

Annex 1: Summary of the Nethergill Associates 'MSO' approach

An explanation of the theory and practice behind the MSO approach adopted by Nethergill Associates to analyse farm accounts to identify the maximum level of farm output that is economically sustainable (MSO) is set out below.

THE THEORY:

According to the 'standard theory of the firm', variable costs are assumed to have a linear relationship with output volumes (see Figure 1), implying that the greater the output volumes, the greater the revenue. This strategy is widely used in the manufacturing industry and implies that limits to expansion are primarily linked to the level of fixed costs. Where the total cost line (comprising both fixed and variable costs) cuts the revenue line is the 'break-even' point. Therefore, if the variable costs line has a lesser gradient than the revenue line, this implies that the marginal cost of production favours an increase in outputs.

Figure 1 suggests that the business will break-even at an output value of 89 on pre-support revenues, having been above break-even from the outset on post-support revenues.

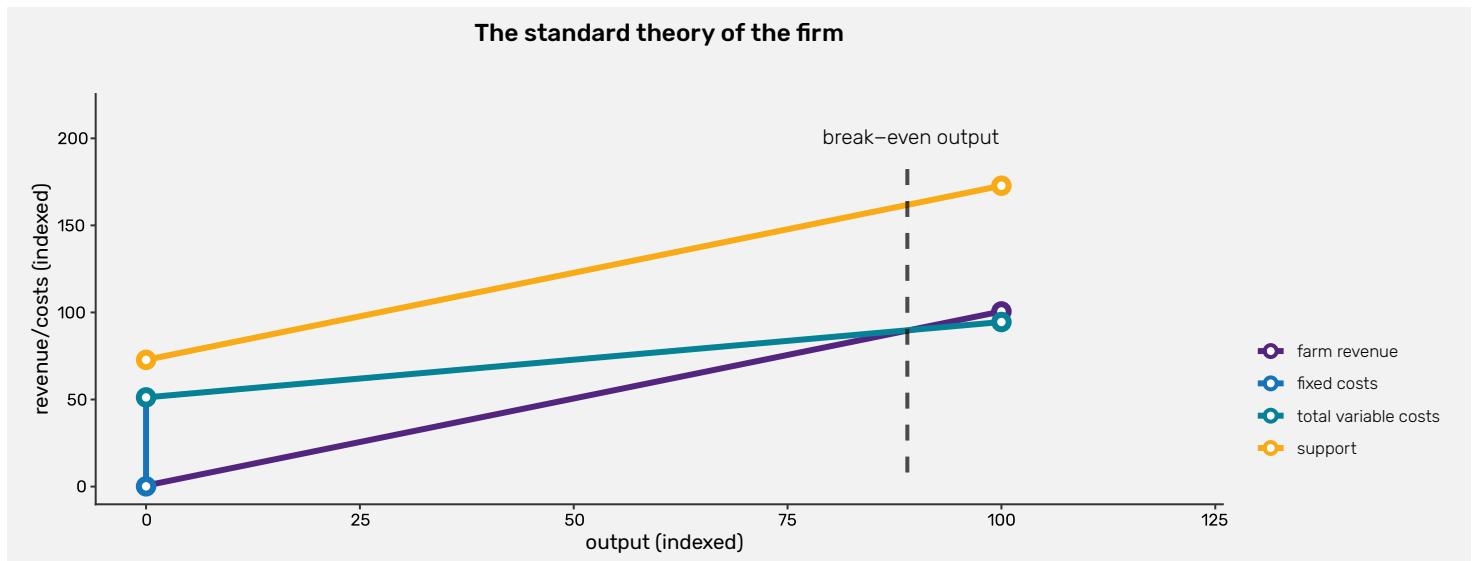


Fig 1: The Standard Theory of the Firm

However, the reality in farming is that variable costs are not linearly related to outputs.

What Nethergill Associates have shown is that variable costs can be broken down into two distinct components:

- Productive variable costs (PVC) – the essential or unavoidable costs incurred when producing within the confines of the naturally available resources – this includes seed, home grown feed concentrates, bedding, contract labour, essential vet and medication costs; and

- Corrective variable costs (CVC) – avoidable or non-essential costs associated with production above what is possible to be produced using the naturally available resources (e.g. artificial fertilisers, plant protection products or bought in feed).

These costs are incurred in sequence: only when natural resources run out are substitutes required.

If variable costs are separated into PVCs and CVCs, the patterns of costs for the same business illustrated above change, as shown in Figure 2. Following this model, the break-even point on pre-support revenue occurs much earlier, at an output value of 51.

The point at which the PVC resources are exhausted and the CVCs cut in is the point that Nethergill Associates call the point of maximum (economically) sustainable output (MSO). This is higher at 94. Beyond this point the profit per unit of output deteriorates and, in this example, at an output level of 101 a break-back point into unprofitability occurs on pre-support revenues. Further expansion would result in a second break-back point, at an output level of 116, on post-support revenues and all profits re eliminated.

The standard theory would suggest expansion as the route to improved returns but when the two types of variable costs are taken into consideration, this shows that in reality output needs to be reduced to the MSO point to maximise profit margin.

It should be noted that:

- The MSO for a farm is not a single number that prevails for all time. It is a function, ultimately, of physical, not financial, factors. The availability of grass on a farm, for example, changes from year to year and the true physical MSO will change accordingly. The weather and previous grazing intensities make this the case.
- The MSOs calculated are designed to provide a direction for farms to move towards, the scale of the task involved and the likely economic benefits. The acid test for reaching the MSO point is that at that point no corrective variable costs are incurred.

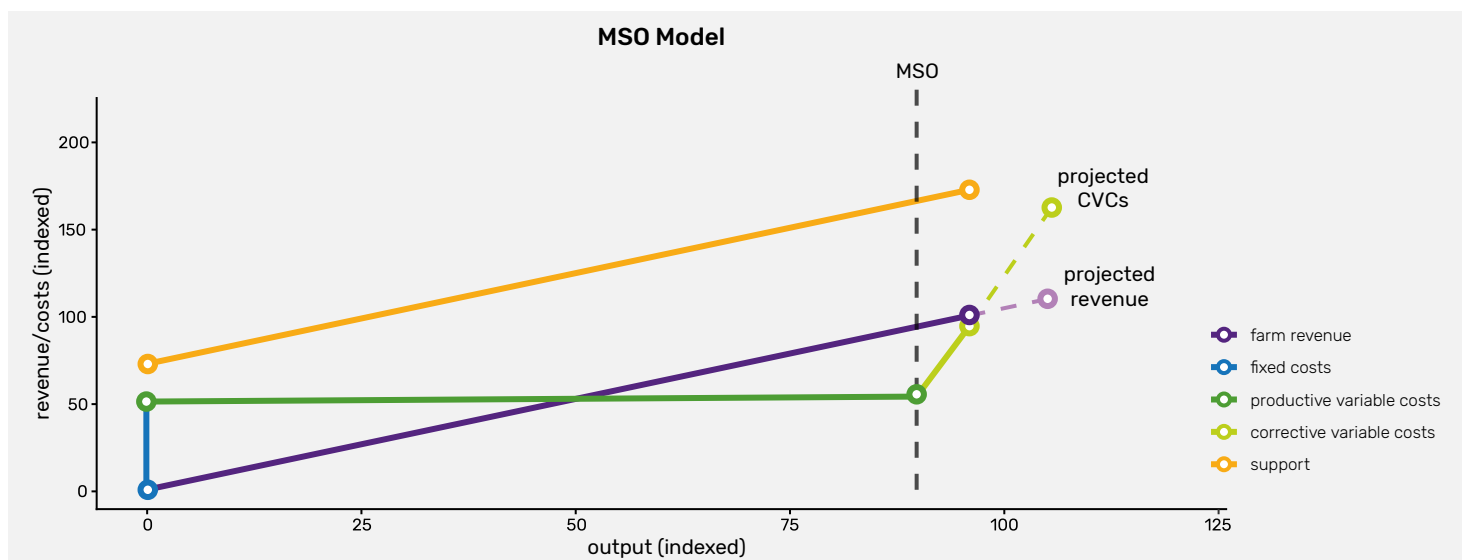


Fig 2: The alternative economic model, dividing variable costs into PVCs and CVCs.

The effect is well-illustrated when the unit cost profiles (shown in Figure 3) for each model are compared. In the actual case shown below, the farm was delivering a pre-support revenue of £135,000. Its MSO point was at £125,000 (co-incident with the dip in the blue line). Expansion of output to £200,000 would suggest that on the standard model (the green line) the unit costs would reduce to £0.79 per £1 of revenue. However, on the MSO model (the blue line) expansion to an output of £200,000 would incur unit costs of £2.70 per £1 of revenue.

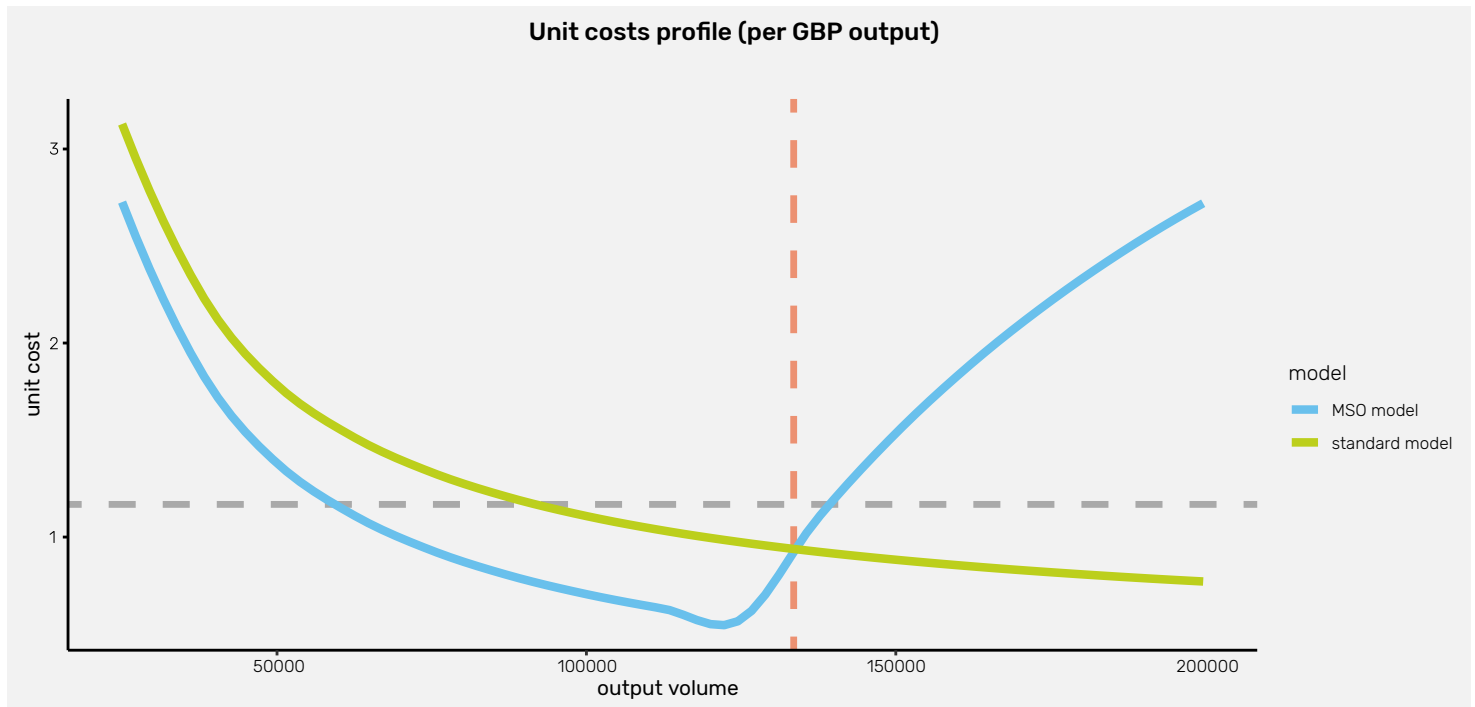


Fig 3: Unit Cost Profile

THE PRACTICE:

Calculating the point of Maximum economically sustainable output (MSO) for an individual farm business.

The steps taken to analyse the accounts and identify the maximum level of farm output that is economically sustainable under the Nethergill approach are set out below. These are:

- A. Analysis of the accounts
- B. Calculation of the Maximum Sustainable Output
- C. Examination of fixed costs

A. Analysis of the accounts

The accounts are re-ordered from standard accounting format and the following steps are carried out:

1. The value of sales from farming-only activities is established first and taken to be the primary measure of revenues.
2. The variable costs associated with farming-only activities are then established. These are broken down into productive variable costs and corrective variable costs (see below for an explanation as to what these are and why this was done).
3. A first level contribution is calculated which comprise the cash flows resulting when total variable costs are deducted from revenues (gross margin). What remains will have to cover the remaining fixed costs, drawings, capital expenditure and tax liabilities left in the business. If this contribution is negative the business is losing cash and, by default, will be decapitalising. Businesses that fail to produce a positive first level contribution are intrinsically non-viable.

4. Fixed costs are established. These will fall into five categories:

- Essential and unavoidable costs. Without these items no business will be possible. Sometimes these costs, when being projected, are referred to as zero-based budgeting costs.
- Mandatory costs. In farming cross compliance and some leases will contain covenants, for example regarding dry-stone walls, which may involve significant maintenance or repair obligations. These, too, are unavoidable.
- Intangible costs. Balance sheets are balanced to account first for liabilities not assets. Invariably there will be an apparent shortfall of true assets to match liabilities. The balancing item becomes the intangible assets of the business and these are deemed to value such things as good will and reputation. Intangible assets represent the premium paid for the quality aspects of a business.
- Lifestyle costs. These cover a spectrum of types and many, for historical reasons, can incur extremely high maintenance and running costs (e.g. farmhouses).
- Unnecessary costs. Whenever farms take on assets that are over-specified for the job or are not strictly needed on profitability to service these costs.

5. A second level contribution is then calculated. This is the amount left to cover drawings, capital expenditure and tax liabilities. This measure is essentially the profit or loss associated with farming-only activities.
6. Support payments are then identified.
7. Support payments are added to the second level contribution to provide the actual profits on the farming business as reported in its Profit & Loss accounts.

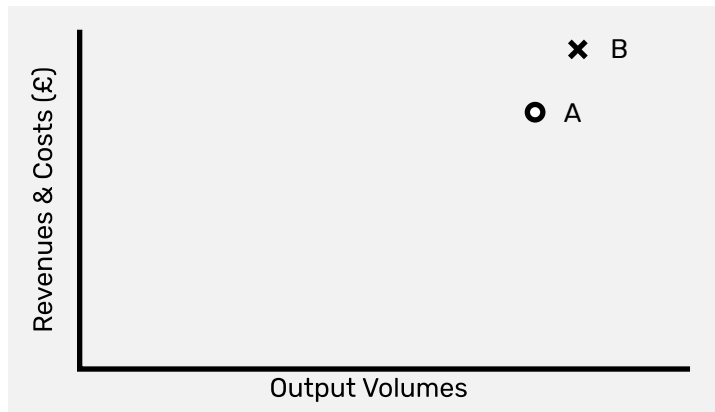
B. Calculating the MSO

As the physical aspects of farming have not been analysed or modelled under the Nethergill approach, the estimate of when Productive Variable Costs are affected by the onset of Corrective Variable Costs is based on an empirical interpretation of the Accounts. Under the Nethergill approach, a geometric version of the method applied to identify the MSO point is set out below.

However, a proprietary algebraic solution was developed specifically for the study work.

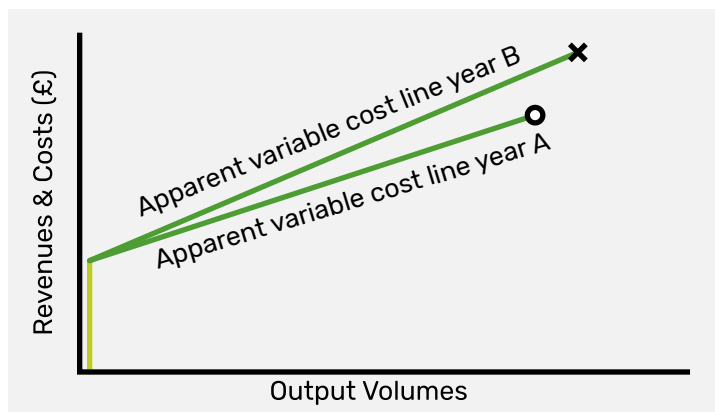
Step 1

- Let o be the total cost in year A
- Let x be the total cost in year B (where year B = year A+1 and adjusted for changes in monetary values)



Step 2

If points o and x are connected to the fixed cost line, the two purple lines represent the apparent total cost lines for years A and B as outputs increase. This is the pattern observed in the standard model of the firm.

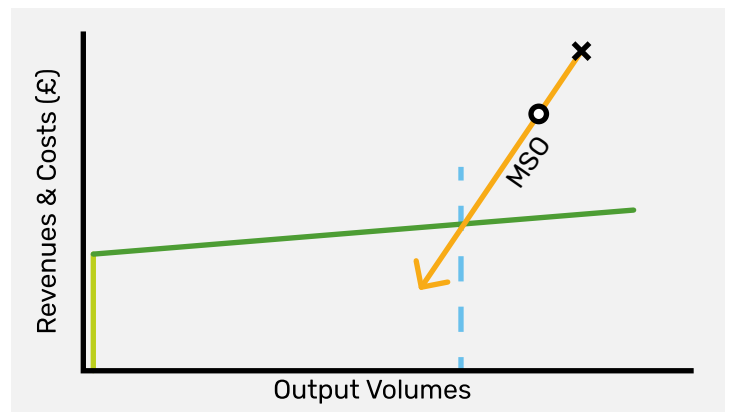


Step 3

The PVCs are established from the relevant cost categories from Year A. The PVC line is projected forward as if it were continuously variable. Then a line is projected from x through o (which represents total variable costs in Years A and B) downwards (orange line) until it crosses the PVC line. The point of intersection is when the CVCs start and is therefore the MSO. The MSO is intended as an indication of where the point of maximum economically sustainable output lies and this will vary over time.

NB: This method uses only 2 years' data for total variable costs. Whilst, in general, line fitting (by regression analysis) improves with more data points, two points are preferred for identifying the point of MSO. This is due to the fact that:

- Data from different years are complicated by issues relating to the value of money (inflation, purchasing power, etc); and
- As the data points increase (relating to more years) the problems of correcting for monetary values outweigh the benefits (theoretically) of more data



NB: Because the formulae are empirical, based on a set of Accounts and not the physical situation on the ground, the new level of activity cannot be guaranteed to be the best possible, only likely to be better than before.

C. Examining fixed costs.

Given that many of the farm businesses examined are making a loss before (and sometimes also after) CAP support payments, a further set of calculations are made to provide an indication of the magnitude of the increase in price or reduction in fixed costs that would be required to break-even (before drawings, capital expenditure etc) both at current levels of output and at MSO level.