *Desmodium uncinatum* (Silverleaf); *D. heterophyllum* (Hetero); *Macroptilium atropurpureum* cv. Sirato (*Siratro*) and *Neonotonia wightii* cv. Tinaroo (Glycine).

### 6.3 Grass and legume species evaluation in growth studies

To improve the quality of pasture in the Solomon Islands, pasture evaluation trials were undertaken in five regional sites with different types of soils by Gutteridge and Whiteman, (1978). The sites were located at Liapari, Lokaru, Liver Point, Dala and Kaonasughu. Pasture species were selected for evaluation on the basis of their known adaptation to tropical environments. Some of them were already in use in the Solomon Islands while others were new introductions. The grasses selected were Para (*Brachiaria mutica*); signal grass (*Brachiaria decumbens* cv. Basilisk); green panic (*Panicum maximum* var. *trichoglume* cv. Petrie); batiki grass (*Ischaemum ciliare* syn. *I. aristatum*) and koronivia (*Brachiaria humidicola*). The legumes were *Centrosema pubescens* cv. Common (Centro); *Pueraria phaseoloides* (Pueru), *Stylosanthes guianensis* cv. Endeavour (Stylo); *Vigna luteola* (Vigna); *Desmodium uncinatum* (Silverleaf); *D. heterophyllum* (Hetero); *Macroptilium atropurpureum* cv. Sirato (*Siratro*) and *Neonotonia wightii* cv. Tinaroo (Glycine).

Results of the evaluation trials demonstrated that there were quite marked differences in adaptation and degrees of compatibility between the species at different sites. For example, in open fertile soils, Para was the most widely adapted of the grasses. It was very easy to establish, produced good yields and combined well with most of the legumes tested. While, signal and guinea grass gave good yields, they tended to suppress the legume component. In these conditions Centro and Pueru were more competitive and higher yielding (Gutteridge and Whiteman, 1978).

The effects of pasture mixtures and stocking rate on animal performance and pasture components were compared. Three pastures, *Brachiaria mutica* (para), *B. decumbens* (signal) and *Panicum maximum* (hamil) each sown with a common legume mixture of *Centrosema pubescens* cv. Common (Centro); *Macroptilium atropurpureum* cv. Sirato (*Siratro*) and *Stylosanthes guianensis* cv. Endeavour (Stylo), were compared at four stocking rates of 1.8, 2.7, 3.6 and 4.5 animals/ha, over 4 years on the Guadalcanal Plains (Watson and Whiteman, 1981b).

The results of the study demonstrated that mean liveweight gain per head over the four stocking rates and 4 years on para pastures was 0.47, on signal pastures 0.38, and on hamil pastures 0.28 kg/head /day. Mean production per hectare at the optimum stocking rates were: para 3.6 animals/ha, 607 kg; signal at 3.6 animals/ha 442 kg; hamil at 2.7 animals/ha, 362 kg/ha/year. The highest stocking rate at 3.6 and 4.5 animals/ha caused the hamil pastures to decline to the stage where they were destocked in the 4<sup>th</sup> year of grazing. It was observed that para pastures maintained the highest legume contents. It was also observed that high nutrient contents contributed to the higher animal production from para grass. In conclusion, Watson and Whiteman (1981b) reported that selection of grass species on the basis of quality including dry matter digestibility and mineral content, on ability to persist with increasing stocking rate, on compatibility with legumes, and on growth habit are more important than selection for dry matter yield.

Smith and Whiteman, (1985) reported liveweight gains of 227–348 kg/ha/year and 219–332 kg/ha/year at stocking rates of 1.5–3.5 for cattle grazed under coconuts and natural pastures in the Solomon Islands. The implications of these results are that good liveweight gains can be obtained from running cattle under the coconuts or grazing them on natural pastures (Watson and Whiteman, 1981b; Smith and Whiteman, 1985; and Reynolds, 1995)

### 6.4 Weed control

The major weeds of economic importance in the Solomon Islands are navua sedge (*Cyperus aromaticus*), *Mimosa pudica*, *Mimosa invisa* and *Sida acuta* and the major control measures used are:

- Hand or manual removal of weeds;
- Use of herbicides such as Glyphosate, Bromacil, “Round up” (a local commercial product), Paraquat and Dalapon to mention but a few; and
- The use of livestock to graze under plantation to reduce and control weeds.

### 6.5 Initiatives in forage improvement

1. The development and rehabilitation of areas planted to pasture;
2. Improvement of existing management and husbandry practices and introduction of improved methods of processing meat and meat products;
3. Continuation of country studies on major land systems to define soil fertility limitations and adaptation of pasture mixtures to edaphic and environmental conditions;
4. Evaluation of a range of sown pasture and stocking rates under *Eucalyptus* reforestation at Kolobangara (Shelton *et al.*, 1987);
5. Assistance to smallholder farmers in weed management control techniques of sown pastures;
6. Promotion of the use of fodder trees/legumes (*Leucaena leucocephala*, *Gliricidia sepium*, *Sesbania grandiflora*, *Calliandra calothyrsus*) as high protein feed supplements;
7. Preservation of forage resources through hay or silage making for future usage by smallholder farmers
8. Improved extension, advisory and farmer training services to increase areas of quality improved pastures, better grazing management and better animal husbandry practices;
9. The government has commenced an upgrading programme with limited bull imports and an AI programme.

In summary, the Government of the Solomon Islands supports programmes which aim to: improve the generally low fertility level of indigenous cattle; encourage the tethering of cattle for fattening; reduce the incidence of disease among livestock and develop the integration of cattle farming with other cash crops with the aim of increasing returns for the smallholder farmers.

## 7. RESEARCH AND DEVELOPMENT ORGANIZATIONS AND PERSONNEL

In the national development plan of the Solomon Islands, the ruminant livestock section was mandated to improve productivity in the rural areas and also to encourage private interest to sustain production at the national level. This was envisaged as a means of achieving self-sufficiency in livestock products, decreasing consumer prices by efficiencies in production and creating job and income earning opportunities in the rural sector. Therefore, the government and the big plantation owners and Lever Solomon Islands Ltd are vigorously looking at means to improve the pasture resources in the Solomon Islands.

Research Unit, Livestock Division  
 Ministry of Agriculture and lands,  
 P.O. Box G13,  
 Honiara,  
 Solomon Islands.  
 Livestock Development Authority  
 P.O. Box 525,  
 Honiara,  
 Solomon Islands.

Lever Solomon Ltd that owns many plantations is another organization involved in pasture research and development.

Lever Solomon Limited,  
 Honiara, Solomon Islands

**Contacts:**

Mr. J. Wahananiu, Agriculture Division, Ministry of Agriculture and lands, P.O. Box G13, Honiara, Solomon Islands

Mr. P. Sakuman, Livestock Development Authority, P.O. Box 525, Honiara, Solomon Islands

Mr. D. Wate, Livestock Division, Ministry of Agriculture and Lands, P.O. Box G13, Honiara, Solomon Islands.

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- Solomon Islands Website

## 9. CONTACTS

This profile will be updated from time to time and was written by **Eroarome Martin Aregheore** while he was at:

The University of the South Pacific, School of Agriculture  
Alafua Campus, Apia, Samoa.

Present address/contact:

Eroarome Martin Aregheore, PhD  
Marfel Consulting (Agricultural and Educational Services)  
118-7341, 19th Avenue  
Burnaby, BC, Canada, V3N1E3  
Tel: 604 395 5428  
778 991 2295 (Cell)  
Email: [aregheore\\_m@yahoo.com](mailto:aregheore_m@yahoo.com)

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