Testing the economic viability of energy crop production in competition with alternative land uses

Author: James V H Jones, Royal Agricultural College, Cirencester, United Kingdom.

Abstract

Work conducted for the UK government in 2005, by Cambridge University and the Scottish Agricultural College, concluded that energy crops were not competitive as an alternative to conventional arable crops. The present study used partial budgets to explore whether this conclusion could be challenged under different scenarios. This proved that they could be competitive against alternative land uses (set aside and grazing livestock) and even against arable crops, if the arable work was undertaken by contractors. However further analysis showed that even under these circumstances the viability of energy crops was reliant on support from public funds to compensate for market failure. It was barely viable without an establishment grant and could only be justified as an alternative to set-aside if all subsidy support was withdrawn.

Key words: energy crops; partial budgets; economic viability

Introduction

In 2005 Cambridge University and the Scottish Agricultural College published a report which explored the economics of energy crop production in the UK(Cambridge/SAC, 2005). This study was commissioned by the Department for Environment, Food and Rural Affairs (Defra). The report examined the economics of growing of willow as a short rotation coppice (SRC) and miscanthus (otherwise known as 'elephant grass') against alternative land uses. It drew the conclusion that 'energy crops are considered unviable on the basis of current production costs and are unlikely to be widely grown without more long-term commitments'. They estimated that 'in order for energy crops production to break-even at the farm level when fully costed (and therefore be viable in the long run), yields (prices) would need to rise by 78 (60) and 88 (60) per cent for Miscanthus and SRC, respectively' (Cambridge/SAC, 2005, p.v). These conclusions were drawn using some sophisticated modelling techniques and using a discounted cashflow model to estimate the investment returns from the establishment of long cycle energy crops.

The aim of this paper was to compare these findings with an assessment of farm level returns using a simpler but more flexible and transparent method of analysis allowing closer examination of alternative situations and unusual cost structures. The method used was partial budgeting. The evidence was used in an unpublished report assessing the business case for public funding of energy crops for Defra and the Treasury (Jones, 2007). Precise cross-referencing to this report has not been made in the paper because the publication is not in the public domain.

Enterprise gross margin comparisons

The Cambridge/SAC (2005) report uses a number of methods to explore the relative profitability of SRC and miscanthus in comparison with a range of arable crop enterprises. These included examining gross margins based on contemporary estimates and from a time series from 1997 to 2002 adjusted for inflation. They also looked at distribution curves of costs of production for sugar beet and wheat, although most of the analysis was based upon a sophisticated form of farm type modelling (probably based on linear programming, although the mechanics were not explained fully).

The report concluded that 'below gross margins of £150 per hectare for energy crops the impact on farm level profitability is generally relatively small' (Cambridge/SAC, 2005, p.52). This seems at odds with their threshold gross margins for a10% uptake of energy crops based on the modelling shown in Table 1. This shows gross margin thresholds as low as £25/ha, especially on larger farms and those with a livestock or cereals bias. However, they also concluded that 'given the relative riskiness of energy crop production due to the long production cycle and uncertainty about markets, risk averse farmers are unlikely to adopt at such high levels as the model predicts' (*op.cit.* p.52).

Table 1 Threshold gross margins for energy crops needed to achieve a 10% uptake based on Cambridge/SAC (2005) economic modelling

Farm type	**Farm size**		
	Small	**Medium**	**Large**
	£/ha	£/ha	£/ha
Cereals	£75	£25	£25
Mixed	£125	£100	£25
General cropping	£100	£225	£150
Cattle & sheep (lowland)	£25	£25	£25

Source: Cambridge/SAC (2005) Table 5.6, p.50

In the Cambridge/SAC report, gross margins are expressed as an Annual Equivalent Value (AEV) i.e. the Net Present Value (NPV) expressed as an average payment every year over the length of the project. These are shown in Table 2. This demonstrates that on standard assumptions on yield, price etc., gross margins are above the threshold levels required for a 10% uptake,(with the benefit of subsidy) on livestock farms and larger cereal farms. This is also true on the larger mixed farms. Clearly it would not be economic on any farms without subsidies.

Table 2 Annualised gross margins for SRC and miscanthus based on Cambridge/SAC standard assumptions

	Interest rate	SRC		Miscanthus	
		With subsidies £/ha	Without subsidies £/ha	With subsidies £/ha	Without subsidies £/ha
Cambridge/SAC	6%	£91	-£43	£75	-£60
Cambridge/SAC	8%	£97	-£27	£63	-£38
Partial budgets	7%	£89	-£17	£67	-£18

Data based on Cambridge/SAC (2005) pp 23-24

The partial budgeting method and the assumptions used

Use of the partial budgeting method

The partial budgeting approach is a well accepted methodology for testing the profitability of switching production. It does involve consideration of the opportunity cost of money and the interest rate chosen to account for this was 7%. This falls between the 6% and 8% rates used by Cambridge/SAC. Table 2 demonstrates that it offers a figure comparable to that used by Cambridge/SAC on a with subsidy basis, although returns are marginally lower on a without subsidy basis. This is the result of discounting on an actual cash flow pattern, rather than applying interest to one that is averaged.

The previous land use/management scenarios that were explored

The partial budgets explored four scenarios:

1) Combinable crops farmed under a ‘typical’ business cost structure i.e. a family run farm, with some paid labour and contract help, but mostly run using own labour and machinery. This kind of self-sufficient approach has a relatively fixed cost structure, which makes it hard to make many cost savings if part of the land is given over to an alternative use that does not require much input from the existing complement of labour and machinery on the farm, i.e. the typical situation when land use is switched to energy crops.

2) Combinable crops farmed almost exclusively by contractors on a farm without much, if any, on-farm grain drying and handling capacity. This means that significant cost savings can be made when switching to energy crops.

3) Land that is in set aside. This means that it is not eligible for the Energy Aid Payment (EAP). This is an annual payment estimated at £30/ha (€45/ha) which supports the growing of energy crops but is not available on set aside land. Under this scenario next to no savings can be made from a decrease in labour and machinery costs, because little existing work is carried out. However, no loss of income will be incurred, as set aside entitlements can still be claimed. One might argue that under these circumstances, energy crops should be competing against alternative industrial crops (which are permitted on set-aside land). This is true, but it would not be the typical situation.

4) Livestock farming on a typical lowland semi-intensive basis. It seems unlikely that energy crops will take over directly from dairying and other intensive uses. It is also less likely or feasible on land previously in permanent pasture. The change of use would require consent and might not pass the Environmental Impact Assessment (EIA). A switch from extensive livestock farming is therefore probably not feasible. However, it would be possible to convert land in temporary or improved grassland. The business cost structure assumed is, once again, a family farm that is relatively self-sufficient on labour and machinery use. This is the typical pattern for livestock farming.

These four scenarios allow a reasonable basis for comparison with Cambridge/SAC standard assumption gross margins. In order to construct a fair comparison, intensive arable production ought to be set against high output assumptions for energy crops. This would be both complicated and ultimately rather unnecessary given that the extra energy crop output is more than likely to be offset by greater income loss from higher output arable farming. Therefore it was decided not to include intensive arable as a fifth scenario.

Determining the gross margin income loss

The gross margin income loss from a cereal based arable rotation has been calculated using a balance of cropping, provided in Table 3. Crop areas are based on census data for England in 2005. Gross margins are based on gross margin estimates for 2007, sourced from Nix (2006). It has been necessary to make some assumptions as to whether the use of margins for winter or spring sown crops and for human consumption or feed is most appropriate. Reasonable assumptions have been employed in accordance with what would be most common. Gross margins are quoted on a low, average and high performance basis, although the partial budgets make use of the average gross margin.

Table 3 Gross margins from combinable crops

	Combineable crops areas in England 2005	Gross margins* in 2007 Low £/ha	Average £/ha	High £/ha	Working capital £/ha	£/ha
Wheat	54.9%	£244	£359	£469	£175	£96
Winter Barley	10.1%	£166	£248	£334	£142	£14
Spring Barley	8.6%	£179	£235	£319	£86	£7
Oats	2.1%	£202	£294	£374	£121	£2
Field beans	5.7%	£167	£254	£341	£86	£5
Peas for havesting dry	1.6%	£102	£166	£232	£97	£2
Oilseed rape	15.1%	£136	£248	£361	£160	£24
Linseed	1.4%	£29	£109	£189	£66	£1
Weighted average	**100.0%**	**£202**	**£304**	**£406**		**£152**

Source for crop areas: Defra agricultural census data for 2005
*Sourced from Nix (2006) - wheat, oats, beans and rape assumed to be winter sown, human or feed end use was assumed as appropriate and as indicated by yields

The assumptions for lowland livestock farming gross margins are harder to establish. It is less easy to use census data in order to establish what is typical or 'normal'. However, stocking on lowland grazing farms from the FBS (Defra, 2007) has been used as a guide and a stocking rate for reasonably good quality land at approximately 1.6 GLU/ha provides a yardstick. Dairying has not been included, although heifer rearing has. It is felt that on most dairy farms, energy crops are more likely to displace this than to alter the herd size (with all its consequent cost alteration effects). These figures are shown in Table 4. The gross margins are shown exclusive of forage costs. They are forecasts for 2007 sourced from ABC (2006). The table also shows working capital assumptions, which vary between the enterprises.

Table 4 Livestock gross margin and working capital assumptions

	Stocking Head/ha	Gross margin £/head	£/ha	Working capital £/head	£/ha
Dairy heifers	0.15	£432	£65	£328	£49
Suckler cows	0.6	£125	£75	£587	£352
Fattening cattle	0.6	£111	£67	£457	£274
Ewes	3.5	£32	£111	£59	£207
Weighted average per ha			**£317**		**£882**

Determining the marginal cost savings

The marginal savings in overhead costs have been estimated based on FBS cereal farm and lowland grazing farm actual results for 2005/6 (Defra, 2007). The full costs are given in Table 5 and this indicates the percentage of these costs that are assumed to be marginal i.e. will be saved if the production activity ceases. There is insufficient detail in these figures to be more accurate. It could be argued that the marginal proportion of costs under these headings might vary slightly across each farm type. Whilst this is true, a simple estimation of this kind is sufficiently accurate for the purpose.

The machinery running costs do not include depreciation, which is the principle fixed cost element. Not all contract costs will be saved; some operations, such as hedge cutting need to take place irrespective of what production takes place. Labour costs have been assessed purely on a marginal cost saving of 25% to represent savings in overtime working. Family labour costs have not been included because it is assumed that they are a fixed cost with no potential marginal cost savings available. If there is an opportunity cost to saved labour costs i.e. that the labour released can be put to an alternative income earning use then this would mean that great cost savings should be allowed for. The full (imputed) value of family labour was £88/ha on cereal farms and £239/ha on livestock farms. Obviously if there is a cost saving to be made in reploying this labour then the figures could alter quite markedly – especially for the livestock farms. It is assumed that most 'general costs' will remain whether the farm is producing energy crops, cereals or livestock. Therefore only a small 10% saving is accommodated.

The estimation of marginal costs is, to an extent, based on the presumption that shifting into energy crops is something that farmers will do on only part of their farm and that most of the energy crop operations will be handled by contractors. The Cambridge/SAC survey work gives some empirical backing to this presumption. They estimate that the combined area of SRC and miscanthus in the UK was around 3,000 hectares (Cambridge/SAC, 2005, p.2) and that the total number of growers in the Energy Crop Scheme was 68 (*ibid.* p.16). This gives an average size of no more than 44 hectares per farm even if we assume that all growers are in the ECS. Against an average size of full-time holding in England of 103 hectares (Defra, 2006, p.16) this suggests that energy crops are likely to only comprise part of the holding. In fact the average size of farm with energy crops is likely to be somewhat higher because of the geographical bias towards areas around the big power stations taking biomass (e.g. Drax in North Yorkshire) and the association with cropping farms. It may be that a different set of costs might apply if the whole farm were to be put into energy crops and the fixed cost structure would alter more radically as a result. The long term nature of the commitment and the wider implications of such a move are likely to make such a drastic change far less likely than devoting just part of the farm to long-term energy crops. This certainly appears to have been the case to date.

Table 5 Marginal fixed cost saving estimates based on FBS farm data for 2005/6

	Marginal cost	Full cost		Marginal cost	
		Cereals	Livestock	Cereals	Livestock
	%	£/ha	£/ha	£/ha	£/ha
Paid labour	25%	£74	£40	£19	£10
Contract	75%	£42	£38	£31	£29
Machinery running costs	90%	£83	£69	£75	£62
General (excl. prof. fees)	10%	£49	£67	£5	£7
Total		**£248**	**£214**	**£130**	**£107**

Based on FBS data (Defra, 2007, Farm Accounts in England 2005/6)

Working capital costs and savings

Working capital is largely that which is tied up in the enterprise. This has been calculated across the rotation for combinable crops and on a per head basis for livestock, with an additional allowance for costs tied up within forage variable costs. Allowance has also been made for average capital tied up in the overhead cost savings.

There is no provision for the working capital cost of the harvesting and management of either SRC or miscanthus post-establishment. This may not be strictly true but it will be negligible because both crops incur the vast majority of costs at the time of harvest. Payment for this is likely to be either at, or close to the point at which payment is made for the crop. Indeed, in many cases payment may be made by the firm that buys the crop so that no money changes hands; it is deducted from income in lieu.

Establishment costs incur a working capital cost, and it is assumed that this is carried throughout the productive life cycle of the crop. This may not be true in all cases. However, the establishment costs are written off during that period, halving costs, representing the average amount during the period. This is not the same result as would be achieved via a discounted cash flow. However, given the long payback periods incurred by energy crops, it is probably not too unrealistic.

Energy crop establishment costs

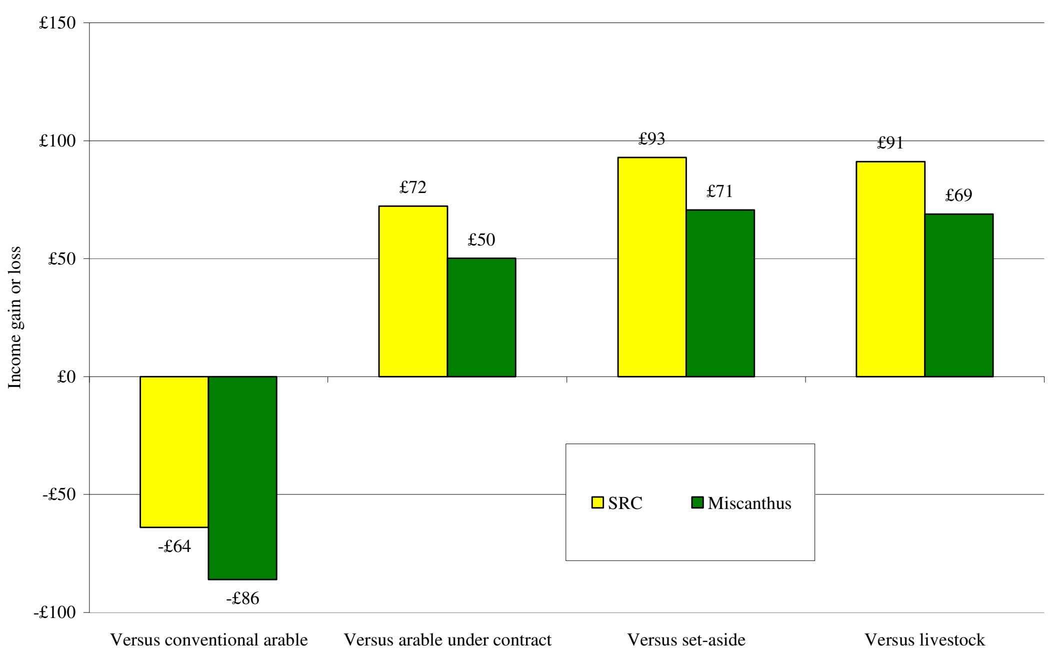
It is assumed that an establishment grant may be available for planting the crops. The ECS up to 2006 had used fixed rates of grant but this has now changed to a grant of 40% of the actual cost. The grant assumed for miscanthus was £668/ha against an establishment cost of £1,691/ha which is almost exactly 40%. However for SRC the grant assumed was £830/ha against an establishment cost of £1,272 which is over 65%. Clearly the grant would now be lower.

Results of the partial budget analysis

Results assuming the full benefit of subsidies

The partial budget workings are provided in the Appendix. The results are summarised in Figure 1. This demonstrates that, against combinable crops grown on a family farm with a cost structure typical of the industry, switching to either SRC or miscanthus is unprofitable; this is true despite the benefit of the ECS establishment grant. However, where a farm is managed by contractors, the balance of advantage is completely altered into a net benefit. Greater profitability can be achieved where a switch from set aside into energy crops is undertaken, despite the lack of an EAP. A similar net benefit can also be achieved by a switch from livestock to energy crops.

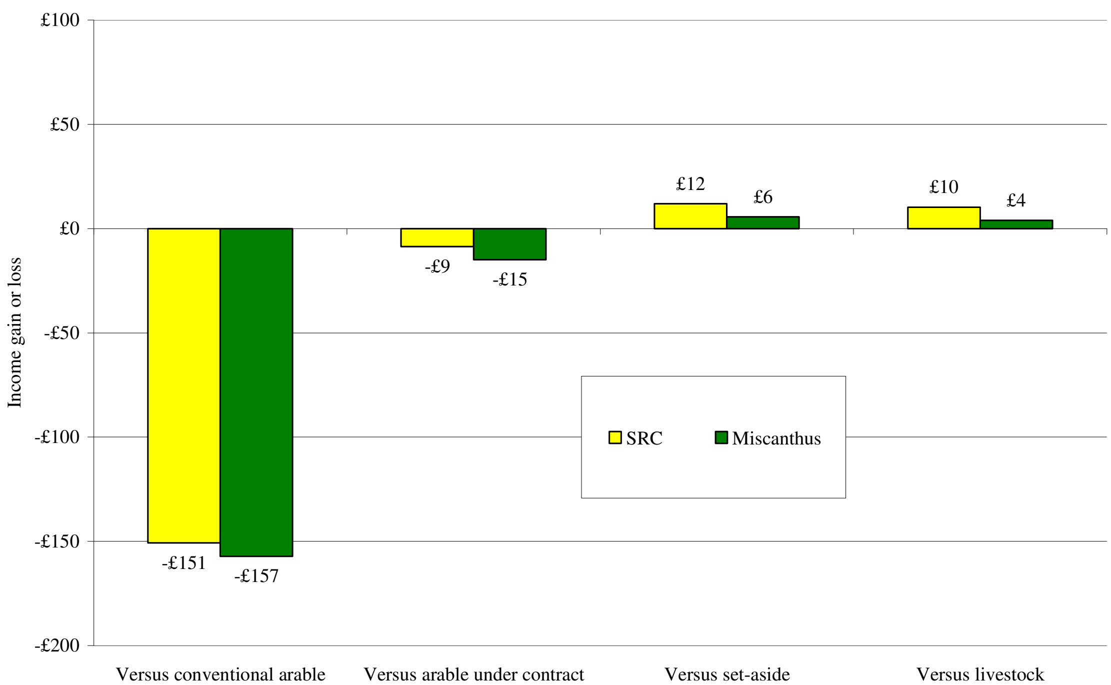
Figure 1 The net effect on profitability of switching agricultural land use to energy crops (with the benefit of ECS establishment grant)



Results assuming that the ECS establishment grant was not available

The obvious question arising from this is whether, in situations where it would appear to be profitable to switch to energy crops, profitability could be maintained in the absence of the ECS establishment grant. This is shown in Figure 2. It indicates that there would no longer be a benefit to diversifying from combinable crops grown by contractors to energy crops. A very small benefit would be achieved from switching from set aside or livestock to energy crops. Diversifying from growing combinable crops under a conventional cost structure is clearly very unprofitable.

Figure 2 The net effect on profitability of switching agricultural land use to energy crops without the benefit of ECS establishment grant

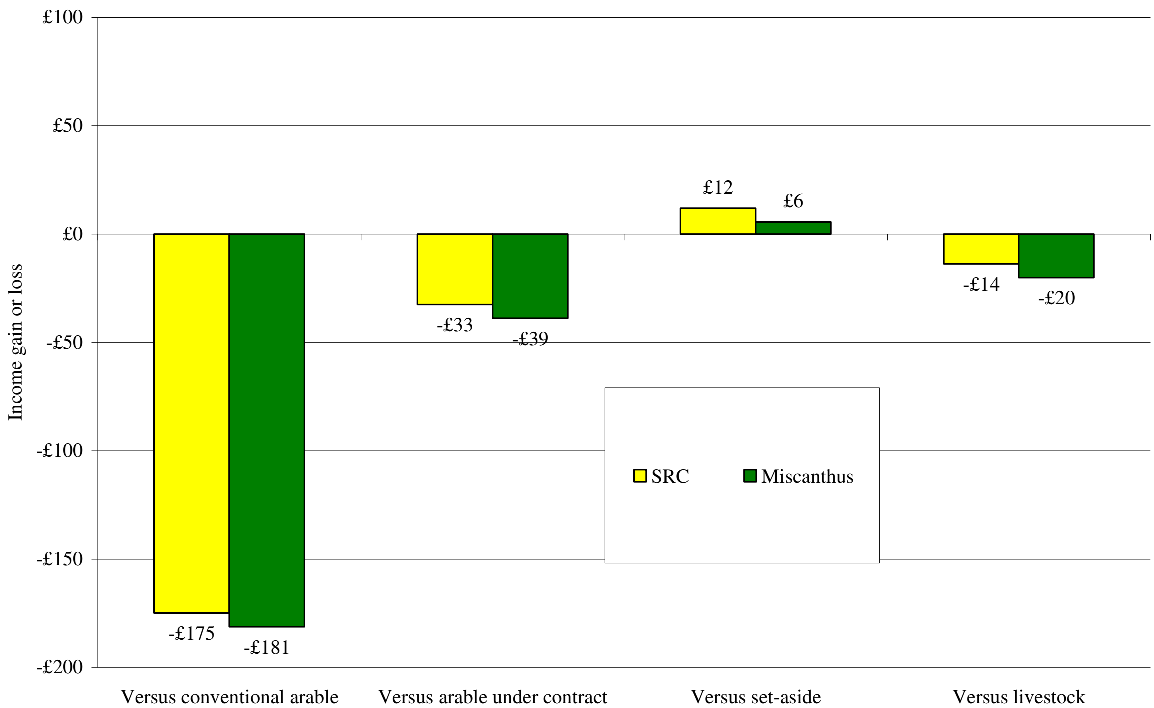


Results assuming that neither the ECS nor the EAP annual payment were available

Given that the lack of an establishment grant pushes all the scenarios virtually to a break-even point it is worth exploring what the further effect would be of excluding the EAP annual payment. This will obviously not affect the set aside scenario as this does not qualify for EAP. But it affects the other scenarios. The results are shown in Figure 3

Figure 3. This makes it clearly unattractive to grow energy crops against growing arable crops using contractors or against livestock farming. Using land as set aside is the only alternative that makes it more worthwhile growing energy crops. What this shows is the clear dependence on public funding to compensate for market failure in order to justify growing energy crops even in the scenarios that favour it the most.

Figure 3 The net effect on profitability of switching agricultural land use to energy crops without the benefit of either the ECS establishment grant or the EAP annual payment



Summary and conclusions

The partial budgets utilise costings for the income loss from both arable crops and livestock enterprises which are likely to be somewhat different to those used by Cambridge/SAC. Cereal price assumptions, in particular, are likely to be higher than those used by Cambridge/SAC based on prices in 2004/5. This would render diversification from combinable crops less attractive. The Cambridge/SAC report concluded that gross margins from energy crops were not thought to be high enough to outweigh farmers concerns surrounding the risks attached to switching to them. The partial budget analysis, using gross margins based on higher prices, firmly underlines this conclusion based on the normal cost structure for arable farms which are typically self-sufficient family-run units.

However the partial budgets show that there are scenarios where energy crops are viable and this can be demonstrated even with higher cereal prices. One of these is the scenario where land is currently not in arable production and is being used for livestock. Perhaps this is not so surprising given the rather lower returns on livestock farms and the impact higher cereal prices have had on livestock margins. But it is also true when land is in set aside or is in arable crops but under management by contractors rather than by utilising own labour and machinery. This was a scenario that Cambridge/SAC did not consider. However a more recent study in Scotland (Bell *et al.* , 2007, p.23) did acknowledge that 'farms which have shed their labour and machinery and rely on contractors are able to make a more straightforward comparison between the enterprise margin for willow SRC and conventional cropping'.

The results of the partial budget analysis, however, do demonstrate the heavy reliance on publicly funded subsidy in order to justify land being devoted to energy crops as opposed to alternatives. In particular there is a reliance on the ECS establishment grant. Without this energy crops show little or no financial benefit over alternatives. If the annual EAP is also removed the only scenario that shows a profit over the alternative is set aside. Even in this case the advantage is slender.

List of References

ABC (2006) *The Agricultural Budgeting and Costing Book*, 61st Edition, Agro Business Consultants Ltd., Melton Mowbray

ABC (2001) *The Farm Machinery Costs Book*, 8th Edition, Agro Business Consultants Ltd.

Bell, J., Booth, E., Ballinghall, M. (2007) *Commercial viability of alternative non-food crops and biomass on Scottish farms – a special study supported under SEERAD Advisory Activity 211*, Scottish Agricultural College, Edinburgh, March 2007

Cambridge/SAC (2005) *Farm level economic impacts of energy crop production*, report for Defra, June 2005, Rural Business Unit, Department of Land Economy, University of Cambridge and the Land Economy Research Group, Scottish Agricultural College

Defra (2001) *Best practice guidelines for applicants to Defra's Energy Crops Scheme: Planting and growing miscanthus*, PB 5424, March 2001, Defra Publications, London

Defra (2004) *Growing Short Rotation Coppice: Best practice guidelines for applicants to Defra's Energy Crops Scheme*, PB 7135, Defra Publications, London

Defra (2006) *Agriculture in the UK 2005*, Defra Economics and Statistics, London

Defra (2007) *Farm accounts in England 2005/6*, http://statistics.defra.gov.uk/esg/publications/fab/default.asp accessed 15th May 2007

Jones J.V.H. (2007) *Verification of the business case in support of proposed establishment grant payments under the Energy Crops Scheme*, report for the Industrial Crops Division of DEFRA, Royal Agricultural College, May 2007 (released December 2007).

Jones, J.V.H. (2006) 'A case study based assessment of the financial impact of agri-environment scheme participation; pre- and post-decoupling', *Journal of Farm Management*, 12 (8) pp 477-498

Jones, J.V.H. (2005) To produce or not to produce – is that the question?, *Journal of Farm Management*, 12 (5) pp 235-249

Nix, J.S. (2006) *Farm Management Pocketbook*, 37th Edition, Imperial College London, Wye Campus

Renwick, A., Reader, M., Lang, B. (2007) *Issues for energy crops at the farm level*, Presentation delivered to the Agricultural Economics Society/Defra conference, Bio-energy – Green gold?, 31st January 2007, London, http://www.aes.ac.uk/documents/index.php?path=events_tmp%2F1day07/ Accessed 24th March 2007

RPA (2007)a *Energy Aid Payments: Growers guide*, Rural Payments Agency, http://www.rpa.gov.uk/rpa/index.nsf/0/0B164572FF7C823680256F8D00502244#The%20scheme, accessed 28th March 2007

RPA (2007)b 2006 *Energy Crop Representative Yields*, Rural Payments Agency, http://www.rpa.gov.uk/rpa/index.nsf/0/0B164572FF7C823680256F8D00502244#The%20scheme, accessed 28th March 2007
http://www.rpa.gov.uk/rpa/index.nsf/contentdocs/01C0DD3FAEBB30528802570760051F09F, accessed 28th March 2007

Shield, I. (2006) Biomass costs in the UK, *British Bio-energy News*, Engineering and Physical Sciences Research Council, Issue 3, p.13

Appendix

Partial budgets to evaluate the net effect on profitability of a change in agricultural land use to SRC or miscanthus with the benefit of an Energy Crop Scheme establishment grant and an annual Energy Crop Payment (as applicable)

Partial budget - switching from arable to miscanthus

	Gain £/ha	**Loss** £/ha
Revenue gain		
Miscanthus production gross margin (x15/16)	£143	
EAP	£30	
Costs saved		
Paid labour	£19	
Contract charges	£31	
Machinery running costs	£75	
Sundries	£5	
Interest on crop working capital at 7%	£11	
Interest on overheads working capital at 7%	£5	
Revenue Loss		
Average crop gross margin		£304
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£64
Interest on establishment costs (on half cost @ 7%)		£36
Totals	**£318**	**£404**
Profit or loss from change	**-£86**	

Assumptions:

Miscanthus gross margin (full production)	*£152*	*per ha*
Crop working capital	*£152*	*per ha*
Establishment cost assumption	*£1,691*	*per ha*
Establishment grant	*£668*	*per ha*
Net establishment cost	*£1,023*	*per ha*

Partial budget - switching from contract arable to miscanthus

	Gain £/ha	Loss £/ha
Revenue gain		
Miscanthus production gross margin (x15/16)	£143	
ECS payment	£30	
Costs saved		
Paid labour	£0	
Contract charges	£218	
Machinery running costs	£0	
Sundries	£5	
Interest on crop working capital at 7%	£11	
Interest on overheads working capital at 7%	£8	
Grain drying	£40	
Revenue Loss		
Average crop gross margin		£304
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£64
Interest on establishment costs (on half cost @ 7%)		£36
Totals	**£454**	**£404**
Profit or loss from change	**£50**	

Assumptions:

Miscanthus gross margin (full production)	*£152*	*per ha*
Crop working capital	*£152*	*per ha*
Establishment cost assumption	*£1,691*	*per ha*
Establishment grant	*£668*	*per ha*
Net establishment cost	*£1,023*	*per ha*

Partial budget - switching from set aside to miscanthus

	Gain £/ha	Loss £/ha
Revenue gain		
Miscanthus production gross margin (x15/16)	£143	
ECS payment	£0	
Costs saved		
Paid labour	£0	
Contract charges	£0	
Machinery running costs	£27	
Sundries	£0	
Interest on working capital at 7%	£1	
Revenue Loss		
Crop gross margin		£0
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£64
Interest on establishment costs (on half cost @ 7%)		£36
Totals	**£170**	**£100**
Profit or loss from change	**£71**	

Assumptions:

Miscanthus gross margin (full production)	*£152*	*per ha*
Establishment cost assumption	*£1,691*	*per ha*
Establishment grant	*£668*	*per ha*
Net establishment cost	*£1,023*	*per ha*

Partial budget - switching from livestock to miscanthus

	Gain £/ha	**Loss** £/ha
Revenue gain		
Miscanthus production gross margin (x15/16)	£143	
ECS payment	£30	
Costs saved		
Paid labour	£10	
Contract charges	£29	
Machinery running costs	£62	
Sundries	£7	
Interest on livestock working capital at 7%	£62	
Forage variable costs	£135	
Interest on forage variable costs at 7%	£5	
Interest on overheads working capital at 7%	£4	
Revenue Loss		
Crop gross margin		£317
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£64
Interest on establishment costs (on half cost @ 7%)		£36
Totals	**£486**	**£417**
Profit or loss from change	**£69**	

Assumptions:

Miscanthus gross margin (full production)	*£152*	*per ha*
Working capital	*£882*	*per ha*
Establishment cost assumption	*£1,691*	*per ha*
Establishment grant	*£668*	*per ha*
Net establishment cost	*£1,023*	*per ha*

Partial budget - switching from arable to SRC

	Gain £/ha	**Loss** £/ha
Revenue gain		
SRC gross margin	£108	
EAP	£30	
Costs saved		
Paid labour	£19	
Contract charges	£31	
Machinery running costs	£75	
Sundries	£5	
Interest on crop working capital at 7%	£11	
Interest on overheads working capital at 7%	£5	
Revenue Loss		
Average crop gross margin		£304
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£28
Interest on establishment costs (on half cost @ 7%)		£15
Totals	**£283**	**£347**
Profit or loss from change	**-£64**	

Assumptions:

Crop working capital	*£152*	*per ha*
Establishment cost	*£1,272*	*per ha*
Establishment grant	*£830*	*per ha*
Net establishment cost	*£442*	*per ha*

Partial budget - switching from contract arable to SRC

	Gain	Loss
	£/ha	£/ha
Revenue gain		
SRC gross margin	£108	
ECS payment	£30	
Costs saved		
Paid labour	£0	
Contract charges	£218	
Machinery running costs	£0	
Sundries	£5	
Interest on crop working capital at 7%	£11	
Interest on overheads working capital at 7%	£8	
Grain drying	£40	
Revenue Loss		
Average crop gross margin		£304
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£28
Interest on establishment costs (on half cost @ 7%)		£15
Totals	**£419**	**£347**
Profit or loss from change	**£72**	

Assumptions:

Crop working capital	*£152*	*per ha*
Establishment cost assumption	*£1,272*	*per ha*
Establishment grant	*£830*	*per ha*
Net establishment cost	*£442*	*per ha*

Partial budget - switching from set aside to SRC

	Gain £/ha	Loss £/ha
Revenue gain		
SRC gross margin	£108	
ECS payment	£0	
Costs saved		
Paid labour	£0	
Contract charges	£0	
Machinery running costs	£27	
Sundries	£0	
Interest on working capital at 7%	£1	
Revenue Loss		
Crop gross margin		£0
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£28
Interest on establishment costs (on half cost @ 7%)		£15
Totals	**£136**	**£43**
Profit or loss from change	**£93**	

Assumptions:

Establishment cost assumption	*£1,272*	*per ha*
Establishment grant	*£830*	*per ha*
Net establishment cost	*£442*	*per ha*

Partial budget - switching from livestock to SRC

	Gain £/ha	**Loss** £/ha
Revenue gain		
SRC gross margin	£108	
ECS payment	£30	
Costs saved		
Paid labour	£10	
Contract charges	£29	
Machinery running costs	£62	
Sundries	£7	
Interest on livestock working capital at 7%	£62	
Forage variable costs	£135	
Interest on forage variable costs at 7%	£5	
Interest on overheads working capital at 7%	£4	
Revenue Loss		
Average livestock gross margin		£317
Extra costs		
Interest on production working capital		£0
Establishment costs depreciation (over 16 years)		£28
Interest on establishment costs (on half cost @ 7%)		£15
Totals	**£451**	**£360**
Profit or loss from change	**£91**	

Assumptions:

Working capital	*£882*	*per ha*
Establishment cost	*£1,272*	*per ha*
Establishment grant	*£830*	*per ha*
Net establishment cost	*£442*	*per ha*