

Supply chain analysis: more than LCA alone

A comparison of South American soy and European legumes

Summary

There are serious sustainability issues with South American soy production, due largely to the rapid increase in soy acreage triggered by a marked rise in global demand. This expansion has led to large-scale deforestation in the Amazon basin, to degradation of the Cerrado - an ecologically important savannah area of Brazil - and to forced migration of peasant communities. A number of NGOs have called for action to address these issues.

One of the crop's main applications is in the form of soybean meal for animal feed. A possible solution to the cited issues might therefore be to replace the soy-based feed used in Europe today with feed made from home-grown ingredients. There are several leguminous crops eligible for this purpose, in particular peas, field beans and lupins.

To assess whether substitution of imported soy by European legumes is a sound strategy, aspects of feasibility and sustainability need to be analysed. Prior to such analysis, though, methodological guidelines are required on how sustainability is to be assessed.

This report presents a proposal for such guidelines. The aim of these is not only to evaluate sustainability as such, but also to provide a means of comparatively assessing soy and legumes.

To address the issue of whether soy can be considered a 'responsible' product, two alternative sets of sustainability criteria have already been drawn up: the so-called *Basel Criteria* and the criteria of the *Round Table on Responsible Soy* (RTRS). In this report it is assumed that 'responsible' can be taken as a first approximation of 'sustainable' and it is proposed that the two lists of criteria be combined, with the exception of a criterion on genetically modified crops, which in the RTRS criteria is lacking, while the Basel Criteria include a blanket ban on use of such crops. In this report an alternative criterion is proposed, designed on the one hand to satisfactorily address the potential drawbacks and risks of GM crops but on the other to leave due scope for future use of GM techniques to achieve improvements vis-à-vis sustainability.

Using the proposed criteria it can then be validated whether or not soy can be deemed a sustainable crop. To evaluate the sustainability of European legumes the same criteria can be used.

To compare the environmental performance of alternative products, use is often made of life cycle assessment (LCA) methods. The question now is how these two instruments relate to one another and how they might be combined in comparative sustainability studies. A second issue is whether soy meeting the proposed sustainability criteria can indeed be deemed sustainable. For comparative studies on food crops or other animal-feed ingredients it is proposed to combine the presented sustainability criteria with LCA, thereby privileging the results of the former over the latter.

This report focuses primarily on two elements of the LCA methodology: definition of system boundaries, and selection of the impact categories on which assessment is to be based. It is argued that it is specifically these two elements that require particular attention in LCA studies involving soy and/or European legumes.

The studies performed to date on substitution of European legumes for South American soy belong broadly to one of three categories:

- Analyses and policy studies on European legume cultivation.
- LCA studies on soy substitution (per kg crop/feed).
- LCA studies on products with soy in their life cycle (per kg meat, milk, etc.).

In this report a number of these studies are reviewed and critically analysed. Most of the analyses and policy studies give a positive appraisal of European legume cultivation, in terms of both technical feasibility and environmental impacts. It remains unclear, however, what the indirect effects of substitution of cereals in crop rotation systems would have on cereal imports and thus on the acreage used for cereal crops elsewhere in the world.

The LCA studies on soy substitution provide a rather varied picture. However, deeper analysis shows that in most studies land clearance falls outside the system boundaries, so that clearance of forests and savannah are not part of the assessment. This holds for all the impacts of such activities, which in terms of LCA impact categories means mainly land conversion (with attendant loss of biodiversity) and climate change.

Including land conversion as a fully-fledged impact category in LCA means it is given a quantitative score. In the studies reviewed this was not the case. Although some of the studies cite deforestation as a concern, in the ultimate conclusions this is rarely if ever seriously addressed. In their assessment of the environmental impacts of European legume cropping compared with South American soy production, then, most of these studies ignore the impacts of loss of tropical rainforest and savannah. Although climate change as such is an impact category in all the studies, this is generally without the possible contribution of deforestation, as stated.

For comparison, an analysis was also made of LCA studies on products in which soy is a key element of the life cycle, like meat, milk and eggs. In most of these studies the issue of land clearance again proves to lie outside the system boundaries, with land conversion scarcely ever being included in the choice of impact categories.

The conclusions of the LCA studies reviewed are thus restricted mainly to the environmental impacts occurring *on top of* those ensuing from the clearance of virgin land and the attendant greenhouse gas emissions. With regard to these additional impacts, it would seem that the differences between South American soy and European legumes are not particularly pronounced.

When it comes to substitution of South American soy by European legumes, the picture to emerge seems generally positive. Issues that need to be duly considered include nitrogen run-off, pesticide use and the indirect influence of substituting soy cultivation by legume cropping on global agricultural land use.

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The report (in Dutch) is available as a download from our website www.ce.nl