

Research Article

Energy – Biodiesel Towards a Life of the Men: A Contribution in the Environmental Protection

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Abstract

Energy is the capacity to perform a physical system, an energy exists in several forms such as: a heat, the mechanical energy, the light, the potential energy, the electric power or some other forms. We use the fossil energy sources which has released large amounts of toxic gases, which are the causes of some diseases to human, affecting the environment and increases the greenhouse effect. Governments have many policies to clean up an environment. One of the most policies that is geared to an economy with “green energy”. In Vietnam country, the productive raw materials of the biological alcohol. The principal biodiesels include: paddies, maize, sweet potato, maniocs, sugar - canes and productive raw materials of the botanical oil are: soy beans, pea - nuts, the trees have many oils... and the physix nuts (*Jatropha curcas* L) - Those are the trees which make the biodiesel, too. The last time, everybody does not take care about them. We observed studied, knew that those trees have many big values, these physix nuts can place the fossil energy, this kind of oil helps to reduce their emission of “greenhouse” and specially no contained Sulfur (S), therefore very close to the environment. However, we had many methods to plant and to make the experiment about the physix nuts (*Jatropha curcas* L) in Loc Thanh village, Bao Lam district, Lam Dong province. By many times, we had a result about those trees which develop very well here, including mountainous areas.

Keywords

Energy, Biodiesel, Physix Nuts, Trees, Material, Oil

1. Introduction About Energy and the Role of Energy to the Human Life

Definition: Energy is the ability to perform a physical system, energy exists in several forms such as heat, mechanical energy, light, potential energy, electric power or some other form.

Historical use of energy by humans: From early times to modern times: In the year 1700, when the industrial Revolution began, most of the energy for industrial countries from

the recovery and permanent sources (animal labor domesticated, wood, water and winds), mostly from the locally supply. In the year 1850, wood fire wood provides about 91% of commercial energy that used in the industrial countries in Europe and America. In the year 1900, oil and natural gas replaced coal extensively because they burn cleaner, easier, cheaper about the transportation the coal, because oil, unlike

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coal, can be filtered to the liquid fuels production for vehicles [4].

In 1984, about 82% of commercial energy that used for all the world by three underground fuel does not recover as oil, coal, natural gas and small quantities by nuclear fission of Uranium atoms are not be recovered to produce electricity.

1.1. Coal

Natural coal is formed certainly in several layers as residuals of the plant has suffered intense heat and pressure over millions of years, mostly Carbon (C) with the change amounts of water and the small number of N and S.

+ The advantages when using coal: radiate much energy, high temperature, low price.

+ Disadvantages: during combustion release CO, CO₂, SO₂, causing some respiratory diseases, cancer-causing substances, a small number of radioactive metal ... so easy to cause illness, death.

1.2. Natural Gas

In the ground state, natural gas is composed of 50 to 90% CH₄ and a smaller number of H₂C heavy gas (hydrocarbon) mixed as propane (C₃H₈), butane (C₄H₁₀), natural gas considered residue of crude oil.

+ The advantages when using natural gas: Heating, cleaner than charcoal and coal. Convenient, quick and flexible in transportation.

+ Disadvantages: Producing of CO. High price, hazardous transporting, burning, sometimes explode.

1.3. Petroleum

Petroleum is used be spent refining and processing of crude oil.

This is a sticky liquid, mostly a mixture of hydrocarbons (90-95% by weight) and small quantities of mixtures containing O₂, S, N. Petroleum supply time:

+ Advantages: Moving easily in countries and between countries. Price is relatively cheap. Fuel can be used to burn, cars, cooking, heating for industrial processing used for electricity production.

+ Disadvantages: Release CO₂, increase global climate change. Air pollution: SO, NO, ...

Water pollution: from spilled oil and groundwater contamination due to the solubility of water mixed into the oil well.

1.4. The Energy Usage and Issues in the Less Developed Countries

Most of the increase in energy consumption issues for each person since 1900 has occupied in the industrial countries and gaps in the average energy use per person between industrial countries and less developed countries are increas-

ing.

The most important energy source for the less developed countries is renewable biomass, mainly wood fuels in particular, it serves for the remaining energy with a simple half the world population. Increasing forest destroyed by logging companies, farms and the poor have stripped all the wood burned in a short time, then do not full replant make deforestation changes this survival recovery energy becomes no recovery resources.

1.5. The Oil Crisis is in the Future

Despite the flood of oil in the 1980s was effective in the short term, but it can lead to long-term U.S.A economic and national oil and other imports in 7 to 20 years in the future.

Most of energy analysts believe that the influx of oil in 1980 is only temporary and the plans significant increase in price increased 32 dollars/ 1 barrel, of course 98 planned to increase to the supply point requiring.

1.6. Electricity

Industrial electricity was born in late 19th century and early 20th century, and developed very quickly.

Industrial electricity now includes areas such as:

- 1) Thermal power plant using coal, oil or gas as primary energy.
- 2) Hydroelectric uses water energy of the river.
- 3) In the mid-20th century form of nuclear power industry.

Nuclear power industry. Countries with nuclear-power industry flourished is the U.S.A, Japan, next to Germany, Britain, France. Raw materials for nuclear power plant is uranium, the nuclear power energy has many advantages, it is a good additional source of energy for the primitive [4].

2. The Role of Energy for the Human Life- A Cause of Research

Since primitive humans have known to use fire cooked food, heating, driving away predators. To this day, the energy is used in all areas related to human life such as: industry, transportation; the family amenities such as: cooking water, air conditioning, cooking, running electrical appliances. Energy is very important.

2.1. The New Types of Energy

With the massive economic development in countries around the world have led to depletion of fuel resources, not enough for man, must have other source of energy for human use such as: Wind energy; Solar energy; hydro energy; energy from the ocean geothermal energy; fusion energy; biofuels

2.2. Biofuels

Currently, the world's people face the important work, that is:

1. The natural environmental deterioration, the phenomenon of gradual heating of Earth emissions increases due to the greenhouse effect, raising sea levels.
2. Sources of fossil fuels more and more exhausted, must have alternative fuel sources, especially not to pollute the environment.
3. Almost 2 billion of poor people lack of running water, no access to modern energy.

Within the scope of today, we pay specially an attention to biofuels.

Biofuels are fuels produced from biomass sources. There are two main types are:

1. Ethanol and methanol produced from biomass.
2. Biodiesel is a clean fuel which produced from the gel, oil can be recycled.
4. Benefits: Biofuels are widely used, because the following benefits:
 - 1) Provide and use the biofuels on the spot from many materials of plants and renewable.
 - 2) Biofuels do not contain toxic substances such as oil, biodegradative ability high. Use biofuels can reduce "the greenhouse" and emissions the other toxic gases.
 - 3) Contribute to building the agricultural economy, in addition to providing food, food for others, food for animals, raw materials for industry and supplying the power society.
 - 4) Use biofuels convenient, simple, besides, the other raw materials can use gasohol and mineral petrol which substituted them.
 - 5) The production technology of ethanol alcohol and preparation biofuel unlike complicated as petrochemical technology and the standard of invest much lower, they can produce with the other scale.

2.3. Biomass

Biomass is the term that used to indicate the organic materials derived from animals, plants.

Biomass contained that stored energy from the sun. Plants have an absorption solar energy through photosynthesis process. Chemical energy in plants was transferred into the body of human and animals. Biomass is the energy abilities renewable base on carbon cycle, unlike the other natural energy sources such as: fossil oil, coal, nuclear fuels. When it heated, the chemical energy in Biomass will be released form of heat energy [14, 15].

2.4. Forms of Biofuels

Many forms of biofuels that have been created, served usefully in daily life of human as well as in production, they

divided into: The level 1st of biofuel, includes; vegetable oil; biodiesel oil.

Solid biofuel such as: wood, household waste, firewood. The level 2nd of biofuel: Through producing the level 2nd of biofuel use plants is non-foods, including the cellulose biofuels. Some products are typical created: biohydrogen, bio-methanol, biohydrogen diesel, general alcohol. The level 3rd of biofuel: fuel from algae. The level 4th of biofuel: base on the conversion of vegetable oil and biodiesel oil to paraffin [6-8].

3. Using Situation of Biofuels in the World and Vietnam

3.1. In the World

- 1) Biofuels were chosen for use in the energy profession as well as the transport profession of OPEC's countries in the line production of substituted fuels for mineral petrol.
- 2) Brazil is the pioneered country for use of ethanol as substituted fuels.
- 3) Nowadays, the countries use biofuel such as: U.S.A, U.K, Germany, Italy, Austria, Belgium, France, Australia, Denmark, Sweden, Spain, Ireland, Hungary, Thailand, China.

3.2. Situation of the Using Biofuels Research in Vietnam

In Vietnam, raw materials for producing ethanol include: Rice: two granaries in Northern is Hong River delta, Northern provinces and Cuu Long River delta. Rice is used mainly for food, a processing industry, export. Corn: areas increased about 10 years later. Corn is used mainly as food for countryman in Northern, used as feed for domestic animals, some used as food for human. Sweet potato: many crops much, good for a sandy soil shallow. Some provinces in the high yield such as: Vinh Long province, Dong Thap province, An Giang and Kien Giang province... Cassava: is cropped much many places such as: mountainous midland in Northern, near the sea in Central area, the West highland, the South East... Sugar canes: are cropped much in East and West of South, have a total of 43 factories of sugar production. Raw materials to produce vegetable oil [12, 14, 15].

4. Object and Methods of Research

4.1. Object of Research

We brought the seeds of physic nuts (*Jatropha curcas* L) [11] which are the households of farmers at Ninh Binh, Hoa Binh provinces.

4.2. Methods of Research

1. In the nature: we observed around about a place of study, learn about the situation of plantation, the kinds of trees (Loc Thanh village, Bao Lam district, Lam Dong province, Southwest of Viet Nam) in order to evaluate about the soil, water source, an environment. We planted physix nuts [3, 9, 10].

2. In the laboratory: We analyzed models of soil, water and analyzed the data, made the plan and wrote the report.

4.3. Time of Research

Since 2012 to 2023 (The experiment has been many times and 1 year was stopped by COVID-19).

5. Results and Discussion

Table 1. Results of water sample at the researching place.

Figure	Analytical quota	Lake water samples	Limit	Note
1	pH	7.22	6 – 8.5	
2	Turbidity (NTU)	9	-	Excessive regulation
3	Colours (Pt – co)	8	-	Excessive regulation
4	Hardness (mg CaCO ₃ /l)	7	-	Excessive regulation
5	Ca (mg/l)	1.60	-	
6	Mg (mg/l)	0.72	-	
7	Cl ⁻ (mg/l)	2.22	250	
8	SO ₄ ²⁻ (mg/l)	1.21	-	
9	SO ₄ ³⁻ (mg/l)	0.011	0.1	
10	N – NO ₂ (mg/l)	NO having	0.01	
11	N – NO ₃ (mg/l)	NO having	2	
12	N – NH ₄ ⁺ (mg/l)	0.05	0.1	
13	Coliform (MPN/100)	<0.03	2500	Excessive regulation
14	E – coli (MPN/100)	<0.03	20	Excessive regulation

(Source by: Analyzed at The Central of Environment, 2015) [13]

A turbidity, color, hardness: high; Mg, Ca, Cl⁻, SO₄²⁻: high; NO₂⁻, NO₃⁻: not; E. Coli, Coliform: high

Table 2. Results of the soil sample at the research place.

Figure	Analytical quota	Results of the soil sample	Methods
1	pH (H ₂ O) 1:5	6.33	
2	pH (KCl) 1:5	4.58	Standard of VN 5979 – 1995
3	EC (μs/cm)	22.9	Standard of VN 6650 – 2000
4	Total N (%)	0.087	Standard of VN 6445 – 2000
5	Total P (%)	0.044	
6	Total K (%)	0.020	
7	Fe exchange (mg/100g)	20.12	AOAC 990.08 – 2000
8	Al ₃ ⁺ exchange (mg/100g)	2.37	

Figure	Analytical quota	Results of the soil sample	Methods
9	Ca ₂ ⁺ exchange (mg/100g)	0.083	Standard of VN 6496 - 1999
10	Mg ₂ ⁺ exchange (mg/100g)	0.059	
11	Form of soil	Sandy (%)	4.3
		Clay (%)	59.3
		Silt (%)	36.4
12	SO ₄ ²⁻ (g/100g)	0.987	Standard of VN 6656 - 2000

(Source by: Analyzed at The Central of Environment, 2015) [13]

Soil is acid, it is poor of the nutrients, it must be fertilized by the humus or had been a neutral by lime powder

Table 3. Information is connected with physix nuts which planted at Bao Lam (Through each stage, we tended plant which grows follows).

Figure	Stage	Total plants from seeds	Times	Everage high (cm)	Everage diameter (cm)	Total of leaf on tree	Note
1	1	100	1 month	1 - 2	-	1	
2	2	100	6 months	10 - 12	1	4 - 6	
3	3	100	12 months	50 - 70	1 - 5	8 - 15	
4	4	100	18 months	70 - 150	5 - 16	16 - 30	Trees for flowers, fruits
5	5	100	24 months	150 - 180	16 - 26	40 - 50	Trees for flowers, fruits
6	6	100	48 months	180 - 210	26-36	50-150	Harvesting fruits, oil seed pressed



Figure 1. Physix nuts (*Jatropha curcas*. L).

6. Comment

In general, plant good develops, high and diameter strong grows. In addition, lived in delta, plant have abilities grows in mountain land, be suitable for forest land development, contribute to minimize environmental pollution worldwide. Plant will bring with the biofuels in the future.

However, in the process of planting (from nursery, planting and tending outside), trees require that are planted and

tended very special, because changing natural conditions, the physix nuts impacted significantly in the process of growth and development.

7. Conclusion

From the research to showed that the physix nuts can be planted and grows in mountain area of Bao Lam District, Lam Dong province [9], but in the plain area, the physix nuts develop more. The physix nuts will be potential tree, bring to benefit economy, protect environment and especially, provide biofuel for all over the world while scare.

By the benefits of biofuel that we said, we must use many biofuels replace gasolines, petroleum.... biofuels are excellent about many factors from materials to spiritual, environment. We must tell about the physix nuts, they are precious. They are not only make oils, but also medicines, too [1, 2, 5].

Abbreviations

pH	Potential of Hydrogen
N	Nitrogen

C	Carbon
CO	Oxide Carbon
CO ₂	Dioxide Carbon
Cl	Clor
Fe	Ferrum, Iron
Al	Aluminum
Ca	Calcium
Mg	Magnesium
O ₂	Oxygen
S	Sulfur
SO ₄	Sulfate
PO ₄ ⁺	Phosphate
NO ₂ ⁻	Nitrite
NO ₃ ⁻	Nitrate
NH ₄ ⁺	Ammonium
OPEC	Organization of the Petroleum Exporting Countries
USA	United States of American
U.K	United Kingdom

Conflicts of Interest

We assure that we work, write this report with a cooperation and an unity, no conflicts of interest.

References

- [1] National Library Medicine "Medicinal plants", Available from: <https://www.Caythuocthienhien.com> [Accessed 8 May 2024].
- [2] National Library Medicine "Medicinal plants", Available from: <https://tracuuduoclieu.vn> [Accessed 3 March 2024].
- [3] An Nguyen Thi Ngoc, Book "The necessaries trees on garden in the South of Vietnam", Agricultural Publishing, Ho Chi Minh City, 1996, pages 4, 5.
- [4] An Nguyen Thi Ngoc, Book "Human and environment", Agricultural Publishing, Ho Chi Minh City, 1997, pages 133-145.
- [5] An Nguyen Thi Ngoc, Book "The trees to cure the diseases and environment", Agricultural Publishing, Ho Chi Minh City, 2010, pages 18, 19.
- [6] An Nguyen Thi Ngoc and alts, 2nd International Conference on Environment and Natural Resources "To apply growing tree for biofuel to serve everyday use - Decrease pollution", Ho Chi Minh City, Vietnam, 2010, pages 5-10.
- [7] An Nguyen Thi Ngoc, Book "Energy: saving, effect, environmental protection and biofuel", Agricultural Publishing, Ho Chi Minh City, ISBN: 978- 604-60-3574-9, 2022, pages 49-73.
- [8] An Nguyen Thi Ngoc, Book "The urgent issues are relatives with an environment", Agricultural Publishing, Ho Chi Minh City, ISBN: 978-604-60-3569-8, 2022, pages 49-62.
- [9] Bao Lam district, "Document about a report of Bao Lam district, Lam Dong province", 2015, pages 5-7.
- [10] Chinh Nguyen Manh, Quyen Mai Van, Nghia Nguyen Van, Book "Doctor of the planting trees", Agricultural Publishing, Ho Chi Minh City, 2005, pages 18-20.
- [11] Ho Pham Hoang, Book "The vegetables of Vietnam country", Montreal Publishing, 1991-1993, pages 245-247.
- [12] Ministry of Industry and Trade, "Document about Scheme on development of biofuels by 2015 to 2025", 2010, pages 23-29.
- [13] Medicinal Ministry, Book "National Technical Regulation on the limits of metals contamination in food", 2011, pages 4-6.
- [14] Phu Nguyen Thien, Bao Nguyen The, Book "Energy conservation- Reasonably used, cost effective in industry", Technical and Science Publishing, 2006, pages 98-100.
- [15] Think Truong, "Document of Strategic investors in the Republic Lao People's Democratic", 2010, pages 25-30.