12. Case Studies Using the AFFFM

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One of the primary functions of the Australian Farm Forestry Financial Model (AFFFM) is to allow landholders and their advisors to explore the potential impacts of forestry development on overall farm profitability, financial position and cashflows. In this chapter, two case studies of real-life landholdings are presented. The first examines the development of native forestry operations on a landholding in the New England Tablelands region, and the second examines the development of a hardwood plantation on a landholding in the Darling Downs region. These case studies illustrate the data input requirements and the nature and interpretation of the output from the model.

12.1 New England Tableland Native Forestry Case Study

This case study illustrates the AFFFM can be used to investigate the financial implications of managing a private native forest for timber production. The data for this case study farm were collected in 1999 during the course of a previous RIRDC-funded project (Thompson 1999).

The case study farm is located in northern NSW and falls within the boundaries of the Uralla Local Government Area (LGA). This is a family-owned business which operates with a high level of off-farm income. The operational features of this business are set out in Table 12.1. The dominant commercial native timber species on the farm are native hardwoods (see Figure 12.1). While there is a range of eucalypt species on the farm, those of most commercial interest are:

- Silvertop stringybark (*Eucalyptus laevopinea*);
- Red stringybark (*E. macrorhyncha*);
- Youmans stringybark (*E. youmannii*); and
- New England blackbutt (*E. andrewsii*).

These species are commonly taken by sawmills in the region which pay stumpage of about $\$25/m^3$, the price varying according to stand size, timber quality, site access and distance from the mill. The farm has a small fixed sawmill on site and the species mix currently put through the mill is approximately 80% stringybark species and 20% blackbutt. The owners are interested in processing their own timber on-farm for sale to local building supply firms. This would attract a sawn timber price of at least $\$320/ m^3$. Expansion of the current sawmilling operation for this purpose would require hiring additional labour, of two men for three days per week, to assist with timber sawing and one man for four days per week to assist with cutting and mill maintenance (i.e. 10 man days per week). The cost of this labour is estimated at $120 per day plus loadings for workers compensation and compulsory superannuation of 24%. On the basis of a 60% recovery (which assumes that only selected logs are milled), this corresponds to a labour cost of $\$89.65/m^3$ of roundlog put through the mill. There were also fuel and maintenance costs of $\$34/m^3$.

The farm manager would be largely responsible for cutting, de-barking and log snigging operations using existing farm machinery. Based on State Forests NSW estimates of harvesting costs of $\$15/m^3$ and the farm manager's estimates of fuel and maintenance costs of $6/ha, the total cost of the log harvesting operation is estimated as $156/ha.

Table 12.1. Case study farm structure

Item	Amount
Total farm area	978 ha
Approximate area available for existing native timber management	400-500 ha
Average carrying capacity (whole farm)	2.87 DSE[a]/ha
Additional carrying capacity generated following non-commercial thinning	1 DSE/ha for a period of 10 years after thinning
Dominant soil type	Granite based soils
Average annual rainfall	850 mm
Initial livestock numbers: Merino ewes	800
Merino hoggets	560
Adult cattle	50
Young cattle	35
Weaning rates: Ewes	70%
Cattle	70%
Wool production: Ewes	3.5 kg/head
Hoggets	1.5 kg/head
Farm labour situation	A full-time manager operator; casual assistance as required
Farm family expenses	$8,000 per annum
Opening equity level	69%

a. DSE = dry sheep equivalent, the amount of energy required to maintain one dry sheep for a 12 month period.

It is estimated that about 10 m^3/ha of harvestable timber might be extracted across the entire farm, although this varies considerably between different sites. Timber growth rates are estimated at about 1-2 m^3/ha (State Forests of NSW 1998). For the purpose of this case study, the simplifying assumption was made that the 400 ha available for logging is divided into 10 coups with a regular annual harvest (i.e. 40 ha was logged every year, so each coup had a 10-year recovery period).

The management cycle thus becomes:

> Each year, log and thin 40 ha removing 400 m^3 of logs and thinning the logged area at a cost of $112/ha (based on estimates by the farm owner and State Forests NSW). Thinning would be performed by chainsaw and brush cutter. Current stand density is estimated at between 200-300 stems/ha and this would be reduced to around 150 stems/ha.

Due to the lack of market opportunities for thinnings in the region at present, thinned timber would be pushed into piles using a tractor and left to break down naturally. As a result, no commercial thinnings revenue is realised.

Two scenarios are compared using the AFFFM, one selling timber at a stumpage price of $25/$m^3$ and the other sawing the timber on-farm and selling green sawn product for $320/$m^3$.

Modelling results - selling timber at stumpage prices

Samples of the model results are presented in Figures 12.1 to 12.3. For this analysis, the model was run over a 60-year planning horizon using a real discount rate of 6%. In Figure 12.1, the 'Financial analysis' section of the screen reports various financial performance measures for the with-forestry and without-forestry scenarios. In this case, there is a clear improvement in farm business performance for the first four performance indicators (NPV, LEV, NPV/ha and EAV/ha) when native forestry is included as a farm enterprise. The model could not calculate an IRR because all business cash flows were positive from the start of the analysis.

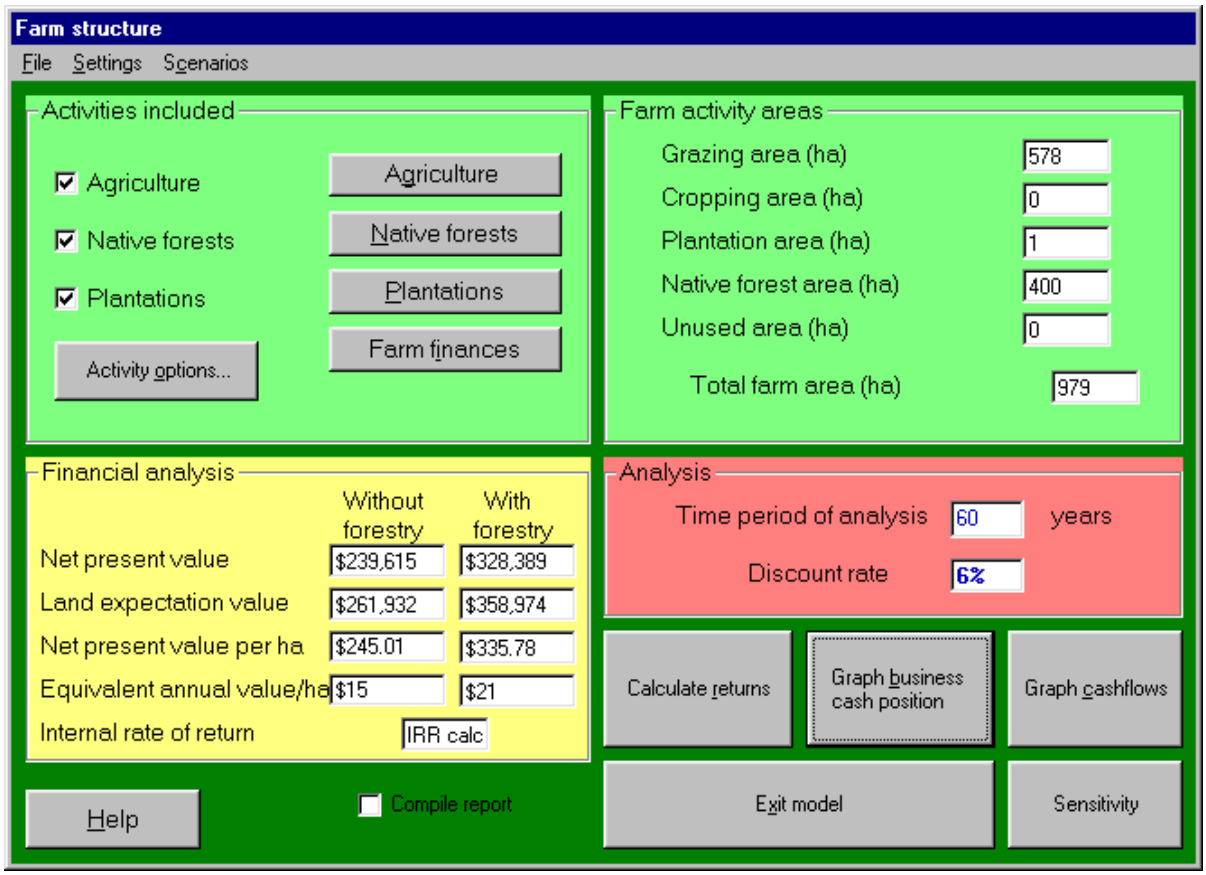

Figure 12.1. Financial analysis of the development of a native forestry enterprise on a New England Tablelands region

Figure 12.2 displays the business cash position (BCP) with and without forestry. BCP essentially tracks the businesses bank balance and is useful for identifying any periods of negative balances which may cause cash flow problems, especially if overdraft limits are breached. In this case, starting from an assumed zero bank balance, annual cash flows are always positive, so the BCP increases. Initially, this increase is slower because a loan is being repaid and principal and interest costs have to be met. After Year 5, this loan has been fully repaid, hence finance costs fall to zero and BCP increases more rapidly. The bank balance is higher at all time periods where native forestry is added to the existing farm business enterprise mix. This is to be expected in the current example because the net cash proceeds from native forestry activities are positive for every year. This may not always be the case, especially where expenditure on silvilcutural treatment is required in order to restore or improve the productivity of native forests that do not currently have harvestable timber.

Because of its cumulative nature, the BCP calculation simulates the bank balance reaching very high levels after 60 years (in excess of $2M with forestry). In reality, additional investments may be made on or off-farm which would offset this rapid rise in BCP.

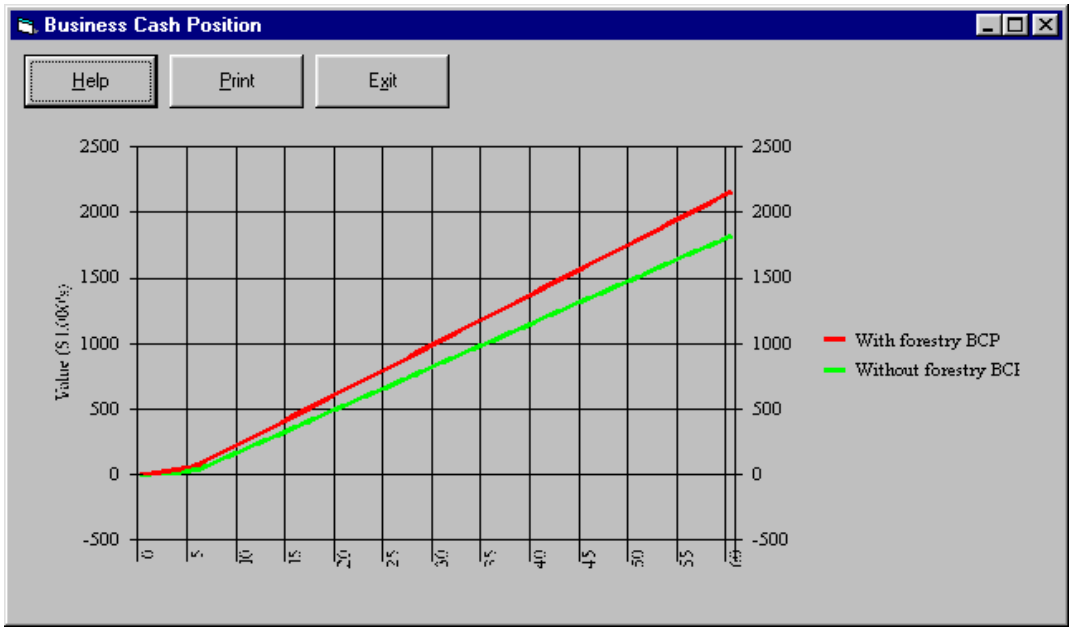

Figure 12.2. Projected business cash position of the farm enterprise with and without the development of a native forestry enterprise on a New England Tablelands region

The annual cash flows are illustrated in Figure 12.3. Unlike BCP, these are a non-cumulative measure and exclude finance costs. It can be seen from this figure that the native forestry enterprise is projected to increase the yearly revenue to the farm business by approximately $6,000 per year.

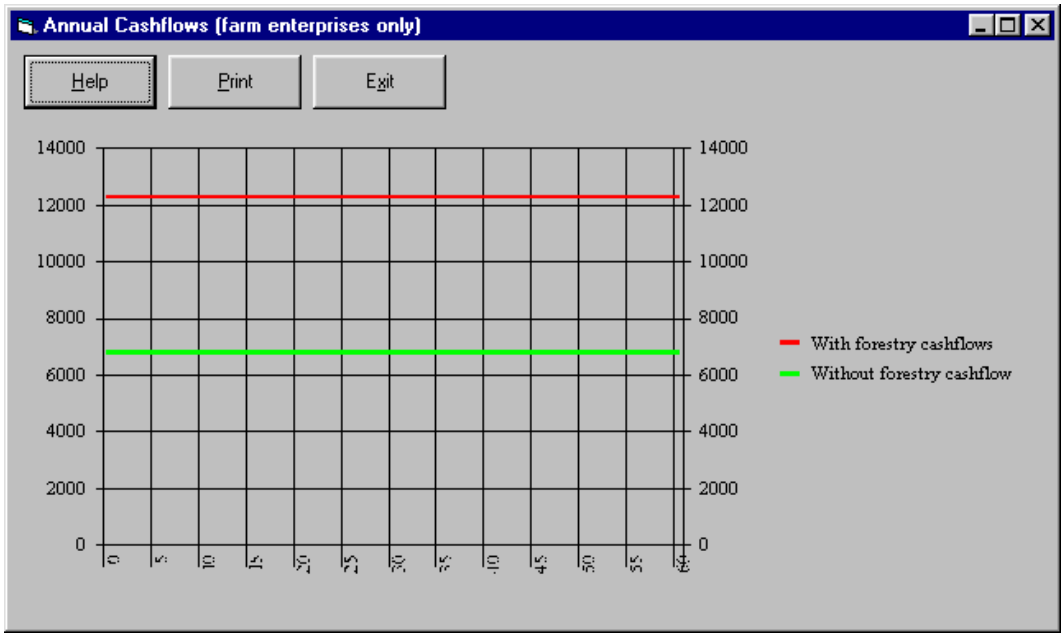

Figure 12.3. Annual cash flows of the farm with and without forestry investment

Modelling results - selling sawn timber

The results of the financial analysis where timber is sawn on-farm are presented in Figures 12.4 and 12.5. These results clearly demonstrate the superior financial performance that can be achieved where the forester is able to move along the value-adding chain and sell a processed product. The NPV with forestry has increased from $328,000 to $508,000 (Figure 12.4) and BCP climbs at a more rapid rate (Figure 12.5).

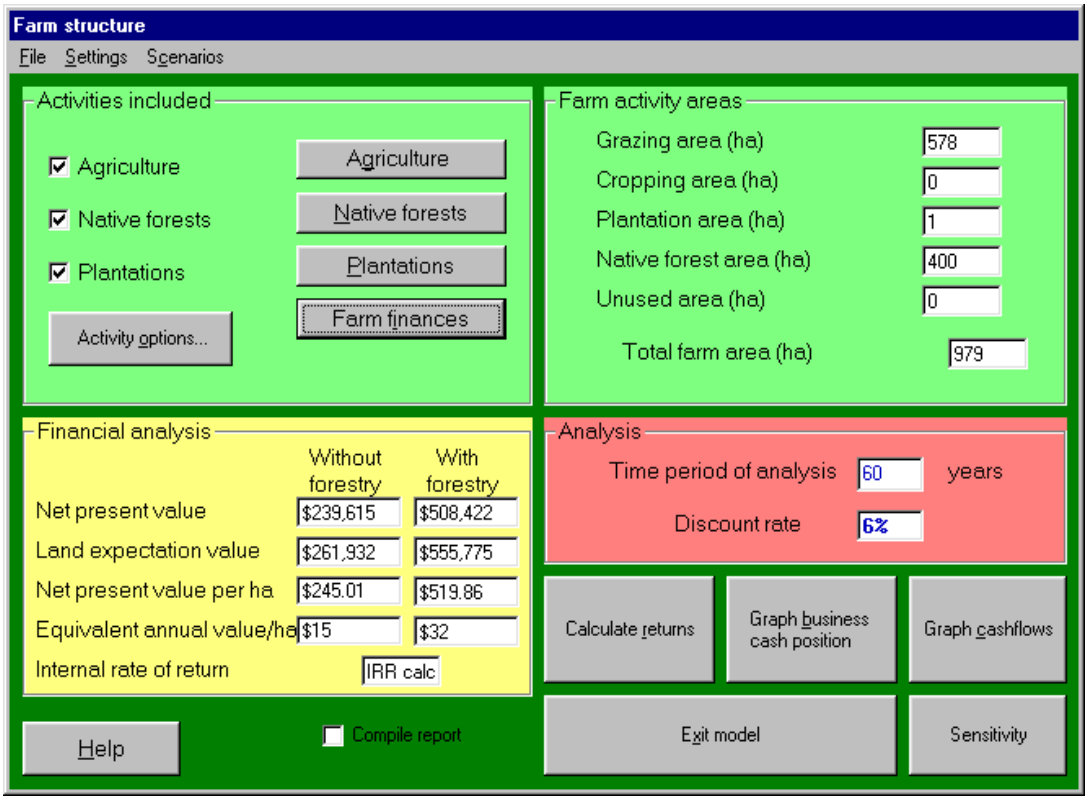

Figure 12.4. Financial analysis of the development of a native forestry enterprise on a New England Tablelands region when the landholder processes their own timber

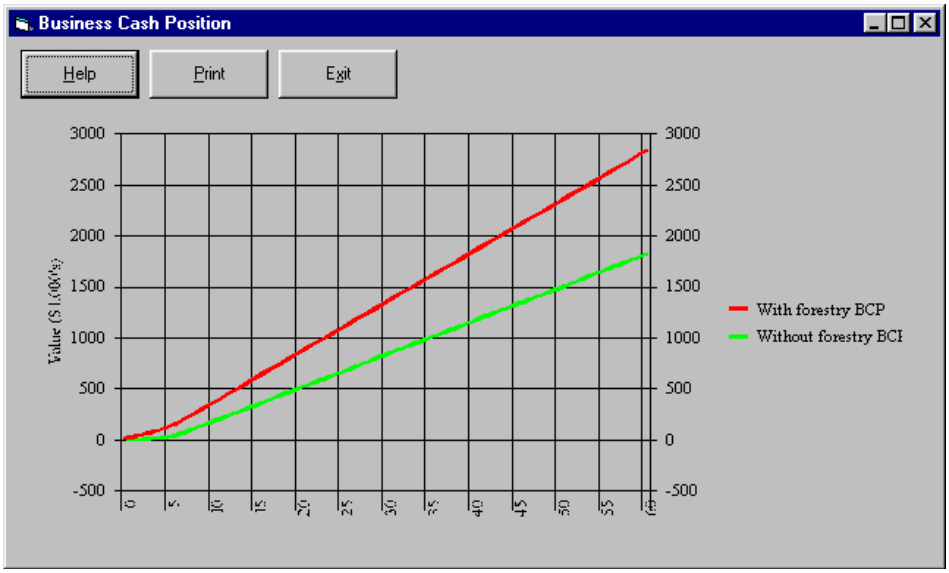

Figure 12.5. Business cash position of the farm business with and without the development of a native forestry enterprise on a New England Tablelands region, with on-farm timber processing

This case study examines the establishment of a plantation enterprise on a mixed cropping farm on the Queensland Darling Downs. The property size is approximately 500ha, most of which is used for crops, although about 50 ha is used for grazing. Data used to populate the grazing scenario were derived in part from Clarke (1997). Under this scenario it is proposed that the grazing activities would be replaced by the establishment of a 50 ha plantation of *Eucalyptus argophloia* (White Gum). The initial planting would be at 400 stems per ha (sph), thinned at the end of years three and seven to achieve a final stand density of 150 sph. The suitability rating of *E. argophloia* on clay loam soil (100 cm deep) and using the climate file for Dalby returned an average MAI for the 30-year rotation of 12 m^3/ha. In the scenario it is proposed that the timber from the plantation would be sold 'on the stump' for \$50/m^3. There are no obvious markets for the thinnings from the plantation. The agricultural enterprises have been simplified for the sake of the analysis: a mixture of 5 crops is grown over a four-year rotation period. The gross margins for the four crop types have been averaged across the entire cropping area to give an average gross margin of \$260 per ha per year.

Table 12.2. Characteristics of the cropping and livestock enterprises, Darling Downs landholding

Item	Amount
Total farm area	500 ha
Approximate area available for cropping activities	450 ha
Total gross margin for cropping activities	\$117,000
Approx. area available for grazing or plantation establishment	50 ha
Average carrying capacity (whole farm)	5 DSE[a]/ha
Initial livestock numbers, young cattle	25
DSE rating per head, young cattle	10
Gross margin per DSE, young cattle	22
Total livestock gross margin	\$5,500
Overhead costs	\$47,000
On-farm capital and maintenance expenditure	\$30,000
Farm family expenses (per annum)	\$30,000
Species used for plantation	*E. argophloia* (White Gum)
Plantation area	50 ha
Plantation MAI	5 m^3/ha/yr
Timber price (stumpage)	\$50/ha
Harvest age (years)	30
Harvest volume	150 m^3

Analysis of the scenario outlined in Table 12.2 reveals that the inclusion of the 50 ha plantation reduces the NPV of the farming enterprise from approximately \$610,000 to \$532,000 at a discount rate of 7% (Figure 12.6). This indicates that the farm would be in a worse financial position if 50 ha of plantations were established. The plantation enterprise in the form that is defined in Table 12.2 is thus not financially viable if the landholders expect a return of greater than 7%, the required rate of return on this investment.

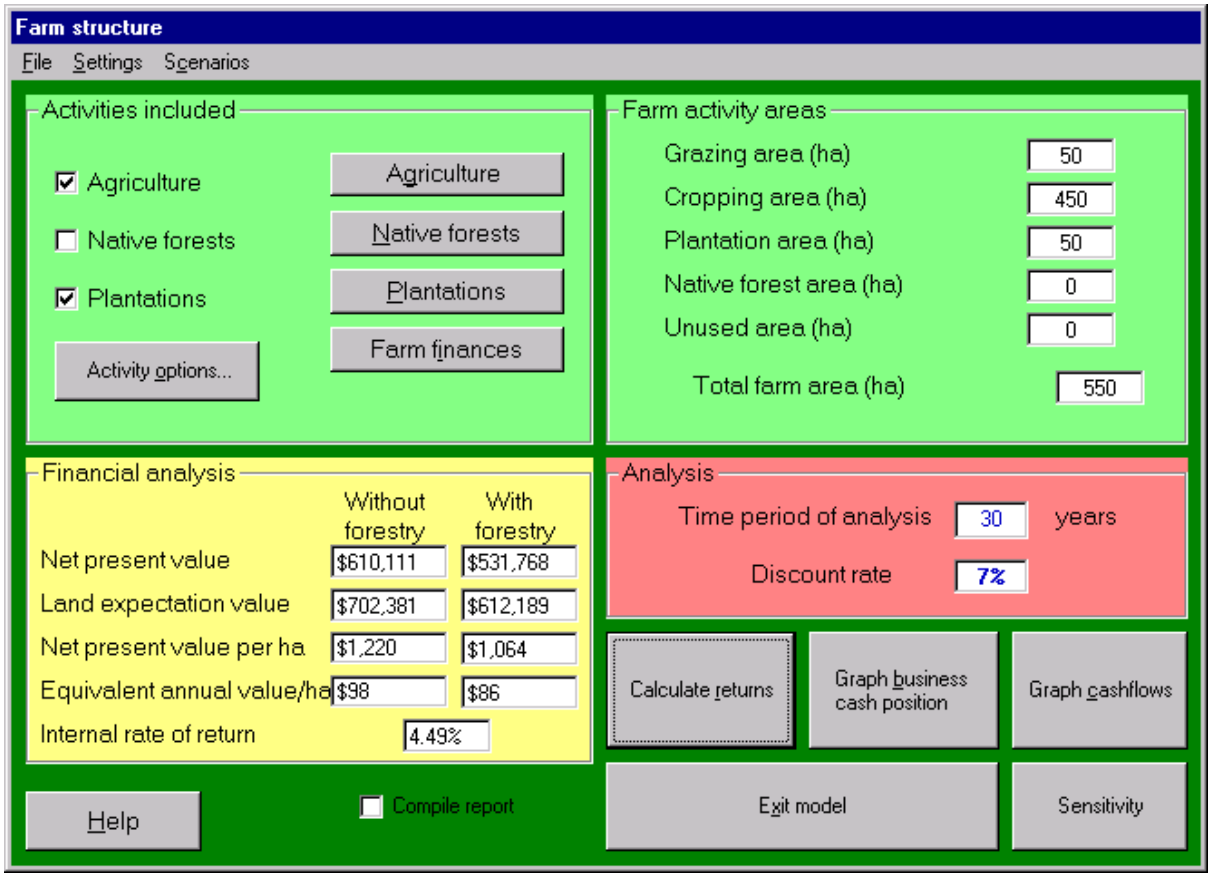

Figure 12.6. Analysis of a whole farm scenario in the Darling Downs based on cropping and plantation enterprises

The negative NPV for the plantation enterprise in this scenario is a result of a number of factors. The projected MAI of the plantation is optimistic at 12 m^3/ha. The suitability ratings assume that fertilisers are applied to correct any soil nutrient deficiencies and that optimal management practices are followed. Use of the sensitivity function of the AFFFM model shows that an increase of approximately 4.5% in the MAI or timber price would be required to generate a positive NPV for the plantation enterprise. If the growth rate (MAI) is increased to 12.54 m^3/ha/yr or above the NPV for the plantation enterprise is positive. Another factor affecting the projected viability of the plantation enterprise is the lack of financial returns for the plantation before the 30th year. The time required to produce timber acceptable to the present market means that the costs of the plantation establishment and maintenance must be carried by the landholders for too long a period. This is confirmed by Figure 12.7 which reveals that the business cash position of the farming enterprise with plantation development would eventually exceed that for the farm without plantations. This measure however takes no account of the time value of money (i.e. the values used to calculate the business cash position are not discounted like those for the NPV).

Further exploration of the scenario using the AFFFM presented in Table 12.2 and Figures 12.6, and 12.7 is possible. Some scenarios that could be explored using the model include:

- examining the financial effects of grazing under the plantations so that the farm does not lose all their cattle once plantation establishment occurs;
- exploration of markets for thinnings from the plantation to provide earlier revenue for the enterprise; and
- exploration of the potential to increase the growth rate of the trees in the plantation.

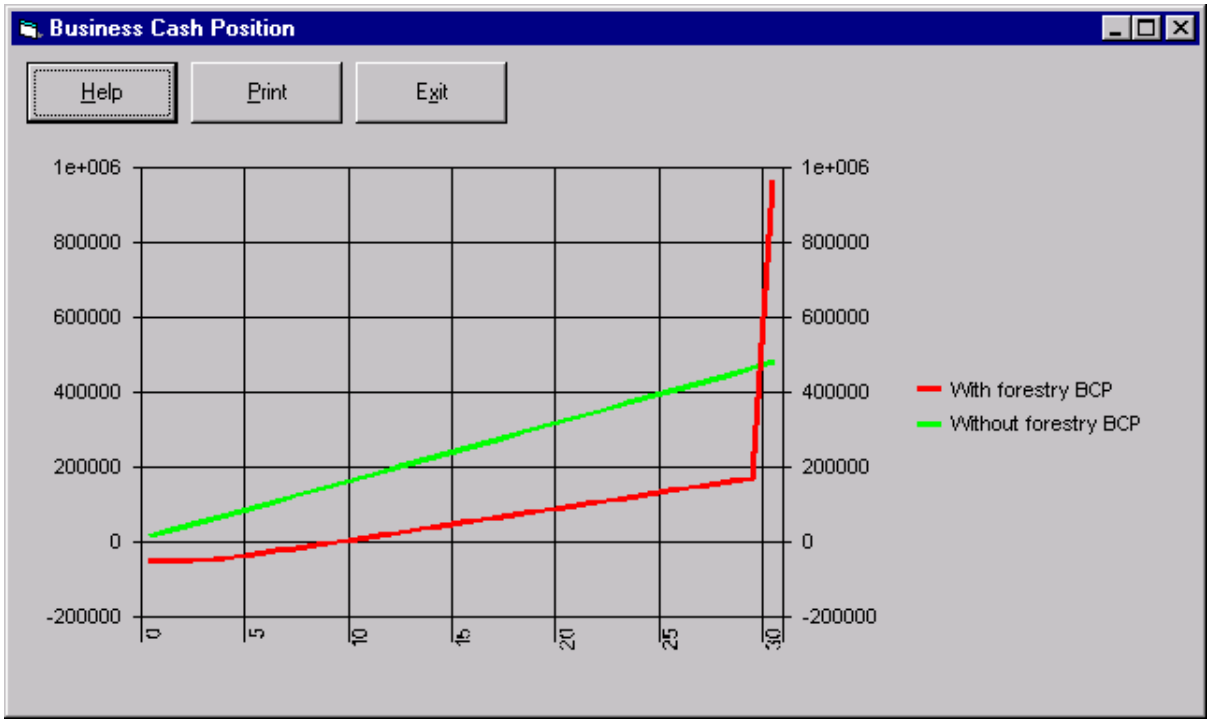

Figure 12.7. Graphical representation of the business cash position of the whole farm scenario in the Darling Downs

12.3 Discussion

The two case studies presented in this chapter illustrate some of the functions that are available in the AFFFM and some of the issues facing the development of farm forestry in the two regions. They are based on real-life farming situations. These case studies are not, however, meant to be representative of all the farming enterprises in these regions. The viability of the native forestry enterprise for the New England region contrasts with the plantation development scenario presented for the Darling Downs region. The difference is a reflection of the higher costs involved in establishing a plantation relative to establishing a native forestry enterprise, and the displacement of grazing activities and lack of early revenues for the Darling Downs plantation scenario.

References

Clarke, M.R. (1997), *Beef cattle production on the Darling Downs*, Queensland Department of Primary Industries, Brisbane.

State Forests NSW (1998), advisory forester, Armidale, personal communication.

Thompson, D. (1999), Agroforestry from existing timber resources on the Northern Tablelands, report to the RIRDC/LWRRDC/FWPRDC Joint Venture Program, Armidale.