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# TAGASASTE: HIGH YIELDS WHEN GROWN ON GRAVELLY LOAM WITH GENEROUS WINTER RAINS

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## SUMMARY

Currently there is a widespread assumption that the profitable growth of tagasaste to provide green feed for livestock is restricted to areas with deep sandy soils. In this paper data are presented from a trial established in 1989 which indicate that this versatile shrub is equally likely to yield rewarding returns when grown on better soils correctly fertilised in regions with generous winter rains.
*Keywords:* tagasaste, fodder shrub.

## INTRODUCTION

In 1952 quantitative data were published which showed that tagasaste, a hardy leguminous tree-shrub, could produce surprisingly high yields of palatable nutritious green feed for livestock in regions with long dry summers (Snook 1952). Despite the apparent multiple benefits to be derived from the planting of extensive areas of farmland with this versatile shrub it was not until the early 1980's that significant plantations were established. Specific machinery has been developed by a group of farmers, led by John Cook of Dandaragan, which now permits large-scale plantings quickly and efficiently by direct seeding. Concurrently, systems of management were evolved so that the shrubs could be used to best advantage by grazing animals. Now that sheep have become less profitable, cattle are being used very successfully to harvest tagasaste. For example, the Martindale Research Project on its property at Badgingarra has set-stocked tagasaste plantations with breeding cows for 24 months at 1 cow plus calf/ha. This gave an annual net return from the sale of calves aged 9-11 months, of $250/ha (Oldham 1993). This is a remarkable return from deep sands previously considered of little value for agriculture. Similar results have been reported for cattle grazing tagasaste on coastal sands at Esperance, Western Australia (WA) (G.J. Kleinig pers. comm.). These successes have led to the assumption that the profitable use of tagasaste is restricted to poor quality sands. However, in an earlier study it was found that very good production was obtained from tagasaste growing on gravelly loams at Margaret River where the average annual rainfall is 1,000 mm (Snook 1986). It seemed important, therefore, to obtain factual information to determine if farmers in favoured localities are justified in making extensive plantings of tagasaste. In 1989 a long-term trial was established at "A-Alla", Margaret River, with this object in view. The earlier studies of productivity had been made with tagasaste shrubs planted singly in rows 4 and 5 m apart. In contrast the current trial is being made with a densely planted hedgerow 2 m wide. The decision to adopt the hedgerow system of planting is supported by studies in New South Wales (Millthorpe and Dann 1991), New Zealand (Lambert *et al.* 1989) and Victoria (McGowan and Matthews 1992).

## MATERIALS AND METHODS

The trial was established in a cleared field which for some 50 years had carried annual pasture consisting mainly of subterranean clover, medics, cape weed and assorted grasses. The soil was gravelly loam which originally had supported a forest of eucalypts (jarrah, marri and karri). Before fertiliser is applied, this soil type is seriously deficient in phosphorus and copper, and is marginal for potassium. In most years superphosphate had been applied at rates of 100-150 kg/ha. On 3 occasions a commercial mixture of superphosphate containing copper and zinc was used. In May 1989 the selected area was cultivated twice to reduce weed competition. On 28 May tagasaste seed which had been treated with boiling water was broadcasted thickly along a strip 2 m wide and 125 m long. Superphosphate containing standard amounts of copper and zinc was applied at about 250 kg/ha. No herbicide or insecticides were used. There is no need to use inoculum in this area. Following establishment fertiliser has been broadcast annually along the strip at about 200 kg/ha, using commercial mixtures of super-copper-zinc or super-potash 3:2. To date the tagasaste plants have shown no evidence of disease nor has there been any damage from insects or other pests. Yields were determined by the periodic harvesting in duplicate of the material growing in areas 2 m x 1 m randomly selected towards the centre of the hedgerow. The first harvests were made on 4 June and 20 December 1990, by cutting the seedlings at 50 cm above the ground. At sampling time the complete hedge was cut so that the successive samples represented the uniform regrowth made between harvests. Subsequent cuttings were made at a height of 1 m. The edible fraction was determined by removing stems more than 8 mm in diameter. Samples from each harvest were collected to determine dry matter content and chemical composition. The analysis was carried out by CSBP, Bassendean, WA. This is not a controlled experiment. The object is to measure the yields obtained under the conditions described.

## RESULTS

By late June there was an excellent germination. Despite severe competition from weeds (mostly rye grass) the seedlings made good growth so that many were 30 cm high in mid-October and several outstanding specimens were 110 cm high on 19 November. In January 1990 there was some evidence of stress from lack of water but despite densities of up to 80 seedlings/$m^2$ the plants remained green and vigorous throughout the dry summer. The regular harvesting inhibited flowering so that seed production did not occur. When counts to determine plant density were made in June 1990 the numbers ranged from 77-84/m? Subsequent deaths have been slow but continuous. Surprisingly most losses have been among particularly vigorous specimens which have failed to recover after being cut back. The bulk of the plants however, made quick recovery after harvest, even when the cut was made towards the end of the summer. Considerable leaf fall occurs in uncut tagasaste during prolonged hot weather, but in the harvested hedgerow the loss of foliage was negligible. The 2 areas harvested on 4 January 1994, each 2 m x 1 m, contained 51 and 79 living plants respectively (ie. 25 and 40/$m^2$). The yields from each harvest, along with the chemical analyses are recorded in Table 1.

**Table 1. Yields of dry matter (DM), and crude protein (CP), phosphorus and copper content, of tagasaste**

| Date | | Yield | | | Composition | | |
|---|---|---|---|---|---|---|---|
| | | Green ($kg/m^2$) | DM ($kg/m^2$) | Edible DM ($kg/m^2$) | CP (%) | Phosphorus (%) | Copper (ppm) |
| 4 June | 1990 | 5.00 | 1.85 | 1.57 | 18 | 0.19 | 9.6 |
| 20 December | 1990 | 3.35 | 1.07 | 0.91 | 12 | 0.12 | 5.6 |
| Total | | 8.35 | 2.92 | 2.48 | | | |
| 30 April | 1991 | 1.32 | 0.35 | 0.30 | 20 | 0.26 | 10.7 |
| 16 September | 1991 | 2.90 | 0.69 | 0.69 | 17 | 0.23 | 5.8 |
| 27 November | 1991 | 1.75 | 0.52 | 0.52 | 16 | 0.22 | 6.0 |
| Total | | 5.97 | 1.56 | 1.51 | | | |
| 19 February | 1992 | 2.00 | 0.62 | 0.62 | 17 | 0.30 | 5.0 |
| 8 June | 1992 | 2.30 | 0.57 | 0.57 | 16 | 0.24 | 6.5 |
| 3 November | 1992 | 4.00 | 1.48 | 1.04 | 14 | 0.16 | 5.5 |
| Total | | 8.30 | 2.67 | 2.23 | | | |
| 28 February | 1993 | 2.60 | 0.96 | 0.91 | 13 | 0.13 | 5.1 |
| 30 May | 1993 | 2.75 | 0.90 | 0.58 | 21 | 0.26 | 10.3 |
| 4 January | 1994 | 3.95 | 1.75 | 1.20 | | | |
| Total | | 9.30 | 3.61 | 2.69 | | | |

## DISCUSSION

### *Yield*

The yields obtained have been impressive. Of particular interest was the high yield obtained at the first harvest which was made 12 months after seeding. This was 1.85 kg dry matter/$m^2$ of planted area. Eighty five percent of this was considered to be edible. The next harvest was made 6 months later and yielded 1.07 kg dry matter/$m^2$. These initial high yields are in contrast to those reported from studies made at Ellinbank, Victoria, from which it was concluded that little production of forage can be expected from tagasaste during the first 18 months after establishment (McGowan and Matthews 1992). In earlier studies made at Margaret River with tagasaste shrubs planted singly in rows 5 m apart (1,000 shrubs/ha) it was found that dry matter yields in the first 2 years totalled little more than 3 t/ha (Snook 1986). In the detailed studies made at Ellinbank (referred to above) marked increases in yields of tagasaste/unit area were obtained with increased density of planting. It seems reasonable to assume, therefore, that the increased level of production in the current trial results from the denser planting. The high levels of production from the hedgerow have been maintained. The 3 harvests made during the last 14 months have yielded a total of 3.6 kg/m$^2$ of dry matter from the planted area. Of this 2.7 kg was considered edible. This means that if similar hedgerows are equally productive when planted in parallel rows so as to take up half the area of the field, the yield of edible dry matter from the tagasaste in the fourth year would be close to 12 t/ha.year. The pasture growing between the rows could be expected to produce at least 2 t/ha of edible dry matter making a total annual production of 14 t/ha in the fourth year after planting. This would be available in the form of green feed for the feeding of livestock when-ever required. Extrapolation is dangerous but the weighed yields do indicate that tagasaste could be a very profitable crop when grown on good soils in areas with generous winter rains. Information on the yields obtainable from tagasaste growing on deep sands appears to be restricted to areas north of Perth with annual rainfalls around 500-600 mm. At New Norcia yields of 3 t/ha of dry matter have been reported (Southern 1988). At Badgingarra under more sophisticated management with cattle set-stocked, the intake of dry matter from tagasaste and pasture amounted to 5.2 t/ha from a plantation established in 1988 (Oldham 1993). Tagasaste planted in rows on deep coastal sand near Esperance is supporting beef cattle at the rate of 1 breeding cow plus calf (to time-of-sale)/ha (G.J. Kleinig pers. comm.). This indicates a level of fodder production similar to that reported from Badgingarra. These profitable levels of production from tagasaste grown on otherwise worthless sands are of considerable economic significance. However, the high yields being obtained in the current trial at Margaret River should return even higher profits. It is puzzling, therefore, that stockowners in the more favoured areas have made no major attempt to learn how to utilise this potentially valuable shrub.

*Nutritive value*

The figures in Table 1 show that there is a marked variation in the level of nutrients in the different samples. These indicate that there can be serious variations in the feed value of the material harvested. It is important to learn why these variations occur and how to limit them. Controlled experiments will be required to determine the factors involved but there is a suggestion that time of application of fertiliser could play a part. It so happens that the samples with high mineral content were collected some weeks after the application of fertiliser while samples with low values were harvested just prior to routine top-dressing. Some such variation in quality could be expected in plants growing on soils rich in iron and aluminium where applied soluble phosphates quickly revert to forms unavailable to plants. In contrast, on deep sands it was found that tagasaste is very efficient in harvesting residual phosphate for as long as 5 years (Southern 1988; Oldham 1993).

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