DRAFT WORK PLAN
California LCFS Indirect Impacts Expert Workgroup

Subgroup 2: Issues Related to Co-Product Credits

Subgroup Membership

Alan Glabe, ARB Staff
Philip Heirigs, Chevron (Subgroup Chair)
Paul Hodson, European Commission
Stephen Kaffka, U.C. Davis
Don O'Connor, $(S\&T)^2$
Mark Stowers, POET, Inc.

Overarching Principles Developed by Subgroup 2

During the subgroup's initial meeting, the following principles were established to help guide the research as we move forward:

- All recommendations and analyses coming from this effort need to be data driven. This is particularly true of current processes because data should exist; if not, appropriate data need to be collected. Future projections need to be data driven to the maximum extent possible. When data do not exist, a framework/methodology for analysis should be the goal. We should avoid extrapolations based on overly optimistic or pessimistic future scenarios.

- All co-products have the capacity to move into different markets over time, e.g., the use of glycerin from FAME production may ultimately serve as a feedstock to propylene glycol production. This needs to be accounted for in developing methodologies for co-product accounting. However, care needs to be exercised in how best to balance this possibility with current practices.

- The investigation should not be limited to solely GTAP and GREET. Other models and analytical approaches should be consulted to serve as comparison points to GTAP/GREET and to help inform future research direction.

- This Work Plan should be considered a "living document." There is no way to know at the outset of this effort precisely what issues will need to be investigated. It is very likely that issues will be added as the work progresses.

Scope of Work

Task 1: Identify Methodologies and Inputs Used to Assess Co-Product Impacts in ARB's Current Carbon Intensity Estimates and those Used in Other Researchers' LCA Modeling – The baseline set of assumptions and methodologies used to estimate co-products effects in both GTAP and GREET need to be explicitly identified in detail at the beginning of this project. This assessment will be done for both biofuels and petroleum fuels, and it will provide a starting point from which to build. In addition, a working definition of "co-product" needs to be developed as part of this task. This has implications related to:

- How best to distribute cost/energy to primary and secondary products.
- Whether the fuel or the co-product(s) is considered the primary or secondary product.

Under this task, the following questions that were developed during the 26-Feb-2010 Expert Work Group (EWG) meeting will be answered with respect to current methodologies and data:

1. Where do the data come from?
2. Relevancy to the future?
3. Which values are most important?
4. How do we validate the assumptions?
5. How robust are the values?
6. What boundaries do we put on these values?

As part of this effort, all co-products currently being produced in conjunction with biofuels production will be identified (e.g., look beyond DGS and soy meal). Also, the review conducted under this task will not be limited to methodologies and data inputs to ARB's analysis. Rather, the review will be expanded to include a more extensive literature review of available co-products estimates prepared by various researchers in the field as well as a review of the methodologies used by U.S. EPA for the Renewable Fuel Standard. Care will be taken to identify whether the methodologies and inputs are applicable to U.S.-based agricultural and feedlot practices (e.g., livestock feeding in Europe is much different than in the U.S.).

Finally, also included in this task will be a review of current methodologies used to allocate co-product credits in lifecycle analyses (e.g., displacement vs. allocation) along with the pros and cons of the various approaches.

Don O'Connor and Phil Heirigs will take the lead on this task but will receive input and direction from the rest of subgroup as this task progresses.

Task 2: Identify, Prioritize, and Analyze Issues Related to Co-Product Impacts that can be Addressed in the Short-Term – Under this task, specific issues related to co-product impacts that can reasonably be addressed in the short-term (i.e., by the end of this year) will be identified, prioritized, and evaluated.

Although the list of issues is likely to remain fluid throughout the study period as new issues and topics emerge, below is a first-cut at identifying topics that the subgroup feels can be addressed this year. Topics that the group feels are highest priority have been identified as such and will be the focus of our initial evaluation. Note that some of these also appear under the long-term issues addressed in Task 3.

High Priority Issues:

- Diet substitution effects/displacement ratios for co-products used in animal feed.
- Consistent treatment of co-products between GTAP and GREET.
- Special issues in co-products related to soy oil (e.g., negative crushing margins in GTAP).
- Co-product treatment for other virgin oils used in the manufacture of biofuels (e.g., canola).

Other Issues:

- New and expanded uses of existing co-products.
- How well GTAP is doing on substitution effects.
- How are co-products valued, especially as opportunities of using them change over time.
- Displacement of petroleum based products with bio-based co-products.
- Marginal use/impact of co-products coming out of biofuels production.
- Consistent approach in dealing with co-products as it relates to land use and direct emissions.
- Issue of double counting between GTAP and GREET.
- Consistent methodologies between biofuel and petroleum co-products – is that possible or even desired?

During this assessment, we will be sensitive to the fact that animal nutrition is dynamic and will change over time, although this effect is likely to more relevant to the next task.

All members of the subgroup will work on this task.

Task 3: Identify, Prioritize, and Highlight Research Needs for Co-Products Issues that should be Evaluated in the Long-Term – For co-product issues that cannot be resolved during 2010, this task would focus on identifying specific data needs and research to fill gaps in our current knowledge. In addition, methodologies for assessing the impact of new co-products or for the expanded use of existing co-products need to be addressed and developed where they do not exist. Among the issues that will be investigated under this task are:

High Priority Issues:

- New co-products.
- Integrated bio-refineries and co-products.

Other Issues:

- New and expanded uses of existing co-products.
- How are co-products valued, especially as opportunities of using them change over time.
- Displacement of petroleum based products with bio-based co-products.

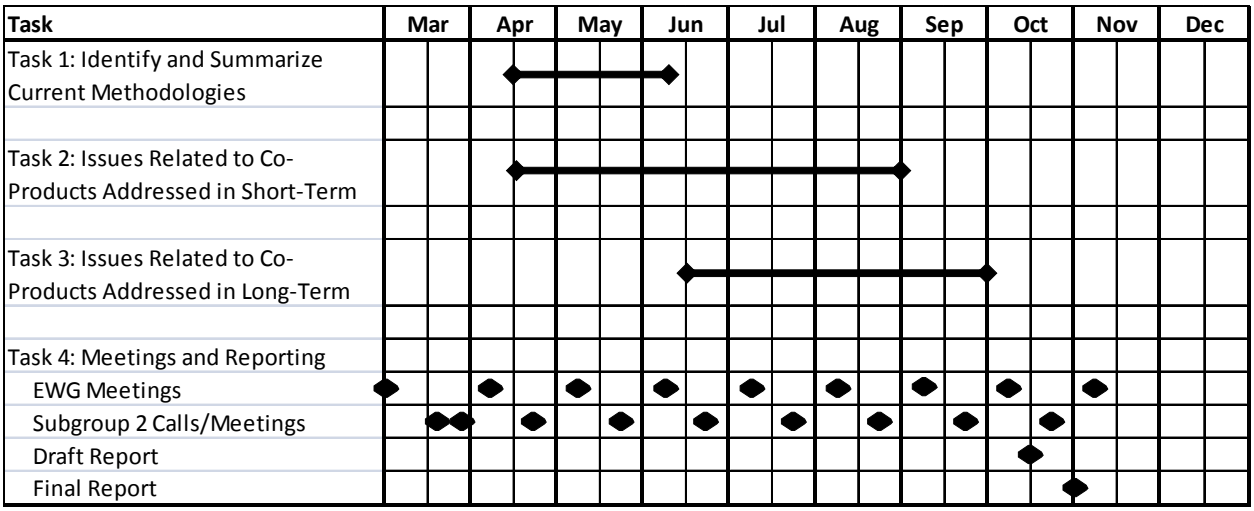
As noted previously, this Work Plan should be considered a living document, and it is quite likely that additional issues will be added to the above list as we move forward.

All members of the subgroup will work on this task. However, Steve Kaffka will be the point person on the integrated bio-refinery topic.

Task 4: Meetings and Reporting – In addition to the monthly meetings of the entire Expert Work Group (EWG), it is anticipated that this subgroup will hold at least one, and possibly two, conference calls a month. It will also prepare monthly progress reports to be presented at the monthly EWG meetings. It is anticipated that the subgroup will conduct several face-to-face meetings during this effort to discuss specific issues where technical experts outside the subgroup have been invited to participate. Our initial plans for invited technical advisors are summarized in a later section of this Work Plan. Finally, a summary report of our findings will be prepared at the conclusion of this effort.

Schedule/Timeline

The figure below is a rough outline of the schedule for completion of this effort. This assumes that our work will need to be completed by the end of October 2010 in order for a full report to the Board to be prepared. Note that the targets below are somewhat fluid at this point. We will have a better idea of the timing as we start to work through the specific tasks laid out in the scope of work.



Invited Technical Advisors/Additional Support

Given the variety of data, models, and methodologies used to estimate the impacts of co-products on carbon intensity estimates, there may be a need to solicit input from experts outside of this subgroup.

Thus far, the subgroup has identified needs in the following areas. As the work progresses, it is likely that additional support on specific topics will be identified.

Animal Nutritionists – One of the key inputs to assessing the co-product credits associated with distillers grains and solubles (DGS), soy meal, and other potential animal feed co-products from biofuel processing is how much feed corn is displaced by the co-product. In addition, inclusion rates impact potential saturation of specific markets. Enlisting the help of animal nutritionists in this effort will help identify current practices, limitations, and data needs. Mark Stowers and Steve Kaffka have offered to coordinate the identification of appropriate experts.

Feed Industry Experts – In addition to animal nutritionists, the subgroup felt that input from experts in the feed industry would be extremely valuable in order to benchmark current practices. We are considering a meeting in which both animal nutrition experts and feed industry experts participate. Mark Stowers and Steve Kaffka have also offered to coordinate the identification of feed industry experts.

Treatment of Co-Products in GTAP – One issue of concern that has been identified with respect to ARB's current CI estimates is consistency between the treatment of co-products in GTAP versus those used in GREET. The treatment of co-products in GREET is relatively straight-forward, and several members of the subgroup can identify the inputs and methodologies used in the ARB staff analysis. On the other hand, treatment of co-products in GTAP is not as transparent, and it would be useful to identify an expert in GTAP to outline how GTAP addresses the effects of co-products.

Responsibilities of Subgroup Members

Alan Glabe – As the ARB staff member assigned to this subgroup, Mr. Glabe will help support the activities of the subgroup and will serve as an interface between the subgroup and the Chairs of the EWG.

Philip Heirigs – As subgroup chair, Mr. Heirigs will have responsibility for scheduling meetings within the subgroup, developing agendas, publishing meeting notes, drafting monthly progress reports, and generally keeping the group on-task and on-schedule. Mr. Heirigs also has substantial experience with GREET and its treatment of biofuels and petroleum fuels pathways.

Paul Hodson – Mr. Hodson brings a European perspective to this subgroup and will be an important resource in identifying studies, data, and methodologies used to account for co-products impacts in the EU.

Stephen Kaffka – Dr. Kaffka has extensive background in agricultural systems and is an extension specialist in the Department of Plant Sciences at U.C. Davis. As such, Dr. Kaffka brings real-world experience from the growers' viewpoint.

Don O'Connor – Mr. O'Connor is the author of GHGenius and therefore is extremely knowledgeable about the structure and function of lifecycle models. He also has first-hand experience in feedlot management.

Mark Stowers – As part of the biofuels industry, Dr. Stowers brings real-world experience from the biofuel producers' viewpoint. Importantly, he has access to information and data on how co-products from biofuel production are currently used in practice.