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PG Economics comments on the Greenpeace paper 'GM and dairy cow feed: steps to a GM-free future for the UK dairy industry'

Greenpeace UK has recently published a paper[1] advocating that the UK dairy sector should make fundamental changes to the way in which milk is produced in order to avoid the use of feed ingredients that are derived from GM crops. In sum, the report advocates that in the long run the sector should move to a more extensive production system, using a larger number of, lower yielding cows, fed on UK grown protein crops (notably lupins) and on-farm grown forage. In the short term, the sector is encouraged to switch to using non GM derived protein ingredients in dairy rations. Any additional costs associated with these changes should be borne by supermarket and other major food retailers in the UK, although government support is also expected to assist farmers to grow more protein crops in the UK.

The report is, however fundamentally flawed in several areas. It:

- shows poor understanding of how markets for and trade in agricultural commodities, feed ingredients and food products function;
- Fails to address a number of relevant technical and cost issues;
- Fails to put important data used in context;
- Uses data that is not representative and/or is factually inaccurate;
- Makes a number of subjective assertions which are not supported by evidence.

In addition, it is disingenuous towards the UK dairy farming sector which, currently provides a quality assured product, to very high health and hygiene standards, and which meets UK market requirements in a cost effective and competitive manner.

More detailed comments on the paper are presented below[2].

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[1] GM and dairy cow feed: steps to a GM-free future for the UK dairy industry
[2] These are not exhaustive and highlight some of the main deficiencies of the paper

Detailed comments on the Greenpeace paper 'GM and dairy cow feed: steps to a GM-free future for the UK dairy industry'

Poor understanding of markets

1. *Structural change in the dairy production*. Section 1, suggests that a decline in the farm level price of milk is the only factor influencing structural change. Structural change is affected by several factors that have their foundation in competitiveness issues (a need to be cost effective and efficient producers). Through structural change (into fewer, larger herds), most dairy farms derive economies of size, lower average costs of production and use resources more efficiently. In turn this contributes to a lower real cost of production and lower long term real prices for consumers.

2. *Trade and employment effect*. The paper suggests (section 4) that a move to a more extensive production system will reduce imports and create additional rural employment. This shows poor understanding of the importance of competitiveness to the dairy production sector, as a supplier of raw materials to the dairy processing sector, how the UK food economy works and the importance of trade to the UK economy (including international trade obligations):

   - Just over 50% of all milk produced in the UK does not enter the liquid milk market but goes into processed products such as butter, cheese, yoghurt and skimmed milk and/or is used as an ingredient in the manufactured food sector (eg, confectionery). These businesses operate in highly competitive and 'open' markets and therefore need to source the most competitively priced raw materials available. If they cannot obtain raw material (milk) at competitive prices they risk loss of competitiveness both in export markets and the UK domestic market;
   - A loss of competitiveness in UK origin raw materials (milk) is likely to result in either a) increased importation of milk or a first stage processed product (like skimmed milk) as a raw material or b) re-location to other countries where dairy raw materials are available at competitive prices. The net result may be the export of added value production, income generation and employment away from the UK. In addition, imported dairy products are likely to be more competitively priced for sale in the UK market and may result in an increase in the import share of the UK dairy product market (the UK already currently has a net trade deficit in dairy products of £651 million[3]);
   - The UK is an 'open' economy with international trade obligations (eg, membership of the EU and the World Trade Organisation). The UK cannot isolate itself from international competition (eg, through the application of additional import duties) and therefore any move that reduces the competitiveness of domestic production is likely to result in increased imports (see above).

3. *Markets for milk.* The report (section 7) suggests that in order to provide liquid milk that comes from cows fed on a non GM diet that only a small increase in the price of milk paid by supermarkets will be required (about 0.5 pence/litre). This does, however fails to take into consideration the nature of the dairy market in which just over 50% of milk is used in the manufacture of processed products. Unless we assume that there is strong demand for processed dairy products (as well as liquid milk) derived from cows fed a non

[3] Source: Dairy Industry Association

GM diet, the burden of any cost increase in using non GM feed ingredients would have to fall on the liquid milk market only. Given the liquid milk market share of utilisation, this suggests that any price premia paid by supermarkets for liquid milk derived from cows fed on a non GM diet would have to be at least double the level suggested by Greenpeace. Also, the cost increase estimate by Greenpeace does not take into consideration other important technical and cost factors (see below) which would further increase the additional cost burden.

Failure to fully consider technical and cost implications

1. *Scope for use of lupins as a primary source of protein in the dairy ration*. The report fails to take into consideration a number of factors that compromise the suggested increased focus on lupins as a preferred source of protein (replacement of soymeal and maize gluten) in the dairy diet:

    - Winter sown varieties (higher yielding than spring varieties) suffer from a range of agronomic weaknesses (eg, require an extended growing season, yield inconsistency and a relatively high pesticide requirement (higher than peas, beans and oilseed rape);
    - Spring grown varieties yield between 0-4.19 tonnes/ha (protein content 28.1-43.85). The average is estimated by PGRO to be 2.5 tonnes/ha (protein content of 35%). The crop requires good weed control (a recent PGRO organic trial crop failed due to excessive weeds) and applications of fungicides to control diseases. Overall, the combination of relatively high variable costs of production plus low and unreliable yields, mean that spring lupins are only a cost competitive crop for a very small number of arable growers and mixed farms where lupins are consumed on-farm;
    - Yield and protein content tend to be inversely related – the higher the protein content, the lower the yield;
    - The high fibre content of lupins (about 33%) mean that it is a poor feed for young animals[4]. Relative to soybeans, lupins also have lower levels of essential amino acids such as lysine and methoinine. Protein from lupins also tend to be more accessible in a cow's rumen resulting in high urea/nitrogen levels in milk and poor feed conversion rates;
    - The scope for the relative competitive position of lupins improving in the future will be determined by the ability of breeders and growers to produce higher and more consistent yields (output and protein content);
    - The market price for lupin seed is a function of the availability of competitive protein crops and feed (which define the value of protein crops for animal feed). The market price of UK origin lupins is, and will be driven by the availability of imported lupins[5]. Hence, market prices will be determined by factors other than the cost of production in the UK – if the UK cannot produce lupins at a price that can compete with imports then domestic production will not expand (as required by Greenpeace);
    - Soil acidity levels constrain the scope for widespread planting of lupins. Rothamsted Research has estimated that there is sufficient acid and neutral land

[4] This is mainly of relevance to monogastrics (ie, not dairy cows) but could be of relevance to any dairy farm that also rears pigs or poultry and is looking to source feed ingredients in a cost effective manner

[5] 30,000 tonnes of lupins were imported in 2002, mainly from Australia

in the UK to increase the area of lupins to a maximum of 130,000 ha (given that lupins can only be grown one year in five, if seedling fungal disease problems are to avoided);

- Current lupin production in the UK comes from 7,000 ha (mostly spring sown) producing 17,500 tonnes, and equivalent to about 17,000-18,150 tonnes of soya meal[6]. Greenpeace's estimate of 162,393 ha of UK grown lupins required to replace the estimated 389,740 tonnes of soymeal currently used in UK dairy feed is probably an under estimate. PG Economics estimate the area required would be 267,500-285,000 ha[7] (if we assume that lupin seed could replace soya meal in the animal ration, growers want to grow the crop and enough land is suitable for lupin production);
- Lupins are not a native arable crop to the UK. If large scale planting of such a crop is proposed, it may be appropriate to first undertake a full ecological and biodiversity study to determine the implications of the crop in the UK environment.

2. *Additional costs*. The Greenpeace analysis only explores the possible impact on the cost of dairy production of switching to using a non GM feed ingredient in current dairy rations and at current prices. It does not explore the impact on costs of switching to a 'lupin-based protein ration' or wider implications of a more extensive production system. For example, any move to a more extensive production system that necessitated an increase in the number of dairy farms would possibly require more labour[8]. Labour is an important element of total dairy costs of production (equal to 4.4 pence/litre (24% of total costs) in England in 2002-03). In addition, as indicated above, lupins have lower levels of available amino acids like lysine and methionine than soybeans. This means that a lupin-based diet is likely to be deficient in essential amino acids relative to a soy-included diet and hence may contribute to poorer feed conversion rates, unless amino acid supplements are added to feed[9].

3. *Implication of cost changes at the farm level.* Section 7 fails to take into account the context of an increase in costs relative to dairy profitability. Drawing on the comprehensive analysis of dairy profitability[10] by the University of Manchester for 2002-03, the average net profit margin across all dairy farms in England was only 0.13 pence/litre, within a range of 2.19 pence/litre for the best performing quartile and -4.29 pence/litre for the worst performing quartile. In context, an extra 0.46 pence/litre cost to a dairy farmer is equal to +354% of the average 2002-03 profit level and if any of this additional cost was required to be absorbed by UK dairy farmers, it would effectively push even more into a loss making position.

4. *Production base post switch to a more extensive production system*
The Greenpeace report does not provide any estimate for the expected level of milk production in the UK after implementation of the suggested changes. If it is assumed that

[6] Depending on the protein % assumed for soymeal

[7] Taking into account an average lupin protein level of 35%, soymeal protein level of 45%-48%, the different ways in which soymeal and lupin protein are processed to extract oil and the poorer availability of protein in a cows rumen (these latter two points effectively mean that one kg of protein equivalent from lupins is roughly equal to about 0.75 kgs of protein equivalent from soymeal)

[8] Labour requirements could equally go down under an extensive system, if it required less over-wintering

[9] The vast majority of which (eg, lysine) are derived from GM fermentation production techniques using GM crop substrates (methionine being the exclusively chemically derived exception)

[10] Coleman & Harvey (2003) Economics of milk production in England and Wales 2002-03, University of Manchester

current levels of UK milk production were to be maintained, additional grassland will be required for forage production. This would have to be diverted from other land uses and could require the conversion of ecologically sensitive, rough grazing land into more permanently grazed pasture.

Factual inaccuracies, mis-representation and subjective statements

1. *Dairy cow welfare*. Greenpeace make the inference that extensive dairy production will bring welfare gains by the movement away from high concentrate diets (that have an assumed negative impact on animal welfare). This is a gross simplification and undermines the professionalism of UK dairy managers and stockmen. High output dairy production systems are sometimes linked with a greater risk of mastitis, lameness and infertility, so animals require good standards of care to maintain a satisfactory standard of welfare. This is as much a challenge to the intensive dairy producer as it is to the extensive dairy farmer because each has to ensure a balanced diet and good management practices to maintain fertility and feed conversion rates. In respect of the two issues of mastitis and lameness:

   - *Mastitis***.** The incidence of both clinical and sub-clinical mastitis has fallen over the last 30 years despite the increase in intensity of production systems (eg, somatic cell counts which provide a broad indication of the general level of udder health within a herd fell from about 600,000 cells/ml in 1971 to about 170,000 in 1997 and clinical cases per 100 cows have fallen from 135 in the early 1960s to about 35-40 currently);
   - *Lameness***.** High yielding cows appear to be more vulnerable to lameness, and require the highest standard of management to avoid being at risk. While intensive management may be a risk factor for foot health, the evidence of this linkage is not convincing. Nutrition is more likely to be a major influence if it is unbalanced or if there has been previous damage to feet.

   All UK dairy farmers and stockmen are likely to be aware of and adhere to the Farm Animal Welfare Council's welfare standards and guidelines known as the Five Freedoms[11], especially as these are integral parts of the National Dairy Farm Assured Scheme (NDFAS). Essentially, good welfare can be achieved through a high standard of stockmanship, effective management, adequate housing and well-maintained equipment. Poor standards of welfare are result of poor management which can occur in both extensive and intensive systems.

   It is also important to recognise that efficient dairy production requires healthy cows that are provided with the welfare 'freedoms'. If these are not provided, efficiency and profitability suffer; it is therefore not in farmer interests to neglect the welfare of their cows.

   A movement to a more extensive production system will not alter the need to provide for dairy cow welfare, it will simply change the emphasis to issues of relevance to a production system that has poorer total feed conversation rates from grass and forage and will require additional grassland area to produce the current UK production level.

[11] Freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury and disease, freedom to express normal behaviour and freedom from fear and distress

2. *Environmental impacts of GM soy and maize crops.* Section 2 cites work by Charles Benbrook which claims that following GM crop use in the US, pesticide usage has increased. United States Department of Agriculture (USDA) pesticide usage data does not support Benbrook's assertions. Benbrook makes adjustments and amendments to USDA data in order to draw conclusions about US farmer herbicide usage on GM crops (eg, for 2003) and hence assert that herbicide usage on GM crops has increased. These are not supported by USDA data and therefore to imply otherwise is misleading and inappropriate. He also fails to highlight the eco-friendly nature of glyphosate compared with alternatives used before the introduction of GM crops. There is also a reasonable body of evidence in North America that shows that the use of herbicide tolerant GM crops has resulted in reductions in total herbicide usage (eg, Gianessi et al 2002, Fernanez Cornejo et al 2003, Canola Council 2001) and/or resulted in switches to more environmentally benign products. The technology has also contributed towards increased use of low/no tillage techniques which reduce the number of tractor runs and frequency of ploughing and hence yield savings in diesel use and a positive contribution towards reducing greenhouse gas emissions[12].

3. *Environmental impact of switching to a more extensive production system.* The Greenpeace paper fails to recognise that moving to a less intensive production system, based on more cows will lead to more methane being produced per unit of milk produced. This will make a negative contribution towards reducing greenhouse gas emissions.

4. *Health and safety aspects of consuming GM derived foods or livestock products derived from animals fed on a non GM diet.* There is no evidence to support any assertion that GM crops, derived foods or livestock products derived from animals fed GM ingredients are unsafe. There are numerous scientific papers and studies that have examined the issue and bodies such as the World Health Organisation, the British Medical Association, the Royal Society and the UK government's Scientific Review Committee have all examined the issue in detail. The key conclusion from all this work is that GM derived foods are at least as safe as conventionally produced foods to consume. In addition, it should be noted that:

   - No research has ever found DNA or protein from GM crops in livestock products from animals fed on a diet that includes GM ingredients;
   - The consumption of some GM crops by animals and humans (notably maize) may be contributing a positive health benefit – GM (Bt) maize tends to have lower levels of mycotoxins than conventionally produced or organic maize.

5. *Self sufficiency in dairy ration ingredients*. Section 4 suggests that a move to a more extensive production system utilising domestically grown proteins would significantly improve the self sufficiency of the UK in terms of dairy ration supplies. This mis-represents the current position of the sector where less than 10% of all dairy rations are estimated to be derived from imported soy and maize products[13].

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[12] Consultancy support for the analysis of the impact of GM crops on UK farm profitability (2003), appendix 5, by PG Economics for the Cabinet Office. www.pgeconomics.co.uk

[13] Based on a typical dairy rations comprising about 16 kgs of dry matter per day consumed per cow of which 10.5 kgs are derived from on-farm forage and 5.5 kgs are derived from compound feeds. Within the compound feed 25% composition is assumed to come from a combination of soy and maize gluten

6. *Origin of soy imports*. The paper suggests in section 2.1 that 'much of what is imported (soya) into the UK is sourced from GM producing countries'. In fact, in 2002-03, two-thirds of all soybeans and meal imported into the UK came from Brazil, the primary source of non GM soy in the world.

7. *Use of compound feed*. The UK dairy sector has not become more reliant on the use of manufactured feeds, high in protein and energy, as suggested in section 1. The total volume of dairy compound feed manufactured in the UK for use in the UK dairy sector has fallen by over 12% during the last ten years (from 3.13 to 2.75 million tonnes[14]).

8. *Demand for livestock products derived from animals fed on a non GM diet*. There is a claim (executive summary) that 'GM-free meat is widely available in the UK'. There are no GM animals commercially reared in the UK, therefore GM animals and GM derived meat do not exist. Whilst, meat from animals fed on a diet of non GM ingredients is available in the UK, it is found concentrated in the fresh poultry and egg sectors. Very little of the other meats and livestock products (eg, pigmeat) are required to come from animals fed on a non GM diet.

Failure to place important information in context

1. *Cost implications*. Section 7 assesses the likely impact on the costs of milk production of using non GM feed ingredients – and put this at between 0.23 and 0.46 pence per litre. Whilst this may be a reasonable reflection of the current cost differentials between GM and non GM derived soy and maize derived ingredients, it fails to take account of likely future market dynamics in the non GM and GM derived soy and maize markets. If the UK dairy sector were to make a major move away from using GM derived soy and maize-based feed ingredients, this will increase demand for these ingredients significantly and likely result in a widening of the price differential between GM and non GM derived soy and maize. Whilst it is speculating as to where this price differential may go in future[15] it is likely to widen beyond the 10% price differential included in the Greenpeace analysis. If a 20% price differential occurred then the additional cost would be equal to about 0.9 pence/litre before taking into account the limited share of total milk usage accounted for by the liquid milk market. If it assumed that all of this additional cost is to be borne in the liquid milk market, the extra cost is likely to be at least 1.8 pence/litre.

Questionable assumptions

1. *The level of demand for non GM derived products*. A key assumption used in the report is that there is widespread consumer support for the use of non GM diets in dairy rations and that there is generally little or no demand for GM products in the EU (ie, that there is strong demand for non GM products). This perception does, however fail to take into consideration several factors that suggest otherwise. These include:

    - In relation to soybeans and maize, a minority (27% of soybeans and derivatives and 36% of maize) are estimated to be required to be certified as from non GM sources across the EU;

[14] Source: DEFRA

[15] See for example Consultancy support for the analysis of the impact of GM crops on UK farm profitability (2003), appendix 3, by PG Economics for the Cabinet Office. www.pgeconomics.co.uk

- where markets have actively required the use of non GM crops and their derivatives to be used, these have, to date been relatively easily obtained at prices that are similar to, or trade at only a small positive differential relative to their GM alternative. Any additional cost associated with this supply (relative to a cheaper GM-derived alternative) has largely been absorbed by the supply chain upstream of retailers, with no impact on consumer prices. When the supply chain has been able to demonstrate difficulty in absorbing even small additional costs involved in using only non GM ingredients (eg, in some of the livestock product sectors) to their customers in the retail sector, the non GM requirement has tended to be dropped or made less demanding (eg, applying only to premium ranges of products rather than all produce) rather than the additional cost being accepted by retail chains and/or passed on to final consumers. This behaviour suggests that the level of demand amongst end consumers for non GM products is highly price sensitive and would fall substantially if a consumer price level differential were to develop between GM and non GM derived products;
- consumer market research studies that have examined factors of importance to consumers when buying food[16] (eg, Institute of Grocery Distribution in the UK in 2003) suggest that for a significant majority of people, the issue of whether their food is derived from GM crops is not important. For example, the IGD research found that 74% of respondents 'are not sufficiently concerned about GM food to actively look to avoid it' and it is not seen as a priority. An additional 13% of respondents indicated that they would welcome GM products on supermarket shelves.

2. *Supermarkets absorbing any additional costs*. The report advocates (section 8) that any additional cost associated with switching away from using the most cost effective and competitive dairy feed ingredients should be absorbed by supermarket retailers. Why should retailers absorb these costs? As a part of the supply chain, operating in competitive market economy, retailers aim to supply what consumers want at competitive prices. If a significant number of consumers want to consume milk derived from cows fed on a non GM diet then these consumers should be willing to pay the relevant (higher) price for the use of such ingredients. On this point it is important to recognise that using non GM ingredients will result in a net increase in the cost of dairy feed mainly because non GM soy and maize ingredients are more expensive to produce than GM alternatives (reflecting the cost saving attribute of GM technology). Also, consumers who wish to consume milk derived from cows fed on a non GM diet can already buy such a product - organic milk is widely available in all of the main food retail outlets in the UK.

   In effect the suggestion that retailers should absorb any additional cost, is *de facto* suggesting that supermarkets operate a form of production subsidy to UK dairy farmers, at a time when EU support policies to the dairy sector are being reduced as part of the 2004 CAP policy reforms.

3. *Government support*. The suggestion that the government should also provide additional subsidies to assist the production of more domestically produced protein crops (section 4) is also at odds with current CAP policies which are targeted at making agriculture more market oriented and less supported. Soy and maize feed ingredients are currently widely

[16] We draw an important distinction here between consumer market research that examines factors affecting actual food buying habits/factors of influence and more simplistic surveys of consumer views on GMOs. Most of the latter form of research has been of very limited value because findings have been biased by the language used in questions, the existing (poor) knowledge of respondents and failure to explore and verify actual buying behaviour relative to views expressed

used in dairy rations because they have technical attributes favourable to efficient milk production and are mostly imported because these products come from countries that can produce them more efficiently and at a lower cost than is possible in the UK (and most of the EU).