THE ECONOMICS OF DEVELOPING A TAGASASTE PLANTATION FOR BEEF CATTLE PRODUCTION ON A FARM IN WESTERN AUSTRALIA

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Summary. Development budgeting techniques were used to analyse changes in annual farm budgets over ten years when establishing 600 ha of tagasaste on a 1600 ha sheep and cropping farm. Data were gathered from 8 experienced farmers using the local consensus data technique(LCD), farm visits,and discussions with researchers, stock and estate agents.
A whole farm budget approach will be applied to these data to determine the full effects on the farm business, including profit levels, cash flows, changes in equity and the after tax position.

The LCD technique was successful and provided very practical information. An initial before interest and tax partial budget financial analysis provided the following indications. The introduced cattle breeding enterprise on Tagasaste was much more profitable than the original sheep enterprise. Disadvantages were, high capital costs, a substantial peak debt not cleared until about year 7 and increased risk exposure of the farm business.

Profitability was most sensitive to cattle reproductive rates, cattle prices, Tagasaste development costs and loan interest rates. Advantages were full tax deductibility of capital costs, increased farm stocking rates of 40-60%, improved livestock equity, enterprise diversity, prevention of wind erosion and control of salinity. The whole farm budget approach when complete, will fully assess the effects of loan and overdraft interest on the farm business as the taxation implications of the project.

INTRODUCTION

Tagasaste (Chamaecytisus palmensis) is a leguminous perennial tree from La Palma in the Canary Islands where it has been used as a fodder tree since the 1700's. It was introduced to Australia in seed form in 1898 and it thrived in many regions in this country, particularly in well drained sandy soils. It was only in the 1980's that tagasaste became a focus of research activity as a potential source of fodder, both in Australia and New Zealand (Borens and Poppi 1980). The leaf material from the plant has a crude protein and digestibility range of 20-30% and 70-80% respectively (Wiley et al 1994). On paper, it is a better quality fodder than lucerne

hay. However, it has since been shown that phenolic compounds in the plant reduce the availability of nutrients in the rumen (Oldham 1993).

It has been estimated that there is half a million hectares suitable for growing tagasaste in the West Midlands region of Western Australia. The main area consists of an 80 km wide coastal strip of land extending from north of Perth to Geraldton. Recent research projects in the West Midlands used farm scale prototypes to demonstrate the great potential for improving the productivity of poor soils (Oldham 1993). Early research work in WA focussed on establishing tagasaste in plantations to supplement sheep during the autumn feed deficit period. The "Midas" computer model indicated that the plantation establishment costs would be recouped over time if the need to grain supplement sheep in autumn was replaced by tagasaste. In 1991 it was discovered that cattle were better suited to browsing tagasaste than sheep. Cattle caused much less plant damage, controlled the growth of the plants in rows down to the short "broccoli" form and could be continuously grazed on it. This in turn reduced the need to mechanically cut back the rows of plants each year at a cost of $40/ha which was necessary when used for sheep browsing (Oldham 1993). These factors, plus a developing live cattle trade out of WA and fluctuating wool prices have resulted in a major research and commercial interest in developing tagasaste plantations for cattle enterprises.

In 1991 Martindale Pty Ltd, the company which funded the original tagasaste research work from 1985 onwards, made a commercial decision to change their farming enterprise mix. They shifted from 80% sheep and 20% cattle to 30% sheep and 70% cattle. They have since turned off calves from tagasaste with gross margins of $100/ha or more net, which compared favourably with $0 - $30/ha from sheep grazing annual pastures on similar soils (Maughan 1994). The results of research conducted on Martindale properties and elsewhere has been effectively publicised at field days in the West Midlands. This has resulted in the early adoption of tagasaste systems by many interested farmers. By 1995 about 70,000 ha of tagasaste was planted on farms in the region (Maughan 1994).

Initial development budgets and financial analyses which assessed establishment costs and likely returns from tagasaste plantations for cattle production have been in partial budget form (Herbert pers. com.) and (Butt, 1994, 1995). Developing a tagasaste plantation involves high capital costs, a change from sheep only to sheep and cattle enterprises and may involve an establishment phase of 5-10 years with significant equity and taxation implications. For these reasons, the authors decided to use whole farm budgeting procedures so that the full impact of the development on the farm business can be assessed. To do this we will use the whole farm computer package "Muresk Budget Generator" programme written in Excel Version 5 by R Beardsmore at the Muresk Institute of Agriculture, Northam, WA. This programme is currently

being modified to accept tagasaste inputs. The programme links livestock and crop schedules into annual cash flow, profit and equity budgets and provides land use and enterprise summaries.

To gather data for the project we used the "Focus group" or local consensus date technique (LCD) which was used by one of us to gather data on the economics of sheep production in Tasmania in 1980. It has since been extensively used to develop best practice grazing management procedures for the beef industry in Queensland (Clark and Filet 1992).

METHODOLOGY

Data Collection Procedures.

Local consensus data technique. Eight farmers who were experienced in the development of tagasaste plantation for commercial use, attended two afternoon meetings at Moora, a central location in the West Midlands area. The objectives of the meetings were to:

- develop a profile of a typical but hypothetical farm in the West Midlands region prior to and after converting some of its land area to tagasaste
- establish costs and returns associated with developing an area of tagasaste for cattle production over a number of years until a steady year in year out cash flow status is reached.
- determine the type of cattle enterprise activity or activities which should be established on tagasaste and the cattle marketing practices which should be used

A report was then prepared, circulated to the participants and corrections and amendments to the report were discussed at a follow up meeting

Other data collection procedures. Visits were made by one of us to eight farms where tagasaste plantations were being established or had mature plantations. Information was also sought from two rural bankers, rural consultants, stock and station agents and a review of the literature.

RESULTS AND DISCUSSION

Information provided by the local consensus data meetings.

The land types used mostly for tagasaste production are in an 80-90 km wide strip of land west of the escarpment. The region enjoys a reliable 400-700 mm rainfall range and mild winters. The main limitation to production is the poor sandy soil which probably should never have been cleared for agriculture. The worst deep sands can only carry from 1-2.5dse/ha, are unsuited to cropping and are very prone to wind erosion and salinity associated with rising water tables. Most of the farms in this light country crop less than 15% of their arable area and predominantly graze sheep. Tagasaste is best suited to the poorest deep draining soils It readily controls wind erosion, reduces water table levels due to its large water uptake and well managed plantations can carry cattle at a stocking rate of 8-10 dse/ha after 3 years of growth

Assumptions used for the case study farm.

Farm Area: 1600 ha with soil types comprised of 600 ha of very poor quality Banksia sand, plus yellow sand and sand over gravel.

The major activity prior to development was Merino sheep breeding with 45% of the ewes mated to Poll Dorset rams for prime lamb production. Ten percent of the farm was cropped with oats and lupins, mainly for on-farm stock usage.

Tagasaste establishment. Tagasaste for a cattle breeding enterprise was established on the 600 ha of poor sand whilst gradually phasing out wethers from that area. Double rows, two metres apart with an inter row space of ten metres were planted via direct seeding. The average paddock size was 50 ha. Stocking rates after two and three years of plant growth were three and ten dse/ha respectively..

The LCD technique was a successful means of data collection. The farmers appreciated the opportunity to exchange ideas with their peers and they in turn provided very practical and up to date details.Follow up contact has since been maintained with the participants.

Development procedures. Several development runs were used in the study to provide a comparison of costs and returns from different activities.

1. Slow development. Planting took place over eight years, the final unit reaching early maturity (3 years growth) in year 11. For the first three years, 50 ha per year was planted followed by 100 ha per year over four years and the last 50 ha in year eight.

Run 2. Fast development. Planting occurred over 4 years at the rate of 150 ha/year. The final unit reached early maturity by year 7.

Changes were also be made to the slow development project (Run 1) to assess the effect of the following:

- The effects of varying herd calving rates from 90% to 80% to 70%
- The effect of a plantation failure of 100 ha in the fourth year of development
- The impact of varying buying and selling prices on annual returns
- The effect of changes in interest rates on the farm business

Cattle operations. A self replacing breeding operation was initiated to supply steers and heifers to the live export trade. Shorthorn or *Bos indicus* cross females were bought from the Pilbara region each year during April-May. At the time of purchase all cows were pregnancy tested and it was assumed that 40% calved down in May-June. Any remaining pregnant cows were aborted using an injectable prostaglandin. All cows were mated for 9 weeks with Droughtmaster bulls commencing in the last week of July to calve down in May-June the following year. Twenty percent of cows were culled each year for non pregnancy, old age, poor quality of their offspring and poor temperament. These were mainly sold live export. Calves were implanted with hormone growth promotants in September and weaned in December. Weaners were placed on tagasaste and supplemented with lupins at 1 to 1.5% of their body weight until sold in April to live cattle ships exiting Geraldton or Fremantle for Indonesia.

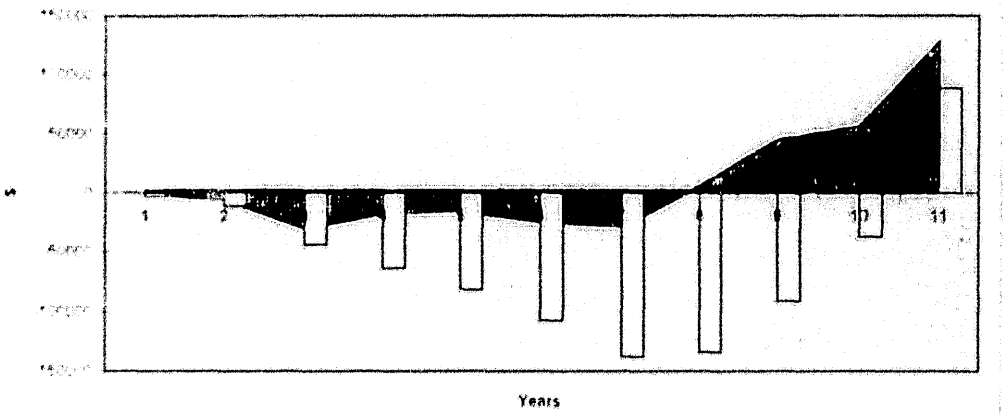
It was assumed that all steers and heifers surplus to replacement requirements were sold within their first year of age. The heifer replacement rate was maintained at 25% or more to phase in better quality Droughtmaster cross bred breeders and to meet the demands of the high culling rate in the adult herd.

The tagasaste project was initially analysed using a financial cash flow analysis which assessed annual cash transactions before tax and interest, year of peak debt, size of peak debt, time required to reach a positive cash flow, time required to clear accumulated cash deficits and the final cash balance. A nominal interest rate of 11.5% was used in the calculations. In the phase to come, these various scenarios will be tested by a series of whole farm budgets which can fully assess the effect of taxes and loan interest on the farm business, plus the changes in net worth.

Development implications

In Run 1, peak accumulated debt was over $138,000 before interest and tax which was not cleared until year 7, providing that the herd calving rate remained at 90%. Because of the high development costs and management problems involved, many owners are likely to use the slow development approach in order to spread their borrowings over 8 years or more. This would help them to manage farm debt levels and reduce risk.

Figure 1. Cash flow before interest and tax using a gradual approach to tagasaste development.



In Figure 1 the cash flow in dollars is plotted along the y axis against the x axis which shows the time in years. The shaded area outlines the annual net cash flows and the bars show the cumulative cash flows.

The internal rate of return (IRR) before tax and interest was 16.5% and the net present value (NPV) at 11.5% was $29,000.

Reductions in calving rates had a serious impact on annual net cash flows. At an average calving rate of 80% a positive cash flow was not reached until year 9 and the NPV at an 11.5% discount rate was only $7,300. An average calving rate of 70% placed the project at great risk as the debt load was not serviceable. In well managed herds, 90% calving rates have been sustainable in the West Midlands.

Lowering cattle sale prices by 10 to 15% had a similar serious effect on cash flows at the above calving rates. Increased purchase prices had less impact on the cattle enterprise since

it affected the value of cows and bulls bought in during the herd build up phase. Once a steady state was reached, the herd was then self replacing except for buying in bulls.

Fast development (4 years vs 8 years) incurred very high capital costs initially and the larger peak debt of $172,000 occurred earlier, was cleared by year 5 and resulted in much earlier positive cash flows. However, it did involve greater risk to the farm business. This option has been used by the corporate sector and by owner operators with full farm equity and a high borrowing capacity. The IRR for this option was 26% and the NPV at a discount rate of 11.5% was $130,135.

The project was also very sensitive to the final stocking rate of tagasaste. A 20% reduction in stocking rate from 10 to 8 dse/ha resulted in a 15% drop in cattle income with flow on effects on debt servicing ability.

A 100 ha plantation failure in the 4th year had a noticeable impact on the project. It doubled the tagasaste establishment costs in the following year, increased interest charges and delayed the return to a positive cash flow by at least one year.

Changes in livestock and land asset values:

Year 0	Area	$/ha (ha)	Total
Land value	600	250	$150,000
Sheep value			$133,870
Cattle value			0
Total			$283,870

Year 10	Area	$/ha (ha)	Total
Land Value	600	450	$270,000
Sheep value			$87,820
Cattle value			$203,872
Total			$561,692

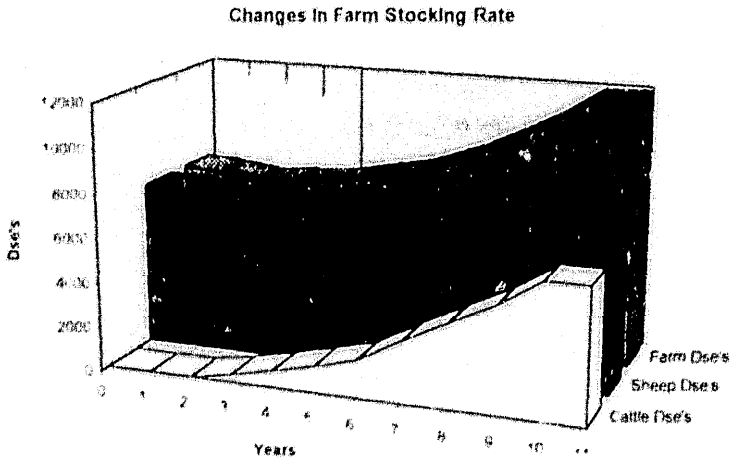
The present value of $561,692 at an annual inflation rate of 5% is $354,006. In the above example, there is a firm improvement in livestock and land values. However land values after tagasaste development are largely an unknown factor at present. (See land values).

Changes in farm stocking rates. The three major benefits of a well established and managed tagasaste development were:

- A marked increase in the farm stocking rate (SR)
- Enterprise diversification
- Increased land values

The change to farm SR is seen in Figure 2 below. Development of 600 ha of 44% of the available grazing land has resulted in a final SR increase of 40-60% (final SR 8-10dse/ha)

Figure 2. Changes in farm stocking rate after tagasaste development



Change to a cattle breeding enterprise is very relevant to the present situation of low and fluctuating wool prices. Over recent years cattle enterprise returns per ha have been much higher than those from sheep enterprises but this situation may be reversed in the future.

Land Values. For the case study farm, the initial predevelopment land value used was $250/ha. It was difficult to determine land values after tagasaste development for the following reasons:

- The long term viability of this fodder tree system has yet to be acknowledged by the industry at large
- no fully established farms have been bought or sold to provide a benchmark price for valuers

The consensus of opinion was that the developed land should be valued on its dse carrying capacity and type of enterprise, ie. its productivity. Estimates by various industry commentators range from no increase in value to $900/ha depending on the final SR. Estimates of $350-$500 were most common. A rural real estate agent noted that the industry put a value on land of about $80 per dse carried. He suggested therefore that if the final SR on tagasaste land is 8-10 dse/ha the land should be valued at $640-$800/ha (R Hatton, pers. comm., 1996).. A rural economist in South Australia showed that land values were strongly correlated with commodity prices (Huzco 1994). She found that the major on-farm determinants of commodity prices were expected cash flow and profit levels, as well as seasonal conditions. The West Midlands has a reliable annual rainfall range of 400-700 mm and a mild winter climate. These conditions are conducive to good fodder growth and animal production levels. This view is supported by researchers who found that "the yields of well fertilised tagasaste are comparable with the best dry land pastures in the state" (Edwards *et al* 1995).

Tagasaste has improved profitability on poor productive sands and allowed enterprise diversity. For these reasons we believe that well managed tagasaste projects will improve the value of developed land in the long term. Farmland is a finite resource and beef cattle farmers who have been squeezed out of the south west region by high land prices are buying into the West Midlands. This will eventually put upward pressure on the land values of farmland which includes well managed tagasaste developments. In this case study a value of $450/ha was used for the developed land at plantation maturity, but this will be varied in the whole farm budgeting approach.

Taxation Implications.

The capital costs of tagasaste plantations which are used primarily for land reclamation purposes are fully deductable in the year of expenditure (Section 75D). To qualify for this deduction the project should be well planned and approved by the regional land care officer. Also, in the case of a relatively large development (such as the 600 ha project in this case study), it would be prudent for the land holder to ensure that the deduction is valid by means of a private ruling from the Commissioner of Taxation, prior to entering a taxation return.

Borrowing for development.

Whilst there are substantial tagasaste establishment costs of about $70 to $100/ha, the major inputs are capital costs for cattle, fencing and water for small paddocks, an additional bore and pump and cattle yards.

Types of Loans. Loan procedures will vary with the extent and pace of development. A fast development over 4 years would initially require an interest only loan until a strong cash flow position was reached. Most owner/operator projects are likely to extend planting over 6-8 years with loan requirements being phased in gradually. A multi option facility would best suit this situation using commercial bills, long to short term loans and overdraft facilities. Current interest rates would be in the range of 10.5% to 12.5% depending on the clients' standing with the bank. Another option according to one banker would be to use overdraft facilities initially and then use an updated term loan approach which many banks are providing to their customers in a bid to provide a more flexible service (F. Skipworth, Bankwest pers. comm. 1996).

Risk Factors

Major risks in tagasaste development are associated with high development costs, resulting in substantial long term debt. This greatly increases the risk exposure of the farm business, particularly in the case of rising interest rates. Delayed returns would also increase debt servicing risk in the case of limited supplies of breeding stock at high purchase prices, a major plantation failure or a substantial fall in export or domestic cattle prices. Although partial plantation failures have been common, improved technology has reduced this risk and establishment rates of 85-80% are expected. Overgrown plantations also post a threat to tagasaste projects since these incur major cutting costs, or at worst take land completely out of production, create a negative land value and may ultimately incur clearing expenses.

Some risk is also associated with the fact that tagasaste farming is a young industry in which research findings are only one step ahead of commercial plantings and expensive mistakes have been made. The potential for large errors to occur due to lack of established procedure is minimised by the fact that most projects are phased in over several years. This allows farmers to avoid repetition of past mistakes in new plantings provided they attend field days to update their knowledge. Many farmers planting tagasaste are inexperienced in cattle management. Poor decisions could seriously impede cash flows, for example in the case of herd reproductive failure, very poor growth rates of young cat , or buying the wrong type of cattle for a particular market.

CONCLUSIONS

The use of tagasaste plantations in poor sandy soils has shown great promise in terms of increasing stock carrying capacity,control of wind erosion and salinity. However because of the high capital costs involved in establishment such developments can place the farm business at risk. Whilst partial development budgets provide a useful early early screening process, large scale developments should be evaluated by a whole farm budgeting approach.The full impact of the proposed project on the farm business including taxation effects can then be assessed. Sensitivity analyses on key factors such as stock prices, fertility levels and interest rates should also be included. The local consesnsus data gathering technique had the full support of the farmers involved and provided up to date and practical information for this project.

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