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Any more Bids? Deciding How Much to Pay for Farmland.

B.J. Madden and L.R. Malcolm

The ultimate risk to be managed by farming families is the risk of the farm family losing their livelihood, their equity and their way of life. The most important risky decision they must make is 'What price to pay when expanding the business and buying more land.?' When a farm business becomes illiquid and then insolvent and is sold up, it is commonly found that the owners paid a price for land in the necessary expansion phases of the business which was too high and the gearing which accompanied the land investment was too high, in the light of subsequent commodity prices and interest rates. Making explicit the usually implicit assumptions about future profitability and debt servicing ability, which form the basis of the decision analysis and underlie land offer prices, facilitates judgments about how realistic are these key assumptions. Land purchase prices can be identified which are likely to put the survival of the business in jeopardy. The prospective buyers then have a good idea about when to stop bidding if they wish to keep farming.

Key Words: Land Value, Decision Making, Inflation, Capital Gains, Taxation, Debt Servicing

Introduction

The ultimate risk to be managed by farm owning families is the risk of losing their livelihood, their equity and their way of life. Numerous studies have shown that one of the major causes of financial difficulties for farm businesses is being too highly geared, generally as a result of land purchases. Prices are paid for land which result in debt levels which are unable to be serviced over the longer run with considerable fluctuations in seasons, commodity prices and interest rates. When a farm business becomes illiquid and then insolvent and is sold up, it is most commonly found that the price paid for land in the necessary expansion phases of the business and the subsequent gearing of the land investment were too high, in the light of subsequent commodity prices and interest rates.

The decision on the purchase of agricultural land was identified by Victorian Rural Counsellors as a major factor in the financial difficulty faced by many of their clients (Madden 1995). Although there were many factors which combined to cause problems for farmers during the late 1980's (wool price crash, high interest rates, poor seasons) it was poor decision making about property purchase and expansion which allowed these factors to have such a dramatic effect on the viability of so many farms. In a study by Edwards (1994) all the 13 case studies of farms in financial difficulty had been expanded during the early eighty's and were on the brink of bankruptcy by the early 90's. Ripley and Kingwell (1984) found the farmers most likely to be in financial trouble had paid high prices for land and had high investments in machinery relative to those farmers in stronger financial positions.

Thus the most important risky decisions farm families must make are 'What price to pay when buying more land, and what financing arrangements are appropriate'. Realistic estimates of land values ought to incorporate expectations about the future profitability and financing arrangements which are going to be used in buying the land. Arrangements for funding land purchase affect the value of an investment in land. Making explicit the usually implicit assumptions about future profitability and debt servicing ability, which form the basis of the land valuation and which underlie land offer prices, facilitates judgments about how realistic are these key assumptions. For each particular case, land purchase prices and whole farm debt servicing ability can be identified which have an unacceptable chance of putting the sustainability of the business in jeopardy. The prospective buyers then have a good idea when to stop bidding if they wish to keep farming.

Appraisal of Land Value

The question arises: how are land purchase decisions currently analysed? Most commonly there seems to be a district consensus based on informal rules of thumb which have some rough basis in theory and facts regarding past and expected profitability (with the short term past seen as a good guide to the long term future) and recent sales which were based on the same factors. Around this consensus the bidder in the strongest financial position and with the most optimism is likely to set the price as other bidders reach the limits of their debt servicing ability and optimism, as determined by their expectations about interest rates and future prices. This process may appear all very well but evidence appears to support the hypothesis that poor decisions in relation to land purchase are the most common cause of severe financial difficulty for farm businesses.

Theoretically appraisal of investment in land, like anything else, is based on economic criteria of expected return to capital (income capitalization and present value approaches, called 'should pay' measures) and whole farm financial criteria (whole farm debt servicing ability after the land purchase, called 'could pay' measures), plus the hard to measure extras (family goals, lifestyle, tradition, hobbies etc.) which, taken all together define how much someone 'would pay'. A useful land value decision model would combine the measurable 'should pay' and 'could pay' elements of the decision, and make explicit the conditions which would need to prevail in the future for land purchase at various prices to be sound (i.e. not too high a chance of sending the business bankrupt).

The following factors need to be taken into account when working out how much to pay for farm land.

a. The planning horizon relevant to the decision
b. Cost of equity and debt capital
c. Expected future costs and returns to be generated from the property
d. Capital required for machinery and livestock
e. Scope for development of the property
f. Expected inflation
g. Expected capital gains if any
h. Taxation
i. Expected salvage value of the land
j. Expected salvage value of machinery and stock
k. Financing terms for borrowings
l. Whole farm debt servicing ability

It ought not be surprising that from a population of farm land buyers over time, some buy well and others buy badly. However, a scan of the main farm management texts reveals that the question of buying land is dealt with in a fairly mixed manner and the literature is of limited help to potential buyers of farm land. For example the two leading U.S. farm and financial management texts, 'Farm Management' by Boehlje and Eidman (1984) and 'Financial Management in Agriculture' by Barry, Hopkin and Baker (1983), and the Australian text "The Farming Game Now' by Makeham and Malcolm (1993) all offer variations on methods for assessing how much to pay for farm land, and each has deficiencies in their recommended approach. Combining the best aspects of these alternative approaches might produce a more theoretically comprehensive method of valuing farm land.

In the rest of this paper, an attempt is made to combine aspects of these previous approaches into a 'more complete' method for assessing the value of farm land. Essentially, the effect of the method of financing is incorporated in a present value method of estimating farm land value, and the whole farm approach is used. The aim of this land value model is to make it easier to identify prices which probably should not be paid, and thus assist buyers of farm land to avoid 'buying their way out of business' sometime later.

Review of Approaches to Valuing Farm Land

Boehlje and Eidman (1984) estimate land value as follows:

$$V = \frac{R - E - L - I}{d}$$

where V = property value
R = total cash farm receipts
E = total cash farm expenses
L = unpaid family labour
I = interest on non real estate capital
d = pre-tax nominal discount rate

This formula is often simplified to the following form;

$$V = \frac{a}{d}$$

where a = net annuity earned from the farm (R-E-L-I)
d = pre-tax nominal discount rate

Further, Boehlje and Eidman (1984) adjust the capitalization (or discount) rate by the expected growth in the value of the asset arising from an expected increase in the income stream generated by the asset. For example: Boehlje and Eidman cite the case of a potential buyer who has a cost of capital of 12%, a 1% risk premium is added to the discount rate and a 1% 'non-economic benefit' is deducted. Finally a 6% capital gain is deducted from the discount rate, giving a capitalization rate of 6%. With this income capitalization approach expectations about changes in net returns to land in the future due to inflation or real gains, and thus expected changes in land value in future, are accounted for by adjusting the capitalization rate. However there seems to be a flaw here. The attempt to account for capital gains by

deducting the expected annual rate of gain from the capitalization rate seems flawed because it does not correctly allow for the reality that the annual percentage capital gain is a percentage of a different value each year.
Malcolm and Makeham (1993) use the discounted cash flow approach with a defined planning horizon including the Walk-in-Walk-out value of land, machinery and livestock. This allows expected inflation or capital gains to be considered. (See Table 1) However, they use the traditional investment appraisal approach: working out the economic value of the land and the financial feasibility of the investment separately. Their method does not take account of the fact that the method of financing the purchase itself affects the ultimate value of the investment.

Table 1: Present value method of land valuation developed by Malcolm and Makeham (1992).

Year	0	1	2	3	4	5
Inflation Factor	1	1.04	1.08	1.12	1.17	1.22
Annual Farm Income		$165,298	$171,910	$178,786	$185,937	$193,375
Expected Land Salvage						$624,948
Expected Stock & Machinery Salvage						$103,433
Annual Cash In	$0	$165,298	$171,910	$178,786	$185,937	$921,755
Land Price	$494,914					
Stock & Machinery Capital	$154,000					
Total Farm Expenses		$105,581	$109,804	$114,196	$118,764	$123,515
Annual Cash Out	$648,914	$105,581	$109,804	$114,196	$118,764	$123,515
Annual Net Cash Flow	($648,914)	$59,717	$62,105	$64,590	$67,173	$775,431
PV of Returns (@ 11% nominal)	($648,914)	$53,663	$50,153	$46,872	$43,805	$454,420
Net Present Value	$0					

The conclusion from this approach is that if you require at least x% return (11% nominal in this case) then you should pay up to $y for the property ($494,914 in this case).

Barry, Hopkin and Baker (1983) cope with the realities of the effects of expected inflation and taxation on the value of land by using the discounted cash flow technique with a defined planning horizon. However they deal inadequately with the technical aspects of the net annual income, focusing on land separately from the associated assets of livestock & machinery. But their focus on the way the method of financing the purchase affects the value of the land is most useful.

$$NPV = -INV - \sum_{n=1}^{m} \frac{P_n + (1-t)I_n}{(1+r)^n} + \sum_{n=1}^{m} \frac{a(1-t)(1+f)^n}{(1+r)^n} + \frac{V_m - C_m - D_m}{(1+r)^m}$$

where INV = the initial investment or deposit
r = the after tax nominal discount rate
P_n = the principal repayment in period n
t = average marginal tax rate
f = annual inflation rate
I_n = the interest payment in period n
V_m = the expected salvage value of the property at time m
C_m = the capital gains tax liability at time m
D_m = the debt outstanding at time m

A Summary of the Models.

The models of land value examined so far have ranged from the simple income capitalization method through to the Barry Hopkin and Baker (1983) equation which separates out the costs of finance from the cost of other capital invested. In Table 4.6 is a summary of the features of the three models examined. None of these include all of the twelve key determinants of a realistic bid price which were outlined above.

Table 2:- Features of the land value models contained in the literature.

	B&E	M&M	BHB
The planning horizon for the decision		✓	✓
Cost of capital invested	✓	✓	✓
Profitability/Productivity	✓	✓	✓
Capital required for machinery and stock	✓	✓	✓
Intended improvements to the property		✓	
Expected inflation	✓	✓	✓
Expected capital gains	✓	✓	✓
Taxation liabilities		✓	✓
Financing terms for any borrowings			✓
Debt Servicing Ability			
Salvage value of the property		✓	✓
Salvage Value of machinery and stock		✓	

Developing a Comprehensive 'Should Pay' &'Could Pay' Land Value Model

'Should Pay'

As a starting point to developing a model which adequately covers all aspects of the land purchase decision, let us build a basic investment budget. An example of such a budget is shown in Table 3. The expected NPV of the investment is calculated. This is the difference between the expected annual NCF after tax plus expected salvage value of land, machinery, stock and improvements, less the initial investment of equity capital and the repayments of principal and after tax interest payments.

If the NPV of the investment is positive, purchase of the land at the asking price represents a good investment as it is expected to earn more than the required rate of return (the discount rate). If on the other hand the NPV is negative the returns do not justify the asking price at the required rate of return. Calculating the maximum offer price for land is then a matter of trial and error, working out the expected NPV at the required rate of return for a range of possible land prices. Where the expected NPV at the required rate of return is zero the price paid for the land is equal to the PV of the future returns plus the PV of any capital gains minus the cost of having capital tied up in the investment.

This technique provides some useful information to potential purchasers in that it indicates whether a particular asking price represents good value or not and a maximum 'should pay' price can be generated through the trial and error process. It would be useful though to be able to calculate the maximum price which could be paid for the property given the assumptions and the required return on capital without having to use the cumbersome trial and error process. In the following section an equation is derived which adequately represents the budget in Table 3.

Table 3:- Example investment budget for the purchase of agricultural land.

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	m
Annual Farm Receipts																	
Wool Sales		126,536	130,332	134,242	138,269	142,417	[illegible]6,689	151,090	155,623	160,291	165,100	170,053	175,155	180,409	185,822	191,396	
Trading Profit		28,583	29,440	30,323	31,233	32,170	33,135	34,129	35,153	36,207	37,294	38,412	39,565	40,752	41,974	43,234	
Agistment		3,955	4,074	4,196	4,322	4,452	4,585	4,723	4,864	5,010	5,161	5,315	5,475	5,639	5,808	5,983	
Total		159,073	163,845	168,761	173,824	179,038	184,409	189,942	195,640	201,509	207,554	213,781	220,195	226,800	233,604	240,612	
Annual Farm Expenses																	
Crutching		2,833	2,917	3,005	3,095	3,188	3,284	3,382	3,484	3,588	3,696	3,807	3,921	4,038	4,160	4,284	
Jetting		1,545	1,591	1,639	1,688	1,739	1,791	1,845	1,900	1,957	2,016	2,076	2,139	2,203	2,269	2,337	
Lamb Marking		1,416	1,459	1,502	1,548	1,594	1,642	1,691	1,742	1,794	1,848	1,903	1,960	2,019	2,080	2,142	
Lamb Drenching		425	438	451	464	478	493	507	523	538	554	571	588	606	624	643	
Shearing		15,965	16,444	16,937	17,445	17,969	18,508	19,063	19,635	20,224	20,831	21,456	22,099	22,762	23,445	24,148	
Wool Packs		915	942	971	1,000	1,030	1,061	1,092	1,125	1,159	1,194	1,229	1,266	1,304	1,343	1,384	
Freight		1,654	1,703	1,754	1,807	1,861	1,917	1,974	2,034	2,095	2,158	2,222	2,289	2,358	2,428	2,501	
Wool Selling Fees		15,184	15,640	16,109	16,592	17,090	17,603	18,131	18,675	19,235	19,812	20,406	21,019	21,649	22,299	22,968	
Stock Selling Fees		2,073	2,135	2,199	2,265	2,333	2,403	2,475	2,549	2,626	2,705	2,786	2,869	2,955	3,044	3,135	
Overheads		62,029	63,890	65,806	67,780	69,814	71,908	74,065	76,287	78,576	80,933	83,361	85,862	88,438	91,091	93,824	
Total		104,038	107,159	110,374	113,685	117,095	120,608	124,227	127,953	131,792	135,746	139,818	144,013	148,333	152,783	157,366	
Net Cash Flow b/f Tax		55,035	$56,686	$58,387	$60,139	$61,943	$63,801	$65,715	$67,687	$69,717	$71,809	$73,963	$76,182	$78,467	$80,821	$83,246	
Tax Payable on Net Cash Flow		13,759	14,172	14,597	15,035	15,486	15,950	16,429	16,922	17,429	17,952	18,491	19,045	19,617	20,205	20,811	
Net Cash Flow after Tax (b/f int)		41,277	42,515	43,790	45,104	46,457	47,851	49,286	50,765	52,288	53,857	55,472	57,136	58,851	60,616	62,434	
Purchasing Costs																	
Initial Investment	$400,000																
Debt Repayments		9,188	10,291	11,526	12,909	14,458	16,193	18,136	20,312	22,750	25,480	28,538	31,962	35,798	40,093	44,904	
Interest Repayments		30,828	30,001	29,075	28,038	26,876	25,575	24,118	22,485	20,657	18,610	16,317	13,748	10,872	7,650	4,041	
Capital Gains Tax																-	Cm
Debt Owing																-	Dm
Total Costs	$400,000	$40,017	$40,292	$40,601	$40,947	$41,334	$41,768	$42,254	$42,798	$43,407	$44,090	$44,854	$45,710	$46,669	$47,743	$48,946	
Expected Salvage Values																	
Land Salvage																$916,923	Vm
Machinery & Stock Salvage																$119,963	SCMm
Total Expected Salvage Value																$1,036,887	
Net Cash Flow	($400,000)	$1,260	$2,222	$3,189	$4,157	$5,123	$6,083	$7,033	$7,967	$8,881	$9,767	$10,618	$11,426	$12,181	$12,873	$1,050,376	
Net Present Value	($0)																

Pn

EC (1-t) * In NPVatcf = $429,724 @ 7% real before tax

As a first step to understanding the budget shown in Table 3 lets break it down into four parts as follows;

1. the initial investment of equity capital

1.1a $$-EC$$

2. the PV of future principal and after tax interest payments on debt capital

1.1b $$-\sum_{n=1}^{m}\frac{P_n+(1+t)I_n}{(1+r)^n}$$

where r = after tax nominal discount rate

3. the NPV of the annual nominal cash flows after tax, generated from the property (without asset purchase or salvage)

1.1c $$NPV_{atcf}$$

4. the PV of the salvage value of the property and associated capital less any capital gains liability and outstanding debt at the end of the planning horizon.

1.1d $$+\frac{V_m+SMC_m-C_m-D_m}{(1+r)^m}$$

where V_m = expected salvage value of land at time m.
SMC_m = expected salvage value of stock and machinery capital at time m.
C_m = capital gains tax liability at time m.
D_m = outstanding debt at time m.

Putting the four parts together results in equation 1.1 which represents the NPV of investing in agricultural land taking account of all twelve factors outlined previously.

1.1 $$NPV=-EC-\sum_{n=1}^{m}\frac{P_n+(1+t)I_n}{(1+r)^n}+NPV_{atcf}+\frac{V_m+SMC_m-C_m-D_m}{(1+r)^m}$$

Equation 1.1 can be solved for V_0 (the initial land value) on the basis that, for the given assumptions, the maximum offer price will be defined when the NPV is zero.

Given that the total debt will be V_0+SMC-INV the annuity (A) will be;

$$A=(V_0+SMC-EC)\times\frac{i(1+i)^{term}}{(1+i)^{term}-1}$$

Chisholm and Dillon (1971) show the process to calculate the outsanding debt on an amortized loan at the start of any year. This is achieved by calculating the present value of the remaining annuity payments.

$$D_n=A\times\left[\frac{(1+i)^{(term-n+1)}-1}{i(1+i)^{(term-n+1)}}\right]$$

where Dn = the outstanding debt at the start of year n
n = the current year
i = the interest rate

The interest payment in any year will be represented by the after tax interest payable on the outstanding debt at the start of that year.

$$I_n=i\times D_n$$

The annual principal repayments will then be represented by the remainder of the annual annuity after the before tax interest has been paid.

$$P_n=A-i\times D_n$$

where n = current year
i = interest rate
t = loan term

The salvage value of the property is the value placed on the property at the end of the analysis. Under conditions of inflation and potential capital gains this value is would be represented by the following formula;

$$V_m = V_0(1+g)^m$$

where g = growth in land value = $f + c + f^*g$
c = annual capital gain

The salvage value of machinery will be dependent on the likely condition of the equipment at the end of the planning horizon and the effects of inflation on salvage values.

$$SMC_m = SMC \times (1+f)^m \times SP$$

where SP = the percentage of the initial value of the machinery and livestock which will be obtained upon salvage.

Australian tax laws stipulate that any increase above inflation in the value of properties purchased after 1986 will be subject to capital gains tax. These capital gains will be included in the owners taxable income in the year of disposal of the property. Averaging laws allow the capital gains to be taxed at an average tax rate. (CCH Tax Checklist)

$$C_m = (1-t)\left[V_o(1+g)^m - V_o(1+f)^m\right]$$

The outstanding debt at the end of the planning horizon will be the present value of the remaining annuity payments. Using the Chisolm and Dillion (1971) approach this will be represented by the following equation;

$$D_m = A \times \frac{(1+i)^{(term-m)} - 1}{i(1+i)^{(term-m)}}$$

Substitution of the above equations into equation 1.1 and solving for the case where NPV =0 leads to the following equation for land value (algebra outlined in Appendix 1).

$$V_o = \frac{\left[-EC - DR(SMC - EC) + NPV_{atcf}\right](1+r)^m - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{\left[DR \times (1+r)^m - \left[S - AF \times PVA_{term-m}\right]\right]}$$

where PVA_X = present value of an annuity for x periods
DR = multiple of the initial debt which represents the NPV of the future after tax repayments

$$AF\sum_{n=1}^{m}\frac{1 - t \times i \times PVA_{term-n+1}}{(1+r)^n}$$

S = multiple of the offer price salvaged after capital gains tax $\{(1+g)^m - (1-t)[(1+g)^m - (1+f)^m]\}$
AF = annuity whose present value equals 1.

'Could Pay' or Maximum Feasible Bid

The limitation to the 'should pay' model developed so far is the assumption that the debt can always be serviced. That is negative annual cash flows can be generated and 'covered' with the expected salvage values at the end of the planning horizon. In practice this is infeasible. In these cases, even though the property may have a higher theoretical value, the 'bidder' will be limited by their debt servicing capacity. This capacity will be determined by the annual cash flow generated from the property and the availability of cash from other sources (from existing farm or off farm income). In this case the maximum 'feasible' offer price will be the debt servicing ability plus the available equity capital, less the value of the associated livestock and machinery capital.

$$\textbf{Debt Servicing Capacity} = (NCF_1 + \text{Other Cash Surpluses}) \times \frac{i(1+i)^{term}}{(1+i)^{term} - 1}$$

$$\textbf{Maximum Feasible Bid} = \text{Equity Capital} + \text{Debt Servicing Capacity} - \text{Stock \& Machinery Capital}$$

A Case Study Farm

The case study farm to be used in this example is a 31,000 acre grazing property located in South Western New South Wales on the salt bush plains to the North of Balranald. The asking price for the land is $700,000 and a further $154,000 would be required to purchase livestock and machinery.

The property has a total carrying capacity of 10,000 DSE. Over the last five years the current owners have run an average of 5,000 22 micron breeding ewes, with an average wool cut of 4.5kg per head. The management has been based on an autumn lambing with a weaning percentage of 60% being achieved. The variability of these averages is shown in Table 4.

For the purposes of this analysis it has been assumed that a manager will be employed on an annual salary of $25,000 to run the property. Appendix 2 contains the assumptions used to calculate the expected annual costs and returns from the property. The main assumptions made include a greasy wool price of $7/kg, 4% annual inflation, 25% marginal tax, 12% interest and a required real return of 7% (equal to a required nominal return of 11.28%, 7% + 4% + 0.28%).

Using the Model

The Effect of Financing on Property Value
To illustrate the effect of financing on the property value, two cases have been investigated. Case One represents a potential purchaser who wishes to purchase the property entirely with equity capital. Case two represents a potential purchaser with $400,000 of available equity cap'tal who wishes to finance the remainder of the investment with borrowings serviced from the net cash flow of the purchased property plus $25,000 pa. annual cash surplus from the current farm. The resulting property values at a range of interest rates are shown in Table 4.

Table 4:- Effects of financing on property value at 7% required real return, 4% inflation and 25% marginal tax.

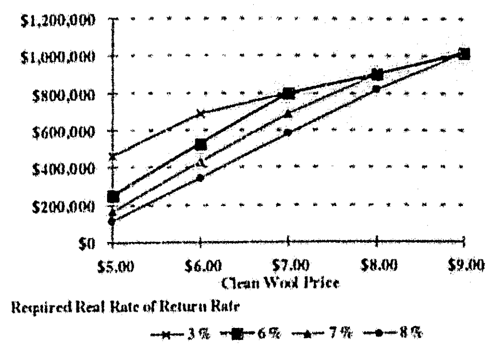
nominal discount rate	interest rate	Case One	Case Two
11.28%	8%	692,704	897,671
11.28%	11.28%	692,704	692,704
11.28%	12%	692,704	662,496

When the after tax required nominal discount rate and the interest rate paid on borrowings are the same the offer price is the same ($692,704). This is the assumption that the Makeham and Malcolm (1993) approach is based on. This assumption causes problems though when the interest rate is different to the required nominal discount rate. If financing was available at 8% interest, the offer price of the purchaser using financing would rise to $897,671. If a more likely interest rate of 12% was incurred the offer price of the purchaser using financing falls to $662,496.

Identifying a Reasonable Price
As mentioned earlier the current asking price for the property is $700,000. The question which needs answering is 'What conditions (prices, yields, interest rates, required real returns) need to occur to justify this price and is there a reasonable chance of achieving such conditions?'. It will be assumed that the property is to be brought with $400,000 of equity capital and the remainder of the purchase price and the stock and machinery capital will be finaced with an amortized loan over 15 years at 12%. Initial use of the model generates a maximum offer price for these conditions of $662,496. This would appear to indicate that the asking price of $700,000 is too high for this particular bidder. By varying the assumptions, the conditions which would justify the asking price can be identified. The graphs in Figure 1 show the effects of yields, prices, interest rates and financing conditions on the maximum bid price for the property.

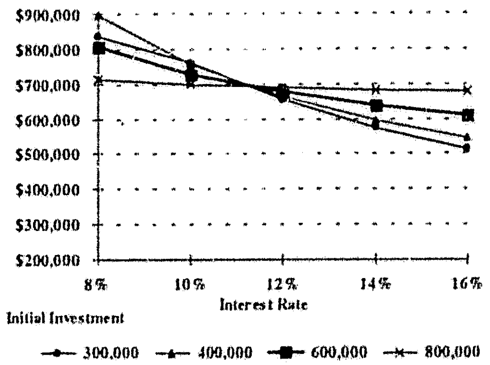
Figure I:-Effect of changing yields, prices and financing on maximum bid price.

A:- Effects of wool price and real return on maximum offer price, assuming all other variables constant.



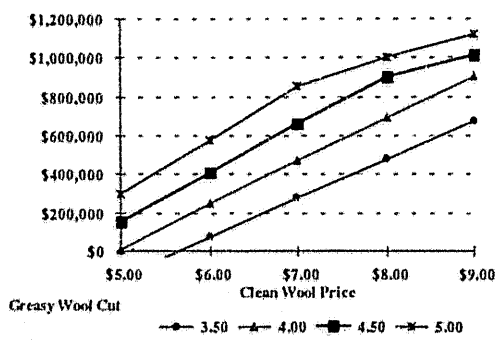
- The asking price of $700,000 implies real returns below 7% with wool price of $7/kg or below.
- Even at a real return of only 3% prices above $800,000 can not be justified unless wool prices above $7/kg are received.

B:- Effects of initial investment and interest on maximum offer price, assuming all other variables constant.



- With a full equity purchase the maximum offer price would be approximately $700,000, with interest rates naturally having no effect.
- Increasing the equity capital above $400,000 has little effect at 12% interest.
- Prices above $700,000 can only be justified if interest rate below 10% can be obtained.
- If interest rates above 12% are incurred a minimum of $400,000 initial equity capital is required to justify prices of $600,000.

C:- Effects of wool price and wool cut on maximum offer price, assuming all other variables constant.



- Offer prices in excess of $700,000 would require wool prices above $7/kg and/or an increase in wool cut.
- If wool prices fall below $7 prices above 600,000 would be unreasonable regardless of wool cut.
- Likewise if the expected wool cuts can't be achieved prices above $600,000 will be unreasonable.

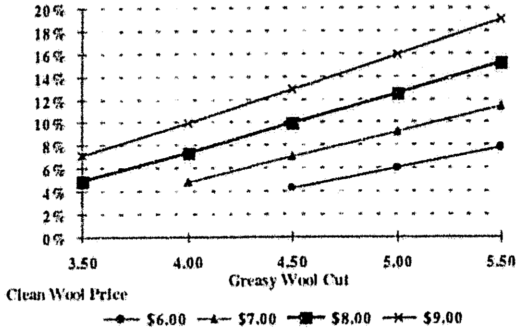
In summary bids above $800,000 would appear unreasonable in any circumstances. A combination of at least $400,000 equity capital with a required real return of 7% and interest rates below 12% are required to justify prices of $600,000. Wool cuts and prices appear to be the major productivity factors which have an effect on property value. If the expected levels of these can be obtained prices up to $600,000 appear reasonable. Prices above this level given the financing and the required real return would appear to be based on unreasonable expectations about the future profitability of the property and/or the likely future interest rates.

Accounting for Risk in the Decision

Agriculture is a risky business with yields and prices varying dramatically from year to year. Under expected conditions we have so far come to the conclusion that somewhere in the range of $500,000 to $600,000 would appear to be the maximum reasonable offer price. The question which needs to be answered is, 'If this price is paid, what will happen to my returns if yields, prices and interest rates don't turn out as expected?'. Figure 2 shows the effect of changes in some of the key assumptions on the pre tax real return on the capital invested when the property is purchased at the expected maximum offer price of $662,496. If the debt cannot be serviced in any year, no return on capital is calculated as the business is likely to be in financial difficulty placing potential returns in jeopardy.

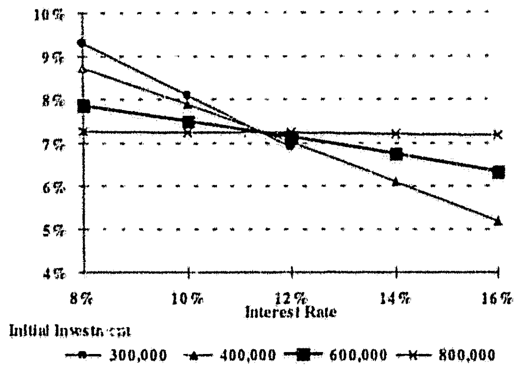
Figure II:- Effect of changes in key assumptions on return on capital invested over the life of the project.

A:- Effects of wool price and cut on real return on capital invested, assuming other variables are constant.



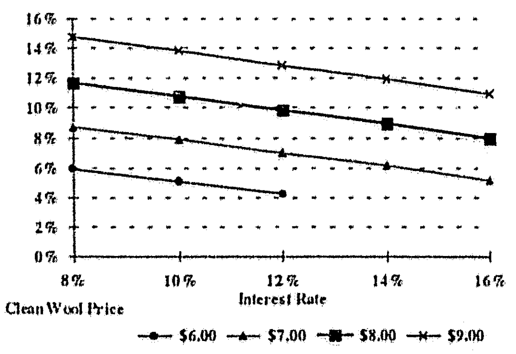
- If wool price above $6/kg and wool cuts above 4.5kg are achieved returns of over 4% can be expected.
- If wool prices fall below $6/kg the debt associated with the offer price of $662,496 will be unserviceable.
- If wool cuts fall below the expected 4.5kg prices of over $7/kg will be required to maintain returns above 4%

B:- Effects of initial equity and interest on real return on capital invested, assuming other variables are constant.



- If the debt is financed at below 12% returns can be expected to rise above the required 7% real.
- If as is more probable interest rates rise above 12% returns will decline, however even at 16% interest a return of 5% could still be expected.
- If the purchase is financed with less than $400,000 equity capital the debt will be unserviceable at interest rates above 12%.

C:- Effects of wool price and interest on real return on capital invested, assuming other variables are constant.



- Wool price has a greater effect on the likely return on capital than interest rates.
- If wool prices fall to $6/kg the debt will be unserviceable if interest rates rise above 12%.
- If wool prices remain at $7/kg or above returns in excess of 4% can be expected regardless of interest rates.

In summary, provided at least $400,000 of equity capital is used, and wool prices above $6/kg are received, real returns above 4% could be expected. Maintaining wool cuts at or above the expected 4.5kg/head would also appear important. Armed with this information the decision maker needs to decide two things;

1. Am I happy to returns of as low as 4%.
2. Am I confident that wool prices will remain above $6/kg and can I maintain wool cuts above 4.5kg/hd.

If the answer to either of these questions is no, then the offer price needs to be revised, if the decision maker is happy with these provisions, then its a matter of trying ones luck in the bidding process.

Concluding Comments

The above approach to deciding how much farm land might be worth in economic and financial terms still encounters the perennial insolubles such as : What discount rate to use? What about risk? Return to margin capital versus return to total capital? What price the unmeasurables?

Opportunity returns from alternative investments help to def   appropriate discount rate to use in evaluating the economic worth of a piece of land. For instance, total ann   urns (dividends and capital growth) from many portfolios of share market investments over the past decade or so have averaged around 10 per cent nominal per annum. Fixed interest investments have averaged around 7-8 per cent interest per annum over the same time. Currently 10 year bonds offer around 10 per cent nominal interest per annum. However, when non-farm market rates of return are used to evaluate farm land investment it is generally found that the economic price which should be paid is well below the prices which are ruling in the farm land market. With inflationary expectations of 4-5 per cent, a nominal 10 per cent or higher discount rate often puts farm land buyers way out of the market, while required nominal rates of return of 5-7 per cent puts farm buyers right in the market. That is, apparent real rates of return required by farm land buyers are quite low compared to non-farm returns. Furthermore, farming is a higher risk activity than many non-farm investments which are available, which should have the effect of raising the required rate of return to debt and equity capital.

The explanation for this phenomenon seems to lie with the non-monetary, non-measureable aspects of the land pricing decision. These factors include preference for the farming lifestyle; wanting to set up heirs; and buying the 'only job I know/the job I am best at'. As well as these considerations there are usually other difficult to measure aspects involved. For example, the benefits of close proximity of extra land. Or, the benefits of spatial diversification to spread climatic risk. Or, the benefits of adding land nearby but which has characteristics which make it less susceptible to various problems which beset the existing operation. Also, farmers adding 20-30 per cent to their land area are able to capitalize the expected benefits of spreading overheads. This effect shows up in the analysis of value as higher net returns per hectare from the extra land as compared to a whole farm, and higher prices can be paid for marginal additions to land area than can be justified for a whole farm purchase. So while some of the net benefits land purchase can be included in the budgets, not all of the benefits can be measured well. They will however be included in some vague way in the offer price.

The estimation of economically sound and financially feasible 'yardsticks' of land price gives the bidders something to 'hang their hat on'. Having defined a reasonable range of economically sound and financially feasible land offer prices. then the potential bidder is in a position to evaluate, within the bounds of the financially feasible and economically sound prices, how much more they might be content to pay for the difficult to measure benefits.

Risk can be dealt with by adding a risk premium to the discount rate, but a more transparent, less ambiguous approach is to proceed by changing the values of key risky variables in the budget, and checking the sorts of values which these risky variables would have to reach for particular purchase prices to be justified. Then, judgment can be made about the likelihood of these critical values being achieved. if they are unlikely, or very optimistic, then the land price being considered too is over optimistic (too high!). As the saying goes in farming, 'optimism involves an intellectual flaw'.

Finally, the objective of the approach outlined here to making decisions about buying farm land is to better inform the process by making explicit many of the usually implicit assumptions and judgment which are hard at work when the land buyer puts in a bid. And another. And another,...?

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Appendix 1:-

Derivation of an equation for Maximum Offer Price (V_0)

1.1a

$$-EC$$

1.1b

$$-\sum_{n=1}^{m} \frac{P_n + (1+t)I_n}{(1+r)^n}$$

Subsitute $P_n = A - iD_n, \; I_n = iD_n$

$$-\sum_{n=1}^{m} \frac{A - iD_n + (1+t) \times iD_n}{(1+r)^n}$$

Let $PVA_x = \frac{(1+i)^x - 1}{i(1+i)^x}$ (present value of annuity at interest i for x periods),

Subsitute $D_n = A \times PVA_{term-n+1}$

$$-\sum_{n=1}^{m} \frac{A - i \times A \times PVA_{term-n+1} + (1+t) \times i \times A \times PVA_{term-n+1}}{(1+r)^n}$$

$$-A\sum_{n=1}^{m} \frac{1 - i \times PVA_{term-n+1} + (1+t) \times i \times PVA_{term-n+1}}{(1+r)^n}$$

$$-A\sum_{n=1}^{m} \frac{1 - i \times PVA_{term-n+1} + i \times PVA_{term-n+1} + t \times i \times PVA_{term-n+1}}{(1+r)^n}$$

$$-A\sum_{n=1}^{m} \frac{1 + t \times i \times PVA_{term-n+1}}{(1+r)^n}$$

Let $AF = \frac{i(1+i)^{term}}{(1+i)^{term} - 1}$ (annuity whose present value is one),

Subsitute $A = (V_o + SMC - EC) \times AF$

$$-(V_o + SMC - EC) \times AF \sum_{n=1}^{m} \frac{1 + t \times i \times PVA_{term-n+1}}{(1+r)^n}$$

Let $DR = AF \sum_{n=1}^{m} \frac{1 + t \times i \times PVA_{term-n+1}}{(1+r)^n}$

(the multiple of the initial debt which represents the NPV of the future after tax repayments)

$$-(V_o + SMC - EC) \times DR$$

1.1c

$$+NPV_{atcf}$$

1.1d

$$+\frac{V_m + SMC_m - C_m - D_m}{(1+r)^m}$$

Substitute

$$V_m = V_o(1+g)^m$$

$$SMC_m = SMC \times (1+f)^m \times SP$$

$$C_m = (1-t)\left[V_o(1+g)^m - V_o(1+f)^m\right]$$

$$D_m = (V_o + SMC - EC) \times AF \times PVA_{term-m}$$

$$+\frac{V_o(1+g)^m - (1-t)\left[V_o(1+g)^m - V_o(1+f)^m\right] - (V_o + SMC - EC) \times AF \times PVA_{term-m} + SMC \times (1+f)^m \times SP}{(1+r)^m}$$

$$+\frac{V_o\left[(1+g)^m - (1-t)\left[(1+g)^m - (1+f)^m\right] - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

Let $S = (1+g)^m - (1-t)\left[(1+g)^m - (1+f)^m\right]$ (multiple of V_o salvaged after capital gains tax)

$$+\frac{V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

Pulling the Parts Together

The four parts can now be pulled together to give the expanded form of equation 1.1 from the text. Assuming that the maximum offer price will occur when the NPV of the investment is zero the resulting equation is left with one 'unknown', V_O, the maximum potential offer price given the assumptions used.

$$NPV = -EC - (V_o + SMC - EC) \times DR + NPV_{act} + \frac{V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

Set $NPV = 0$

$$(V_o + SMC - EC) \times DR = -EC + NPV_{act} + \frac{V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

$$V_o \times DR + DR(SMC - EC) = -EC + NPV_{act} + \frac{V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

$$V_o \times DR = -EC - DR(SMC - EC) + NPV_{act} + \frac{V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{(1+r)^m}$$

$$V_o \times DR \times (1+r)^m = \left[-EC - DR(SMC - EC) + NPV_{act}\right](1+r)^m + V_o\left[S - AF \times PVA_{term-m}\right] - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}$$

$$V_o \times DR \times (1+r)^m - V_o\left[S - AF \times PVA_{term-m}\right] = \left[-EC - DR(SMC - EC) + NPV_{act}\right](1+r)^m - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}$$

$$V_o\left[DR \times (1+r)^m - \left[S - AF \times PVA_{term-m}\right]\right] = \left[-EC - DR(SMC - EC) + NPV_{act}\right](1+r)^m - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}$$

$$V_o = \frac{\left[-EC - DR(SMC - EC) + NPV_{act}\right](1+r)^m - SMC\left[AF \times PVA_{term-m} - (1+f)^m \times SP\right] + EC \times AF \times PVA_{term-m}}{\left[DR \times (1+r)^m - \left[S - AF \times PVA_{term-m}\right]\right]}$$

Appendix 2:

Assumptions Used in the Valuation of the Case Study Farn.

Key Assumptions	
* Planning Horizon	15
Required Real Rate of Return Rate	7%
* Breeding Ewes	5,000
Greasy Wool Cut	4.5 kg
* Wool Yield	65%
Clean Wool Price	$7.00
Marking Percentage	55%
Lamb Price	$18
* Salvageable Portion of SMC	50%
* Inflation	4%
* Marginal Tax Rate	25%
* Capital Gain	0%
Initial Investment	$400,000
* Extra Cash Flow Available to Service Debt	$25,000 p.a.
* Loan Period	15
Interest Rate	12.00%

Overheads		**Variable Costs**	
Fuel & Oil	10,000	Crutching	$0.55
Shire Rates	2,060	Jetting	$0.30
Western Lands	1,424	Lamb Marking	$0.50
PP Board	787	Lamb Drenching	$0.15
Wild Dog Tax	301	Shearing	$3.10 /hd
R & M Machinery	5,000	Freight	/bale 11.00
R & M Improvements	5,000	Bale Weight	185 kg
Water Rates	2,000	Wool Selling Fees	12%
Phone	3,000	Wool Packs	$7.50 each
Office Supplies	750	Ram Costs	$500
Managers Fee	25,000	Ewe Cull Sales	10
Casual Labour	2,500	Stock Selling Fees	5%
Insurance	2,400		
Total Overheads	60,222	**Livestock Assumptions**	
		Lamb Deaths	0%
Machinery Capital		Joining Percentage	2%
Ute	20,000	Ram Life	4 years
Fordson Tractor	2,500	Ewe Life	5 years
Fegie Tractor	1,000	Ewe Deaths	3%
5 tonne Truck	1,500	Cattle Agisted	100 head
Portable Sheep Yards	2,500	Agistment Period	weeks 16
Motorbikes	2,500	Agistment Fee	$2.40 /hd/week
Tools	4,000		
Total Machinery Cost	34,000		
Stock Capital			
Average Ewe Value	$15.50		