Food Security Versus Bio-fuels Development: A Review

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Abstract:-This paper reviews the effects of biofuels on food security and the costs of food varieties in recent years. One of the premier issues with the expanding creation of biofuel is that it meddles with the regular and rural assets utilized as food since its primary wellspring of creation is a farming crude item. Along these lines, the increment underway of biofuel will affect the generally speaking horticultural area and the food costs and in this manner it prompts food instability. The reason for this paper is to research whether the increment underway influences the costs of food items and feedstock for biofuel creation or not. The critical elements like raw petroleum costs, biofuels creation, and the variety in the costs of food things are dissected. We are moving towards biofuels because of their sustainable nature however it contrarily affects the rural area and food security, yet on other hand, it will likewise make a period of prosperity in the car and agribusiness area and can set out open doors for the horticultural area. It is the need of great importance to imagine that the varieties in the costs of feedstock are a central issue that how biofuel creation will affect agrarian turn of events. Policymakers ought to recognize the impact of the value variety of feedstocks when they advance their biofuel crusades and select feedstock to set up into the horticultural turn of events.

Keywords: - Agricultural Development, Bio fuels, Feedstock, Food Prices, Food Security, Transportation Fuels.

I. INTRODUCTION

Bio-fuel Production is expanding quickly everywhere on the globe, driven by the rising unrefined petroleum costs in the worldwide market, the fantasy of the nations to become energy autonomous. In the previous few years, the interest in fills dependent on inexhaustible sources has been expanding around the world, mostly because of the problems associated with the use of fossil fuels such as:-

1. Increased consumption of fossil fuels.

2. Rapid increase of greenhouse gas emissions

3. Countries those are mostly dependent on imports from the other countries.

The purpose of this paper is to analyze whether the increment in the creation of bio-fuels influences the costs of food items or not which is by all accounts a significant worry for food security. The extremely important factors like crude oil prices, bio-fuels production, and the variation in the prices of food items are analyzed. Bio-fuels are the alternatives to fossil fuels, which give cleaner energy and will provide opportunities to the agriculture sector. However, developing countries will face problems like food security, increase in food prices, food shortage, etc. They must address the issues related to food security and the prices of food items while they develop biofuels because the significant feedstocks right now utilized for biofuels creation are somehow or another utilized for food creation and there are a few cases that an increment in biofuel creation will build the food costs and will prompt food instability. The increase in the production of ethanol around the world has affected the food market and food prices in the domestic as well as international markets.

Since now more food grains will be needed to create biofuels just as to use as a food item, which increases the prices of food grains. So ultimately it will affect the price of the feedstock too causing an increase in the price of feedstock. Here the inquiry emerges that how could non-industrial nations react to the advancement of biofuels

when food security is an issue? Since the very feedstock that is being utilized in biofuel creation is utilized as a food item [1].

II. METHOD OF APPROACH

The strategy for approach applied in this paper depends on the two boundaries:

1) Evolution of energy assets: How we continued towards the biofuels from wood and petroleum products.

2) Relationship between the amount of biofuel delivered, cost of creation, and following the market costs.

3) A survey on the food versus fuel conversation.

In years with high horticultural yield expanding interest for feedstock for biofuel was not influencing the food costs however in years with low agribusiness yield food costs will increment in light of the fact that the significant part of the harvest is getting utilized in the biofuel creation.

The present biofuel creation is low since it is expensive and there are not very many vehicles that utilizes biofuel. Biofuels will not rival petroleum derivatives without endowments in view of their exorbitant costs. Their cost is reliant upon bunches of elements, like the cost of feedstock, transformation cost, Research and Development, and executed arrangement measures.

2.1 Evolution of the Energy Resources:

Until the nineteenth Century, biomass was the fundamental wellspring of energy utilized by people. Wood, Animal manure and other waste were utilized for quite a long time and was the solitary wellspring of energy for cooking and for other use during the eighteenth and nineteenth century. Till now biomass served the energy requests of the people groups. Indeed, even today a major piece of total populace is reliant upon biomass for Energy needs, basically the individuals who are living underneath the neediness line. In numerous spots cooking with cow fertilizer or wood is the standard. As indicated by information from the United States Environment Protection Agency(EPA), generally a large portion of the number of inhabitants on the planet relies upon consuming biomass, like fertilizer, wood, coal, etc[2].

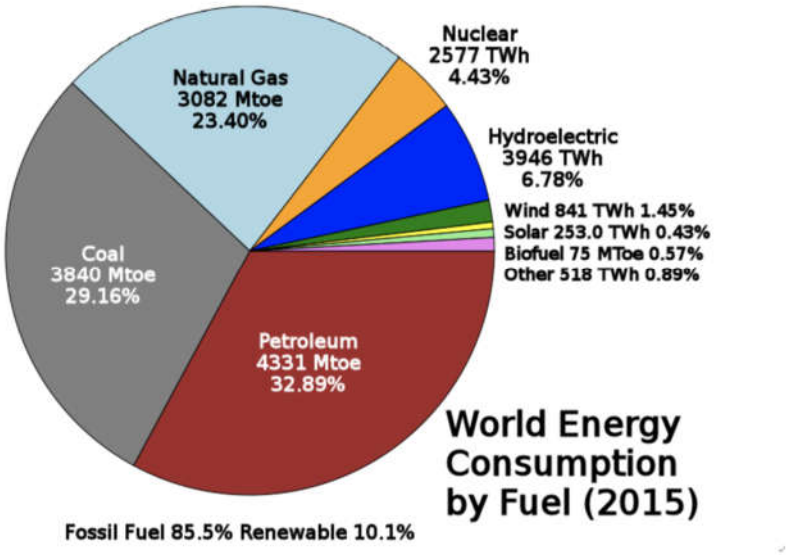

Fig. 1. Worldwide Consumption of various fuels in 2015.

From the eighteenth to nineteenth hundreds of years, with the Industrial Revolution, petroleum products turned out to be famous among individuals, first coal and Later on gas and oil, which totally succeeded biomass as the fundamental fuel source. During the twentieth century, fossils fills in their strong gas and fluid structures were ruling the world as far as energy assets, notwithstanding the rise of different sorts of energy creation like atomic, which was created in the twentieth century and caused solid social discussion.

A turning second in reclassifying the wellsprings of energy was the oil emergency of the 1970s, the primary at any point significant emergency for the fuel, whose utilization was rising step by step after the second universal conflict and the created nations were profoundly reliant upon its inventory. A few issues like the fall in the costs of dollars and other policy driven issues prompted the choice by the Organization of petroleum trading nations to expand the cost of unrefined petroleum in 1973, on the grounds that around then there were not many options in contrast to the interest for the oil as it was the selective wellspring of energy for the entire world. The cost of unrefined petroleum per barrel rose fourfold in a limited capacity to focus time.

Again at the beginning of 1980s, the world saw a second oil emergency; the cost of the barrel of raw petroleum, which had shifted between 10 to 15 dollars during the 70s, presently rose to 35 dollars in 1982. This emergency rolled out a significant improvement in the created nations, which were absolutely subject to oil, to track down a new elective wellspring of energy to fulfill their needs and diminish their reliance on oil. From that point research was ventured up to discover new fuel sources other than petroleum derivatives and subsequently, we become acquainted with about sun powered energy, wind energy and, biofuels. Bueno-Oliveros clarified that in 1912 Rudolph Diesel, who concocted the engine, imagined that the utilization of vegetable oils, which was not huge during that time, would abruptly become as significant as those created from petrol.

Thus, after using fossil fuels for more than a hundred years, again biomass came to light. This has been boosted by a set of conditions:

1) Huge part of unrefined petroleum supply comes from those nations that are politically unsteady and it is a state of worry after the main oil emergency.

2) Moreover, expanding unrefined petroleum costs alongside signs showing that oil stores might be nearly depleted in the primary portion of the 21st Century is another motivation to move towards another wellspring of energy.

3) Since the vehicle area is vigorously reliant upon oil and where it is more troublesome, expensive, and delayed to utilize different sorts of energy(solar, wind). Nonetheless, the presentation of fluid fills from biomass with the end goal that ethanol and biodiesel is a notable innovation that doesn't need any significant motor adjustments for their utilization in the traditional motors which is by all accounts productive in the current situation.

Every one of these conditions referenced above have added to biofuels extending quickly.

The biofuels industry is a new player in the business landscape. The biofuels industry will grow rapidly in the coming decades. Corn ethanol was the first phase of biofuel’s evolution. Other phases will follow. So, the biofuels industry needs attention right now, not only as it exists now, but how it will look in the future[3].

What role does agriculture play in the biofuel market?

Biofuels is an admissible source of energy in particular if feedstocks are grown economically: because feedstock is an essential part of biofuel production. Agricultural sector plays an important role in the production of biofuel. Because almost every feedstock is an agricultural product so for the production of biofuel countries are heavily dependent on the agriculture sector.

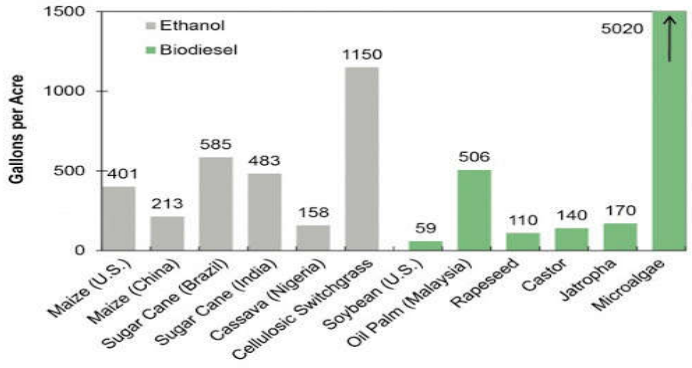

Fig. 2. Production of biofuel from various feedstocks in different countries.

Broad biomass resources in the villages have a great scope for independent heat and power supply. Extensive agricultural products are getting used for biofuel production for eg. in the USA around 82% of biodiesel is produced from soybean oil. Every year the production rate of biofuel is increasing and also the need for feedstock would be larger in the upcoming days.

III. RECENT TRENDS IN BIOFUEL PRODUCTION

As examined before that, regardless of the ascent that biofuel has appreciated as of late, that far covers a little level of all out fuel sources, just 0.5%. Its overall weight is higher in the event that we consider just the vehicle area where, as indicated by information from the worldwide energy office, it presently has a portion of about 3% and the expectation is that it could stretch around 7% till 2030. The majority of the nations are supplanting some piece of the petroleum derivatives with biofuels at first. The principle feedstocks utilized for biofuel creation are grain, Soybean, Corn, Sugarcane, and sunflower [4]. These feedstocks change from one country to another in light of the fact that each nation's environment and soil quality shifts.

In most European nations wheat is utilized as a significant feedstock for ethanol creation. Though the creation of biodiesel depends on rapeseed oil and just 3% of biodiesel is delivered from sunflower oil and 18%from soybean oil. In the USA ethanol creation is principally founded on corn. Though biodiesel is created from soybean oil, 82% , and canola oil, 13%.

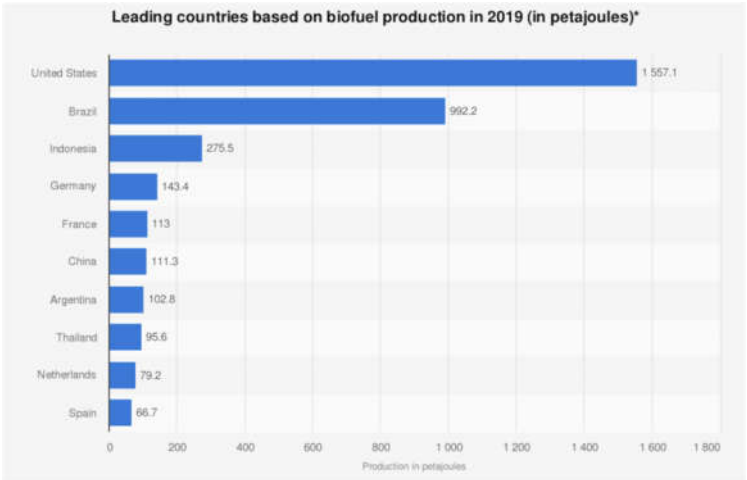

Fig. 3. Manufacturing of Biofuels in Various Countries.

It is currently a hot topic in the international discussion if and to what extent biofuels production will affect agricultural commodity prices. There are two points of views:-

1. The primary central point in the increment in food costs is the utilization of food crops for the creation of ethanol. Because of the fast development in the creation of ethanol in the past couple of years, it abbreviates the accessibility of food things at the global market with expanded costs.

2. Expanding feedstock costs are predominantly a direct result of components, for example, monetary hypothesis and oil value improvements.

The greater part concurs that biofuels are pushing the costs of food vertical, yet gauges of what extent fluctuate broadly.

3.1 Biofuel Production

As indicated by the WBA Global Bio Energy Statistics 2018, Since 2000-2017, the creation of biofuel has expanded multiple times from 16 billion liters to 143 billion liters. Ethanol is the most delivered biofuel and subsequently, the biggest sustainable fuel in the overall vehicle area. This is the venture needed to run a plant that burns-through 2000 dry huge loads of feedstocks each day, with around 8410 activity hours. The yearly creation of ethanol is around 35,150,000 gallons, and the absolute capital needed for speculation per gallon of ethanol will be around $7.26[5]. The creation of biofuel is expanding at an exceptionally quick rate. Ethanol creation is developing at a quicker speed in numerous pieces of the world because of the greater oil costs and expanded ozone harming substance emanations, which is making ethanol more serious, principally in mix with motivating forces given by governments.

Item	Description		Amount
Total equipment purchased cost, TEPC			$72,666,884
Equipment installation	39%	of TEPC	$28,340,085
Instrumentation and control system	13%	of TEPC	$9,446,695
Process piping	31%	of TEPC	$22,526,734
Electrical equipment	10%	of TEPC	$7,266,688
Buildings	10%	of TEPC	$7,266,688
Site development	10%	of TEPC	$7,266,688
Total plant direct cost, TPDC			$154,780,464
Engineering design and supervision	32%	of TEPC	$23,253,403
Construction	34%	of TEPC	$24,706,741
Total plant indirect cost, TPIC			$47,960,144
Total plant cost, TPC			$202,740,607
Contractor's fee	5%	of TPC	$10,137,030
Contingency	10%	of TPC	$20,274,061
Fixed capital investment, FCI			$233,151,698
Working capital	5%	of FCI	$11,657,585
Land			$10,497,049
Total capital investment, TCI			$255,306,332

Fig. 4. Summary of the total Capital investment[5]

3.2 Land usage, water demand, and yield

Around 99.7% of food come from the natural climate, while just 0.3% comes from seas and other amphibian biological systems. The vast majority of the land reasonable for the creation of biomass is as of now being used. Assuming we recognize the entire land accessible around the world, we can say out of the all out 13 billion hectares of land territory on earth the rates being used are: cropland, 11%; field land, 27%; timberland land, 32%; metropolitan 9%; and other 21% The other 21% is essentially not appropriate for crops in light of the

fact that the dirt is too barren to even consider exposing the development of plant, or the environment is excessively chilly, dry or wet [6-8]. At present, the utilization of biomass covers around 13% of the overall interest for energy. Biomass supply potential is very subject to land accessibility, crop yields, interest for food, and seeking biomaterial products [9].

In 2006, around 14 million hectares of land are utilized for the creation of biofuels. Given that almost 1% of in general transportation powers are gotten from biomass, raising the offer to 100% is unmistakably unthinkable with the exception of fuel request is diminished, the efficiency of land is expanded or feedstock for the biofuel is moved from biomass to another one, for example, crop deposits, grasses that can be developed on non-arable terrains, family buildups, and so forth The enormous scope utilization of biofuels is preposterous except if second-age innovations dependent on lingo cellulosic biomass that requires less arable land can be created commercially [10].

IV. COMPONENTS OF FOOD SECURITY

The United Nations expresses that "Food security exists just when all individuals, consistently, have physical and financial admittance to enough measure of food that meets their dietary requirements[11]. Costs are the fundamental financial markers of continuous changes in the necessary sum and nature of food things. Notwithstanding varieties in costs, value instability is a check of food security. Fast value changes recommend quick varieties in the admittance to food things. The costs of food things mirror the harmony among request and supply in the food market.

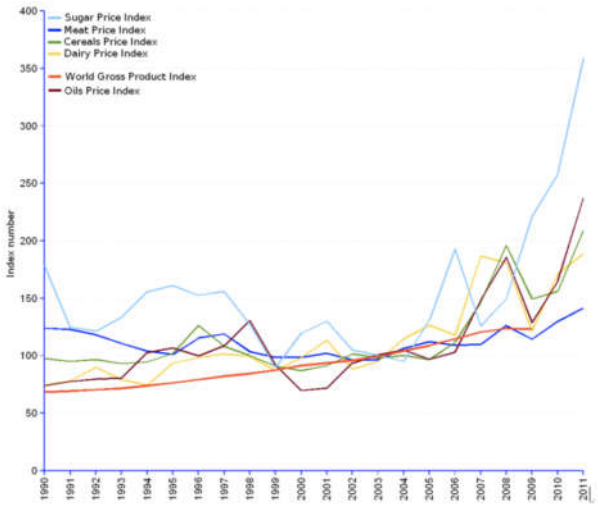

Fig. 5. Rise of Food Prices with Increase in Biofuel Production

On the off chance that the costs are going high, it implies request is more and supply is less and the other way around. Costs additionally show the consumption of family earnings per unit of the necessary sum and nature of the food. Board (1) of figure 6 addresses two inverse instances of family responses to supply stuns for a specific food thing. In the event of A, the significant impacts of the inventory misfortune on costs are totally counterbalanced by diminishing utilization because of a versatile interest bend, coordinating to a minor expansion in cost.

Yet, if there should be an occurrence of B, family needs are profoundly inelastic, coordinating to an enormous value change. The vast majority of the food things are fundamental in nature and subsequently profoundly inelastic sought after.A third likelihood is shown in Panel (2) of figure 6. Case B' joins an inelastic interest bend with an inelastic stock bend. An exceptionally inelastic short-run supply bend will result from the mix of sudden gather misfortunes and low harvest stocks. As demonstrated in figure 6, case B' delivers a lot more costly impact than case B, though the value impact in the event that A' is equivalent to that of case A. These theoretical cases express two focuses. One is that the market value impacts of a given inventory stun rely upon the interest bends for that thing, and the other one is that solitary value changes can't give a full proportion of the relationship of food market changes on family welfare [12].

The majority of the biofuel research is centered on achieving costs similar to petroleum derivatives, and analysts accepted enormous scope organizations for the energy harvest would be created [13].

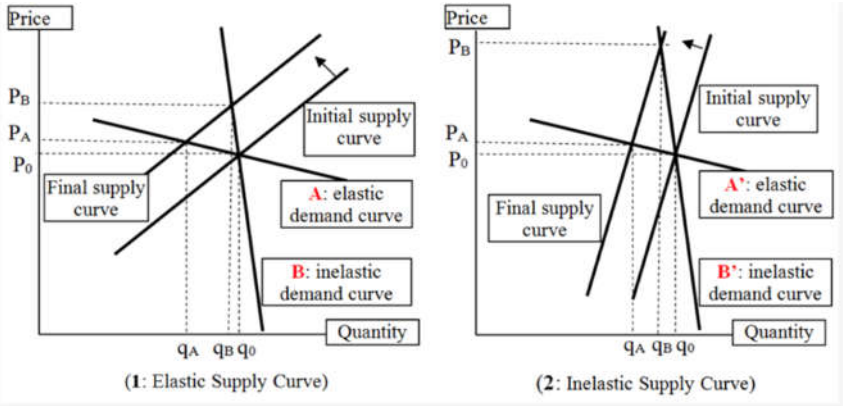

Fig. 6. Demonstration of price fluctuations in the food market when stock shortens[12].

4.1 Does bio-fuel have some impact on food prices?

Expenditures on food add up to an enormous piece of the least fortunate families, thus the expanding costs of food things compromises them with food frailty, which is the absence of safe admittance to solid and nutritious nourishment for a sound life. The Food and Agriculture organization (FAO) gauges that there were at that point 923 million undernourished individuals around the world, and speedy sharp in biofuel creation, which requires some Agricultural products, like corn, maize, wheat, grain, sugarcane, and so on can possibly influence the food security at both public and family levels primarily through expanding the costs of food items[14]. As per the most recent release of the State of Food Security and Nutrition in the World, appraises that almost 690 million individuals went hungry in 2019-an expanded by 10 million from 2018, and nearly by 60 million out of five years. A few examinations condemn bio-fuels as one of the elements responsible for the 2008 food emergency. Around 93 million tons of wheat and coarse grains were utilized for ethanol creation in 2007.

4.2 Impacts of Petroleum prices on Food Products

Transport is the sector which heavily depends on oil and any fluctuations in the prices of oils in the international market will affect the food prices because of the transportation of goods from one place to other because the prices of oils are very volatile.

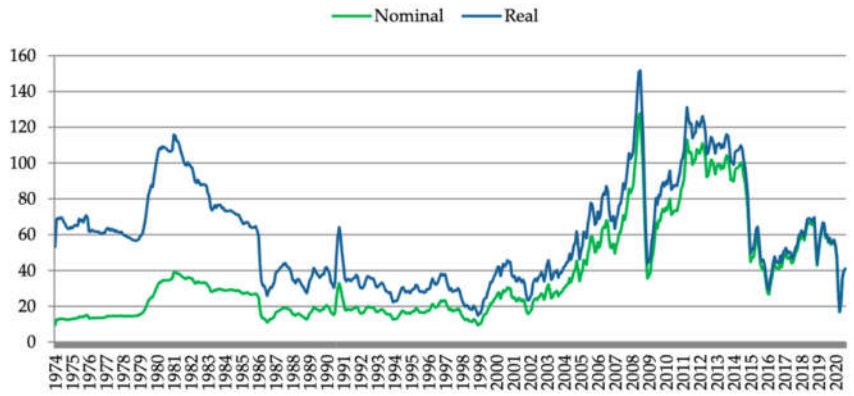

Fig. 7. Price Variation of oil imported between January 1974 to August 2020(Prices in US dollars per barrel) [14].

Food prices are somewhere interlinked to the oil prices due to the transportation costs and if the oil price increases then the transportation cost will also increase and will affect the food prices. Oil isn't just utilized as an essential wellspring of energy yet it additionally helps in the creation of different types of energy like power or treatment facility items, which here and there helps in the assembling of different merchandise or effect transportation processes [15]. The investigation of Sarwar and Tiwari about Pakistan shows the nonlinearity of the connection between the nonfood customer value record and oil costs.. An increase in crude oil prices results in an increase in the prices of food items, whereas there is no such condition in the reverse direction [16].

Every country specializes in producing some foods at large scale which will give him edge over other countries, which imply that a country needs to import other food items that they are not producing from the other countries like Tea from India, Rice from China and India, Sugarcane from Brazil , and many more food items that are the part of our daily food habits. So for this a country has to import other food items that they are not producing from the other countries. All countries import most of the items via sea route which is the very slow route among others and the distance between the countries is large and these ships keep moving back and forth throughout the year so the consumption of oil would be high so if the oil prices rise it will increase the transportation cost and which will give rise to the prices of imported food items. As I discussed already the transport sector heavily depends on fossil fuels, it is clearly understood that if the price of fuel increases it will ultimately alter transport services and because oil reserves are about to finish in the 2nd half of the 21st century, so the prices will increase it won't come down due to its limited availability, which ultimately increases the prices of food items.

CONCLUSION AND RECOMMENDATIONS

The major conclusions of this study are:

1. Naturally, the use of feedstocks like sugarcane, corn, wheat, and barley will increase the demand of the feedstock which ultimately increases the prices of the feedstock.

2. With the technology available right now we can't say that biofuels are the alternative to fossil fuels. Because of its high price and they can't meet the requirements of fuel for the transport sector globally.

3. The majority believes that biofuels affect the prices of food directly or indirectly, thus contributing tto the food crisis.

4. Because of the high requirement of feedstock required for biofuel production it won't help the farmers having small lands and does not provide solutions to food insecurity affecting peoples living in countryside.

5. Strategies for the advertisement of biofuels need to be amended. Countries should consider the mandatory portion for blending biofuel with petroleum products.

6. To avoid an increase in food prices and food insecurity biofuel should be produced from the residuals of biomass, residual oils of households, grasses, algae, etc. Which won't affect the food products and their prices?

ACKNOWLEDGMENT

This whole research work has done under the guidance of Professors, Automobile Department Chandigarh University, Gharuan, Mohali who has provided all necessary resources like data book, research articles for getting necessary and valuable information for the completion of this work and learned about the AI methods and above all, utmost appreciation to the almighty God for the divine intervention in this endeavor.

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