Nature's Bounty

Assessing the Benefits of Bio-Diversity Projects

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It is taken by many people, including qualified experts, that increasing bio-diversity in a particular habitat is a "good thing". It is also widely accepted that projects to increase bio-diversity will come at some short-term cost (at the very least) but the general expectation is that there will ultimately be some long-term benefits to the community at large. In general, many see the whole issue as a case where the short-term costs can be simply quantified but where there are real difficulties in quantifying the prospective benefits in conventional commercial or accounting terms. To reconcile these two different aspects many people, not unreasonably, argue that the costs of such initiatives are being offset by an increase in the "natural capital" of the environment, particularly bio-diversity.

Our recent work at Nethergill Associates has resulted in the development of an environmental stress index (ESI). It is a relative not an absolute measure and therefore can play no direct part in a conventional accounting system. However, its application has highlighted some surprising issues which now shed a new light on bio-diversity type projects.

All variable costs in farming fall into two groups: productive variable costs (PVCs) which are incurred when working with *Nature* and corrective variable costs (CVCs) which are incurred when substituting for *Nature*. These costs change from PVCs to CVCs at the point when the natural resources being husbanded run out and have to be replaced by purchased feed-stocks or artificial substitutes. This phenomenon produces the concept of a maximum sustainable output (MSO) on a farm. Not only is profitability (expressed as the profit% of sales) maximised at the MSO point but the ESI is also minimised. Evidence suggests that most farms (overwhelmingly so) operate above its MSO point (at a cost to its profitability) and that moving away from the MSO point, in either direction, increases the ESI. This latter phenomenon is the consequence of working in a long-established managed landscape whereby any change to the "norm" puts up the stress. The "norm" it must be remembered is the result of over 400 years of evolving farming practices.

[Scientific Note: All change in a system, from one state to another, takes work (ie absorbs energy) and this results inevitably in an overall increase in the entropy[1] of the system. This is the 2nd Law of Thermodynamics]

[1] *This is a measure of disorder. As the Universe evolves the degree of disorder increases. Therefore, to restore or create order (in a limited environment) it will take extra work and energy but overall, the degree of disorder in the total system increases.*

Therefore, whilst it may not be possible to quantify the benefits attributable to a bio-diversity scheme in conventional terms, it is possible to choose intelligently between different options - the best course of action will always be that option which has a pathway that minimises entropy change. This helps to put bio-diversity in a new context.

Farming, in general, should aspire to move to MSO levels of activity. This is best done by progressively reducing its CVCs, if not to zero, to an absolute minimum. If bio-diversity projects can be designed to increase the MSO level on a farm not only will this deliver a commercially quantifiable benefit it will have moved in such a way as to minimise the change in ESI. This latter aspect suggests that this change will then be on the pathway with the smallest change in entropy.

The question now becomes one of "how can such bio-diversity schemes be designed?" Simply adopting any scheme, no matter how "worthy" or "attractive", will not do. *Nature*, which is a stakeholder and a partner in any farm business, does not behave in a "competitive" or obvious advantage-seeking way - it plays by the rules of dice (ie chance). Changes to habitat or the introduction of wild species have to "take" or thrive without disturbing or de-stabilising the natural predatory order. The effect of such changes will never be easy to predict (except when exact replications can be made). The biggest problems thrown up when the mathematics of chance prevail are often referred to as "the laws of unintended consequences". This will be the inherent risk in habitat change or re-wilding.

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