The year 20XX, in a farm in Japan

Hey, why don’t you take a break and watch this TV program with me?

The situations, characters etc. in this story are basically fictional.

People are gathering for digging business somewhere overseas!
"The Shale Revolution"

In countries like the USA, where efficient recoveries of nontraditional natural resources in shale layers had been unrealistic, an epoch-making approach of digging enabled to recover the resources like shale gas. The technology dramatically influences not only the energy supply-and-demand structures but also the social structures of the areas.

Are we lucky enough to have profitable things gushing out there? Oh, God! What’s that?
Unbelievable!
A huge crack in
the ground?!
The ground is
swallowing
the straws!

...A SUDDEN STOP
Wow! Something is gushing!!

Well, this seems to contain... "sugar".....

*Not approved as food yet.*

The jet seems to be kindly keeping our rice safe. It’s not swallowing our bags of rice grains.*

Surprisingly, rice straws are becoming sugar!

*No competition with food.*
What shall we do with this sugar?

How about fermenting it?

I’ve heard that it would be cool to convert it to chemicals for plastics such as succinic acid and furfural, as the alternatives to the corresponding products made from petroleum.

No. I don’t think that it’s a good idea to do so on such a small scale, while the situation would be different by assembling tens of these fountains.

Above all, we should deal with natural-brand specialties, because it gushed out HERE. Fermentation technologies are among the strengths of Japan.

Meanwhile, the environmental value of the sugar should not be overlooked. We should think about its best role for the rural areas, in parallel with the process development.
How about starting with making products like docosahexaenoic acid (DHA)?

Sounds great! Feeding that to animals would add extra value to the products.

DHA production by microorganisms:
For example, T. Yaguchi, et al., Production of high yields of docosahexaenoic acid by *Schizochytrium* sp. strain SR21, *JAOCS*, 74, 1431-1434 (1997).
But can we secure feedstock?

Of course!
As long as we keep on growing rice, we get tons of straw every autumn.
In short, it will work well as long as our agriculture keeps steadfast.

What other “reserve materials” do we have to make it work throughout the year?

Energy crops: *Erianthus spp.* and *Miscanthus spp.*, are being developed, which can be harvested 10 times more than rice straw. Additionally, we should also manage well with residual materials in the food industry.
Then, rural agriculture could play the central role for activating various rural industries. I hope people in the area can get together and cooperate on this project.

Feedstock production

- Enhanced collaboration with the livestock industry
- Efficient straw collection for smooth feed supply

Saccharification fluid

- Use of the digestive juice for liquid fertilizer (resource recycling)

Wastewater

- Understanding of the values of sugars made in the area

Advanced cropping systems (use of cover crops, double-cropping, or energy crops for feedstock)

Creation of a novel bio-industry with rural specialties

- Vitalization of the distribution/tourist industries by unique products

Supply of residues from the rural food industry

Collaboration with existing domestic industries

- Creation of new industries by collaboration

Hey, guys! Don’t think that’s all! Who on earth are you?

Who am I? It’s none of your business, Ha-ha-ha.
Rural sugar production is expected to significantly contribute to rural food/energy securities, because the sugars can be converted to feed, food and biofuel in case of emergency.

Wow, that must mean that the agriculture would contribute more to rural areas.

That is the “CaCCO” process developed in Japan.

The spiral shapes in this story has been adopted for emphasizing the impact of the conversion process, and in actuality, the saccharification fluid would be produced at a reaction vessel in a manufacturing factory.
The CaCCO (Calcium Capturing by Carbonation) process

The CaCCO process was designed as a simple process for saccharification-fluid recovery for rural areas; accepting a wide range of domestic herbaceous feedstock, saving heat consumption in the pretreatment, and using calcium hydroxide and carbon dioxide, which are not categorized in poisonous- nor hazardous substances. The fundamental figure of the process is about to be fixed.

Do you remember the shale-gas news some years ago? The company seems to be planning to dig a neighboring town. The original one has almost dried up.

Some years later,

It’s quite natural. No underground resources last forever.
In contrast, ours are sustainable. Farming keeps on activating our area in many ways.

Exactly...

To Be Continued...

For the beginning of bio-industry revolution from Japan

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