Pasture Work in the Grasslands of the Northern District—Part 1

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A considerable amount of research on pastures has been carried out at the Popondetta Agricultural Training Institute. To appreciate the problems, it is necessary to know something of the soil and climate of the area, so these facts are given first. The article gives details of a wide variety of legumes and grasses tested under normal grazing conditions.

Soil Type

The soil is known as Popondetta sand. It is a sandy pumice, severely leached and very porous. Average topsoil depth is 5 in, merging into a coarse sandy subsoil to a depth of 8 ft. Underlying this is a gravel aggregate. Generally this area is known for its nitrogen and sulphur deficiency and its poor moisture-holding capacity.

Vegetation

Owing to subsistence gardening and cash cropping, there is little climax forest left. Most of the area consists of secondary regrowth, interspersed with large areas of cane grass, blady grass, spear grass and kangaroo grass. This kind of grass mixture is frequently called "kunai" or "kunai complex', although botanists will insist that only *Imperata cylindrica* should be called "kunai".

Rainfall

Monthly rainfall average 1966-1969 inclusive:—

Month	*Points*	*Wet days*
January	1265	17
February	1290	15
March	841	13
April	1006	11
May	808	12
June	382	8
July	186	7
August	476	8
September	251	8
October	391	13
November	834	16
December	1080	17

PASTURE PERFORMANCE

The type of pasture initially planted on P.A.T.I. was determined largely by the amount of planting material available of promising species already growing well in ungrazed trials in the district. The same grasses were planted for local native cattle projects. The species available were:—

Grasses

1. Elephant grass (*Pennisetum purpureum*)
2. Guinea grass (*Panicum maximum*)
3. Para grass (*Brachiaria mutica*)
4. Molasses grass (*Merlinis minutiflora*)
5. Ruzi grass (*Brachiaria ruziziensis*)

Legumes

1. Centro (*Centrosema pubescens*)
2. Siratro (*Phaseolus atropurpureus*)
3. Puero (*Pueraria phaseoloides*)
4. Calopo (*Calopogonium mucunoides*)

The performance of these species under grazing is outlined below. The pastures were grazed at one beast per acre per year using a grazing cycle of 1 week in 5.

Elephant Grass and Siratro

After 6 months rotational grazing, Elephant grass showed signs of a severe nitrogen deficiency. There were very few leaves compared with the amount of stalk present, and the clumpy nature of the grass allowed a serious infestation of "broomstick" (*Sida rhombifolia*). The grass was slashed to stimulate new growth of leaves, and this renovation was repeated each year.

The Siratro established well with the Elephant grass but was severely attacked by insects. Skeletonizing of the leaves was so severe that Siratro barely existed after 2 years.

Guinea Grass and Siratro

Guinea grass tended to clump more than the Elephant grass, allowing a higher weed infestation. Nitrogen deficiency was even more evident. The performance of Siratro was the same as when planted with Elephant grass.

Molasses Grass

This species is easily established by seed, and produces a good ground cover. It is not very palatable and suffers heavily from trampling. Molasses grass burns easily, and in this district annual large-scale burning is practised. So there is always the danger of fire spreading to this pasture, which makes it unsuitable for most projects. Furthermore, often it will not re-establish after burning.

Para Grass and Siratro

Para proved an excellent grass on low-lying ground, especially on ground near streams where the water-table is not severely affected in the dry. On ground where the water-table drops considerably during the dry, Para suffered severely. Siratro was again unsuccessful due to insect attack.

Ruzi Grass and Centrosema

Ruzi grass cuttings established quite well on thoroughly prepared ground. Recovery after grazing was very slow. This species has now disappeared from the paddock. Centro established well but was severely affected by mosaic virus. It has spasmodic flushes through the year, but is very unreliable.

Pueraria

A pure stand of Pueraria was subjected to rotational grazing. It was obvious at the beginning of each grazing period that the natural grasses *Paspalum conjugatum* and *Paspalum paniculatum* were getting the upper hand Pueraria is severely affected if grazed during the dry season. Four years of grazing has virtually wiped out the species.

Calopogonium

This legume is naturalized in this area. It is not palatable to stock and is a problem because it competes with establishing pastures, especially on cultivated ground.

LOCAL CATTLE PROJECTS

Elephant grass, Ruzi grass and Para grass were used on local cattle projects. In the majority of cases the species proved unsuitable, the reasons being:—

1. Only small areas were planted. The labour involved in hand-planting discouraged project owners to continue their planting programme.
2. Ruzi grass is not suitable for this soil.
3. Elephant grass cannot be managed successfully under average project management without machinery.
4. The abovementioned species do not produce viable seed in this area, so natural reproduction is limited to vegetative regrowth, which is impossible under project management systems.
5. Overgrazing of these small areas resulted in an extremely severe weed problem.

PASTURE WEEDS

The six main weeds are:—

Broomstick (*Sida rhombifolia*)

Potato tree (*Solanum verbascifolium*) (see *Plate* I)

Digitaria longiflora

Sensitive plant (*Mimosa pudica*) (see *Plates* II and III)

Ferns

Roman Candle tree (*Cassia alata*)

Of these species, all except Broomstick and Sensitive plant are potentially poisonous. Occasional deaths—which might have been caused by plant poisoning—have occurred on projects where cattle were forced to graze these weeds on overstocked pastures.

It would be thought that Leucaena would suit our coastal high rainfall conditions. Many cattle projects already had areas of this species which had been planted for coffee or cocoa shade. Stands cut back for grazing were very slow to recover after grazing and it has generally been accepted that Leucaena on this soil area and under project management is not a successful grazing legume.

NEW SPECIES TESTED

To rectify the problems outlined above, a pasture mixture with the following qualities was required:—

1. Can be established by seed, preferably into a kunai burn;

Plate I.—This is a 3-year-old stand of Elephant grass, Para grass and Pueraria, completely overrun by Potato Tree and ferns

Plate II.—The foreground shows an Elephant grass pasture recently burnt. Twelve months ago this pasture was similar to the paddock in the background. Note the Sensitive Plant creeping in the foreground (arrow)

Plate III.—A 2-year-old stand of Elephant grass completely overrun with Sensitive Plant, Potato Tree and ferns

2. A hardy grass and legume mixture suitable to our soil conditions;
3. A pasture which can be managed satisfactorily without machinery;
4. A pasture which establishes quickly and supplies a good ground cover to compete with weeds.

With these factors in mind the following trial was carried out at P.A.T.I.:—

An area of one acre was selected and harrowed twice. The following species were planted:

Grasses

American Buffel (*Cenchrus ciliaris* cv American)
Biloela Buffel (*Cenchrus ciliaris* cv Biloela)
Green Panic (*Panicum maximum trichoglume*)
Hamil grass (*Panicum maximum*)
Rhodes grass (*Chloris gayana*)
Kazungula Setaria (*Setaria anceps* cv Kazungula)
Paspalum plicatulum
Brachiaria decumbens

Legumes

Lotononis bainesii
Silverleaf (*Desmodium uncinatum*)
Dolichos axillaris
Tinaroo (*Glycine javanica* cv Tinaroo)
Stylo (*Stylosanthes guyanensis*)
Perennial Cowpea (*Vigna luteola*)
Greenleaf (*Desmodium intortum*)

The trial was rotationally grazed at the rate of one beast per acre per year. The stocking intensity during grazing periods was eight cows to the acre.

Lotononis and Rhodes grass did not germinate so they were not included in the result. *Table* 1 sets out the results of the trial. "Exc'nt" means "excellent"; "Recovery" means not only the speed of recovery but also the amount of leaf produced after grazing.

Results

From *Table* 1 it is clear that the most promising grass species were *Paspalum plicatulum* and Kazungula Setaria. Most promising legumes were Stylo and Greenleaf Desmodium.

Following on from this trial a series of pastures were established, to test various combinations of grasses and legumes. Results of these trials are reported in Part II of this article which will appear in the next issue of *Harvest*.

Plate IV.—Kazungula Setaria in the trial after 12 months grazing. The photographer put his boot in the photo to give an indication of size

Table 1

Species	Palatability: Establishment	Recovery		Remarks
Grasses				
American Buffel	Good	Fair	Fair	Tended to become woody—did not spread in trial
Biloela Buffel	Good	Fair	Fair	As above
Green Panic	Good	Exc'nt	Fair	Very soft and suffered from trampling. Did not spread
Hamil	Exc'nt	Good	Good	Became very woody and showed nitrogen deficiency. Definitely requires mechanical control.
Kazungula Setaria	Exc'nt	Exc'nt	Exc'nt	Spread well, vegetatively and by seed
Paspalum plicatulum	Good	Exc'nt	Exc'nt	Spread by seed
Brachiaria decumbens	Fair	Exc'nt	Exc'nt	Spread vegetatively
Legumes				
Silverleaf Desmodium	Fair	Good	Nil	Disappeared completely
Dolichos axillaris	Poor	Fair	Good	Thickened up gradually; a promising climbing legume not prone to virus or insect attack
Tinaroo Glycine	Good	Exc'nt	Poor	Disappeared eventually
Stylo	Exc'nt	Fair	Exc'nt	Spread vegetatively and by seed. Age improves palatability
Perennial Cowpea	Exc'nt	Exc'nt	Nil	Insect attack. Disappeared completely
Greenleaf Desmodium	Exc'nt	Fair	Exc'nt	Spread vegetatively