BIOENERGY

The Official World Bioenergy Association Magazine

NO 8 2019

Bioenergy Sector at the Leading Edge of Transformation & Innovation

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Role of Southeastern U.S. in the World's Pellet Market

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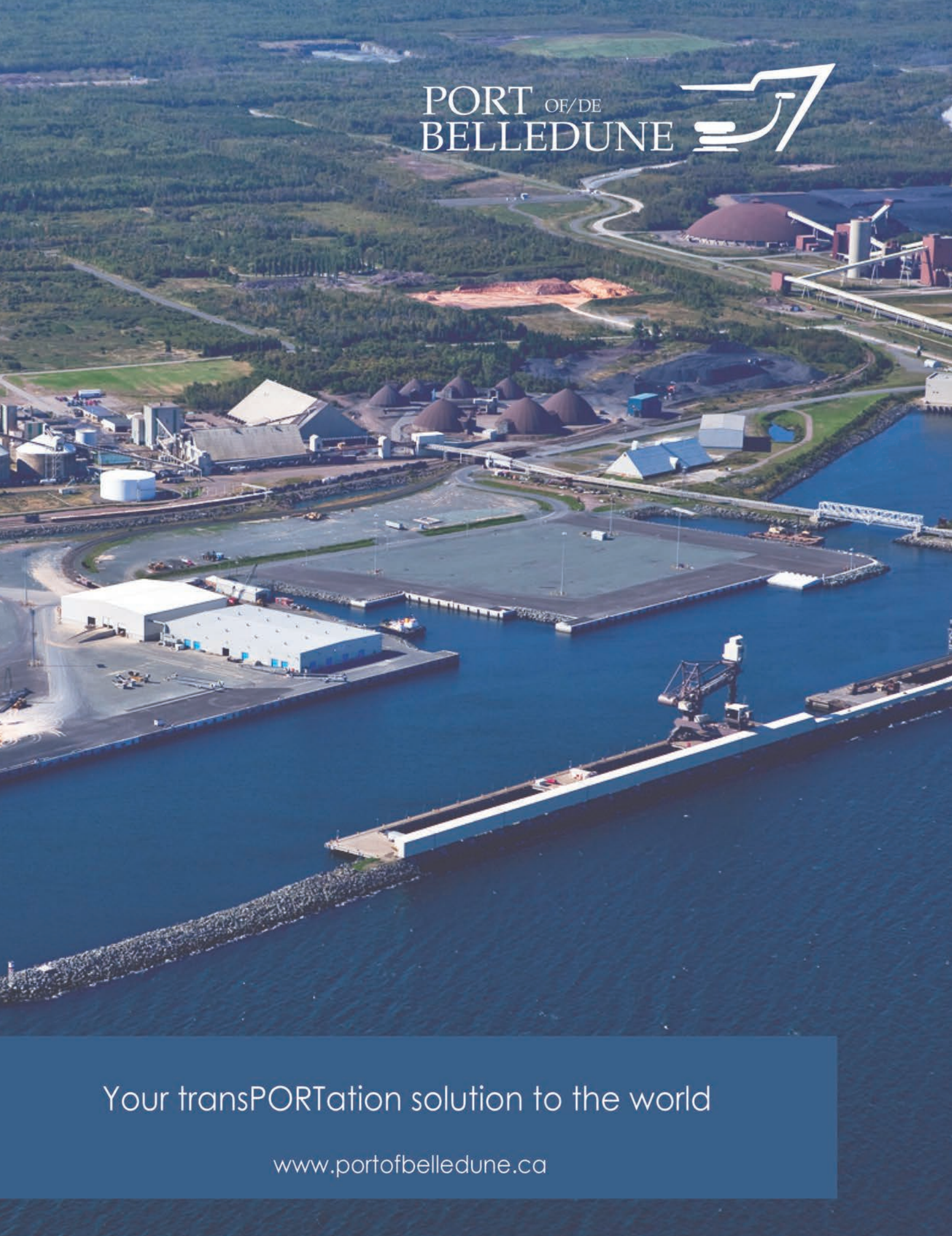
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A Message from the President of the World Bioenergy Association

The Sustainability of Bioenergy:
Delivering Progress Against Climate Change

THE WORLD BIOENERGY Association (WBA) has two main goals when executing and developing its activity. The first is the creation and expansion of bioenergy markets in different parts of the world, which will allow the use of different biomass resources on a larger scale and improve research and development activity by cooperating with academia and practical examples. This is how bioenergy can and will deliver to the process of combating climate change and reducing dependence on fossil fuels.

Simultaneously, we must develop and follow sustainability criteria and rules with a systemic approach. Implementing the criteria into all phases of bioenergy practice is important, as the renewable energy future must avoid all the negative experience we have had with fossil fuels. Nowadays, all renewable energy technologies, especially bioenergy, are under scrutiny of civil societies and regulatory authorities. The sustainability part of developing bioenergy business has crucial meaning because any faults, misunderstandings, or insufficient ability to explain aspects of bioenergy processes (i.e., biomass mobilization and procurement to final energy delivery), can impact the concept of "biomass to energy," slowing development of bioenergy locally or internationally.

In early May 2019, WBA organized a mission trip to Georgia, USA, with a delegation consisting of different WBA members—associations, companies, and research organizations—aimed to learn about theory and practice of forestry and biomass production in southeastern U.S.

In Europe and within the United States, several organizations accuse bioenergy of causing deforestation in the region, with wood pellets produced in southeastern U.S. being exported to Europe and wood procurement for pellet production forcing the clear-cutting of forests.

To understand the background and impacts of the wood pellet industry in the region, the delegation visited several forest sites and met with private forest owners, executives from the Georgian State Forest Agency, pellet production plants, and port facilities. We also heard speeches and presentations at a pellet workshop at the University of Georgia.

The findings of this five-day mission trip are optimistic: forest land in the State of Georgia is increasing (covering 67 per cent of Georgia and growing at two tons of wood per second); the productivity of the forest increases (growth exceeds removals by 41 per cent annually); forest owners follow recommendations on best practices and constantly increase their skills; low-quality wood (mainly from forest thinning) is supplied to pellet production; pellet producers participate and learn from sustainability programs; and the quantity of round-wood supplied to pellet production does not exceed five per cent from total logging volume.

The reasons for unsustainable forestry—if those exist—should be addressed in general, not to bioenergy business.

The WBA is open to any discussion regarding bioenergy sustainability.

Remember, the main challenge to humanity—and the cause of this challenge— is global climate change. Global warming is driven by over 14 billion tons of oil equivalent of fossil fuels consumed annually in the world, emitting over 40 billion tons of carbon dioxide. Renewable energy takes only 19 per cent of the market share in global energy consumption. Only united efforts of all renewable energy technologies can change this situation.

The WBA is an association of practical steps and actions. During the COP24 in Katowice, Poland, we held our first Global Bioenergy Forum, where the development of solid biomass for heat and electricity, liquid biofuels for transport, and biogas in Poland and globally were discussed.

Remigijus Lapinskas
President
World Bioenergy Association

An idea for initiation of closer cooperation between Poland and Lithuania was born at the Forum, as bioenergy in district heating of Lithuania already achieved over 70 per cent market share, while Poland is proactively developing liquid biofuels and biogas.

The first Lithuanian-Polish Bioenergy Conference (open to all interested parties from around Europe), under the flag of the WBA and with support from the ministries of energy of both countries and efforts from the national Polish and Lithuanian bioenergy associations, took place on June 4 in Vilnius, Lithuania's capital. This event marked another small but important step toward faster renewable energy development in the region, and acts as more proof of WBA's leadership in this business sector.

Enjoy reading!

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Circular Economy & The Role of the Bioeconomy: Views from WCEF 2019

About two dozen stands showcased circular economy developments and innovations of all sorts at the 2019 World Circular Economy Forum.

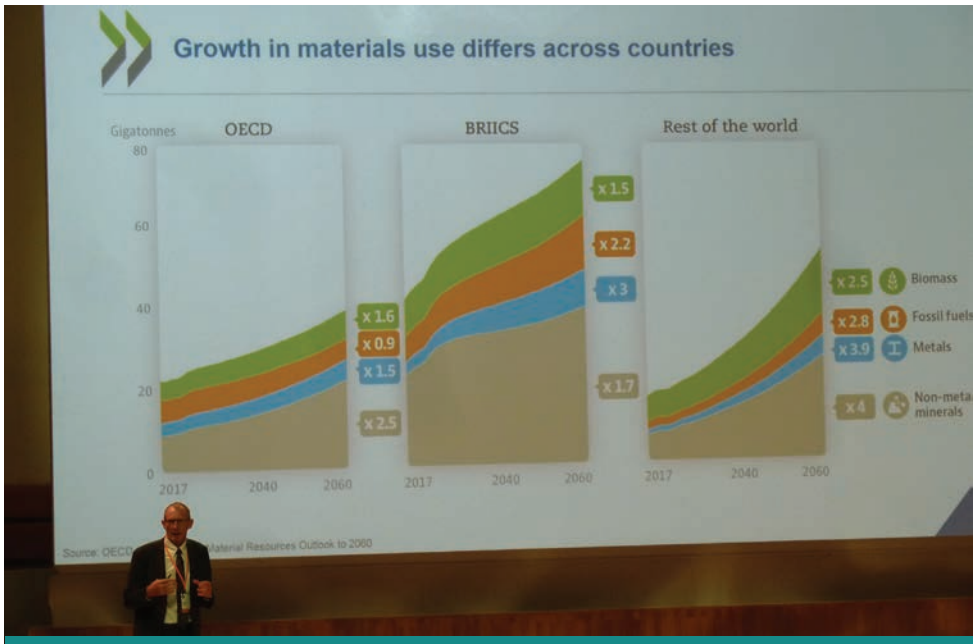
***By Andrew Lang**, Senior Consultant, WBA*

A circular economy is a system in which as much material as possible continues to cycle in use rather than be disposed of into the landfill. The whole rationale is that a linear economy—where most material is predominantly somewhere in the linear process of extraction, processing, manufacturing, using, disposing—involves high greenhouse (GHG) emissions. If extraction and processing of minerals, petroleum products, and other causes of GHG emissions are reduced through greater focus on recycling materials, reusing them, and reducing the use of non-recyclable packaging, GHG emissions are greatly reduced.

While the linear economy is associated with ownership, the circular economy will have a greater emphasis on sharing and renting things designed for greater durability, ease of repair, and efficient recycling of their material content.

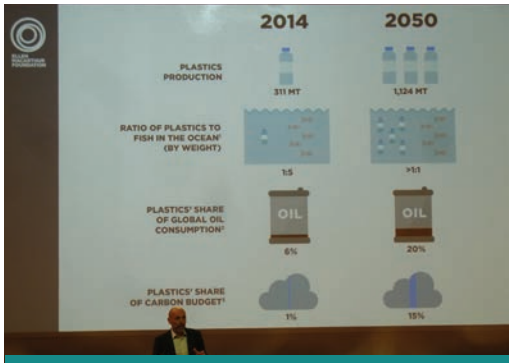
In 2015, Finland was the world's first country to adopt the development of a circular economy as a national policy, but many countries, including Japan, Slovenia, Denmark, the Netherlands, and Canada, are following suit. Finland expects this policy to lead to new areas of employment, generation of increased export income, and significant reduction of national GHG emissions.

Left to right: Mari Pantsar, director of Sitra; Tiina Kähö, director of the Smart Clean Foundation; and Anni Sinnemäki, deputy mayor of Helsinki, address attendees following the forum.

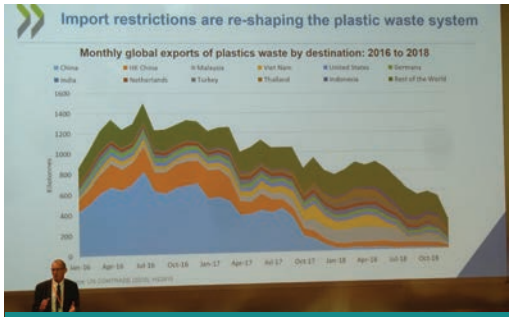


Anthony Cox, deputy director of the environmental directorate of the Organisation for Economic Co-operation & Development, explained how growth in materials use means emissions will more than double by 2060.

Antti Vasara, president and CEO of VTT Finland, discusses the development of cellulose-derived replacements for petrochemical plastics.



Jocelyn Bleriot, executive officer of the Ellen MacArthur Foundation speaks about the growth in plastics use.



China's policies affect the world's management of used plastics.

Development of a circular economy is most effective when there is an existing bioeconomy. This is the case in Finland, which has focused on developing a bioeconomy since 1980. Finland aims to achieve zero-net GHG emissions by 2050, with its intensively managed forests and timber processing industry playing a major role in achieving this.

Finland's substantial investments in R&D in value-adding wood fibre products, in development of its clean tech sector, and its strong focus on improving energy efficiency in buildings, transport, and the industry, have been integral to this bioeconomy development. As a result, GHG emissions from industry and households have fallen compared to 2005 figures; over 28 per cent of all energy consumed comes from biomass, and industries, including the pulp and paper sector, are increasingly producing biofuels, biochemicals, and biomaterials as a profitable part of their output.

WCEF 2019

The World Circular Economy Forum (WCEF 2019) held in Helsinki from June 3 to 5 attracted about 2,200 people from over 95 countries. During the event, 210 speakers gave presentations, most of whom are leaders from corporations, European Union agencies, national and transnational organizations, non-governmental organizations (NGOs), and from state and municipal departments. Topics covered were related to need, establishment, or benefits of a circular economy at the industry, city, state and / or national levels to reduce GHG emissions, environmental pollution and global warming, and to maintain biodiversity.

The role of governance and road maps in the transition toward a circular economy was one of many topics discussed.

Finnish company Esbottle Oy has developed a bottle for liquids made from paperboard rather than polyethylene terephthalate.

Principal topics included:

1. The issue of single-use plastics;
2. Reduction of emissions in construction, food production, and minerals processing; and
3. How the development of a circular economy can be facilitated by using procurement policies, finance, removal of subsidies on fossil fuels, and other state or regional agreements on the introduction of policy drivers.

There were many different venues and opportunities for attendees to meet and network. A central area had about two dozen booths and displays from businesses, educational institutions, and NGOs. Stands included Zero Waste Scotland, Aalto Sustainability Hub, the University of Helsinki, Betolar (producing building materials from mineral processing wastes), and Esbottle Oy (making liquid containers from paper). Another area had circular areas called "campfires," where 8 to 10 people could discuss specific topics.

The Forum was designed to create many opportunities for participants to meet, network, and socialize. A well-organized B2B area on a separate floor hosted one-on-one

meeting throughout both days. Access to the Forum was provided by Sitra at no cost to participants and included lunch, morning and afternoon refreshments, and some catered evening events. All meals were vegetarian-based, highlighting the issue of GHG emissions resulting from meat production, and oat milk was offered as a dairy alternative.

Sitra minimized its waste generation in all areas, which included a simple card identifying label for participants, no printed publications, and providing all daily information through a continually-updated smartphone app.

After the conference on June 3 and 4, the following day featured several events organized by Sitra and other groups.

These events looked at the practical aspects of developing circular economy approaches in different sectors, including construction, energy, natural resource management, food production, forestry, circular economy in developing countries, procurement, recycling, and remanufacturing. Many events involved the delegation from Canada, which is working with Sitra to organize the 2020 Forum.

The WCEF was organized by Sitra, the Finnish Innovation Fund. Several partner organizations helped plan the Forum, including European-KIC, the European Investment Bank, Nordic Innovation, the European Commission, the Ellen McArthur Foundation, the European Environment Agency, the EU Environment Program, and the World Bank.

Canada, which will host WCEF 2020, has been active in developing its own bioeconomy, including increasing production of energy from biomass. The country has policy at provincial and national levels to develop a bioeconomy and a circular economy, has developed a nation-wide strategy aimed at achieving zero plastic waste, has a federal "green" procurement strategy, and has streamlined information and regulation by bringing up to 16 government departments and service agencies together in a Green Growth Hub. ■

A Background on Finland

Finland has a population of about 5.5 million, about 75 per cent of its land area is covered by forest, and the country total area is about 118,455 square-kilometres, which includes about 188,000 lakes and some major rivers that make up about 10 per cent of the area. Only about seven per cent of the land area is used for agriculture.

About seven per cent of its forested area is set aside as permanent reserves—the highest proportion in Europe. The population is highly educated, with 14 universities and 25 applied science institutes (polytechnics).

About 72 per cent of the population has studied beyond the legislated minimum education level. In 2018, the GDP was 234 billion Euros. Finland's economy is based on exporting machinery, equipment, value-added wood fibre products, IT products, advanced technologies, expertise, and services.

Finland is home to major corporations, including Neste Oil, Kone, Aker Finnyards, Valmet, Ponsse, Marimekko, Valtra, Nokia, Sako, VTT, Pöyry, Stora Enso, UPM and Metsä, Fiskar, Sisu Auto, Suunto, Outotec, Hewsaw, Wärtsillä, Fortum, and leading companies involved in nuclear power, tunnelling, ship building, manufacturing of locomotives and rolling stock, and forestry harvesting and handling equipment.

Palm Oil: Is it Bad?
A Critical Review

Oil palm cultivation.

***By Dilip Khatiwada**, Ph.D., Assistant Professor (Bioenergy Systems Analysis), Energy & Climate Studies, KTH Royal Institute of Technology, Sweden*

Palm oil production is debated due to carbon debts (land use change) and biodiversity loss. Indonesia and Malaysia contribute around 85 per cent of palm oil production globally. Is palm oil bad? What conditions are suitable for sustainable palm oil production? How can we improve resource efficiency and reduce climate change impacts, thereby contributing to sustainable development in the region? It is of the utmost importance to understand the entire supply chain and co-benefits of palm oil bioenergy production systems.

Palm oil and its production systems

Palm oil is one of the most widely consumed edible oils and main feedstock for biodiesel production in the world. Palm oil production systems include oil palm cultivation, palm oil milling, and refining. It also contains several co-products (i.e., kernel oil and cake), residues, and wastewater (effluents), which are valuable feedstock / bio-resources for industrial application (i.e., cosmetics and chemicals) and energy production (i.e., bioelectricity and biogas).

Today, out of 73.4 million tonnes (Mt) of total palm oil production, Indonesia and Malaysia contributed around 85 per cent of palm oil production globally, with over 70 per cent of palm oil traded internationally.[1] Palm oil represents 35 per cent of the world vegetable oil production,[2] while 15 per cent of palm oil is used for biodiesel production.[3] It is also the major feedstock for oleochemicals.

Oil Palm production and trade

Oil palm plantations provide a versatile ingredient and multi-purposed oil for food and non-food applications. Palm oil is one of the vital agricultural commodities in Indonesia and Malaysia, and it is a significant traded product worldwide.

Palm oil production chain.

Oil palm fruit.

Palm oil milling.

The demand of palm oil for food is expected to increase, alongside population and economic growth. With major efforts to reduce fossil fuel dependency and achieve climate goals, new targets for introducing biodiesel (renewable fuel) blends have been set for the transport sector in many countries worldwide. Currently, India, China, and the European Union (EU) are the major importers of palm oil.

In the EU, imported palm oil is mainly used to produce biodiesel, which is later used as a transport fuel for meeting renewable mandates. Other emerging economies, like India and China, have been using the agri-food commodity as edible oil. From 2004 to 2014, the production of palm oil doubled worldwide, parallel to increasing population and food consumption, and the trend continues.

Debates on oil palm

The expansion of oil palm plantations has led to debates related to deforestation, threatened biodiversity, and greenhouse gas (GHG) emissions.[4,5,6,7] The loss of primary forests continued to accelerate,[8] and industrial plantations are considered the main cause of deforestation.[6] It is important to understand how major palm oil producers take advantage of the expanding markets for palm oil without compromising sustainability.

The major part of GHG emissions result from land use change.[4] With blending mandates aimed at reducing GHG emissions, the overall benefits of the policy will be jeopardized if increased demand of palm oil causes additional deforestation and land use change.

Expansion of palm oil cultivations is publicly criticized for deforestation and land use change by international news media and non-government organizations working in nature and environmental conservation, resulting in the extinction of the planet's most important and sensitive habitats for orangutans, tigers, elephants, and rhinos, and biodiversity loss.

The EU recently banned the import of palm oil, aiming to limit deforestation, protect endangered species and biodiverse forests, and reduce climate change impacts from land use change. On the other hand, major palm oil producers claim palm oil industries are the backbone of their economy, job creation, and national development. It is important to resolve the issues of divide and non-consensus based on scientific evident and social / political dialogues at the national and global level.

Conditions for sustainable palm oil development: A way forward

Increasing agricultural yields could serve the purpose, while reducing the need for new land.[9] The increased demand of palm oil for food and meeting the renewable mandates are pursued in combination with a strategy for increased productivity in palm oil production and use of degraded land.

The selection of the right seed and application of fertilizer are crucial for increased yield of palm oil. It is worth exploring the yield improvements measures, thereby meeting palm oil demand in a context of increasing climate policy stringency.

The palm oil supply chain generates a huge amount of biomass source. The oil extraction from palm fruits occurs at palm oil mills. In the palm oil supply production chain, we obtain palm and kernel oil, together with other co-products, in the form of empty fruit bunches, palm kernel shells, palm mesocarp fibers, and palm oil mill effluents.

All bio-resources can be converted into useful energy (i.e., heat, electricity and biogas) and non-energy (i.e., organic fertilizer and fiber) products. It is worthwhile to use palm oil wastes / residues for the production of value-added products. Otherwise, they contribute to methane emissions, one of the most potent greenhouse gases (GHG).

Modernization of palm oil agro-industries using biomass residues is important

when it comes to improving resource efficiency and climate gains.[10] This not only helps meet the renewable energy targets but promotes cost-competitiveness of palm oil industries. Efficient palm oil supply chains should be investigated to harness the full potential of the palm oil sector, including technologies, costs, and alternative products.[11]

A transparent sustainability framework on the assessment of palm oil production is essential for evaluating lifecycle emissions (climate change impacts), land use change and deforestation, biodiversity loss, and protection of endangered species, including social conflicts and human rights issues.

International standards on sustainability criteria of palm oil production should be developed in consultation with all relevant stakeholders, along with the formulation of stringent policies and monitoring for implementation. All national and international stakeholders, like governments, private sectors, non-governmental organizations, and researchers, should collaborate on how to reduce the negative impact of oil palm expansion without compromising the local / national economy and global markets of palm for renewable energy and food production.

Increasing yield and intensification of palm oil plantations in suitable land, plantations, and sustainable land ownership (business model) for improved yield, use of degraded lands, and modernization of palm oil mills for value additions and co-creations would help improve the negative image of palm oil industries while simultaneously serving for meeting people's well-being and nature protection. ■

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Transport in 2050:

Biofuels or Batteries? The Future Will Include Both

The Exqui.City is a 24-metre hybrid (biogas-electric) tram-bus manufactured by Belgium manufacturer Van Hool. This tram-bus is a 24-metre double-articulated vehicle with an electric engine, whereby electricity is generated by a power generator connected to the biogas engine.

***By Andrew Lang**, Senior Consultant, WBA*

Norway has said it will have no new fossil-fuelled vehicles after 2025. The French government has announced there will be no more diesel engines in French cars made after 2040, and the United Kingdom government has agreed to a similar target by 2050.

There is a growing push by many countries for electric vehicles to replace most fossil-fuelled vehicles. Norway is leading the charge, with official support for a transition to electric vehicles, and 52 per cent of new cars sold there were electric in 2017. India, China, Ireland, Israel, the Netherlands, Taiwan, and Denmark are among the small but increasing number of countries that have announced aspirational targets for transitioning to electric vehicles—but nowhere, yet, are any of these targets backed by legislation.

The situation is reminiscent of the early years of motor car development—electric and steam-powered vehicles were quite competitive, with the complex and unreliable vehicles powered by fuels derived from crude oil. However, biofuels can also replace liquid fossil fuels, and it should be remembered that Nicholas Otto used ethanol in his four-cylinder engine of the 1860s, Rudolf Diesel used peanut oil to fuel his early compression-ignition engine at the 1900 Paris World Fair, and Henry Ford, by 2017, was advocating ethanol as the preferable fuel for spark-ignition engines, as he regarded petrol as a source of air pollution.

One-hundred years later, history appears to be repeating itself. While some countries evidently see no alternative than a near-total conversion to electric-powered vehicles, others are well down the path of replacing fossil fuels with biofuels for all forms of transport.

This latter option is clearly feasible, relatively low-cost, and simple. Brazil showed the benefits of introducing ethanol into its fuel system. Ethanol is compatible with existing storage and distribution systems, can be blended at any percentage, maintains or adds to agricultural and rural jobs, and does not require major changes to engines or fuel lines. Brazil has even developed agricultural spray planes powered by ethanol instead of Avgas, and biojet fuel can also be produced from ethanol. While ethanol was initially produced from cane sugar and molasses, it can now be produced cost-effectively from cellulosic residues, including sugar cane harvest trash and bagasse.

The transesterification process for converting vegetable oil into biodiesel in the laboratory has been known since 1853. However, it was only in 1989 that

a commercial plant was constructed in Austria using feedstock from rapeseed oil. They also discovered how to convert used cooking oil (a worthless waste product with real disposal issues) into a sought-after feedstock for biodiesel, along with plant oils from high-yielding sources such as oil palm. Biodiesel is slowly giving way to renewable diesel—a higher quality fossil diesel substitute made by hydrogenating fatty acids under pressure, including animal fats or the tall oil byproduct of producing pulp from northern conifers.

Finland recently announced that it will be using diesel blends containing 20 per cent renewable diesel by 2020, and by 2030, it will be 40 per cent. In Helsinki, the newest city buses are fitted with the latest Euro 6 standard engines and use 100 per cent renewable diesel. Other buses are powered by compressed biomethane. Both forms of bio-fuelled buses produce near-zero particulate emissions and are regarded as CO_2 neutral. Finland is advanced in the production of biogas from all forms of putrescible wastes, as well as commercial production of pyrolysis oil from wood residues. ST1 in Finland is producing ethanol from sawdust and from industrial food residues, and it now has cellulosic ethanol plants in other countries, including Sweden.

In Sweden, over 21 per cent of all transport fuel is presently sourced from biomass. In Stockholm, most buses run on one of three biofuels. Airport buses use biodiesel and suburban and city buses use compressed biomethane, biodiesel, or bioethanol. Biodiesel / electric hybrid city buses are also in use. In other cities in Sweden, including Malmö, Jönköping, Uppsala, and Gothenburg, it is typical for buses to run on compressed biomethane mixed with a declining percentage of natural gas. Göteborg Energi is producing methane at a commercial scale from wood residues, but more often, biomethane is coming from anaerobic digestion of city putrescible wastes, including sewage. The Swedes have "a rule of thumb" that a city's wet wastes can power the city's public transport.

Denmark is a world leader in the use of straw for producing ethanol, with Danish company Novozyme playing a key role in this development alongside the part-government-owned energy company Ørsted (previously DONG Energy). Ethanol is used to provide an increasing blend with petrol, from an initial base of five per cent. On the island of Samsø, straw will be used as one main feedstock for producing biomethane for powering the island's own vehicle ferry. Work is also proceeding in Denmark on producing pyrolysis oil from straw.

Norway is a world leader in electric vehicle share, with the world's highest ownership per capita. However, Norway is also fostering biofuels production, using mandated blending legislation. Borregaard, a company operating in the pulp and paper industry since 1889, has been producing ethanol for industrial uses from sawdust since the 1930s. Now, with expanded production the company is supplying ethanol for blending with petrol. Norway's mandated biofuel blend in petrol is five per cent, and for diesel, it is 3.5 per cent (B5 is standard and B7 is available). In 2016, Norway announced a target of 20 per cent biofuels use by 2020.

It is clear that many countries, including Spain, Turkey, and Australia, which presently import fossil fuels and have an excess of available biomass feedstocks, now have the option to replace costly fuel imports by making a variety of biofuels. This is already happening at an increasing scale in many countries, including Germany, Thailand, Poland, Italy, South Korea, and India. ■

The Myths & Misconceptions About Bioenergy: Part III

By WBA

The majority of energy production from wood is as heat for households, institutions (i.e., hospitals, schools, and nursing homes), and small-scale industry (i.e., food production and processing).

Some district heat plants are using add-on economical systems, like this 500-kW wet steam turbine generator.

Most woody biomass used for energy is the lowest-value, or valueless, residue from forestry thinning or harvest operations, like rotted and insect-damaged wood.

Myth: That it is possible to achieve *Paris Agreement* targets without efficient use of sustainably sourced woody biomass.

Well-meaning people who are strongly focused on greenhouse gas emissions reductions to keep the global average temperature increase under 1.5°C can still be bioenergy denialists. One group of such people brought a case on May 4, 2019 to the European Court of Justice against the European Commission classification of biomass as a renewable energy source. If successful, this would undermine the entire transition to renewable energy in the European Union (EU). Further, if this goal is achieved more widely, it would make keeping the average global temperature increase under 1.5°C quite impossible.

People around the world are working hard to accelerate the transition to energy from renewable sources rather than fossil ones. But the process is still moving slowly, with only about 19 per cent of all energy consumed worldwide coming from renewable sources. About 75 per cent of this is from biomass of all sorts, but

Continued on page 16

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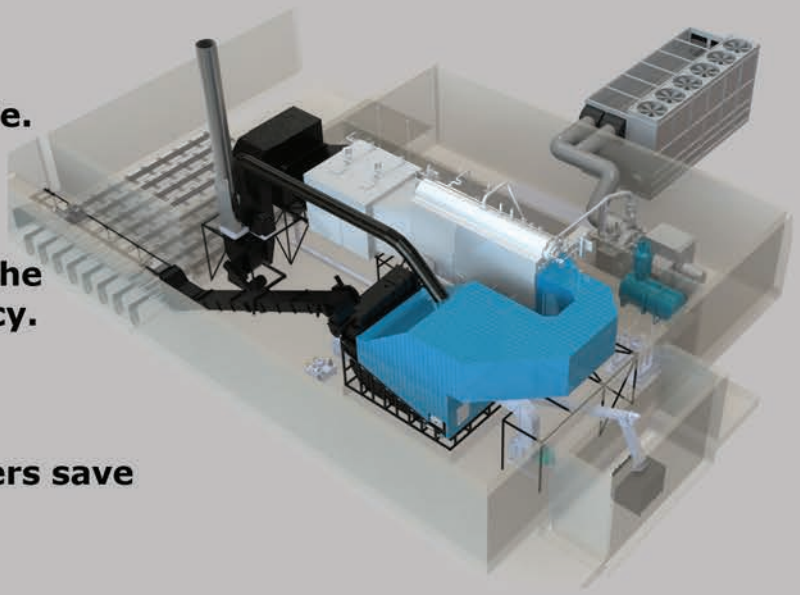

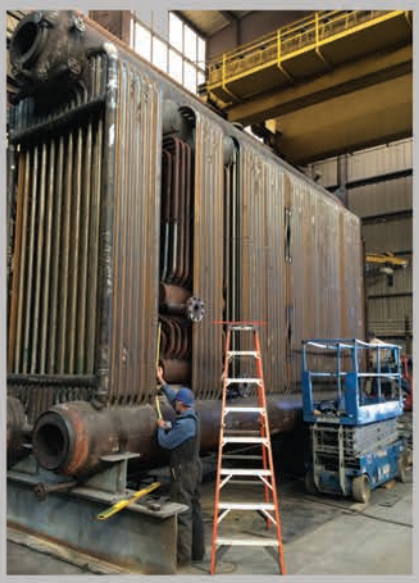

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KMW EQUIPMENT SHIPS FULLY ASSEMBLED AND SHOP TESTED

Continued from page 13

mainly as woody residues from forestry operations and timber processing.

In 2018, biomass was the source of about 17.2 per cent of all heating and cooling in the EU, with 6.5 per cent of electricity produced—or 19 million tonnes of oil-equivalent (Mtoe)—and 29 Mtoe of transport fuels. Overall contribution of biomass to consumed energy is higher in Austria, the Nordic countries, and Brazil, and higher still in developing countries in Africa, southeast Asia and South America.

Currently, the biggest challenge for the bioenergy sector is bringing about the transition from the inefficient use of biomass in these developing countries to the energy-efficient use of sustainably sourced biomass, whether as agricultural residues, residues from forestry, or city organic wastes.

Presently, biomass is the third-largest renewable source of electricity in the EU (after hydro and wind); by far the largest renewable source of heat and cooling and, effectively, the only source of non-fossil transport fuels. Overall, the largest sources of biomass are forestry residues and residues of timber industry processing. Secondary sources are agricultural biomass and all forms of putrescible waste, including sewage, manures, and wet organic material (i.e., food waste).

Yet, among many renewable energy organizations and environmental NGOs, there is a blindness to the vital importance of using biomass to combat climate change and achieve the *Paris Agreement* targets. An example is the aforementioned legal action presently in front of the European Court of Justice. The claimants are arguing that the RED II Directive, in treating biomass combustion as carbon-neutral, means the European Commission is encouraging the continued logging of natural forests in Europe and North America.

The claimants are also arguing this will result in forest degradation, more carbon dioxide emissions, and the loss of forests acting as carbon sinks. They claim the RED II Directive is counteractive in "preserving, protecting, and improving the quality of the environment...in particular, combating climate change."

The claimants include one person from southeastern U.S., who wants to stop the production and export of pellets to Europe, and another person from Ireland, who is concerned that co-firing energy plants with peat and woody biomass will perpetuate the use of peat as a fuel. Others include a group from Romania that is against logging forests, some people in France, who live near a bioenergy plant, and both individuals and groups in Slovakia and Estonia, who are concerned about logging in areas of "cultural and spiritual significance."

Each claimant or group sees it as a legitimate tactic to target the general use of biomass, rather than acting to improve the national regulation of sustainable forestry or push for cleaner energy plants. If their case is successful, the development of renewable energy in the EU will be greatly slowed at this critical period. The claimants have chosen to bring this to action, and they are supported by a number of "climate" NGOs, even though the claimants' case is mainly based on the fake science and myths that the World Bioenergy Association, the International Energy Association, the United Nation, the International Renewable Energy Agency and the European Commission Energy Directorate, among many other peak bodies, work to correct. ■

Construction of a biodigester in Ethiopia.

Cooking on a biogas-fuelled stove in Cambodia.

Global Status of Household Biodigesters

A status brief from SNV Netherlands Development Organisation on household biodigesters installed in Asia, Africa, and Latin America in 2018. This update was prepared in June 2019.

This brief provides data on the status of household biodigesters in Asia, Africa, and Latin America, for countries in which the SNV Netherlands Development Organisation implemented support.

In many of these countries, SNV's support was terminated while partners (i.e., private sector, government, and donors) have continued developing the sector. In this respect, the following data combines digesters installed with direct SNV support and with support of related follow-on projects.

Due to the absence of reliable data, most biodigesters sold in the free market or by NGOs or local governments through small projects could not be included. SNV expressed gratitude to all partners who provided information for this brief.

Installation rate in 2018

In 2018, over 38,000 household biodigesters were installed in 17 countries in Asia, Africa, and Latin America (see Table 1 on page 18). Almost all these digesters are fed by animal manure and provide two precious outputs: biogas (mainly used for clean cooking) and bio-slurry (a potent organic fertilizer to enhance agricultural production).

Asia delivered most digesters (over 27,000 units), particularly in Nepal, Vietnam, Bangladesh, and Indonesia. Africa surpassed 10,000 digesters, with most units installed in Ethiopia, Kenya, Zambia, and Burkina Faso. Numbers in Latin America are low. Up to 2018, over 868,000 households in 24 countries invested in a biodigester since the start of SNV's interventions in Nepal in the early 1990s. Of this number, about 315,000 units (36 per cent) have been established without SNV support, most of them in Nepal (over 154,000 units) and Vietnam (over 107,000 units).

Investment costs

The investment costs of biodigesters depend on the size of the unit, which is determined by several factors. Table 2 (on page 18) provides an overview of the most popular size of digesters in 14 countries, the investment cost of the most popular size (in local currency and USD), and the investment subsidy provided by the government and / or program, if any. The most popular size in most countries is four or six cubed-metres, comprising the total volume of the digester and gas storage. Niche markets for medium (up to 100 m^3) and large digesters (mostly up to 1,000 m^3) are emerging in countries like Ethiopia, Rwanda, Bangladesh, Nepal, and Vietnam, though numbers are still quite low. Most digesters are still constructed in-situ, using traditional materials, like sand, gravel, and cement, though companies are beginning to bring pre-manufactured digesters to the market in countries like Kenya, Vietnam, and Nicaragua.

Investment costs of the most popular sized biodigester in Asia and Africa range from US$500 to US$800. Exceptions include Nepal, Pakistan, and Nicaragua. In Pakistan, the greater investment cost is caused by the larger size. The higher cost of the

Asia:		
Country	2018	Up to 2018
Bangladesh	2.105	50.374
Bhutan	240	5.239
Cambodia	903	27.757
Indonesia	1.370	23.817
Lao PDR	-	2.888
Nepal	9.574	385.490
Pakistan	45	6.121
Vietnam	13.354	279.049
Total	**27.591**	**780.735**

Latin America:		
Country	2018	Up to 2018
Bolivia	-	50
Honduras	36	40
Nicaragua	317	1.466
Peru	-	26
Total	**353**	**1.582**

Africa:		
Country	2018	Up to 2018
Benin	25	132
Burkina Faso	1.699	11.986
Cameroon	-	355
Ethiopia	4.148	22.574
Ghana	13	17
Kenya	2.139	20.699
Rwanda	?	10.009
Senegal	-	2.287
Tanzania	28	6.570
Uganda	663	8.235
Zambia	1.738	3.394
Zimbabwe	-	97
Total	**10.453**	**86.355**

All regions:		
	2018	Up to 2018
Total	**38.397**	**868.672**

Table 1. The number of household biodigesters installed in 2018 and cumulatively by the end of 2018 in countries in Africa, Asia, and Latin America, where SNV provided support.

Region/country	Digesters installed (number)	Most popular size (m3)	Specification	Local currency (LCU)	Costs: Average investment cost for most popular size (LCU)	Costs: Exchange rate (LCU:USD)	Costs: Average investment cost (USD)
Africa:							
-Benin	25	4	in-situ	CFA	305.700	553,09	553
-Burkina Faso	1.699	4	in-situ	CFA	310.000	553,09	560
-Ethiopia	4.148	6	in-situ	ETB	15.661	27,43	571
-Kenya	2.139	6	pre-manufactured	KES	67.073	101,28	662
-Uganda	663	6	in-situ	UGX	1.876.040	3.744,01	501
-Zambia	1.738	6	in-situ	ZMW	9.000	11,16	806
Asia:							
-Bangladesh	2.105	6	in-situ	BDT	49.500	83,57	592
-Bhutan	240	6	in-situ	BTN	52.000	67,15	774
-Cambodia	903	4	in-situ	USD	550	1,00	550
-Indonesia	1.370	4	in-situ	IDR	10.749.000	14.500,35	741
-Nepal	9.574	6	in-situ	NPR	109.000	104,37	1.044
-Pakistan	45	15	in-situ	PKR	160.000	110,04	1.454
-Vietnam	13.354	6,5	pre-manufactured	VND	14.000.000	22.942,02	610
Latin America:							
-Nicaragua	317	6	pre-manufactured	NIO	37.646	31,55	1.193

Notes:
1) Exchange rates 2018 by IMF
2) Digester sizing in Bangladesh is based on gas production (2,4 m3/day)

Table 2. Investment costs in 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

Region/country	2010: Most popular size (m3)	2010: Specification	2010: Average investment cost (USD)	2018: Most popular size (m3)	2018: Specification	2018: Average investment cost (USD)	2018 versus 2010: Cost difference (USD)	2018 versus 2010: Cost difference (%)	2018 versus 2010: Remarks
Africa:									
-Benin	6	in-situ	1211	4	in-situ	553	-658	-54%	size reduction
-Burkina Faso	6	in-situ	808	4	in-situ	560	-248	-31%	size reduction
-Ethiopia	6	in-situ	800	6	in-situ	571	-229	-29%	same size
-Kenya	6	in-situ	947	6	pre-manufactured	662	-285	-30%	pre-manufactured
-Uganda	6	in-situ	741	6	in-situ	501	-240	-32%	same size
Asia:									
-Bangladesh	5	in-situ	488	6	in-situ	592	104	21%	size increase
-Cambodia	4	in-situ	430	4	in-situ	550	120	28%	same size
-Indonesia	6	in-situ	660	4	in-situ	741	81	12%	size reduction
-Nepal	6	in-situ	663	6	in-situ	1044	381	58%	same size
-Pakistan	10	in-situ	505	15	in-situ	1454	949	188%	size increase
-Vietnam	12	in-situ	621	6,5	pre-manufactured	610	-11	-2%	size reduction and pre-manufactured

Note:
1) Digester sizing in Bangladesh is based on gas production (2,0 m3/day in 2010 and 2,4 m3/day in 2018)

Table 3. Investment costs in 2010 and 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

Region/country	Most popular size (m3)	Specification	Local currency (LCU)	Exchange rate (LCU:USD)	Costs: Average investment cost for most popular size (LCU)	Costs: Average investment cost for most popular size (USD)	Financing: Subsidy amount (LCU)	Financing: Subsidy amount (USD)	Financing: Net investment by household (USD)	Financing: Share of households financing in cash (%)	Financing: Share of households financing through loan (%)
Africa:											
-Benin	4	in-situ	CFA	553,09	305.700	553	257.700	466	87	100%	0%
-Burkina Faso	4	in-situ	CFA	553,09	310.000	560	160.000	289	271	98%	2%
-Ethiopia	6	in-situ	ETB	27,43	15.661	571	7.000	255	316	79%	21%
-Kenya	6	pre-manufactured	KES	101,28	67.073	662	0	0	662	54%	1%
-Uganda	6	in-situ	UGX	3.744,01	1.876.040	501	0	0	501	86%	14%
-Zambia	6	in-situ	ZMW	11,16	9.000	806	1.500	134	672	99%	1%
Asia:											
-Bangladesh	6	in-situ	BDT	83,57	49.500	592	13.500	162	431	62%	38%
-Bhutan	6	in-situ	BTN	67,15	52.000	774	11.700	174	600	59%	41%
-Cambodia	4	in-situ	USD	1,00	550	550	150	150	400	93%	7%
-Indonesia	4	in-situ	IDR	14.500,35	10.749.000	741	9.229.000	636	105	43%	11%
-Nepal	6	in-situ	NPR	104,37	109.000	1.044	24.400	234	811	90%	10%
-Pakistan	15	in-situ	PKR	110,04	160.000	1.454	0	0	1.454	100%	0%
-Vietnam	6,5	pre-manufactured	VND	22.942,02	14.000.000	610	0	0	610	100%	0%
Latin America:											
-Nicaragua	6	pre-manufactured	NIO	31,55	37.646	1.193	15.788	500	693	98%	2%

Notes:
1) Exchange rates 2018 by IMF
2) Digester sizing in Bangladesh is based on gas production (2,4 m3/day)

Table 4. Financing of household digesters in 2018 for the most popular size of household digesters in countries in Africa, Asia, and Latin America.

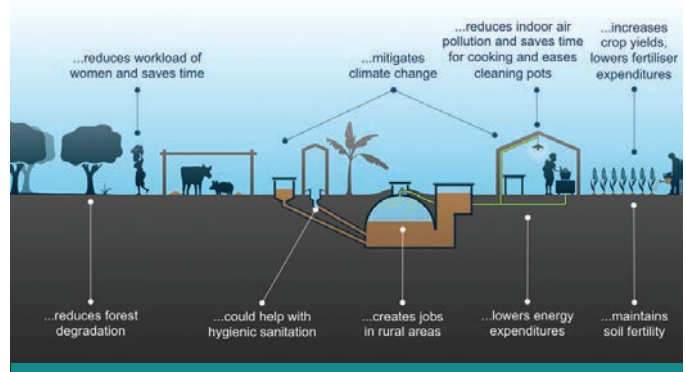


Figure 1. Multiple benefits of household biodigesters contribute to multiple Sustainable Development Goals.

(pre-manufactured) popular digester in Nicaragua may result from the small market (low economies of scale). Table 3 compares the investment costs of household digesters in 2010 and 2018 for 11 countries in Africa and Asia. Companies in Nepal appear to have increased margins to make operations sustainable. This may also be true, to a lesser extent, for other countries in Asia. The average investment of household digesters in Africa was reduced by about 35 per cent.

Financing

An investment of US$500 to US$800 is a major barrier for a rural household, even if the technical lifetime of the digester surpasses 20 years. It may be partially covered by the household through collection of traditional construction materials, like sand and gravel, and / or through the provision of unskilled labour. Some governments and / or programs, like those in Burkina Faso, Ethiopia, Nepal, and Indonesia, provide investment subsidies, lowering the net investment for farmers. See Table 4 for data on the most popular size.

In addition to subsidies, facilities for customer finance are key to market development. Credit facilities have made progress in countries like Ethiopia, Bangladesh, and Bhutan, but not in other countries, despite considerable efforts. In these countries, households are obliged to finance the (net) investment through cash and informal loans.

A new lease-to-own arrangement has been pushed by a limited number of companies in Kenya. Through this, no less than 45 per cent of the 2,139 Kenyan households that have installed a digester in 2018 financed their unit. In Indonesia, 46 per cent of biodigester households in 2018 received full subsidy from central or local government to provide better access to energy.

Multiple benefits

Operating biodigesters provide multiple benefits, as shown in Figure 1, by creating more income, increasing well-being, reducing vulnerability, improving food security, and offering more sustainable use of the natural resource base for small farmers. They potentially contribute to nine of the 17 United Nations Sustainable Development Goals (SDGs). Based on current UNFCCC methodologies, household digesters reduce greenhouse gas emission by three to four tonnes of carbon dioxide-equivalent each year.

Final remarks

Countries vary comparatively and within themselves, making it hard to compare data and information on household digesters. However, further analysis and sharing of results, challenges, and opportunities contribute to useful learning at the global level. ■

Please contact SNV Netherlands Development Organisation (wvannes@snv.org) for any questions or comments.

Technology Update: Olive Pomace Gasification

***By José Antonio La Cal**, MBA., Ph.D., Industrial Engineer, Polytechnic University of Madrid*

The drying process for olive pomace produced in olive oil mills.

Jaén Group's olive pomace drying plant in La Carolina, Jaén, Spain.

Jaén is one of the eight provinces of Andalusia, which has 650,000 hectares of olive grove (there are approximately 1,500,000 hectares in the Andalusia region). One of the most important biomass sources generated by the olive oil sector is the exhausted olive pomace, which is obtained from the drying process of olive pomace produced in the olive oil mills, and the next extraction of residual olive oil.

Traditionally, it has been used as fuel in drying ovens to generate the hot air necessary for drying olive pomace, where the humidity was reduced from approximately 65 to 10 per cent. It has also been exported to European Union countries, like Italy or the United Kingdom, to be used in its coal-fired power plants (co-combustion). It is also used as fuel in biomass power plants in Spain and Portugal, essentially via combustion technology.

Nevertheless, this fuel of renewable origin, which has low-humidity (under 10 per cent), high LCV (about 4,200 kcal/kg or 17.8 MJ/kg), and low ash content, is having difficulties finding new markets. The current situation in Spain is characterized by several tonnes stored at low prices (between 10 and 20 €/t).

One alternative is exhausted pomace gasification by the industries themselves, which can be integrated into cogeneration systems for combined production of heat and electricity. This is the project of Bioland Energy, a company of the Oleícola Jaén Group, which has an olive pomace drying plant in La Carolina, a municipality in the province of Jaén. This industry produces about 30,000 tonnes of exhausted olive pomace per year, while demanding significant amounts of electrical and thermal energy for its productive process.

The project consists of using pelletized exhausted olive pomace (about 14,000 tones per year) due to its high fine-particle content (approximately 80 per cent) and introducing it into a downdraft gasifier to produce syngas (gas mainly consisting of carbon monoxide and hydrogen), which must be cleaned before introducing it into a genset (three 400 kWe engines). The electrical energy (one MWe of total power) will be used for self-consumption along the plant production period (about nine months per year). The rest of the energy can be introduced into the grid and sold to the electrical distributor. Thermal energy must be used for drying olive pomace at the current ovens, thus replacing the current fuel and reducing emissions below the levels allowed by current legislation.

Olive pomace can be used as fuel in biomass power plants in Spain and Portugal, essentially via combustion technology.

Conclusion

There are many advantages resulting from this new model for the valorization of olive sector byproducts in relation to other systems as combustion. Some of the advantages include:

- It is based on a modular technology and is adaptable to different industries, depending on thermal and electrical demands.
- It is versatile because it can produce thermal and electrical energy simultaneously, as well as other coproducts, like biochar, which can be used as fertilizer or biofuel.
- It is based on the bioeconomy model and generates added-value for olive oil producers.
- It reduces particle emissions to the atmosphere—one of the most prevalent problems in the pomace oil sector industry.
- It has high energy efficiency, above 70 per cent.
- It is profitable from an economical point of view (IRR > 12 per cent). ■

José Antonio La Cal is an industrial engineer from the Polytechnic University of Madrid. He earned his executive MBA and doctorate from the University of Jaén, Spain. He works as an associate professor and is also the founding partner of BIOLIZA, a o subsidiary of the University of Jaén.

HAVE YOU HEARD?

Upcoming Events

Stay informed on exciting industry developments by attending these informative events throughout the year. For more information, visit the WBA's Upcoming Events page, www.worldbioenergy.org/upcoming-events. For event organizers, if you wish to be included in the list of upcoming events, please contact the WBA Secretariat at info@worldbioenergy.org.

SEPTEMBER 2019 TO MARCH 2020 EVENTS

September 17 to 19
Biomass North Forum 2019
BNDC
Ottawa, Canada

September 17 to 19
Advanced Biofuels Conference
SVEBIO
Stockholm, Sweden

September 19
Biogas China Forum 2019
ICESN
Qingdao, China

September 24 to 25
Biomass for Energy 2019
UABIO
Kiev, Ukraine

September 24 to 26
Expo Biomassa
AVEBIOM
Valladolid, Spain

October 6 to 8
USIPA 2019 Exporting Pellets Conference
USIPA
Miami, USA

October 22 to 23
International Biomass / Biogas / Biofuels Congress & Expo
Bioenergy Insight & Biofuels International
Brussels, Belgium

October 23 to 25
Korea International Renewable Energy Conference
REN21
Seoul, South Korea

October 29 to 30
Nordic Energy Forum
World Energy Council
Helsinki, Finland

October 29 to 31
Lignofuels Americas
ACI
Omaha, USA

October 29 to 31
Argus Biomass Nordics & Baltics
Argus
Copenhagen, Denmark

November 4 to 7
Solar World Congress
ISES
Santiago, Chile

November 11 to 15
Bioenergy Mission to Australia*
WBA
Brisbane, Australia

November 11 to 15
2019 Bio Innovation Week
Bioenergy Australia
Brisbane, Australia

November 14 to 15
3rd International Biomass Energy Summit
ACI Events
Shanghai, China

November 20 to 21
Power ON Gas
Fortes Media
Copenhagen, Denmark

November 25 to 27
Biogas Asia Pacific Forum
ICESN
Jakarta, Indonesia

December 2 to 13
25th Session of Conference of the Parties (COP25)
UNFCCC
Santiago, Chile

January 22 to 24
6th Central European Biomass Conference (CEBC)
ABA
Graz, Austria

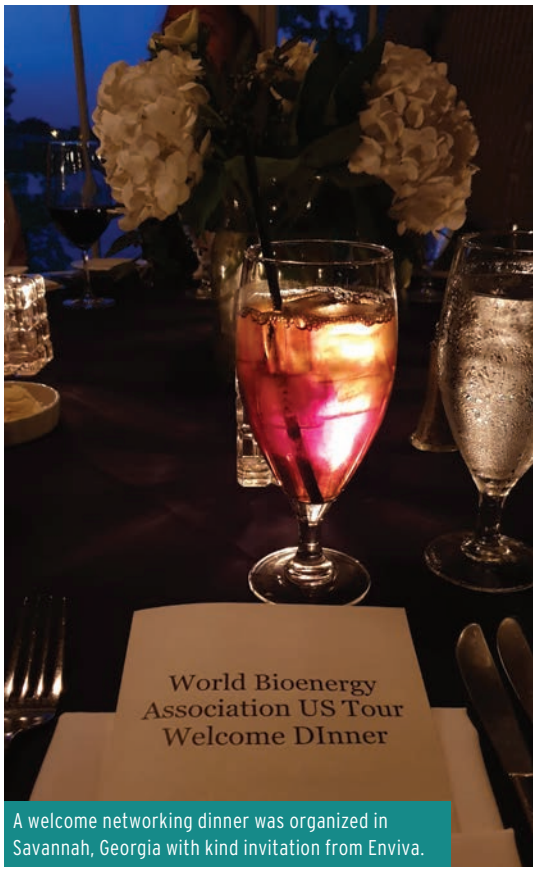
January 29 to 30
Regen Europe / Biogaz Europe / Bois Energie
BEES
Nantes, France

Event listings are current as of August 2019. Exact dates and locations may change. Please contact event organizers for confirmation. The above events have partnership with the World Bioenergy Association or have a WBA representative attending as a speaker or delegate. Some events feature distribution of WBA's BIOENERGY magazine.

denotes events hosted by the World Bioenergy Association.

WBA News: Role of Southeastern U.S. in the Global Pellet Market: Updates from WBA's U.S. Bioenergy Mission Trip

***By Bharadwaj Kummamuru**, Executive Director, WBA*



A welcome networking dinner was organized in Savannah, Georgia with kind invitation from Enviva.


A working forest site near Hawkinsville, GA.


The Georgia Biomass Pellet Facility in Waycross, GA, pictured here, is one of the largest facilities in the world, with 750,000 tonnes' capacity.

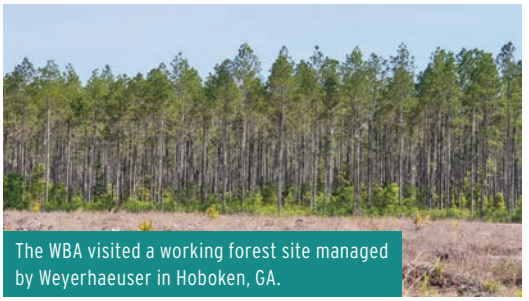
The World Bioenergy Association (WBA) organized a delegation from Europe and around the world to the American State of Georgia during April 29 to May 3, 2019. The delegation was comprised of bioenergy researchers, equipment manufacturers, consultants, civil society, and project developers. The purpose of this Mission to the U.S. was to connect local and global stakeholders to discuss issues related to pellets, forestry, sustainability etc., and to understand the successful development of forestry and the forest products sector in Georgia.

Study trip

The BIOENERGY Mission to the U.S. started with a study tour that included a two-day and 750-mile road trip. Starting from Georgia's capital city of Atlanta, delegates travelled through the southern part of Georgia, covering Waycross, Hoboken, Savannah, Hazlehurst, Hawkinsville, and the college town of Athens.

Discussions took place at pellet mills, ports, and forest harvest sites, which provided ample evidence on the sustainable harvest and use of forests in Georgia and the broader southeastern U.S. Clearly, there were significant synergies between the bioenergy (pellet) sector and sustainable forest management in Georgia. The production and export of pellets from Georgia to the European Union to meet

The WBA organized its 12th annual meetings at the Warnell School of Forestry & Natural Resources, University of Georgia, in Athens, GA.



The WBA visited a working forest site managed by Weyerhaeuser in Hoboken, GA.

demand for renewable energy in Europe was a key driver for success and sustainability.

Annual meetings

On May 1, 2019, the WBA organized its 12th annual meetings in Athens, Georgia. Organized at the Warnell School of Forestry & Natural Resources at the University of Georgia, the meetings included the Steering Committee meeting, General Assembly and the 45th Board Meeting of the World Bioenergy Association. The steering committee elected a new board of 18 members for 2019, comprised of experts from forestry, agriculture, liquid biofuels, pellets, etc., from 17 countries. At the general assembly attended by WBA members, the annual report 2018 was approved, and the meeting included a review of WBA activities in 2019 and its future course of action.

Pellets workshop

Finally, the workshop organized by Warnell School of Forestry & Natural Resources entitled *Adequacy of Spatial Databases for Conducting Risk Assessments of Sustainable Wood Sourcing Practices of the US Industrial Wood Pellet Industry Supplying European Energy Demand* provided a perfect opportunity to understand ways for sustainable forest management in wood pellet supply chains, along with issues at the interface of social, environmental, economic, and policy aspects of wood pellet supply chains. The participation of private sector, academia, and civil society provided opinions from diverse backgrounds.

Georgia forests

Georgia boasts one of the highest amounts of forest land in the country, with 24-million acres (approximately 10-million hectares), an all-time high. The state has 49 per cent more volume (m^3) of wood growing than 40 years ago. The ownership model is unique, as 91 per cent of the acreage is privately owned. The ability of the region to supply local and foreign demand for wood products is viable, as forest growth exceeds removals by 41 per cent annually. The socio-economic benefits of the sustainably managed forests are quite clear. In 2017, the economic impact of forestry was US$35.9 billion and created over 147,000 jobs in the region.

Georgia's abundant, productive, and sustainable forests are an integral part of the state's economy. Sustainability is an important part of the local forestry management practices in Georgia, ensuring there is a constant growth of forest land, more forest area than ever before, growth exceeding harvest annually, and the generation of local employment and revenues. ■

The WBA's BIOENERGY Mission trips are an annual event organized from April to May, wherein members and non-members in the global bioenergy community get together to discuss the latest challenges and opportunities for the bioenergy sector. Previously, WBA organized successful study trips to Sweden, Japan, Turkey, Kenya, Brazil, etc. A detailed report on the 2019 U.S. mission trip will be available soon and accessible only to WBA members. To access the report, please join WBA, https://worldbioenergy.org/join-us, or contact info@worldbioenergy.org.

Pannonia Bio:

At the Leading Edge of Transformation & Innovation

Pannonia Bio's corn ethanol production facility on the Danube River in Dunaföldvar, Hungary.

Mark Turley, founder of Pannonia Bio.

***WBA interviewed Mark Turley**, Founder of Pannonia Bio, in June 2019.*

> All our new investments go outside the traditional corn ethanol trichotomy of ethanol, corn oil, and distillers' grains. The reasons and benefits are all economic, and while we may be at the leading edge of the transformation, our entire industry is moving in the same direction.

Q: Pannonia Bio is the largest bioethanol plant in Europe, with a total capacity of 500-million litres of bioethanol. Bioethanol contributes significantly to the decarbonization targets in the mobility sector in the European Union (EU). What was your experience in the market uptake of bioethanol from your facility since its inception, and what has been the role of the Renewable Energy Directive (RED) I (2009) in creating a favourable market for biofuels in Europe?

A: Pannonia Bio is actually well above 500-million litres, but not thanks to anything coming from Brussels. The last decade has seen huge numbers of biofuels projects in the EU go bankrupt and has seen the EU go from a biofuels leader to now using less ethanol in its fuel than Argentina or Ethiopia. The way RED was managed killed off biofuel investments.

Q: The European Renewable Energy Directive (RED II) commences in 2021, with an obligation to member states to have a minimum of 14 per cent renewable energy in the transport sector by 2030, while limiting the contribution of crop-based biofuels. As an investor and bioethanol producer, what is your opinion on RED II and its impact on future bioethanol projects in Europe?

A: It is a classic Brussels bait-and-switch. RED II's transport sector provisions indeed state 14 per cent, as you note, but then sets provisions that allow member states to reduce the 14 per cent,

down to less than three per cent. That is a clear message to investors to look elsewhere. However, RED II also requires 32 per cent renewable energy across all sectors, and the *Effort Sharing Regulation* also requires huge amounts of decarbonization, and, under both of those realities, lots more biofuel will be needed.

Q: Considering the focus on second-generation / advanced / cellulosic technology in Europe and around the world, does Pannonia Bio have any future plans to invest in these technologies?

A: Yes, of course, but as with everything else under RED, how this actually plays out will be interesting to watch, and the predictions in Brussels will be completely wrong because they are based in ideology and fantasy rather than commodity prices and industrial realities. Pannonia should have large amounts of advanced biofuels online before RED II enters force.

Q: Formerly known as Pannonia Ethanol, your company recently rebranded itself as Pannonia Bio. Considering your history, the company seems to be moving from a purely ethanol-producing facility to a biorefinery, with the production of a multitude of value-added products, including corn oil, distillers' dried grains with solubles and bioproducts. What are the reasons and benefits for such a change?

A: All our new investments go outside the traditional corn ethanol trichotomy of ethanol, corn oil, and distillers' grains. The reasons and benefits are all economic, and while we may be at the leading edge of the transformation, our entire industry is moving in the same direction. Because you mentioned advanced in the last question, the great irony of EU biofuels policy is that all the true innovation is happening in crop-based refineries.

Q: Apart from the environmental impacts of climate change mitigation, bioethanol facilities or biorefineries have an immense socio-economic benefit, including jobs, local economy, public services, and impacts on local farming. What has been the impact of Pannonia Bio locally, and how does the facility engage local stakeholders?

A: Thank you for asking. Far beyond anything I ever imagined, Pannonia now supports 5,500 jobs. That's not my number; that's the number of the Hungarian Academy of Sciences. Likewise, the statistics now show that farmers in Pannonia's catchment basin are becoming increasingly more productive than more distant farmers. It's a story of win, win, win, win.

Q: Being Europe's largest bioethanol plant means a lot of effort should go into ensuring a well-functioning feedstock supply chain. What has been your experience in developing such a supply chain, and what are lessons learnt?

A: You're right. But I won't divulge details. Let me just say I believe we've put more effort into listening to our farmers, truckers, and suppliers over the past 10 years than anyone else, and we have developed practices and infrastructure that create huge mutual benefits all stakeholders share.

Q: One of the discussions globally these days is on emissions in cities due to population migration from rural to urban areas. Cities around the world are exploring options of restricting, or outright banning, internal combustion engine vehicles and promoting electric vehicles or public mobility. This poses a dilemma for flex fuel or pure ethanol cars. What should be the way out of the dilemma?

A: Rational policy based on a sober appreciation of costs and industrial realities should be the answer. Unfortunately, none of that describes current transport policy, especially in the EU. So long as transport issues are treated as an exercise in choosing the popular ideologies rather than a management exercise, oil companies will benefit as much as taxpayers suffer. There's not much more to say. Policy that swings from extremes and is full of platitudes is no less dangerous today and in the climate context than it was a century ago when applied to social and economic issues.

Q: One gets the impression that policymakers prioritize electromobility as the one and only way to a sustainable future concept. What is your view on the e-mobility versus biofuels debate?

A: Anyone who imagines some great struggle for transport dominance is already oil's great friend, including, therefore, most of the European Commission. Oil has 95 per cent transport market share today, and even Transport & Environment, e-mobility's great champion in Europe, has recommendations that will only result in fossil's market share reducing to around 85 per cent in 2030. Renewables versus renewables debates, by definition, miss that the real debate should be oil versus renewables, and everything else is, by definition, a failure.

Q: How much influence do international climate agreements (e.g. the *Paris Agreement* and the UN Sustainable Development Goals) influence your investment decisions on a local / regional level?

A: Regrettably, not at all. But that statement needs to be taken in context. As the WBA knows, we (through the Climate Ethanol Alliance) are the only dedicated biofuels presence at every Conference of the Parties of the UNFCCC other than the Brazilian Sugarcane Association (UNICA). We value the *Paris Agreement* and implement the SDGs. We spend money promoting both; a lot, actually. But because governments are not credibly implementing either, they don't influence our investments because it would be irrational to invest based on aspirations or poorly designed policies, the results of which won't match their stated goals.

Q: From a global perspective, renewables' contribution to the transport sector is less than three per cent, dominated by biofuels. Decarbonization of the transport sector is a major challenge. What has been the major roadblock for the rapid uptake of biofuels globally, and what key policies / technologies that can assist in the process?

A: Technology is not the issue; nor is this a transport sector issue. This is a bioenergy issue. The single biggest obstacle to developing the bioenergy sector is a belief system emanating from urban places where urban myths about land use are accepted as facts. Under this ideology, agricultural and forestry capacity is maxed out; hence, any use of biomaterial for energy diverts the material from the food and products sectors, causing hunger, driving up food prices, and driving deforestation to create more land. ■

Pannonia Bio is a 550-million-litre corn ethanol production facility in Dunaföldvar, Hungary, located right on the Danube River. It directly employs roughly 250 people and provides more than 5,000 others indirectly.

Biomass in Spain:

Markets, Trends & Mediterranean Technologies

Wood chippers in operation in Spain.

KEY FACTS

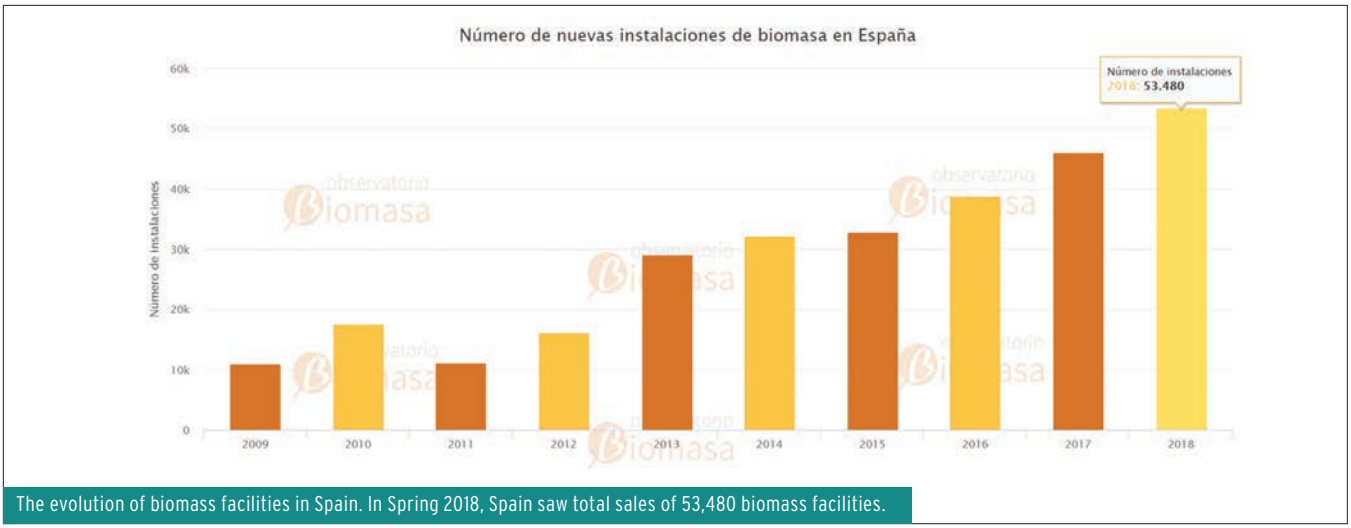
Population: 46.72 million
Country Area: 505,990 km^2
GDP: 1.314 billion USD
Energy Consumption: 122,176 Mtoe (2016)
Emissions: 263 Mt CO_2 (2016)
Renewable Energy Share: 14.3%
Bioenergy Share: 5.6%

***By Jorge Herrero**, Forest Engineer & Economist Project Manager, AVEBIOM*

Biomass is a key resource for the development of the Spanish bioeconomy. New renewable targets of 32 per cent by 2030, which must be completed with a PNIEC (National Energy and Climate Plan) in Spain, are celebrated by AVEBIOM, the Spanish Biomass Association. This must facilitate the development of renewable energies and implement coherent rules that avoid subsidies to fossil fuels.

Olive farms are prevalent in Spain and are an important source of bioproducts for energy.

Biomass is a sustainable and renewable feedstock for the Spanish energy system.



The evolution of biomass facilities in Spain. In Spring 2018, Spain saw total sales of 53,480 biomass facilities.

In Spain, renewable targets of 20 per cent by 2020 will be met thanks to biomass, which contributes 40 per cent to the target. Biomass has added benefit of reducing the dependence on imported fossil fuels, which, in Spain is 74 per cent, and to mitigating the costs and consequences of climate change. Currently, biomass accounts for 0.34 per cent of Spain's GDP, which corresponds to 3.700 million euros.

However, challenges remain. The current government does not collaborate enough in energy transition, with a lack of particular emphasis on bioelectricity.

The new electric generation projects with biomass stopped by RD 1/2012. Currently, there are 677 MW of electric power with agricultural and forest solid biomass, 224 MW with biogas, and 210 MW for municipality waste; an additional 200 MW are being built, which will come into operation this year.

For 2030, the Spanish PNIEC marks 1.7 GW for biomass and 235 MW for biogas. A clear commitment to new projects is necessary to boost the rural areas of the country, creating thousands of jobs and generating investments.

Thermal sector breaks record every year

In Spain, 47 per cent of the energy consumption in residential sector is heating. For 50 years, the gas distribution network has been boosted in Spain, with the consequent overcrowding of individual boilers in the cities. Still, the traditional use of biomass in Spain has remained largely in rural areas and the agri-food and forestry industry, and currently responsible for six per cent of the country's GDP. Thanks to the modernization of equipment and a local supply of low-priced, stable quality biofuels, biomass has gone from 9,600 installations in 2008 to 298,399 in 2018.

The progress of the thermal use of biomass in Spain has been important in recent years. The sector currently aspires to satisfy 50 per cent of the energy used in heating by biomass. This implies quadrupling the current percentage over the long-term, based on the modernization of biomass equipment, which already contributes 35 per cent of that 12 per cent, a figure that was barely eight per cent only 10 years ago.

The new installed capacity exceeded 1,000 MW for the fifth consecutive year. In 2018, 1,064 MW of biomass were installed (stoves, boilers, and other equipment). Total installed power has multiplied by

Residential pellet stoves are a renewable and modern heating solution.

seven over the last 10 years, from 1,510 MW in 2008 to 10,466 MW in 2018. This level of installed power with biomass allows generation of a significant amount of clean and renewable energy. It also prevents the consumption of the equivalent of 1,567 million litres of heating oil. Replacing fossil fuels with biomass prevents the emission of 4.1 million tonnes of carbon dioxide per year—equivalent to the pollution produced by 2.8 million vehicles, or approximately 12 per cent of cars in Spain.

Forecasted growth of the thermal sector at the national level is sustained within the number of installations for the next few years. The energy efficiency of all the equipment is improved, adapting to new directives, like eco-design or emissions.

Installation of pellet stoves grows again

Ninety per cent of biomass installations in Spain are as stoves. In 2018, 50,130 pellet stoves were installed in Spain, 16 per cent more than the previous year, with numerous brands exceeding 1,000 units per year and several of those surpassing 5,000 units per year. The marketing trend of "large DIY warehouses" continues, with more technological equipment being installed at an average power of 11 kW.

The annual increase of working stoves is increasing the consumption of bagged wood pellets—a booming market that is supplied by 90 pellet factories. In Spain, 85 per cent of pellet production is ENplus® certified, guaranteeing a homogeneous quality for the proper functioning of equipment.

Pellet production has increased by 2.7 times since 2012. In 2018, 593,000 tonnes of wood pellets were manufactured in Spain. Expectations suggest consumption will exceed one million tonnes in 2022.

Installation of boilers maintains a stable rhythm

In 2018, Spain had 18,127 biomass boilers for domestic use with power below 50 kW; 11,214 for industrial or collective use with power between 50 and 1,000 kW; and 1,138 industrial boilers with power exceeding one MW. The annual sales of biomass equipment in the last six years remain stable, with figures between 3,000 and 3,600. A low price of heating oil in recent years, combined with an aggressive pricing policy by natural gas companies in Spain, has kept the pace of installation stable.

However, the trend is more positive with help from the current price of heating oil, which is 67 per cent more expensive than three years ago. This is the main reason for changing to a biomass heating system for industries, families, and administrations, as there is a 50 per cent (or more) saving on energy bills.

In Spain, the consumption of chips for energy use is still much higher than wood pellets. On the one-hand, the 350 new biomass district heating built over the last decade are forecast to double in 2022. On the other hand, there is back-up fuel in the form of consumption of several-million tonnes of biofuels from the agri-food industry, like orujillo, nut peels, olive stones, coffee grounds, and rice husks. ■

AVEBIOM, the Spanish Association of Energy Valorization of Biomass constituted in 2004, brings together the biomass sector to promote the development of the industry in Spain.

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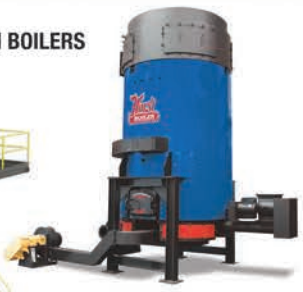

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