



**Analysis and critique of Broom Barn's Research Station research report:
'Economic consequences for UK farmers of growing GM herbicide
tolerant sugar beet.'**

Summary

Recent findings published by the Broom's Barn Research Station have enthusiastically suggested vast savings for farmers growing Genetically Modified Herbicide Tolerant (GMHT) crops [1].

The research claims,

'The average national saving for UK sugar beet growers if they could use the technology would be in excess of £150 ha/ yr or £23 million/yr, which includes reductions in agrochemical use of c. £80 ha/ yr or £12 million/yr.'

Britain's Sugar Beet Growers are facing uncertain times with the "Everything but Arms" reform of the Common Agricultural Policy (CAP) sugar beet regime set to come into effect, which will ensure access to EU markets for sugar from less developed countries. Not surprisingly, cost savings such as these claimed by Broom's Barns make attractive reading to hard-pressed farmers looking to reduce growing costs and develop new biofuel markets.

farm has taken a closer look at the figures used in the research and found that the greatest proportion bear little or no relation to normal farming practice.

Although the report has apparently been peer-reviewed before being published by the Association of Applied Biologists, it contains fundamental inaccuracies that question its scientific validity and raise concerns more widely as to the independence and objectivity of other papers making similar claims for GM crops.

Farmers need to know the true facts relevant to their working practices, if they are to be able to make an informed decision about the likely costs and benefits of

GM crops to their businesses. This research from Brooms Barn does not provide the credible research that farmers need and is just one of an increasing number of research findings that bear little relation to the realities of practical farming.

It is also of concern to **farm** that the research report was peer reviewed by and published in the Annals of the Association of Applied Biologists, the very same body in which the author, M J May, holds an official position.

farm's analysis found several major flaws in the report, including the following:

- q Herbicide costs for 'conventional practice' that have been used to compare against GM equivalents have been overstated by **75%**.
- q Far from reducing costs, the contractual requirements of growing GMHT sugar beet would increase farmer's growing costs by up to **£46 per ha**.
- q Although the report acknowledges the EU proposals to segregate and label GM crops and their produce, no costs have been attributed to this or associated red tape within the analysis.
- q The report suggests that 'Band Spraying' could lessen the environmental impact of growing beet, but fails to accurately quantify the impact on yield (acknowledged by Monsanto to be 10% [2], with other published research suggesting yield loss may be up to 31% [3]).
- q Further, the capital investment and operating costs of applying this method of spraying are not insignificant yet they have been ignored in the report.
- q In the absence of specific support payments and any significant financial gain, GM crops are likely to be grown in a manner that maximizes yield and weed control within the rotation.

Herbicide Costs

One of the major claimed savings, comparing GMHT treatments with the 'conventional' treatments, relies on the figures of £100 - £120 per ha for conventional herbicide costs.

farm's survey of farmers growing sugar beet in a number of different locations (see Appendix 2) show that the actual conventional herbicide costs are in the range of £57 - £72 per ha in typical farming situations. Our findings are supported by figures published by other research stations [4] (See Appendix 3).

Therefore, Brooms' Barn has overstated conventional costs by a factor of 75%.

However, the report does give us an idea of the cost of being tied into a 'technology agreement' though, with the cost of 'Roundup Biactive' (the designated herbicide) being suggested at £4.43 per litre, compared to the generic form of glyphosate, which is currently available from £1.75 per litre – **an increased price of 255% over the generic herbicide.**

The maximum application of 6 litres per ha. therefore, would cost £26.58 compared with £10.50 for a generic equivalent – **an increased cost of £16 per ha.**

The study also establishes the order of magnitude that the technology agreement will cost farmers – **between £20 and £30 per ha.**

The total increased costs could therefore be as much as £46 per ha.

Despite high-profile court cases in the US, many UK farmers seem unaware of the implications of these technology agreements and many are under the illusion that they will be able to use generic sprays with GMHT crops.

It isn't difficult to see why the biotech. companies are so eager to promote these crops when it secures their market for herbicides, for sales of seed and also brings in an acreage payment.

Insecticide Costs

The research suggests that a cost saving of £10.50 per ha could be achieved by avoiding the need for applying an insecticide when applying herbicides. The suggestion is that,

'...leaf burrowing pests, such as leaf miner, damage beet, this can render the crop susceptible to herbicide damage with conventional herbicides. Therefore growers tend to spray with insecticide to prevent yield reductions from following herbicide treatments.'

This argument is flawed. This is not the principal or sole reason for applying insecticides. There is nothing to suggest that such savings would be achieved in practice. Most sugar beet seed is treated with 'Gaucho' (an insecticide seed coating) which helps protect the plant from attack to both its roots and leaves. In practical growing conditions, there is little need for an insecticide thereafter.

In practice, factors such as hail damage are of far greater significance and would affect GM crops and their conventional counterparts in equal measure.

Cultivations

Another “saving” suggested is that moving to a GMHT regime would obviate the need for sub-soiling due to reduced soil compaction from reduced sprayer machinery passes. This is claimed as giving a saving of £30 per ha.

Soil damage – especially deeper compaction - primarily occurs at harvesting time through tractor, trailer and harvester movements and it is these that tend to influence subsequent sub-soiling decisions.

The difference between ‘4.5 applications of herbicide’ and ‘2 applications’ under the HT regime (again we dispute these figures) just wouldn’t make any significant difference to damage to soil from sprayer tramlines, even taking into account the greater flexibility in timing alluded to. To suggest that in typical situations, the need for sub-soiling will be completely avoided is misleading.

The report also attributes a potential saving of £17 per ha by the potential to adopt ‘minimum tillage’ methods of growing sugar beet. This is misleading as minimum tillage practices are not inextricably linked to GM crops, and are indeed being practiced in many conventional systems. The report fails to identify or quantify the effect on yields of using minimum tillage techniques.

Wind erosion

Wind erosion occurs when there is little or no ground cover - typically, immediately after planting when dry soil has been disturbed. However, this is only a significant problem on sandy soils or peat soils and as such, constitutes only a small percentage of the area of land upon which beet is grown.

In order to minimise the effects, growers with soils particularly prone to this have adopted the practice of first establishing a cereal crop, such as barley, and then sowing the sugar beet between the rows of that crop at a stage where the barley has emerged but not become competitive. Weed competition is one of the most significant factors in the establishment of sugar beet, and any form of competition during the emergent phase can have a huge impact on the plant development of the sugar beet and the final plant population.

The report suggests a potential saving of £22 per hectare by allowing weeds to remain during the establishment phase and to act as a wind erosion control. It is highly unlikely however, that weed coverage would be either uniform or be able to meet the requirements of providing a stabilising effect whilst having minimal impact on the germination and development of the plant. Such management strategies are by no means the sole preserve of GM crops and they are equally applicable to conventional crops.

Sprayer costs

We were unable to find any farmer who felt, as the research suggests, that adoption of GMHT crops would allow them to dispose of a 'second sprayer' kept specifically for spraying Sulfonylurea herbicides - a claimed cost saving to farmers of £85 per ha.

Bolter control

(Sugar beet is a biannual plant, but approximately 1% of crop beet 'bolts' – i.e. seeds in the first year and, if not controlled, creates a seed bank of volunteer beet that emerges as 'weed' beet in following sugar beet crops)

Very few farmers facing a cost of bolter weed beet control at £500 per ha would continue to grow sugar beet on that land given the opportunity to use other fields or to move production to clean land (e.g. under a contract farming agreement.)

The problem of weed beet has arisen from a combination of problems including inadequate rotational control (through pressure on land), failure to remove seeds from previous bolters, and control of volunteer plants growing from root residues. There is no evidence to suggest that the same problems won't emerge with GM crops.

A significant fact that hasn't been acknowledged in the report is that bolters from GMHT weed beet cannot be effectively controlled with glyphosate in a following GM sugar beet crop.

Despite the inclusion of these highly tenuous 'benefits', very few of the likely costs have been included. One missing cost would be that for segregation:

Segregation costs

GM Sugar Beet is more than likely to be subject to the need for segregation in the way that most GM crops will need to be in order to comply with labeling requirements. Even if the primary product is not destined for food or feed use (e.g. for Bioethanol), the processing residue will have to be segregated and labeled. This will require a rigorous audit trail with assured segregation measures throughout the production chain. That itself will incur costs for grower and processor alike creating even more red tape, meaning that commodity prices are unlikely to be as high as for conventional sugar beet.

The research factors the value of the crop residues into the growers' returns. However, it is uncertain whether the animal feed industry would accept GM beet pulp and if it did, it is unclear at what price.

Reduced environmental impacts

Even claims that a more environmentally friendly method of production will be possible, ignore the likely modes of adoption by farmers. Given the additional costs of the herbicide and the cost of the technology license fee, farmers will be reluctant to incur any reduction in yield resulting from weed competition unless there is specific incentive to do otherwise. The commercial pressures that farmers face mean that many of the 'potential' management regimes that could encourage weeds & wildlife will never get beyond trial plots on research stations.

farm believes that likely patterns of adoption mean that farmers will take full advantage of the potential to 'clean' the land before the following cereal crops, which would result in a virtual monoculture.

The direct impact on yield likely from adopting the sorts of management practices needed to deliver these environmental benefits have been suggested to be 10% by Monsanto, with other research suggesting this figure could be as high as 31%. Given typical yields of sugar beet at 50 tonnes per ha and an adjusted value of £28 per tonne, this suggests a cost of £140 to £430 per hectare in loss of yield alone, quite aside from the increased costs incurred through applying sprays in this way.

Clearly, to deliver such environmentally-aware management regimes, financial incentives would have to be provided of a similar order to these yield losses. If such payments were available, then there are a range of non-GM management regimes available that could deliver similar, if not greater benefits.

Stewardship schemes being currently trialed suggest arable payments of around £30 per hectare may be available and as such are significantly less than that needed to encourage adoption of these practices within the management of GM crops.

All of the above presumes that the adoption of GM crops would occur without any unforeseen problems. With the worrying lack of objective research into the possible environmental impacts and longer-term effects on human and animal health, those concerns remain valid and the extent to which the biotech. companies are actively ducking any liability undertaking does little to instill any confidence in their warm words.

It isn't difficult to envisage who will be blamed should, as experience from the US suggests is likely, the reality of GM technologies fails to live up to the hype. It will be farmers, who will be accused of putting commercial interests before wider environmental and public concerns.

References

1. Economic consequences for UK farmers of growing GM herbicide tolerant sugar beet
By M J MAY, Broom's Barn Research Station, Higham, Bury St Edmunds, Suffolk IP28 6NP, UK
Published by the Association of Applied Biologists (2003) 142:41-48
(Accepted 21 January 2003; Received 15 November 2002)
2. CROPS magazine, (published by Reed Business Publication) 15th February 2003, p34-35
3. Pest Management Science, Vol 56, Issue 4, 2000. p 345-350 April 2000
4. Morley Bulletin 145, February 2003; 'Sugar Beet Growing Costs' by Martin Lainsbury

Appendix 1

Economic consequences for UK farmers of growing GM herbicide tolerant sugar beet

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(Accepted 21 January 2003; Received 15 November 2002)*

Table 1. *Cost comparisons* (Figures in red we consider to be unrepresentative of normal practice.)

	Current average cost £ ha ⁻¹ (where applicable)	Average GMHT cost £ ha ⁻¹ (Where applicable)	% Area applicable	Estimated average savings or gains. £ ha ⁻¹	Maximum saving or gain on individual field or farm £ ha ⁻¹
Herbicide cost in beet	100-120	13-27	100	80	237
Herbicide applications	29 4.5 applications	13 2 applications	100	16	33 (e.g. peat soils)
Technology fee	-	20-30	100	-25	-30
Consultancy	3	0	100	3	10
Nozzle changes	1	0	100	1	1
One less sprayer					85
Weed beet and bolter control	15-500	5	70	10	500+
Yield loss from weed beet	6	0	7	2	138
Set-aside groundkeeper control	11	37	25	-8	-26
Rotational weed control	13	8	30	2	8
Stubble spraying	15	0	30	5	16
Manganese use	2	0	55	1	2
Insecticide use	11	0	10	1	11
Subsoiling	30	0	30	10	30
Minimum tillage	34	17	25	4	17
Wind erosion	22	0	5	1	19
Wind erosion – cost of redrilling					181
Wind erosion – loss of yield					73
Stewardship option					40
Reduced area owing to higher Yield	0	50 Reduction owing to less area required for contract		100	50

Appendix 2

Analysis provided by FARM

Sugar beet herbicide costs:

Two regimes are commonly used:

1. On loams and silts one pre-emergent application followed by two post-emergent applications
2. On peat soils and soils with a very high weed burden the **FAR** technique is employed using very low doses at a 7-day interval over a 5-7 week period. This method is effective but the schedule is very demanding.

Generic herbicides employed as tank mixes within the figures quoted. (herbicides are applied along with trace elements and fungicides in the mix as required)

Pre- emergent	chloridazon
Contact	pharediphan; ethfumsate; metamytron; lenacil; triflusulfuron-methyl

Case Studies:

The following costs for herbicide in 2002 sugar beet crop to achieve an acceptable level of weed control as supplied to FARM (individual farmers have asked for their identity to be withheld but the range of soil types and locations are indicative of the region):

Newark , Notts	Warp soil type	£27.89/acre (£68.90/ha)
Vale of York	Loam soil type	£29.04/acre (£71.72/ha)
Bourne, Lincs (FAR technique)	Black peat	£23.24/acre (£57.40/ha)

Appendix 3

Sugar Beet Growing Costs

Morley Bulletin 145, February 2003

Sugar beet herbicide costs:

Two models are suggested:

Pre- emergent chloridazon 430 @ 2.5 L/ha

£11.75

FAR 1 herbicide application 0.5 Betanal Flow
+0.2 Nort Flo
+0.5 Goltix

£13.50

FAR 2 herbicide application 0.5 Betanal Carrera
+0.2 Nort Flo
+0.5 Goltix
+0.5 Gif

£15.00

Graminicide application 1.0 Laser
+ 1.6 L/ha oil

£25.60

FAR 2 herbicide application 0.5 Betanal Flow
+0.2 Nort Flo
+0.2 Venzar
+0.5 Oil

£10.50

TOTAL
£76.35

NB. This spray regime leaves considerable scope for savings to be made where rotations and previous cropping present comparatively light weed burdens.