Juan Carlos Mirande

Harvest without Burning: A One-way Road

Green cane harvesting is considered in some areas as an original and interesting alternative still in development; in others, as an imperative or just an obligation to fulfill,; and for the rest, is just a curiosity, far away from reality.

It has been thoroughly discussed in different meetings worldwide; just mentioning the ISSCT's activities; its aspects were analyzed at the Agricultural Engineering Workshops held in Louisiana 2003 and Argentina 2006; at the Agronomy Workshops in Mauritius 2003 and Thailand 2006, and at the Congress held in Guatemala 2005 and Durban 2007.

In general, green cane harvesting requires mechanization of harvest first since there are very few countries with manual cutting cheaper than the mechanical ones, and this difference becomes larger in harvesting with no burning.

The reasons why the most developed agroindustries are adopting it as a regular practice vary. We can mention:

- The official policies, if considered from a positive view, protect quality of life and people's health.
- Global warming, burning cane before harvest contributes to it.
- General fall in labor availability for semimechanized harvest and consequent transition to integral harvesting.
- Organic matter and nutrients restitution to soils, when total or part of biomass is left on the fields.
- Herbicides savings, as a result of leaves shading and the allelopathic effect of residual biomass.
- Harvest-to-milling delays of burnt cane as causal loss of recoverable sugar.
- Use of biomass as a fuel for boilers, paper manufacture, gasification, etc.
- Potential selling of carbon credits.

There are additional effects which advantages are still in doubt or depend on other variables:

- Although biomass is known for its ability for nutrient restitution to soils, is necessary to increase nitrogen doses over the first years in order to balance carbon: nitrogen relationship of decomposition matter, avoiding its deficit in the crop.
- Regarding to field productivity, there are increases but is important to consider the effect of highest trash in green cane with regard to burnt cane.
- Compaction will probably decrease through years, but it doesn't seem to be a verifiable benefit in a short term.
- The effect on changes in soil temperature over crops subsequent to harvest is positive in tropical and subtropical climates, due to water loss decreasing by direct evaporation. But this doesn't occur in temperate zones like Louisiana, where less soil surface warming, due to a higher vegetative coverage, generates significant delays in stalks sprouting and growing.

Finally, there are unquestionable negative aspects due to trash increase. This increases harvest, haulout and milling costs, increasing the amount of undesirable elements such as starch, reducing sugar, ash, silica, etc, to obtain good quality of sugar. Molasses quality is also affected, and in general it increases sucrose losses during the production process, especially when factories have not been adapted to this raw material.

Restrictions to the generalization of this harvest method emerge from limitations or impediments to harvest mechanization, and at the same time have different origins:

- First is the social aspect: in some countries the employment of unskilled labor depends on sugarcane; its mechanization would imply significant labor, social and eventually political disturbances.
- There are also insuperable physical impediments: some areas with irregular topography or with high presence of rocks make harvest with combines not possible.
- Meteorological conditions, especially rains during harvest season may restrict mechanized harvest.
- Finally, in many cases financial constraints prevent a change towards mechanical harvest. This is the case of agroindustries with considerable participation of small-scale farmers.

There are areas where the transition to green cane harvesting is difficult, even when harvest is mechanized; limitations, such as an excessive volume of residual biomass are mentioned as in Colombia; low temperature like in Louisiana, or lack of financial ability to reconvert field and factory machinery in order to adapt them to the new reality.

There are assorted harvest and haulout methods from additional biomass to millable cane, from baling to rolling from the ground -with load and further transport to the mill- to its harvest and simultaneous transport with the cane going to the mill. In this case there are dry cleaning projects with promising results in process. An advantage of transport along with cane is the reduced amount of soil and hence silica taken to the boilers, due to biomass not in contact with soil. As a disadvantage, haulout of this less compacted material generates significant decrease in weight per travel, consequently it will be necessary to increase the number of trips every season so as to transport the same quantity of net cane.

Definitively the issue to be considered is the global energetic balance (produced energy minus consumed energy) and its corresponding economic balance. Even when an exploitation of additional biomass to normal trash is not brought up, dry cleaning stations allow separating part of that trash avoiding its entry to the sugar mill, generating an improvement in raw material quality and hence reducing sucrose losses and improving quality of sugar.

continued on page 20

continued from page 6

Strategies for the future have to consider two unavoidable aspects: non-renewable energy sources decrease, and on the other side, environment and public opinion pressure. Time, up to these influences become essential, will depend on a series of factors, but is evident that the struggle for energy sources and their economic value will be higher each time, and communities will not accept turning-back and will become more demanding once they see the benefits of less burning.

For all this, the way to green cane harvest is a one-way street: there's no possible turning back. All the participants of the activity, suppliers included, should adapt to this reality.

Sugarcane shows significant advantages over other crops: its high biomass production per surface unit turns sugarcane into one of most efficient choices for getting renewable energy at lower cost.

Although current trends show increasing surplus of sugar stocks at a worldwide level, at short or medium term, they will tend to balance due to reorganization of sugar mills to energy production plants or biofactories.

In addition, it is expected that research will make contributions to the cost: benefit ratio of bagasse exploitation through the gasification process which is being investigated throughout the world and will possibly give positive economics results.

Agro-industries that can expect this to happen, while they undertake research would expect to benefit the most from this new perspective.

The sugarcane agro-industry's future depends on energy, and in particular, on green cane harvesting. Sooner or later, we should get there.

SJ

Ag. Eng. Juan Carlos Mirande
ISSCT Ag Eng Section Member
Jujuy, Argentina

continued from page 7

tierra y por ende de sílice que se lleva a calderas, debido a que la biomasa no se pone en contacto con el suelo. Como desventaja, el traslado de este material poco compactado genera importantes disminuciones en el peso por viaje, con la consiguiente necesidad de aumentar la cantidad de viajes a realizar por zafra para transportar la misma cantidad de caña neta.

En definitiva la cuestión a considerar es el balance energético global (energía producida menos energía consumida) y su correspondiente balance económico.

Aún cuando no se plantee un aprovechamiento de biomasa adicional al trash normal, las estaciones de limpieza en seco permiten separar parte de dicho trash evitando su ingreso a los trapiches, generando una mejora en la calidad de la materia prima que a su vez disminuye las pérdidas de sacarosa y aumenta la calidad del azúcar producido.

Las estrategias futuras deben tener en cuenta dos aspectos que son insoslayables: por un lado, la disminución de las fuentes de energía no renovable, y por otro, el medio ambiente y las presiones de la opinión pública. El tiempo que transcurra hasta que estos condicionamientos pasen a ser vitales dependerá de una serie de factores, pero es evidente que la lucha por las fuentes energéticas y su valor económico serán cada vez mayores, y que las comunidades que se vean beneficiadas con mejoras ambientales derivadas de la disminución de la quema, no aceptarán retrocesos y serán cada vez más exigentes.

Por todo esto, el camino hacia la cosecha en verde es de una sola vía: no hay retroceso posible. Los actores de la actividad, incluyendo a los proveedores de maquinaria para el campo y tecnología para las fábricas, deberán adecuarse a esta nueva realidad.

La caña de azúcar presenta importantes ventajas sobre otros cultivos: su alta producción de biomasa por unidad de superficie la convierten en una de las alternativas más eficientes de producción de energía renovable a bajo costo.

Si bien el contexto actual muestra crecientes excedentes de stocks de azúcar a nivel mundial, a corto o mediano plazo estos se tenderán a equilibrar a causa de la reconversión de fábricas de azúcar a usinas de producción de energía o biofábricas.

Adicionalmente es de esperar que la investigación aporte mejoras a la ecuación costo:beneficio del aprovechamiento del bagazo para estos fines, mediante procesos como la gasificación, sobre el cual se está investigando en todo el mundo y seguramente pronto dará resultados económicos favorables.

Las agroindustrias que puedan esperar a que esto ocurra, mientras investigan y desarrollan, serán seguramente las más beneficiadas con esta nueva perspectiva.

El futuro de la agroindustria cañera pasa por la energía, y esta, por la cosecha en verde. Hacia allí deberemos ir, más tarde o más temprano.

SJ

Ing. Agr. Juan Carlos Mirande
Miembro Sección de Ingeniería Agrícola
ISSCT