

# Northern AONB's Test and Trials Project

FINAL REPORT  
Nethergill Associates



## **Letter of Transmittal**

### **Northern AONB's**

5 March 2021

### **Test and Trials Project**

On Monday 22nd February Brian Scanlon and I presented, via Zoom, our draft Final Report to you. Within the presentation we discussed with you, amongst other things, the principles and actual MSO and ROTA, natural capital considerations and the relationship between MSO (Maximum Sustainable Output) and ESI (Environmental Stress Index).

This Letter of Transmittal (LoT) highlights the most important points of interest that we discussed with you and we have pleasure in attaching our Final Report.

Hill farming as practiced in the study farms within the AONB areas is intrinsically unprofitable without considerable external support. Most farms (70%) were unable to recover fully their associated fixed costs. A few farms (15%) were even unable to cover their variable costs and this suggests an intrinsic un-viability in their business proposition. Farm prices are a critical issue in this as a consequence of the continuous regime of support since 1945 and the political sensitivity of food prices. It is claimed by the organisation Sustain, which promotes sustainable farming, that British farming takes only 9% of the market revenues in the food sector of the economy.

A ROTA analysis of farm performance in the study group identifies the reasons behind this small share of the food supply chain. The low margins achieved on sales of produce confirm that farming operates as a commodity supply business. This is inappropriate for a sector with such a high element of business risk. The ROTA analyses also show up the characteristically low assets turn in farming as a consequence of underutilised plant, the capital tied up in land ownership and the impact of natural constraints on land fertility.

The constraints of *Nature* have led us, at Nethergill Associates, to contest the applicability of conventional wisdom in that production volumes will drive profits. This behaviour comes from a cost model in which variable costs increase linearly with output volumes. In fact, variable costs in farming are non-linear and comprise two separate and sequential cost elements; productive variable costs incurred when working with *Nature* and corrective variable costs when substituting for *Nature*. The point where productive costs end and corrective costs begin coincides with the point at which the natural resources available, such as grass, will run-out. This is also the point of maximum sustainable output (MSO). For the study farms as a whole the MSO averages at 72% of current output levels.

If farms were to downsize to their respective MSO points their profitabilities will increase but this increase will not be sufficient alone to offset the need for support.

If small groups of neighbouring farms are taken to comprise part of a local economic community (one in each of the AONB areas) the net contribution (before support payments) to that local economy is negative. That is, farm support payments can be regarded as an economic correction factor for the local economy.

Support payments do transform the picture. After support payments most farms become profitable (80%) but only a small group (20%) is capable of making a ROTA of over 15%.

Tactical improvements to performance (on all farms) can come from two initiatives:

1. Downsize over a two-to-four-year period to MSO levels of output by progressively cutting-out corrective variable costs.
2. Attack, aggressively, the burden of fixed costs with the objective of containing the burden to 40% sales value.

Strategic improvements to performance (independently budgeted to not cross-fund the farming activity) can also come from four longer-term initiatives:

1. Diversify into new, but related, activities such as farmhouse accommodation, renting-out surplus pasture, or offering services on contract (say, where one has under-utilised plant)
2. Invest in new added-value products, such as ready-meals production, or cheese-making.
3. Organise some branding initiatives (with help from organisations such as the AONBs, and the National Parks) that will differentiate product offerings and command a price premium.
4. Grow through contiguous aggregation when opportunities arise as, whilst this will not change individual MSOs, it will offer more scope to recover the burden of fixed costs.

With the imminent phasing-out of some support payments all farms should be encouraged to pursue, as an immediate next step, a programme for profits improvement.

It was a pleasure to work with you on this important assignment and we look forward to working with you again.

Best wishes

A handwritten signature in black ink, appearing to read "Chris Clark".

Chris Clark

**Nethergill Associates**

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# Main Report

## 1. The Study Farms

There were 19 farms in the study group. The location of the farms and an outline of their main physical characteristics are given in Exhibits 1 and 2.

### Exhibit 1

#### The Location of Study Farms

AONB	No Farms
North Pennines	7
Nidderdale	6
Forest of Bowland	6

### Exhibit 2

#### Outline Characteristics of Study Farms

	Units	Range	
Hectares	Ha	51	1,032
Average Elevation	m	150	850
Rainfall	mm	66	2,000

## 2. Patterns of Profitability

### 2.1. A Note on The Accounting Conventions Adopted in The Study

A typical business survives on the revenue it generates from the sale of its output. We have adopted this general approach for the study work. As a consequence, income from support has been accounted for after a conventional business profit has been determined. Support payments in farming are significant in size, widespread in application, and central to the current economic well-being of the sector. Our approach may therefore seem harsh, but it is realistic as support payments come under review and it is certainly instructive from a business management standpoint.

### 2.2. The Essential Hierarchy of Profitability

The first imperative of any business is to ensure that revenues generated cover variable costs incurred. This is essential if fixed costs are to be recovered and subsequent profits can be made. If a business is unable to cover its variable costs (before other costs are taken into account) it is *intrinsically un-viable*.

Of the 19 study farms, three farms (15% of the group) did not cover their variable costs from its sales of output.

The second imperative of a business, given that variable costs are covered by revenues, is to recover its fixed costs. Only then can a contribution be made to accommodate a draw, any interest payments, and a profit to service the capital employed.

Of the 19 study farms 13 farms (70%) were unable to recover fully its fixed costs after its recoveries of variable costs. In this and other studies of hill farms (representing over 80 farm businesses) it appears that no farm is profitable when fixed costs equate to more than 40% of sales output.

When a business makes a contribution after covering variable costs and fixed costs its first obligation is to provide a draw (salary) for the proprietor. Of the 19 study farms three made no provisions (explicitly) for a draw. The picture for the remaining 16 farms is summarised in Exhibit 3. In many ways the figures are just notional (as 85% of the farms do not make a contribution after variable and fixed costs) but the average hardly represents a “fair wage” for the efforts and risks involved.

<b>Exhibit 3</b>		
Farm Draws		
Average	Range	
£19,372	£3,293	£56,118

Only three farms (15%) made a conventional contribution to profits after covering its variable and fixed costs. These were three of the four biggest farms in the study group by sales output value.

### **2.3. The Critical Importance of Support Payments**

Support payments transformed the ultimate profitability picture for the farms. After support payments, all but 4 farms (20%), became “profitable” including two of the three farms that failed to cover variable costs before support. However, only 4 farms (20%) then exceeded the 15% ROTA test rate for a healthy conventional business (and one of these were capable of doing this before support payments).

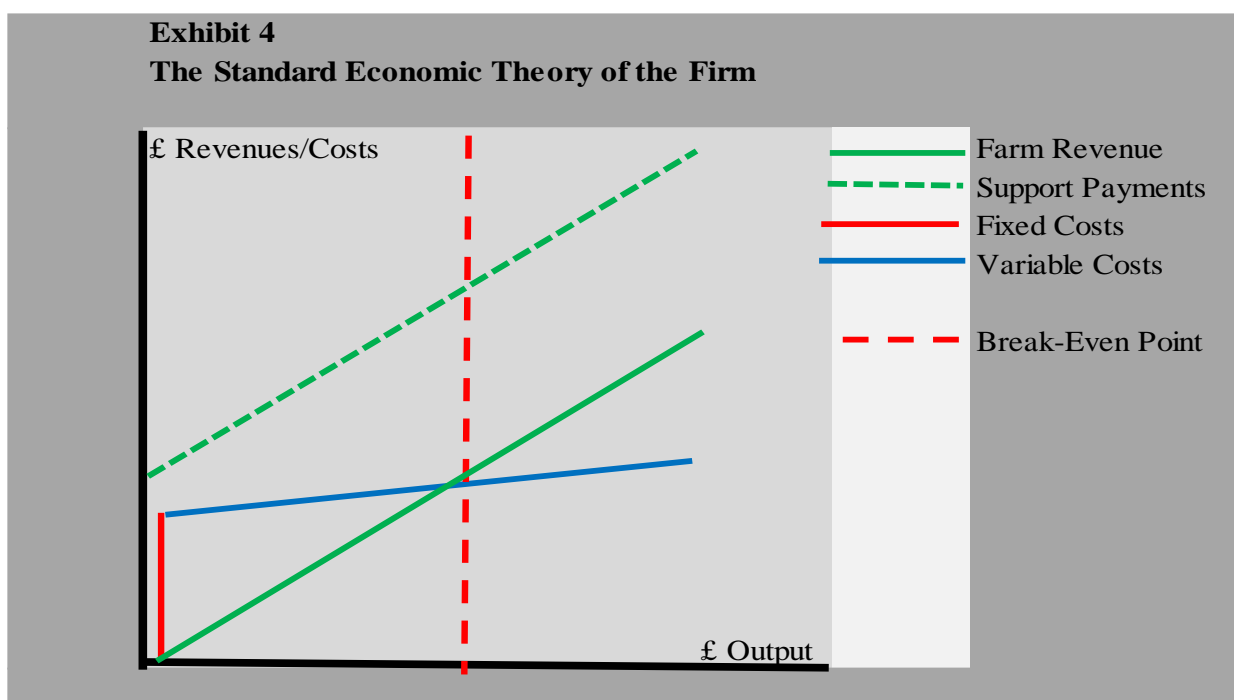
The aggregate revenue of farm outputs for the study group was £1,931,532. This puts the average farm output at £101,660. The aggregate support for the study group was £1,181,383 and this is equivalent to a price increase of 61%, which is truly prodigious.

Without significant levels of support hill farms in general have serious problems with profitability if output prices do not increase substantially.

### 3. The *Economies-of-Scale* Trap

#### 3.1. The Standard Economic Theory of The Firm

In the *Standard Theory of the Firm* (see Exhibit 4) it is assumed that variable costs are homogeneous. This leads to the conclusion that if revenues grow with volume at a greater rate than variable costs there will be an *economic break-even point* at some volume. Profit then becomes a matter of increasing outputs and the *economies-of-scale effect* will do the rest.

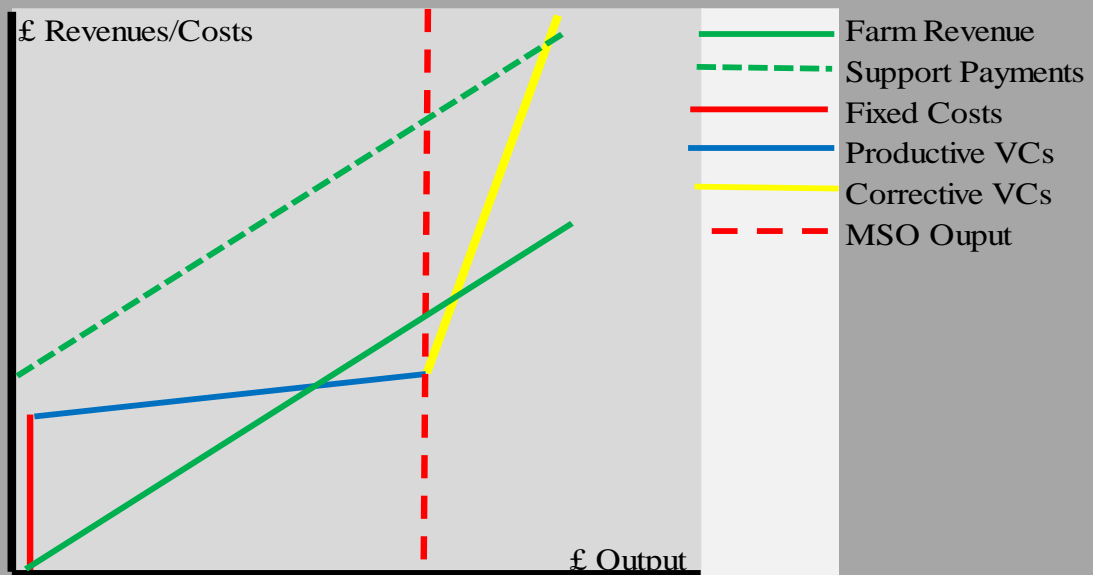


In fact, variable costs in farming comprise two different and sequential components: Productive variable costs (PVCs) where activities work with *Nature* and corrective variable costs (CVCs) where activities substitute for *Nature*. In the case of hill farming for livestock the PVCs end at the point at which the natural grass runs out and the CVCs begin at this point as artificial feed-stocks and fertilisers are adopted.

This critically changes the picture presented by the *Standard Theory of the Firm* (see Exhibit 5). Now there is a distinct prospect of a break-back point into un-profitability. This will happen whenever CVCs increase at a faster rate than output revenues. In work which has encompassed the study of nearly 80 hill farms this has been found to be true in all but one case.

The theory of *Economies-of Scale* does simply not apply to hill farming and therefore the unlimited pursuit of volume to become profitable is a false stratagem. Natural resources are always limited and its replacement by substitutes is not necessarily sound in economic (or environmental) terms.

**Exhibit 5**  
**The Effect of Non-Linear Variable Costs**



### 3.2. The Concept of a Maximum Sustainable Output (MSO)

The point of inflexion between the end of PVCs and the onset of CVCs defines the position of *maximum sustainable output* (MSO) for a business. In hill farming the MSO point corresponds to the point at which the naturally available grass runs out.

Also, at this point:

- Profitability (expressed as profits as a percentage of sales) is maximised.
- The contribution from *Natures' Bounty* (in the form of “free-issue” grass in the case of hill farms) is also maximised.
- The commercial benefits of natural capital, in the form of fertility and grass produced, are also maximised.

Beyond this point (as output grows) the intrusion of substitutes for *Natures' Bounty* (in the form of artificial fertilisers and feed-stocks) erodes profitability and eventually there will be the prospect of a *break-back* into un-profitability.

At output levels below the MSO point a farm will simply not be taking full commercial advantage of its available natural capital. This is not only a lost commercial opportunity but in a landscape that has been modified and managed for hundreds of years changes will not come without some form of cost.



### 3.3. Impact of MSO Adoption on Study Farms

If all the study farms were to move to its MSO levels of output there would be a reduction in output levels (to 72% of current volumes) but this would be accompanied by a significant increase in profits and profitability (by a factor of 2.27x). The situation is summarised in Exhibit 6.

<b>Exhibit 6</b>	
<b>The Impact of Working at MSO</b>	
Total Output (of Study Farms)	£1,931,612
Total Support Payments	£1,181,383
Revenues Reported (P&L Account)	£3,112,995
Profits Reported	£527,058
Profit Margins	16.93%
Aggregate MSOs (of Study Farms)	£1,389,612
Ratio: MSOs to Reported Revenues	72%
Aggregate Profits at MSO Points	£1,197,895
Prospective Margins at MSO	38.38%
Uplift Factor on Margins at MSO	2.27x

Moving progressively to MSO levels of output by a continuous reduction in CVCs until these are eliminated (or reduced to an absolute minimum) will not only deliver greater commercial benefits but it will also increase the benefits of *Natures' Bounty*.

If, as many suspect, the continued use of CVC items might well increase the physical volume of output but at the cost of an ever-increasing ratio of CVCs to PVCs then by reversing the process (by the progressive elimination of CVCs) it is likely that the conditions will be laid for the MSO point to increase (that is to move to the right on the Exhibit 5 chart). This is the real prize of an MSO mentality. Further, it is likely that regenerative farming techniques that result in more grass / better fertility of the soil will move the MSO to the right.

## 4. The Community Effect

### 4.1. Economic Impact

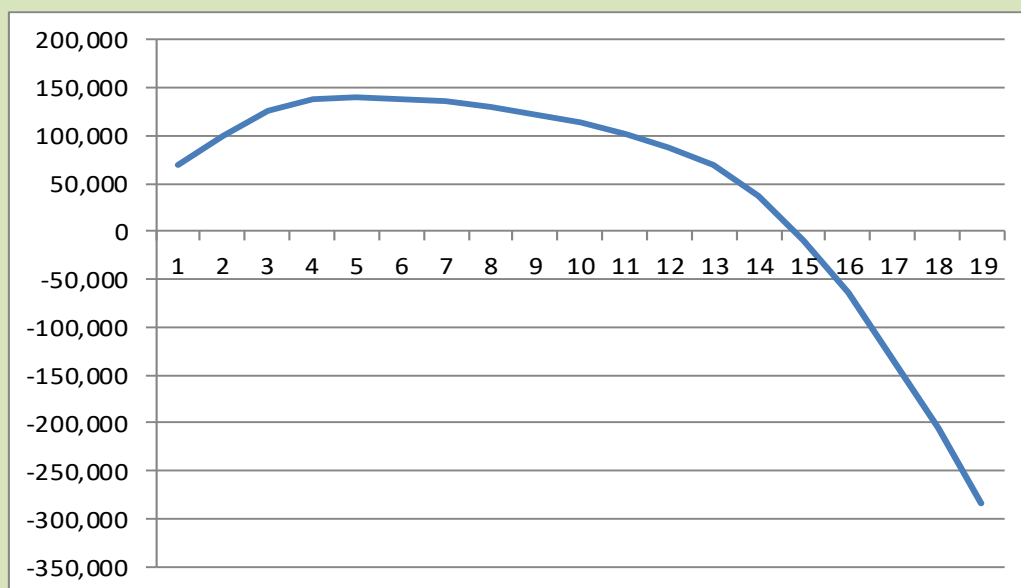
If the study farms are taken to comprise a small, local economic community (say, North of England Hill Farms) it is possible to examine the social impact of the farms.

The contribution each farm makes to its local economy is the net profit it delivers (adding to the net wealth of the community). By ranking each farm in terms of its profits and examining the growth pattern of cumulative profits a picture emerges of the composite social value of the farming sector in the local economy. For the study farms, when profits are taken before support payments, the picture shown in Exhibit 7 then emerges.

#### Exhibit 7

#### Ranked Cumulative Profitability of Study Farms (Pre-Support)

£ Profit



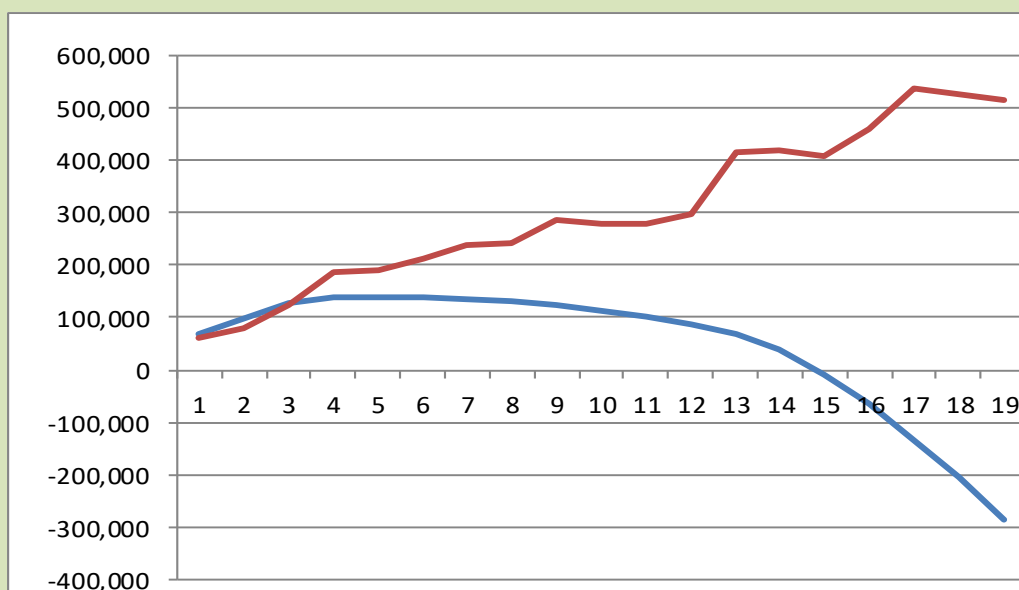
No of Farms (Ranked by Profits)

The pattern of intrinsic profitability is quite startling. Only five farms of the 19 make a positive contribution to the local economy. The remaining 14 progressively reduce the value of farming in the community. The first 15 farms make a collective contribution of zero and the remaining four take the group to a substantial cumulative deficit.

When support payments are taken into account the picture is transformed. This is shown in Exhibit 8 (keeping the pre-support rankings)

**Exhibit 8**  
**The Impact of Support**

£ Profit



No of Farms (Ranked by Profits)

The blue line is the ranking from Exhibit 7 and the red line is the improvement brought about by support payments.

Support payments are not only vital for farm businesses, but it is also vital for the local economy.

**4.2. The Impact of Working at MSO Levels of Output**

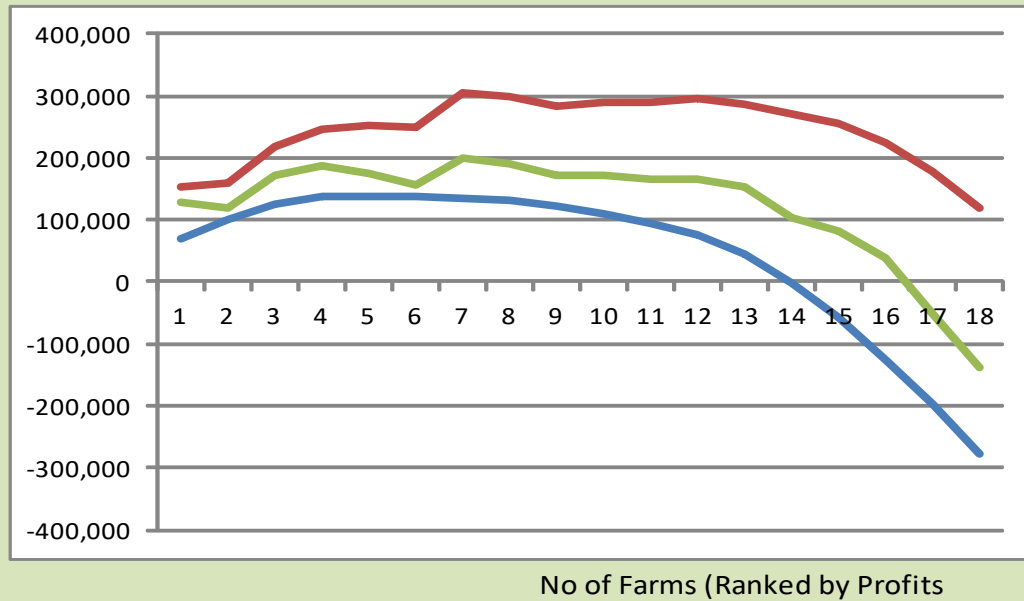
The strategic imperative in hill farming is to change the shape of the *hook-curve* (as in Exhibit 7) through fundamental performance improvement schemes. This is addressed in the next chapter.

If the study farms were to operate at their respective MSO levels the prospective improvements in profitability are shown in Exhibit 9.

**Exhibit 9**

**The Benefits of Producing at MSO Levels of Output**

£ Profit (Pre-Support)

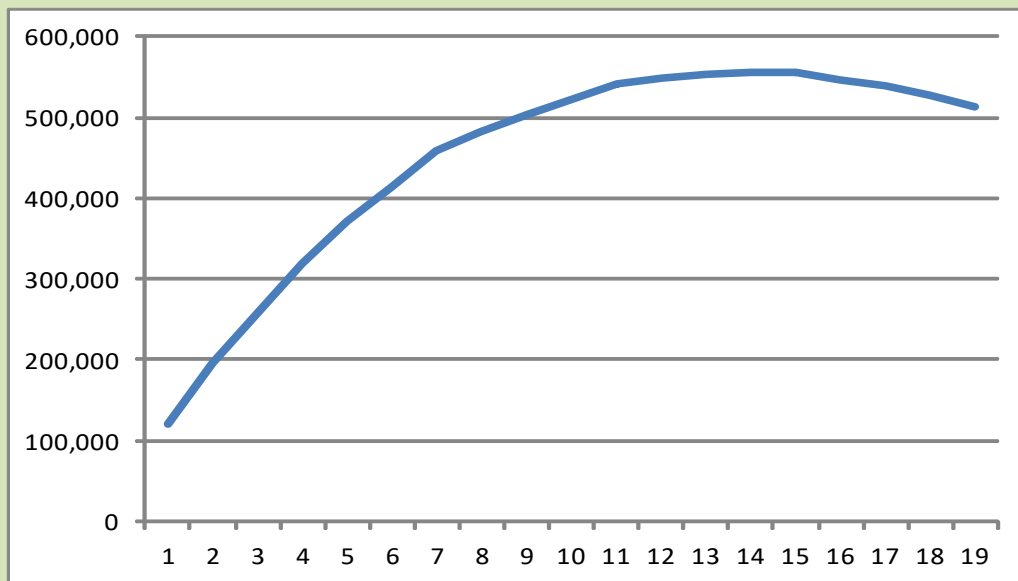


The green line in Exhibit 9 shows the likely improvement in profitability when all farms operate at MSO levels; the red line shows the extra potential for profitability when an aggressive approach is taken to fixed costs to accommodate the lower levels of output. It must be noted that whilst moving to an MSO philosophy will improve profits this is not sufficient to compensate for the current levels of support.

The current reality in farming is that support payments are a long-standing feature of life. If the components of the red line in Exhibit 8 are re-ordered by ranking the farms by profits (post support). The resulting picture is shown in Exhibit 10. The *hook-curve effect* is still present but much less dramatic.

**Exhibit 10**  
**Ranked Cumulative Profitability of Study Farms (Post Support)**

£ Profit

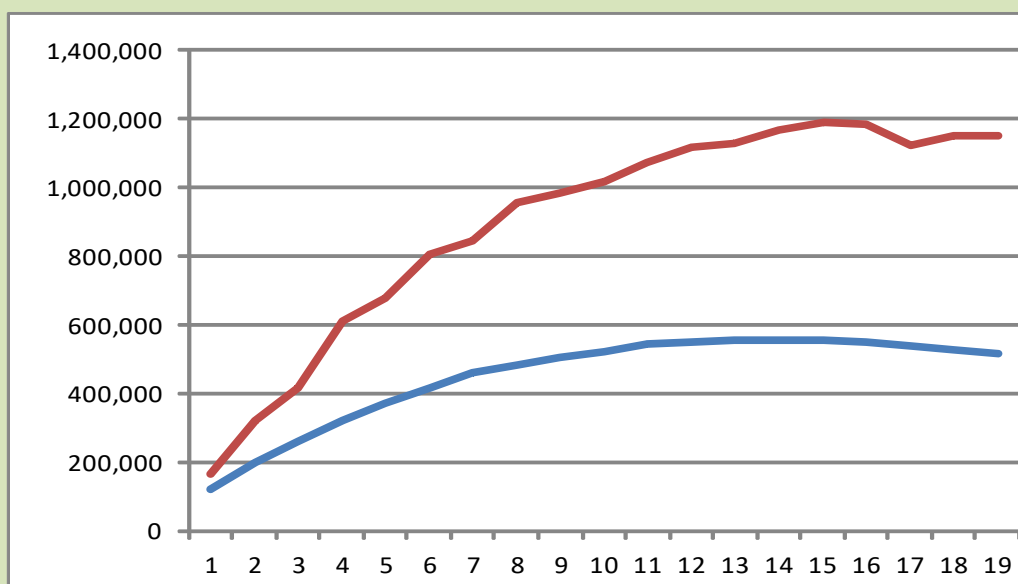


No of Farms (Ranked by Profits)

Further improvements can be made if all the farms worked at MSO levels of output. The effect of this is shown by the red line in Exhibit 11.

**Exhibit 11**  
**Potential Improvements from Adoption of MSO (Post Support)**

£ Profit



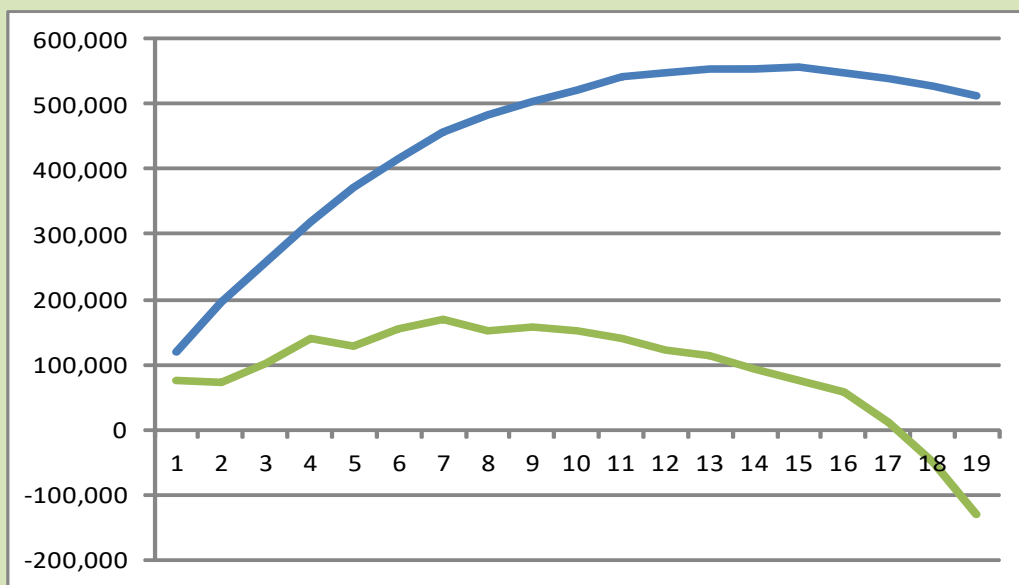
No of Farms (Ranked by Profits)

### 4.3. The Impact of Losing Pillar 1 (BPS) Support

BPS payments will be, after a transition period, phased out by 2027. A new support payments scheme will be introduced as a replacement but the shape and scope of such a scheme has not yet been determined. Exhibit 12 shows the impact of losing BPS payment on the study farms. The current pattern of profits, represented by the blue line, is transformed into the green line. The change is dramatic.

**Exhibit 12**  
**The Impact of Losing BPS Payments**

£ Profit



No of Farms (Ranked by Profits)

## 5. Performance Improvement Strategies

### 5.1. The Rota Parameter (Return on Total Assets Employed)

The essence of a business is to produce a return on capital investment that is better than that available from interest on deposits but commensurate with the extra risks that might be involved. If the price of money is 7% (that is equivalent to the interest rate on deposits) and 8% is thought to be a fair return for the risks involved then a business might set its objective to be a 15% return on capital (in the form of assets employed).

However, ROTA is a two-dimensional parameter as set out in Exhibits 13 and 14.

#### Exhibit 13

##### The Algebra of ROTA

$ROTA = \text{Profit} / \text{Total Assets Employed}$

This can be re-cast as

$ROTA = (\text{Profit}/\text{Sales}) * (\text{Sales}/\text{Total Assets Employed})$

That is,  $ROTA = \text{Margin} * \text{Asset Turn}$

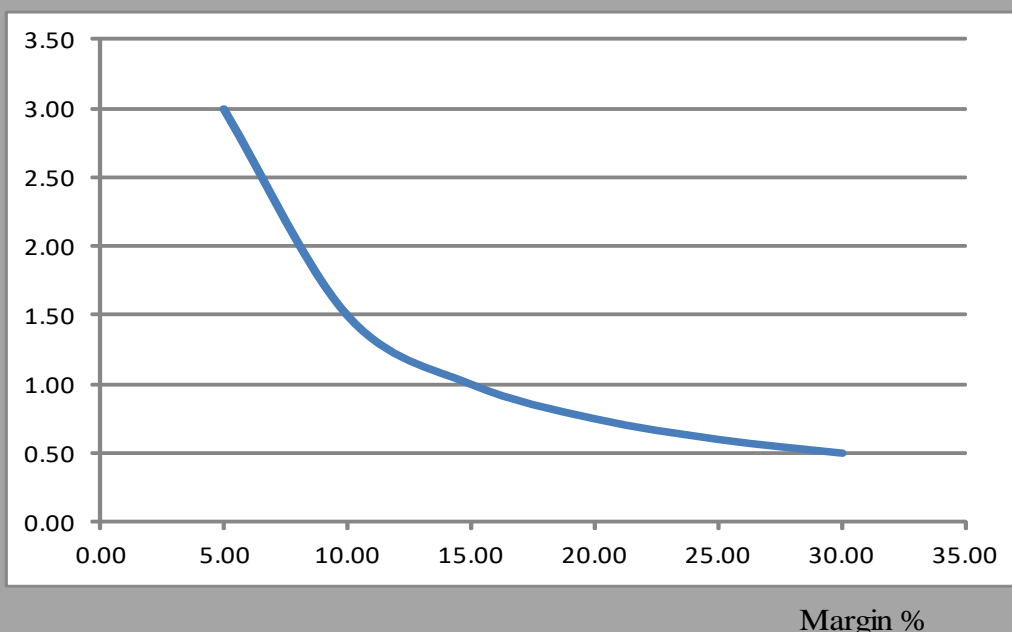
Or algebraically,  $ROTA = X * Y$

When ROTA is a constant this equation is an hyperbola

#### Exhibit 14

##### The 15% ROTA Curve

Asset Turn x



If the objective in a business is to deliver a 15% ROTA then its performance must lie on the blue line in Exhibit 14. It does not matter where this is but in practice it will be easier to meet the target at one particular point.

Businesses with a low assets turn and a high margin will tend towards the extreme bottom right-hand side of the line. These are typically service businesses (such as lawyers and accountants).

Businesses with high assets turn and low margins will tend towards the upper left-hand side of the line. These are typically commodity traders.

The businesses that cluster around the middle of the line are usually converters (such as manufacturers of consumer durables).

## **5.2. Where Should Hill Farming Be on A Rota Curve?**

Hill farming is a conversion business, but it is heavily influenced by two factors which will determine its natural position on a ROTA curve:

1. It produces a commodity product: a product which is largely un-differentiated and very price sensitive. This results in low margins.
2. Its' major asset will be the land and its fertility. Land is a relatively expensive asset (in comparison to factory buildings and machine tools) and farming land commands a premium. This is a formula for a low assets turn.

Hill farming therefore can expect both low margins and low assets turns which make it very difficult to achieve a decent ROTA.

## **5.3. Business Segmentation**

Businesses which comprise a number of very different types of activity usually segment its operations into groups with some common features for purposes of comparison. In hill farming it is useful to segment the business into conversion activities and land ownership. Tenant farmers can operate as a single segment business, but freehold farmers should operate as a two-segment business.

In the study farms group 12 of the 19 farms were freehold and 7 were tenanted. For purposes of comparison a notional rental charge was applied to the freehold farms equivalent to 2.50% of the land valuations.



## 5.4. Rota Performances

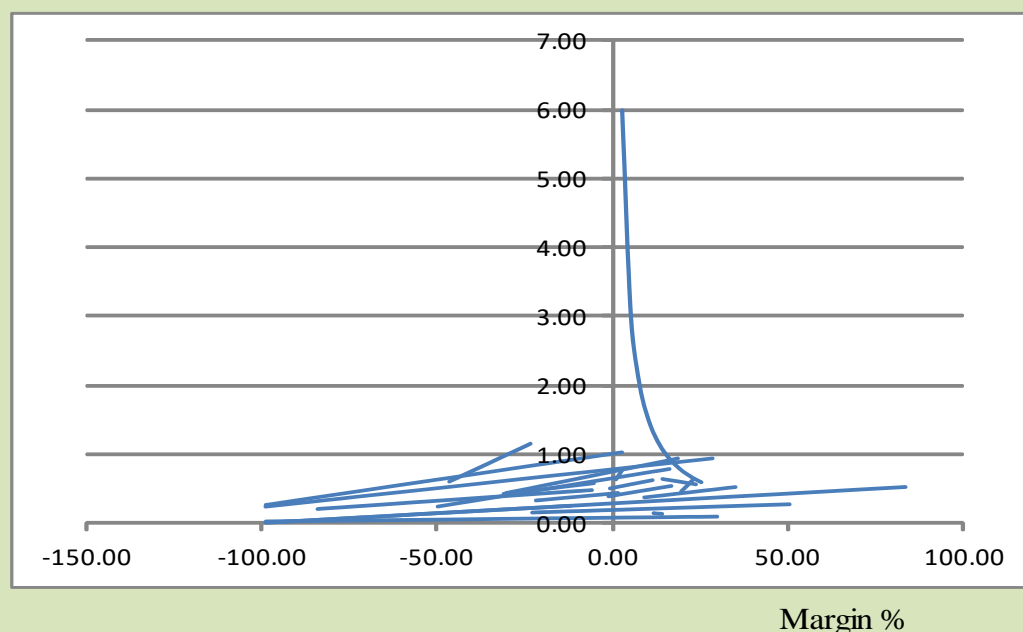
ROTA performances were computed for all 19 farms in the study group on two bases: before support payments and after support payments. The “flight patterns” are shown in Exhibit 15.

### Exhibit 15

#### The ROTA Improvements (Pre-Support to Post-Support)

15% ROTA Curve

Assets Turn x



Again, the impact of support can be seen mostly on margin improvements (the net effect of support payments mimics a price rise) and to a lesser extent on assets turn. Low assets turn is the controlling factor that limits performance potential.

## 5.5. The Theory of Performance Improvement

As  $ROTA = (\text{Assets Turn}) * (\text{Margin})$ , performance improvement comes from actions which improve assets turn followed by actions which improve margins.

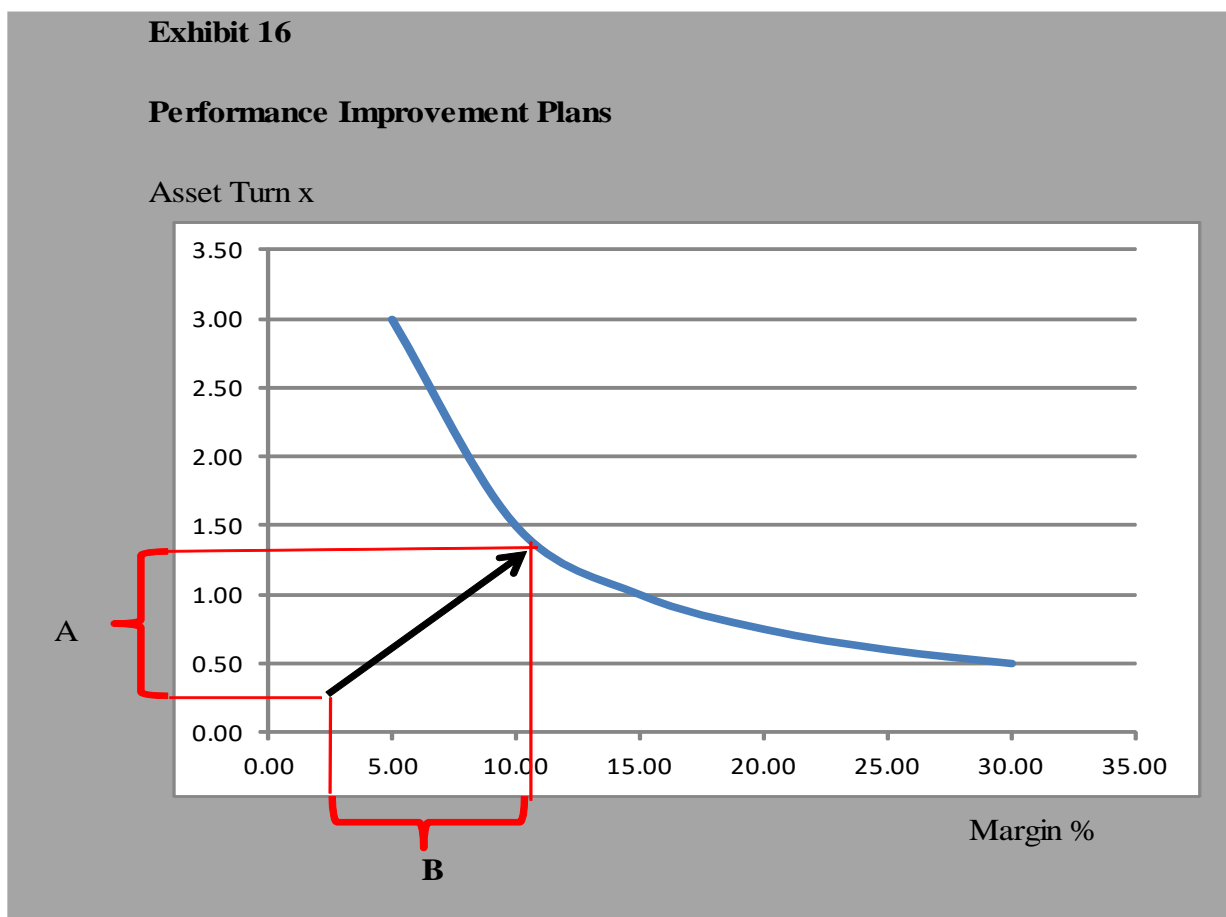
Actions that influence assets turn are changes that address items on a balance sheet, such as:

- Reducing fixed assets (for example by renting land not owning it)
- Reducing machinery assets (again by renting in preference to owning)
- Reducing stocks and work in progress
- Reducing accounts receivable

Actions that influence margins are changes that address items on the profit & loss account, such as:

- Increasing prices (through added-value activities, such as ready-meals)
- Reducing fixed costs (by moving to more maintenance-free type options)
- Improving productivity (to reduce unit costs)
- Eliminating CVCs progressively

The overall process is illustrated in Exhibit 16.



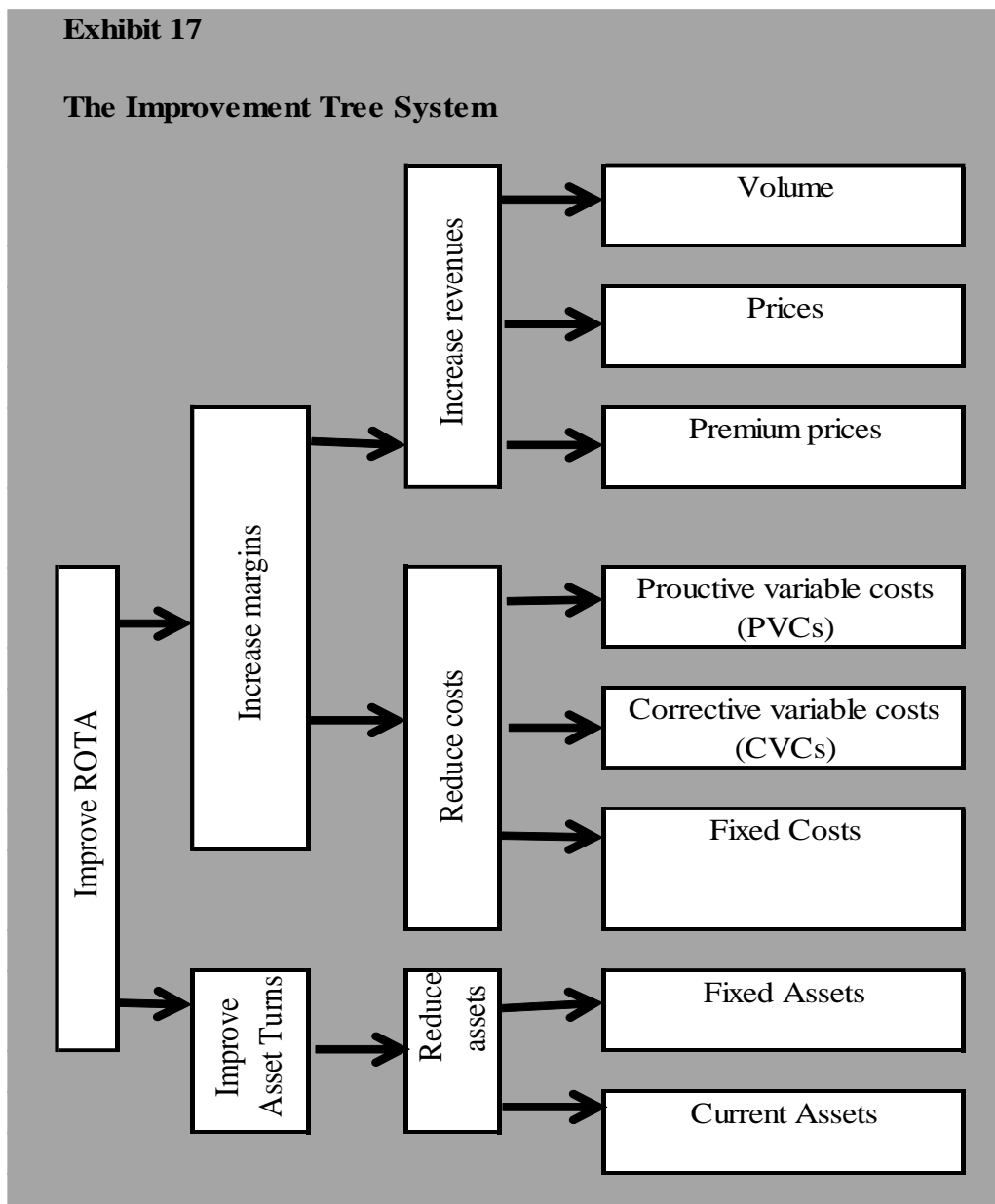
To move along the black *arrow-of-improvement* (from where the business is now to where the business aspires to be) asset turn improvements represented by A must be secured together with margin improvements represented by B.

### 5.6. The Improvement Tree System

The task of making improvements to ROTA performance can be broken down successively into a series of different aspects for attention. When this is done a tree-like structure can be developed. The merit of this is that if one aspect is addressed it cannot affect any other (except as an improvement in ROTA). This system is illustrated in Exhibit 17.

**Exhibit 17**

**The Improvement Tree System**



The most effective sequence for addressing the different aspects that will improve performance is to start with the Balance-Sheet items and then to tackle the P&L Account items. This sequence, however, will differ from the degree of leverage that an item has on the potential for improvement. Typically, in any business price will have the biggest leverage on results. Then for any particular business (or group of businesses) there will be a set of specific priorities which reflect the actual operational imperatives that happen to prevail. This is summarised in Exhibit 18.

## Exhibit 18

### Applying The Improvement Tree to the Study Farms

	Sequence for Attention	Leverage on Results	Priorities for Study Farms
<b>Balance-Sheet Aspects</b>			
Fixed Assets	I	G	4
Current Assets	II	H	
<b>P&amp;L Account Aspects</b>			
Volume	III	B	
Prices	IV	A	
Price Premia	V	C	3
PVCs	VI	F	
CVCs	VII	E	1
Fixed Costs	VIII	D	2

### 5.7. Performance Improvements on The Study Farms

As shown in Exhibit 18, prices have the greatest leverage on performance improvement. In hill farming support payments act as quasi-price premia (also review Exhibits 8 and 12). The protection of this support (or its equivalent) is critical to the maintenance of commercial viability in the study farms. This might well require a political initiative and some form of group action.

However, all other aspects of the *Improvement-Tree* approach can be addressed at a farm level. In the study farms, the key priorities are:

1. To eliminate (progressively) the CVCs. This will allow the farm to eventually operate at MSO and benefit from improvements in profitability directly (also review Exhibit 10).
2. To minimise fixed costs commitments. Cash flow is critical and whilst the ownership of plant and equipment will qualify for tax offsets asset ownership can result in low plant utilisation and high repair and maintenance costs that compromises cash flow. Rental (or hiring specialist services) will help in the reduction of fixed costs. Fixed costs at the study farms average 82% of pre-support farm income and 52% of post-support revenues. This is far too high and well above the 40% threshold that seems to guarantee unprofitability.
3. Reducing fixed costs would be greatly aided if some form of collaborative measures were adopted, such as sharing capital plant assets within the local farming community. Ownership of plant demands high assets utilisation to be cost-justified

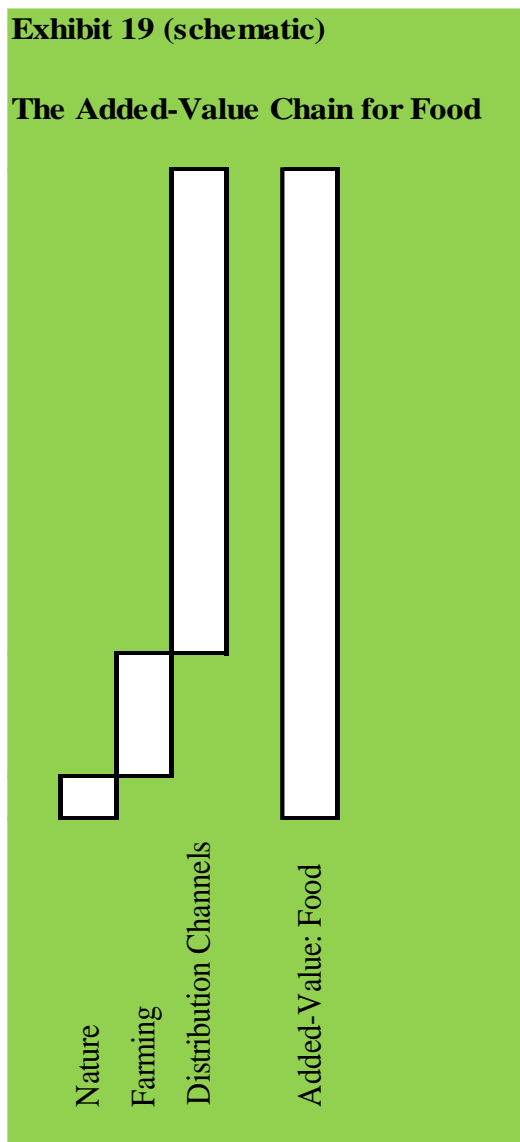
and this is not possible in a farming regime where high availability (but only when needed) is a better proposition.

4. Added-value activities point the way to the future. As commodity producers, hill farmers are at the mercy of meat purchasers and their pre-occupation with price.

## 6. Imbalances in the Added-Value Chain

### 6.1. Added-Value in The Food Supply Chain

The three principal components of the food supply chain (*Nature*, farming, and distribution) are poorly matched in size and scope. This affects the *relative punching power* of each component. This is illustrated in Exhibit 19. Farming (and *Nature* especially) can exert little overall impact in comparison to the food industry in general.



Offsetting this disadvantage in farming is a matter of taking a greater share of the added-value chain. This can be addressed in two ways; develop new added-value products and take into the farming sector more of the distribution chain (starting with abattoirs that slaughter for a fee rather than act as commodity brokers).

### 6.2. Pre-Requisites of New Added-Value Strategies

6.2.1. There must be a real and attractive *market opportunity*. Some farmers have been successful in ready-meals offerings, cheese-making, and (as a complete diversification) hospitality. However, in each case capital investment would

have been needed and whilst commercial benefits can certainly come it must be recognised that the levels of risk (more capital investment) and the levels of market exposure (the intrinsic demand for new products or services) have been increased for the overall business.

6.2.2. New added-value products need *differentiation*. All dairy farms could consider cheese-making but unless the cheese is differentiated from the mainstream offerings of established players it simply will not sell. With genuine differentiation comes the prospect of *branding* and it is this that allows markets to be targeted and any unique features of a product to be promoted.

6.2.3. All successful products are built on the back of *competitive advantage*. It is not enough to have a good idea; it has to be available at an attractive price and it has to be made in such a way that would-be copiers are deterred from competing. This is best achieved when some features of the production process are advantageously placed with respect to alternatives. Cheap energy is one well-tried route (Canada is a cost-effective producer of aluminium because it enjoys very inexpensive hydro-electric power); by-product availability is another successful route (Jet petrol is cheaper to produce than that of any other brand because it is a by-product of the production of petroleum coke); and specialisation is a further route (Denmark is a leading producer of insulin as a consequence of its specialisation in pig farming for the bacon market).

### **6.3. Agencies for Branding in Farming**

Farming Co-operatives are not the answer. A co-operative is essentially a scheme for producer protection; it usually fails to ensure the consistent application of high product standards and the consistent delivery of quality. As membership rather than branding is the only qualification cooperatives are usually defensively-minded.

However, organisations such as an AONB, the National Parks, the RSPB, or the National Trust could be well-placed to help farming move up the added-value chain. Such organisations have a respected image and project a set of values to the general public. These characteristics would have significant value in establishing new brands.

## 7. An Outline Programme for the Future

### 7.1. Profitability Improvement in Hill Farming

General encouragement should be given to all the farms in the respective AONB areas to:

1. Progressively reduce CVCs so as to operate at MSO levels. This will improve profitability and reduce environmental degradation.
2. Aggressively reduce fixed costs. This, too, will increase profitability but more importantly it will improve cash flows. Under-utilised plant and equipment (which often come with heavy repair and maintenance costs) should be sold off in favour of rental-hire type solutions.

Each farm should be encouraged to do some business planning to improve its ROTA performance. This is best done through an application of the *Improvement-Tree System* – a discipline which will quickly teach farmers the principles behind leverage and performance improvement.

### 7.2. The Maintenance of Support Payments

In a perfect commercial world support payments are difficult to justify. The mechanism distorts the market-place. However, farming has been dependent on support payments in a substantive form since 1945 and the total elimination of these payments now would be dramatically disruptive.

Support payments currently transform almost un-viable hill farm businesses into just-about viable businesses (albeit at close to *subsistence-levels*). Until the sector can be re-structured, with a better more-sustainable business model and improved pricing strategies, these support payments are essential. The critical questions for the future will be *what should the payments be for and how should the payments be dispersed?*

There is a new commitment to link support payments to maintenance and improvement of the natural capital asset. Implementation is pending prior to a commitment to a specific protocol for defining and measuring natural capital.

### 7.3. Ending the *Commodity Producer* Status of Hill Farming

Two issues condemn hill farmers to a commodity producer status.

Firstly, the carcasses offered to the market are undifferentiated. The prevailing farce in the market is price (£/kg). In such regimes the only winner is the *least-cost producer* and there is no place for attributes that might come from different breeds, or different farming districts, or different farming practices.

Secondly, the abattoirs act as commodity traders. These businesses are factories (in the sense that it will be driven by aspects of plant utilisation and the traditional economies-of-scale in production) and the slaughter sector behaves as a bottleneck in the overall supply chain.

The constraints imposed by these two issues need to be broken.



Farms, especially those within an AONB area or a National Park, can embark on the road to differentiation by being associated with the images of these organisations. The cost to the farms would be conformance to a set of protocols and standards that represent real attributes to consumers.

Abattoirs, having grown like industrial concerns into ever-larger units, are now sometimes quite remote from livestock rearing districts. This is a potentially fatal situation in a world where animal welfare issues can only increase in importance. Transportation of live animals is a serious welfare issue and needs to be minimised, if not eliminated. This offers the prospect of *slaughter-at-source*; it only needs some innovative approach to offer new mobile slaughter facilities.

#### **7.4. The Trend Towards Farm Unit Aggregations**

In the study farms the only truly profitable businesses were two of the much bigger units. Aggregation of farms into bigger units will help in the containment of fixed costs; aggregation will not, however, change the implications of MSO but as small farms are denied the salvation that historically has been falsely offered through the *economies-of-scale* effect aggregation has few economic downsides. Aggregation, which does offer a better ability to contain and spread fixed costs, will have some adverse social costs.

#### **7.5. Encouraging the Development of Added-Value Products**

Whilst new product development can offer the prospect of unlimited and quite glittering opportunities it is also the most difficult and risky of endeavours. Some farm businesses will make a success of *niche-market* opportunities, and amongst the study farms are some good examples (in cheese-making), but real progress is likely to come only when on-site slaughter (for a fixed fee) becomes a reality. Then products can be offered directly to wholesale and retail outlets.

#### **7.6. Promoting a Proper Balance with *Nature***

*Nature* and farming are inevitably closely related. Bad farming practices can easily adulterate the natural environment and some aspects of farming have a reputation for passing-on the costs of rectification to other parts of the economy (such as re-instatement of water quality after capture). Promoting a better balance between farming and *Nature* can only come when the evaluation of natural benefits can be quantified on an agreed basis.

## APPENDIX 1: Remarks and Observations

### Farmer remarks

- Unsurprised but really anxious
- I thought you knew what you were doing!
- I am a farmer; I do not want to do anything else.
- I am a farmer; I cannot do anything else.
- If I do not work long hours I am not a good farmer
- How do I move on?
- Will I be able to stay here?
- What will I do if I cannot?
- If I do what you suggest, how do I hold my head up at the auction mart?
- It is not easy to get another career.
- We will always be supported.
- How do I know when I have reached MSO?
- My livestock bloodlines have been built up over generations. What will my father say if I do not continue?

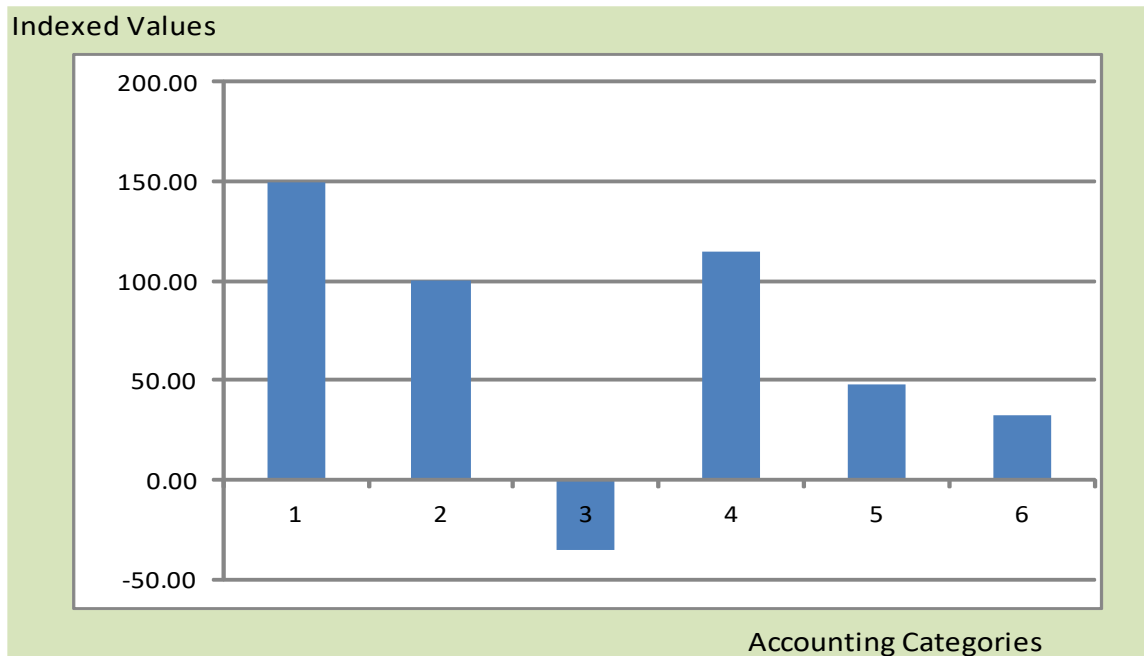
### Nethergill Associates' observations

1. The next few years will bring significant industry change. Managing change at farm level, is and will continue to be, daunting for land managers.
2. Enabling the inevitable change it would help if the psychology of the individual farmer as well as that of the industry, is understood and addressed.
3. Change will also be required of agricultural colleges, senior academics, government departments, conservation NGO's, National Parks etc. etc.
4. Currently there is an industry-wide national leadership vacuum. NGO's, including AONB's might well have to fill that vacuum, at least temporarily.
5. Food at one level is simply a package of energy. Farming simply converts natural sources of energy, such as grass, into edible meat products.
6. If artificial feed-stocks and fertilisers are used care must be taken (in terms of the physical sciences) to make sense of the energy balances. If it takes 5kg of feed-stock to deliver 1kg of live-weight only fancy economic pricing can deliver the apparent effect of beating (the un-beatable) 2nd Law of Thermodynamics!
7. Farmers are conservative and many take farming to be a way of life in preference to commercial considerations. However, this project and others, found an almost universal acceptance of the *economies-of-scale* effect (unfortunately fatally-flawed) taken from post-war economic sentiments. If such concepts can be embraced why should not others be?

8. When taken through the arguments surrounding MSO, farmers readily understood the issues (perhaps because it accorded with their own anecdotal evidence). What they lacked was the confidence to embrace the change (interestingly, quite often it was the outside-salaried family member who was more willing to consider and drive change).
9. With evidence-based messages there is no reason why farmers would be short of understanding any new realities in economic theory.
10. However, to overcome the uncertainties of change, there will need to be a change of national industry leadership style, particularly differentiating between policy objectives and business management objectives.
11. The primary driver for any business is profit. Nonetheless, there is a sweet spot where nature and farm business coincide to their mutual benefit.
12. Farmers should form regionally-based fully-commercial producer groups (but NOT co-operatives). Offering products which are differentiated in the marketplace, defensible by being exclusive (e.g. from AONB's for example), and capable of being branded (e.g. through quality, process or recipe). Taking a slice of the retail trade which might well take the form of denying the supermarkets access to the group's brands except at a premium.
13. Most abattoirs not only kill animals; they also kill-off most attempts by the farming sector to develop branded products by reducing meat produce to the status of undifferentiated commodities.

## APPENDIX 2: North Pennines - Miscellaneous Analyses

Chart I - Profile of Profitability Build-up for Composite Farm



Key: (Accounting Categories)

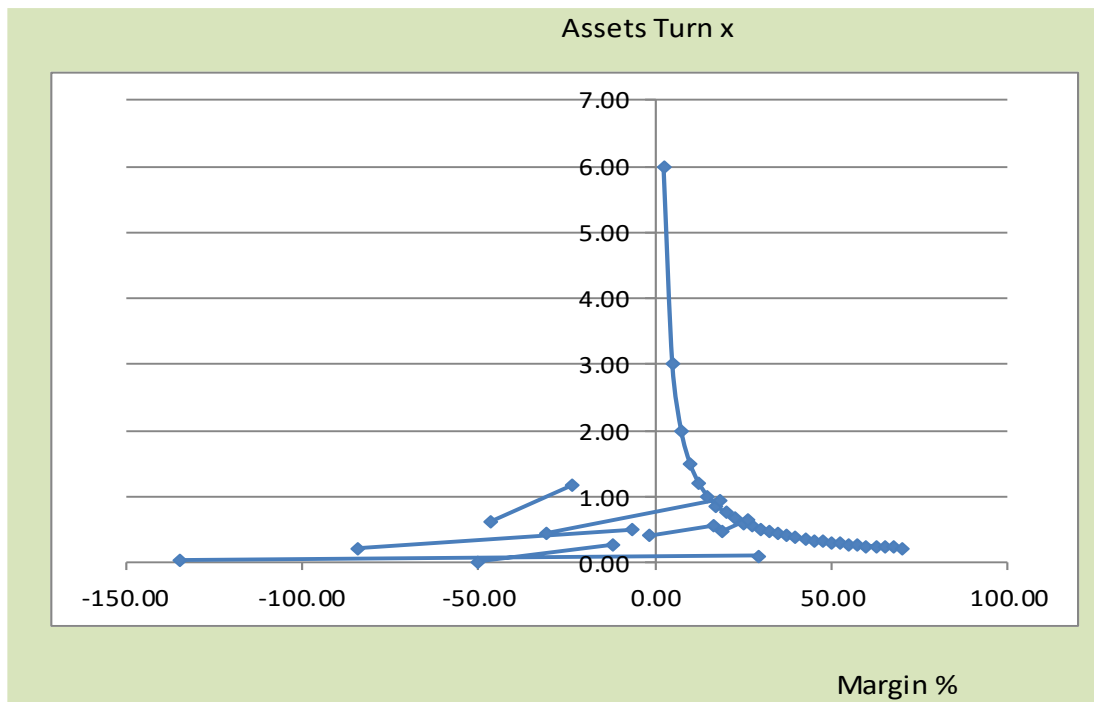
- 1- Farming Output (Before Support)
- 2- Output at MSO
- 3- 4<sup>th</sup> Level Contribution (Profit before support & after operating costs)
- 4- Support Income
- 5- Drawings
- 6- Reported Profits (Pre-tax & Interest Payments)

NB:

- 1- Output at MSO is indexed at 100.
- 2- Support is vital for ultimate profitability.

## APPENDIX 2: North Pennines - Miscellaneous Analyses

Chart II - Movements in ROTA for Study Farms: Pre-Support to Post-Support

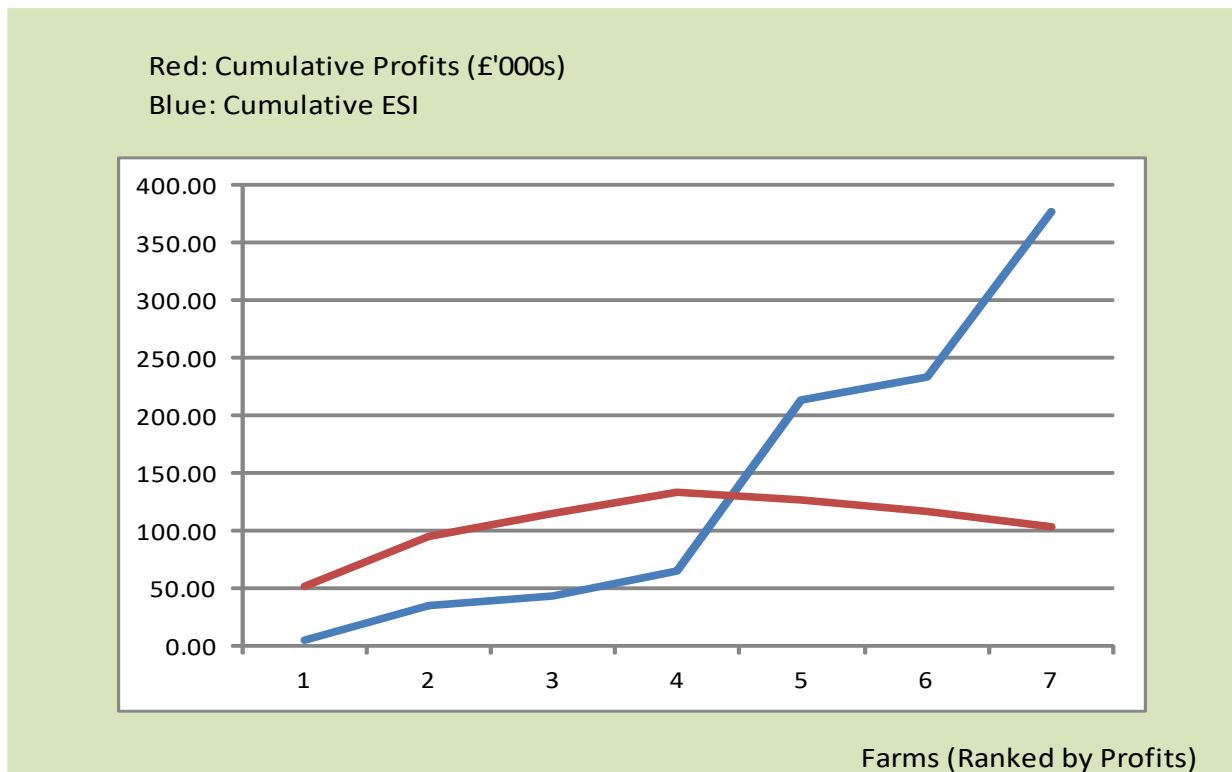


NB:

- 1- ROTA curve is set at 15%
- 2- Support payments are not sufficient to make all farms profitable.

## APPENDIX 2: North Pennines - Miscellaneous Analyses

Chart III- Comparisons of Profits Growth & ESI Growth

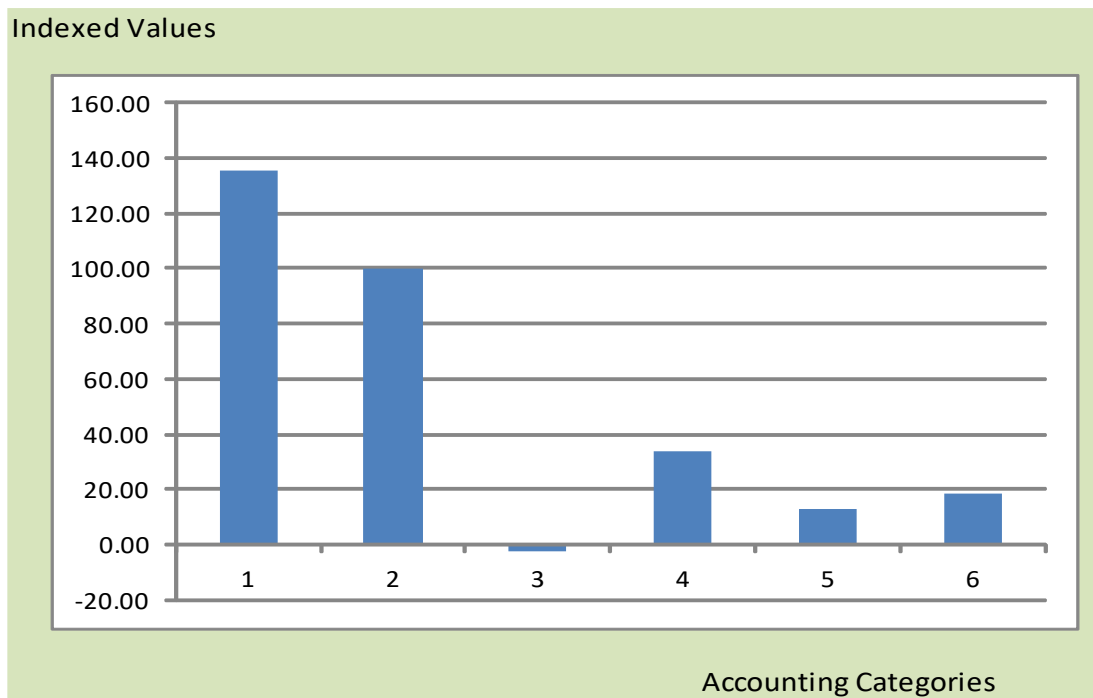


NB:

- 1- ESI is the Environmental Stress Index (See Glossary)
- 2- The more profitable farms present a lower stress on the environment.
- 3- Conversely, the least profitable farms present a higher stress on the environment.
- 4- The optimum position for this “community” of study farms is at point 4.

### APPENDIX 3: Nidderdale - Miscellaneous Analyses

Chart I- Profile of Profitability Build-up for Composite Farm



**Key: (Accounting Categories)**

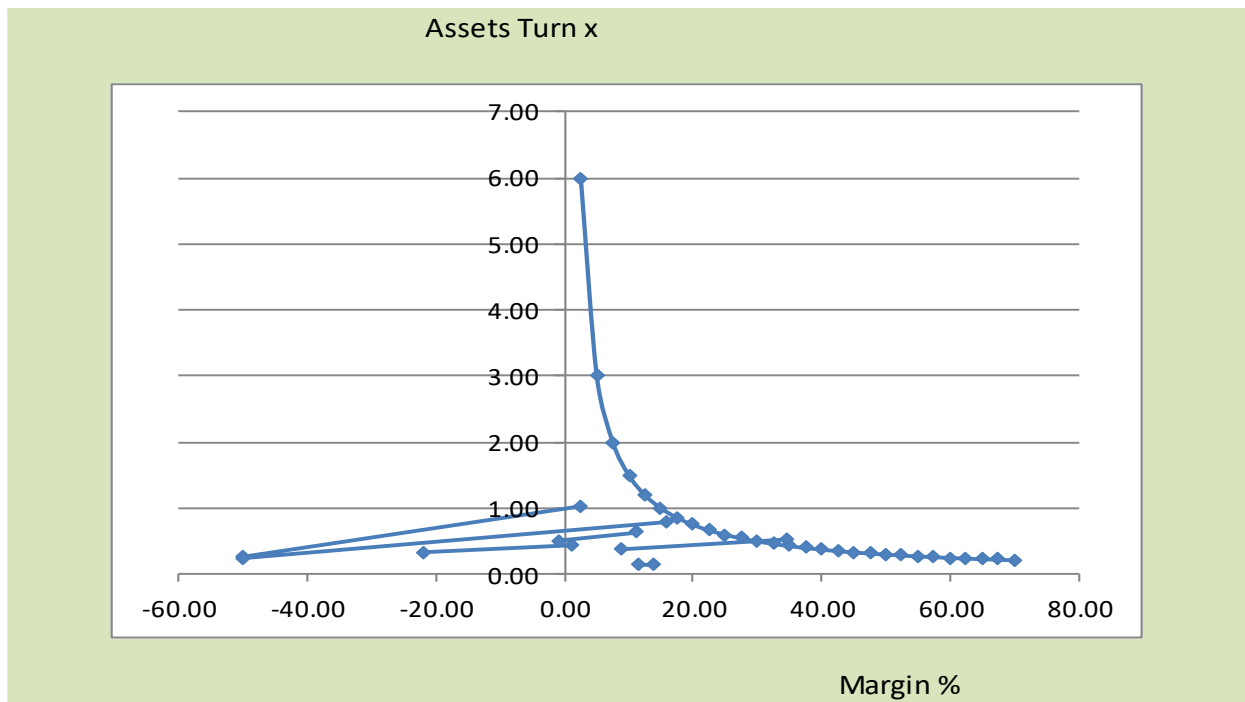
- 1- Farming Output (Before Support)
- 2- Output at MSO
- 3- 4<sup>th</sup> Level Contribution (Profit before support & after operating costs)
- 4- Support Income
- 5- Drawings
- 6- Reported Profits (Pre-tax & Interest Payments)

**NB:**

- 1- Output at MSO is indexed at 100.
- 2- Support is vital for ultimate profitability.

### APPENDIX 3: Nidderdale - Miscellaneous Analyses

Chart II- Movements in ROTA for Study Farms: Pre-Support to Post-Support



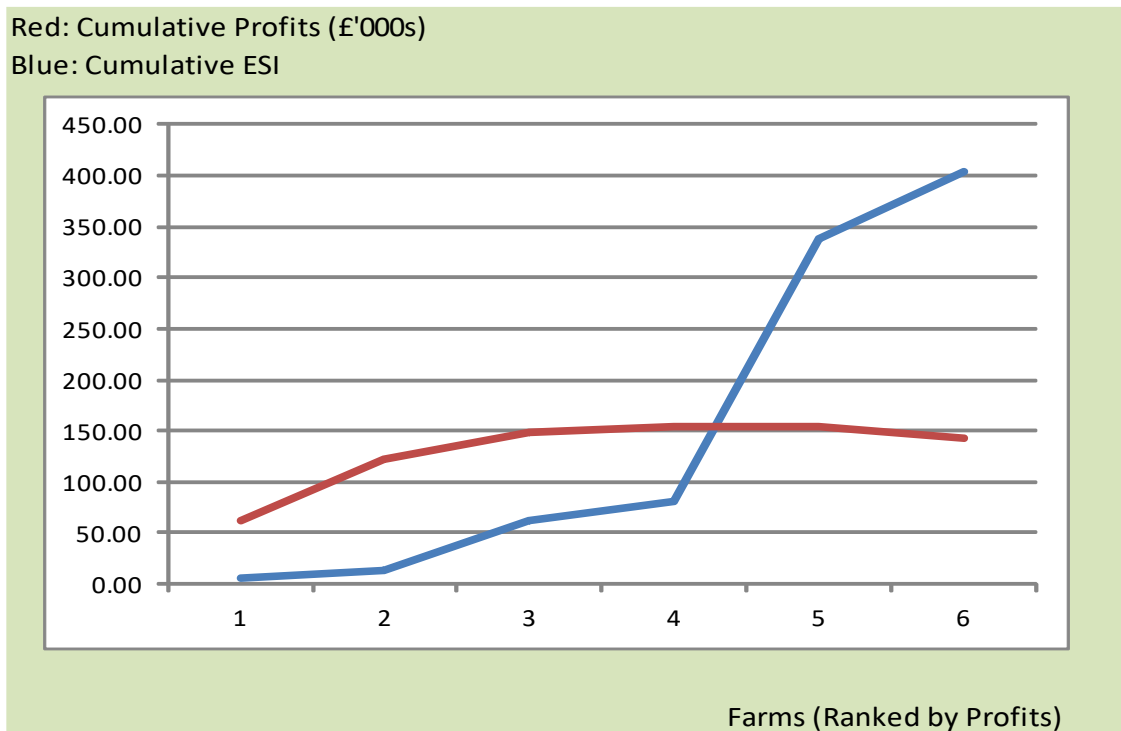
NB:

- 1- ROTA curve is set at 15%
- 2- Support payments are not sufficient to make all farms profitable.



### APPENDIX 3: Nidderdale - Miscellaneous Analyses

Chart III- Comparisons of Profits Growth & ESI Growth

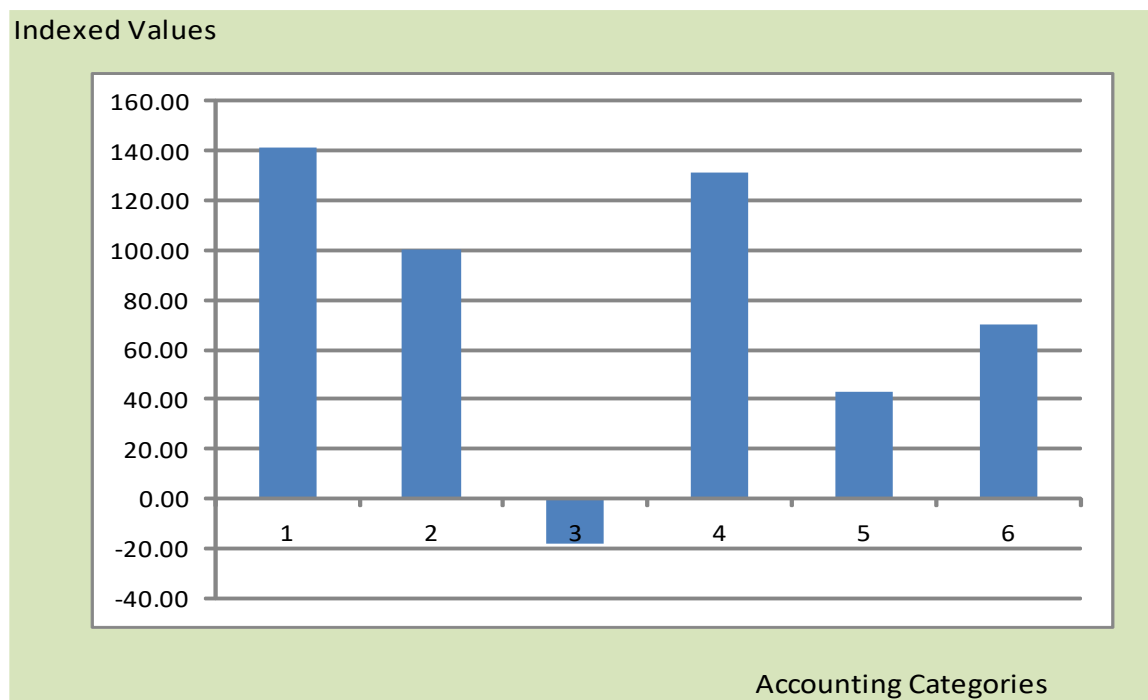


NB:

- 1- ESI is the Environmental Stress Index (See Glossary)
- 2- The more profitable farms present a lower stress on the environment.
- 3- Conversely, the least profitable farms present a higher stress on the environment.
- 4- The optimum position for this “community” of study farms is at point 4 or 5.

## APPENDIX 4: Forest of Bowland - Miscellaneous Analyses

Chart I- Profile of Profitability Build-up for Composite Farm



**Key: (Accounting Categories)**

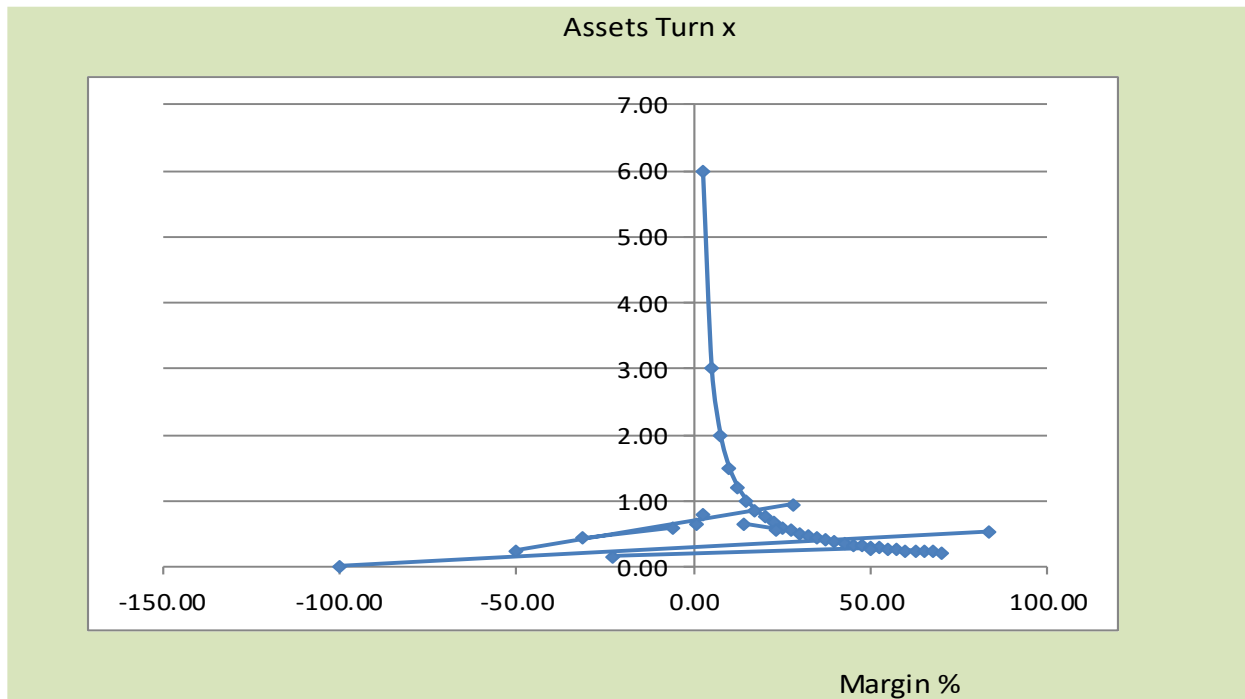
- 1- Farming Output (Before Support)
- 2- Output at MSO
- 3- 4<sup>th</sup> Level Contribution (Profit before support & after operating costs)
- 4- Support Income
- 5- Drawings
- 6- Reported Profits (Pre-tax & Interest Payments)

**NB:**

- 1- Output at MSO is indexed at 100.
- 2- Support is vital for ultimate profitability.

**APPENDIX 4: Forest of Bowland - Miscellaneous Analyses**

Chart II- Movements in ROTA for Study Farms: Pre-Support to Post-Support

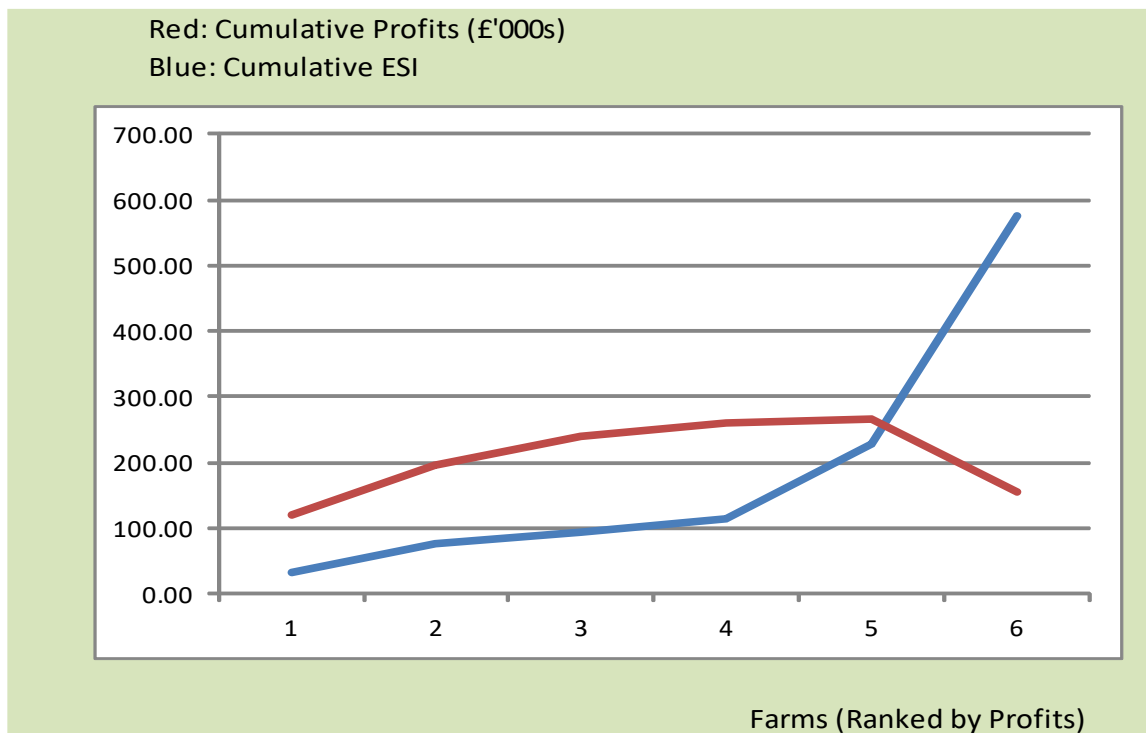


NB:

- 1- ROTA curve is set at 15%
- 2- Support payments are not sufficient to make all farms profitable.

## APPENDIX 4: Forest of Bowland - Miscellaneous Analyses

Chart III- Comparisons of Profits Growth & ESI Growth

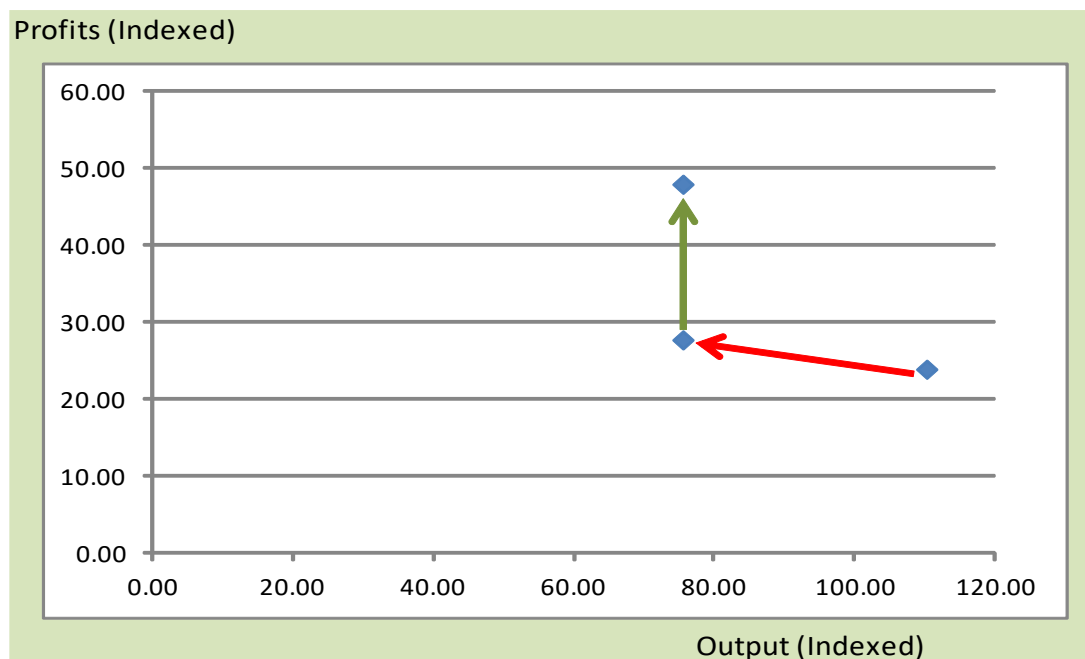


NB:

- 1- ESI is the Environmental Stress Index (See Glossary)
- 2- The more profitable farms present a lower stress on the environment.
- 3- Conversely, the least profitable farms present a higher stress on the environment.
- 4- The optimum position for this “community” of study farms is at point 5.

## APPENDIX 5: The Scope for Profits Improvement

Chart I- The Impact of Operating at MSO & Fixed Costs Leverage

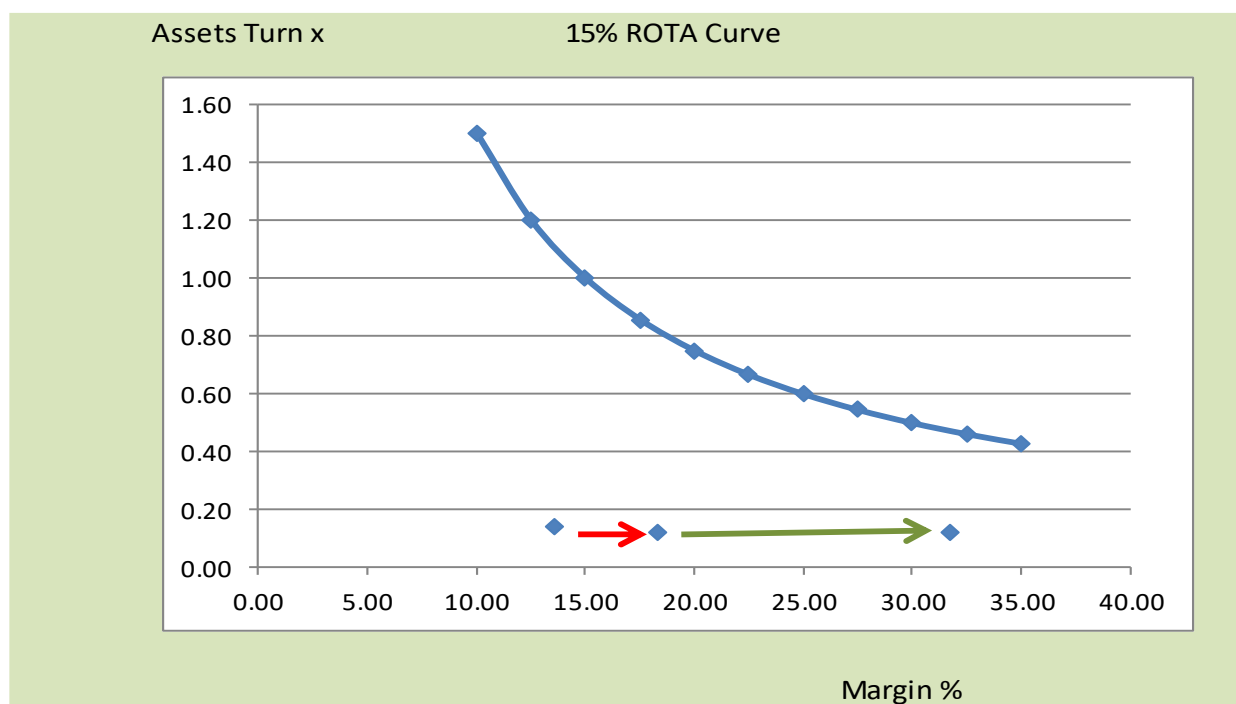


NB:

- 1- The red arrow shows the potential improvement in profits when outputs are taken down to MSO levels.
- 2- The green arrow shows the potential improvement in profits when fixed costs are reduced to 40% of total revenues (including support payments)
- 3- The indexed data relates to a composite farm drawn from the data of ALL study farms (i.e. North Pennines, Nidderdale, and Forest of Bowland)
- 4- In moving to MSO profits increase in absolute value at a lower level of output - this increases the margin of profitability considerably.
- 5- Reductions in fixed costs have a very high leverage on profits (and these can be addressed independently of moving to MSO levels)

## APPENDIX 5: The Scope for Profits Improvement

Chart II- The Impact of Profits Improvement on ROTA



NB:

- 1- The red arrow is the impact on ROTA of moving down to MSO.
- 2- The green arrow is the impact on ROTA of reducing fixed costs to 40% of output values.
- 3- Whilst there is little impact on assets turn the impact on margins is substantial
- 4- The data relates to the composite farm as in Chart I

## APPENDIX 6: Glossary of Terms

1. **“Free-issue”**: This is a term borrowed from industry where issues of parts are made to production cost centres for conversion into products. These issues of parts are charged out at a cost and the costs are eventually collected up into overall product costings. In some cases, items are issued without charges (e.g. nuts and bolts) to simplify the accounting process and these issues without charge are known as “free-issues”. In farming, grass is provided effectively on a “free-issue” basis (courtesy of Nature) and this grass, by virtue of the costs-avoided in purchasing a substitute, makes a significant contribution to farm profitability.
2. **Maximum Sustainable Output (MSO)**: In the Nethergill models (for hill farming) MSO is defined as **the volume of output commensurate with the point at which the natural grass runs out**. Beyond this point grass substitutes will be needed and these will be not only more expensive than natural grass, but they will push stocking rates beyond the point that can be maintained entirely (and therefore, sustainably) by *Nature*.
3. **Natural Capital**: When the natural resources in a business (e.g. land) are capable of delivering a revenue (e.g. from mineral ores) or a benefit in the form of cost avoidance (e.g. from “free-issue” grass) it has become the fashion to regard the resources as part of the natural capital of the business. This is a simple, powerful, and common notion; but this notion presents all sorts of problems when attempts are made to put a value on natural capital. In the Nethergill models natural capital is defined as **the capital equivalent of the operating profits made at the point of maximum sustainable output (MSO)**. This form of natural capital has been designated as **notional natural capital (NNC)**
4. **Environmental Stress Index (ESI)**: Operating profitabilities (expressed as profits as a % revenues) are maximised at MSO. This is true because beyond MSO corrective variable costs (CVCs) come into play and these invariably will increase at rates greater than the corresponding growth in revenues. Natural capital (NNC), as defined in the Nethergill models, must therefore be maximised too at MSO. Arithmetically, as this form of natural capital is maximised its inverse ( $= 1/NNC$ ) must be minimised. This simple relationship provides a basis for the measurement of environmental stress (as it is a parameter that is minimised at the point of maximum benefit from natural capital). In the Nethergill models the environmental stress index (ESI) is defined by the relationship  $ESI = KTq/NNC$  where K is a constant scaling factor, where T is a topographical rating reflecting acreage and elevation, and where q is a factor reflecting cover-type classifications.
5. **The 2<sup>nd</sup> Law of Thermodynamics**: This states that it is impossible to transfer thermal energy from a colder to a hotter body without doing work. In farming terms this is equivalent to postulating that it is impossible to substitute for natural grass without putting work/energy/cost into transforming some other material/substance into a concentrate. As the role of grass is simply to provide calorific energy **it will therefore take extra calorific energy to convert the components of some concentrate into a state equal to the calorific value of the grass it replaces**.