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Review Article

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Increase of CO_2 and NOx Promote CO_2 Assimilation, CO_2 Fix and Food Production

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Abstract

Since the industrial revolution, burning of fossil increased. Production of CO_2 and NOx increased greatly. Increased CO_2 and NOx promoted the CO_2 assimilation. Production of grain and fish increased. About 360 billion tone CO_2 is produced by burning of much fossil. About 14.4 billion tone NOx is produced in 2015. Most of emitted CO_2 is fixed by CO_2 assimilation. Developed country like USA, Japan, Germany, UK, France and Italy started NOx elimination and NP elimination at around 1980, 6 billion tone NOx is eliminated. NOx is main nitrogen fertilizer. NP in waste water is main nitrogen, phosphorous fertilizer. Therefore CO_2 assimilation, CO_2 fix plant growth is retarded and emitted 360 billion tone CO_2 is not fixed completely. Concentration of CO_2 increased about 2 ppm. In 2016, 142 billion tone CO_2 is remaining to give global warming. We must promote CO_2 assimilation by complete use of NOx and NP in waste water.

Fossil fuel is burning out soon. We should not spend precious fossil fuel for the elimination of NOx and NP. We must increase CO_2 assimilation as much as possible.

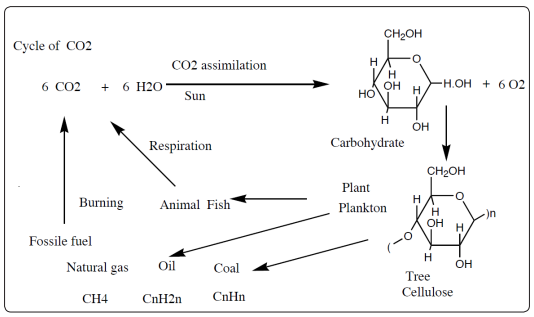
Keywords: CO_2, NOx, Protection of global warming, CO_2 assimilation, Fish production, Grain production

Introduction

The earth is warmed by the fossil fuel burning releasing CO_2 and heat. The plant is growing by CO_2 assimilation absorbing CO_2 producing carbohydrate and O_2. If we can compensate the generation of CO_2 and heart with the absorption of CO_2 and heart by CO_2 assimilation, global warming can be protected.

CO_2 react with water by CO_2 assimilation to produce carbohydrate and oxygen. Carbohydrate turns to cellulose, tree, plant and plankton. Tree turn to coal, plankton turn into oil in many billion years.

Our human being are using this fossil fuel and enjoying civilized life. Animal including fish can live by eating plant and plankton. Animal release CO_2 by respiration. Released CO_2 react with water to give carbohydrate. CO_2 is cycling in such way.



CO_2 assimilation is accelerated by fertilizer: nutrient nitrogen and phosphorous. Nature set up the system to change Nitrogen gas to nutrient nitrogen, nitrogen oxide by the reaction of nitrogen with oxygen. The reaction needs high temperature. High temperature is obtained by burning of something like, fossil fuel or by thunder. By burning, CO_2 is produced and NOx is also produced.

The ratio of CO_2/NOx is around 25/1. When 1 tone fossil is burned, 1x 44/14 = 3.14 tone CO_2 is produced. 3.14x1/25 =0.125 tone NOx is produced.

When 140 billion tone fossil is burned. And 140x 44/ 14= 440 billion tone CO_2 is produced. And 440x1/25= 17.6 billion tone NOx is produced. By the increase of CO_2 and NOx production, CO_2 assimilation is promoted greatly. Some developed countries are eliminating NOx. Then CO_2 assimilation is retarded. I wish to describe the relation of NOx elimination, global warming, CO_2 assimilation, production of grain, fish and showed the best method to protect global warming [1-28].

CO_2 Assimilation is Promoted by Increase of CO_2 and NOx

Since plant growth by CO_2 assimilation reaction. Velocity of CO_2 assimilation is carried out in proportion to the concentration of CO_2, H_2O, sunshine, nutrient N, nutrient P as shown by following equation

$$v = A\,(CO_2)\,(H_2O)\,(\text{sunshine})\,(N)\,(P)$$

Since the industrial revolution, burning of fossil and producion of CO_2 and NOx increased greatly. CO_2 emission, CO_2 fix, NOx

emission, Grain production, GrainJa (Grain production of Japan), GrainInd (Grain production of India), Fish (Fish production of the world), FishJa (Fish production of Japan), Fish Chi (Fish production of China) Fishp (Fish price in Japan), GDPgJ (GDP growth rate in Japan) are shown in Table 1. Unit is billion tone [22-24].

Table 1

Year	CO_2em Bill t	CO_2f bill t	NOxem bill t	Grain bill t	Grain Ja bill t	GrainInd bill t	Fish bill t	FishJa bill t	FishChi bill t	Fishp bill t	GDPgJ USD/kg
1900	20	20	0.8								
1920	30	30	1.2								
1940	50	50	2				0.02				
1960	100	50	4			0.7	0.35	0.035	0.015	0.2	6
1970	150	150	6	11	0.13	1.		0.062	0.02	0.4	7
1975	170	170	6.8	12	0.1			0.095	0.025	0.7	6.5
1980	200	150	8	14	0.1	1,2	045	0.11	0.03	1	6
1985	210	140	8.4	15	0.095		1.05	0.12	0.04	1.5	1
1990	220	140	8.8	17	0.09	1.7	1.1	0.09	0.04	2	
2000	250	150	10	22	0..085	2.2	1.4	0.085	0.16	3	1
2005	270	160	10.8	21.5	0.082		1.55	0.05	0. 3	4	1
2010	300	170	12	23.5	0.08	2.5	1.65	0.04	0.5	5	1
2017	360	220	14.4	27	0.075		2.	0.032	0.78	8	1

Weight of vegetation of world increased about 2 times since the industrial revolution, Area of tropical rain wood area increased very much since these several 10 years. Total weight of wood is said to be 800 billion tone.

Zaichun Zou reported the change of global change of leaf area from 1982-2009. Total area of increased green is 18 million km^2, double of USA area [28]. The effects of CO_2 and NOx on climate and plant growth are studied by many investigators [29-48].

The increase of CO_2 and NOx production increased the CO_2 assimilation. The increase of CO_2 assimilation increased the production of grain and fish. The production of grain in 1960 0.85 billion tone in 2010 2.6 billion tone 3 times.

The production of grain in India increased 5 times from 1950 to 2010. In 1950 0.5 billion tone, 1060 0.7 billion tone, 1970 1 billion tone, 1980 1.2 billion tone, 1990 1.7 billion tone, 2000 2.2 billion tone, 2010 2.5 billion tone, CO_2 emission is now 24 billion tone. NOx emission increased to 1 billion tone. The increase of NOx contributed for the production of 2.5 billion tone grain. Population of India increased 1951 3.8 billion to 2014 12.5 billion. 3,3 times. Grain production increased 5 times.

Fish production of the world increased. In 1940 20 million tone, in 1960 35 million tone, in 1980 45 million tone, in 1990 80 million tone, in 2000 130 million tone, in 2010 130 million tone, in 2016 200 million tone. China increased fish production. 57 times from 1960 to 2017. In1960 1.5 million tone, 1970 2 million tone, 1980 3 million tone, 1990 4 million tone, 1997 16.33 million tone 2002 16.33 million tone 2016 78.38 million tone, 2017 85.3 million tone. China produced 106 billion tone CO_2 and 4 billion tone NOx. 4 billion tone NOx contributed for the increase of nitrogen concentration of sea, and growth of plankton, increase of fish production.

China produced 4 billion tone NOx. This NOx increased nitrogen concentration of sea. East China sea in now top fishing sea. The three big fishing sea were north Pacific ocean, north Atlantic ocean, west of south America. These sea were rich in nutrient NP caused by counter current of deep sea water NP rich deep sea with NP poor surface sea water.

When CO_2 concentration increase, yield of grain increased about 30%. The concentration of CO_2 at green house is kept at 1000-1500 ppm. Normal concentration of air is 400 ppm. Therefore the concentration at green house is 2.5-3.75 times higher than normal air CO_2. The tree at population dense big city growth much rapidly than normal district.

NOx is very effective promotor of CO_2 assimilation. Therefore the production of grain and fish increased proportionally to the increase of CO_2 and NOx. In 1900 20 billion tone CO_2 is emitted and 20 billion tone CO_2 is fixed. In 1920 30 billion tone CO_2 is emitted and 30 billion tone CO_2 is fixed. In 1940 50 billion tone CO_2 is emitted and 50 billion tone CO_2 is fixed. In 1960 100 billion tone CO_2 is emitted and 100 billion tone CO_2 is emitted and 100 billion tone CO_2 is fixed. After 1980, amount of CO_2 emission and fix become different. Fix amount become smaller than emission.

In 1980 200 billion tone CO_2 is emitted and 180 billion tone CO_2 is fixed. In 1990 220 billion tone CO_2 is emitted and 140 billion tone CO_2 is fixed. In 200 250 billion tone CO_2 is emitted and 160 billion tone CO_2 infixed. In 2010 300 billion tone CO_2 is emitted and 160 billion tone CO_2 is fixed. In 2016 360 billion tone CO_2 is emitted and 220 billion tone CO_2 is fixed. Amount of CO_2 fix is 140 billion tone less than emission. This is caused by the elimination of NOx and NP. CO_2 assimilation is retarded by NOx, NP elimination.

Most emitted CO_2 is fixed by CO_2 assimilation. CO_2 increase is calculated based by CO2 emission minus fixable CO_2. CO_2 increase of 10 countries is shown at next Table 2.

10 K tone CO_2 can be fixed at 1 km^2 wood and 10 k tone CO_2 is fixed at 1 km^2 cultivated land. Then we can calculate fixable CO_2 by area Km^2 multiply 10 K tone.

Table 2

Country	CO_2 em	NOx	Area	Fixable CO_2	Fish	CO_2 fpla	CO_2 increase
	billion t	bill t	km2	Kt	mills	bill t	bill t
World	360	14.4					142
China	106.4	4.25	1.0x 10^7	1x 10^{10}	79.38	19.8	0
USA	51.0	2	9.5x 10^6	9.5x 10^9	6.05	1.2	0
India	24.6	1	3.2x10^6	3.2x 10^9	10.11	2.0	0
Russia	19.6	0.63	3.2x10^6	3.2x 10^9	4.61	1.1	0
Japan	12.5	0.5	3.8x10^5	3.3 x 10^8	4.6	0.92	8.7
Germany	7.8	0.31	3.5x10^5	3.5x 10^8	0.29	0.58	4.3
Iran	6.3	0.25	1.6x10^6	1.6x10^6			6.3
Canada	5.6	0.22	1.0x10^8	1x10^{10}	1.05	0.2	0
Indonesia	5.0	0.2	1.9x10^6	1.9x10^6	3.7	0.7	0
U. K	4.0	0.16	2.4 x 10^4	2.4x 10^8	1.6	0.3	1.6
Turkey	4.0	0.16	7.8x 10^5	7.8x 10^5	3.2	0.7	3.2
Italy	3.5	0.14	2.0x 10^5	3.0x 10^8	0.5	1.0	0.3
France	3.3	0.13	6.4x 10^5	8.4x 10^8	0.9	1.2	0

China can produce goods with cheapest price electricity (1.6-4.3 c/kWh) and China is winning priority of productive industry of the world.

Japan is emitting 12.5 billion tone CO_2, Germany 7.6 billion tone, UK 4 billion tone, Italy 3.5 billion tone, Areas of these countries are narrow. They cannot fix all CO_2 produced at his country. Green wood or cultivated land 1 Km^2 can fix 1000 tone CO_2. Area of Japan is 3.8x 10^5 Km^2. Fixable CO_2 is 3.8x 10^5 x 1000 = 3.8x 10^8 3.8 billion tone. Japan is increasing 12.5- 3.8 = 8.7 billion tone CO_2.

Germany is increasing 4.3 billion tone CO_2. UK 1.6 billion tone. Italy 0.3 billion tone. Amount of NOx produced at world 14.4 billion tone. At China 4.25 billion tone. USA 2 billion tone, India 1 billion tone, Japan 0.5 billion tone. Japan eliminating this 0.5 billion tone. Butane 0.1280 billions is used for the production of H2 0.0606 billion tone and CO_2 0.7480 billion tone is produced. If Japan stop NOx elimination, 25 times of NOx 0.5x 25 = 12.5 billion tone CO_2 can be fixed. By doing plankton CO_2 assimilation at 3 times area of Japan land, 3.8x 10^5 Km^2 area, 11.4 billion tone CO_2 can be fixed. 0.745 billion tone CO_2 by stopping of NOx elimination can be saved. 0.5 billion tone CO_2 by stopping NP waste water purification can be saved. Total 11.4 + 0.745 + 0.5 = 12.645 billion tone CO_2 generations can be stopped. Japan can produce 0.3 billion fish and Japanese can enjoy anti-aging and long life [25,49-55]. If Europa stop the elimination of 0.71 billion tone NOx and 0.2 billion tone NP, 10 billion tone CO_2 generation can be stopped. And 0.1 billion tone fish can be produced.

CO_2 Assimilation Must be Promoted by Stopping of NOx Elimination and by Stopping of Waste Water Purification [21]

In 2015 fossil 140 billion tonne was burned and CO_2 360 billion tonne and NOx 14.4 billion tonne are produced. If we use all NOx for the fixing of CO_2, we can fix 14.4x25x 10^8 = 360 billion tone CO_2. But NOx is hated as pollution gas causing illness. Many governments of developed countries set up very strict law to eliminate NOx in burned gas and forced to eliminate NOx using ammonia. To eliminate NOx, huge amount of ammonia is necessary and huge amount of fossil is burned.

$$4NO + 4NH_3 + O_2 \longrightarrow 4\,N_2 + 6\,H_2O$$

Elimination of NOx is promoting global warming three ways. One is retardation of CO_2 fix. Two is increase of CO_2 by using much butane. Three is consumption of precious fuel for the production of ammonia.

About 0.5 billion tone phosphorous and 10 billion tone nutrias nitrogen are contained in waste water. By using this phosphorous and nitrogen, 100 billion tone CO_2 can be fixed. And 37.5 billion tone plankton can be produced and fish 1.5 billion tone can be produced.

Animal eat food containing P and exclude excreta containing P. When toilet disposal and drainage are sent to excreta disposal treatment plant. P in water was made to water insoluble mass, mixed with cement and made to concrete and buried in soil. Plant cannot use P any more [1]. This process use huge electricity and consume much fossil fuel. Around 10 billion tone fossil and producing 30 billion tone CO_2. For the elimination of one phosphorous, about 25 carbon fossils are used and about 25 CO_2 is produced. One phosphorous can fix 56 CO_2 [10]. The phosphorous and nitrogen elimination process should be avoided. Excreta is best food for plant. Ocean dumping, field dumping and forest dumping of excreta are recommended to increase CO_2 assimilation.

I wish to propose plan that NOx elimination should be stopped and waste water purification should be stopped. Then CO_2 assimilation is promoted and food production increase and global warming can be stopped.

Heat Balance of Earth [24]

On earth 140 billion tone fossil fuel is burned and CO_2 3.6 x 10^{10} t was produced. And 7.4 x 10^{15} kcal is produced. When we consider the heat produced by animal respiration, 7.4 x 10^{15} kcal x 4.6/3.6 = 9.45 x 10^{15} kcal are produced.

The earth is also warmed by the heat of atomic energy. Uranium produce 2 x 10^{15} kcal heat. Electricity generation capacity of the world is 16868 Tetra watt h. Electricity generation by atomic energy is 2086 Tetra watt h. Therefore 7.4 x 10^{15} x 2986/ 10868 = 2 .02x 10^{15} kcal evolved by atomic energy.

The earth is also warmed by the heat evolved by animal. Human being eat 1000 kcal food every day and release heat 1000 kcal every day. Population of the world is 76 billion. Therefore human being is releasing 1000 x 365 x 76 x 10^8 = 2.8 x 10^{15} kcal in one year. Animal other than human being, caw, bird, whales, seal are producing heat. We can estimate as same as human being 2.8x10^{15} kcal. Therefore total heat is fossil burning produce 7.4 x 10^{15} kcal, atomic energy produce 2.02 x 10^{15} kcal. Human being produce 2.8 x 10^{15} kcal. Other animal produce 2.8 x 10^{15} kcal.

Total heat produced is (7.4+2.02 + 2.8+ 2.8) x 10^{15} = 15.02 x 10^{15} kcal. We must absorb 15.02 x 10^{15} kcal by CO_2 assimilation.

CO_2 assimilation must be promoted by stopping of NOx elimination and by stopping waste water purification. By stopping NOx elimination. 14.4 billion tone NOx can fix 14,4 x 25 = 360 billion tone CO_2. Amount of N.P in drainage is around 10 billion tone. By using this 10 billion tone N.P, we can fix 10 x 25 = 250 billion tone CO_2. By adding 360 + 250 = 610 billion tone CO_2 can be fixed. And we can absorb 15 x 10^{15} kcal. And earth can be cooled down.

Electricity Generation by Solar System

Construction of solar mega system by the sacrifice of wood is not clever way. 1 hector, 1000 m^2 wood can absorb heart 3.8 x 10^6 kcal and can fix 13.7 tone CO_2. Heart absorption efficiency of solar system cell is 1/3 of green leaf of tree. Solar system cell cannot fix CO_2. For the preparation of solar cell material, much fossil fuel is necessary generating much amount of CO_2 in compared with the generation of CO_2 and electricity by burning of fossil fuel. Therefore construction of solar mega system by the sacrifice of wood is promoting global warming.

1000 m^2 cell can generate 114000 kWh and can save 7.5 t CO_2 and can absorb 1.3 x 10^6 kcal for the production of 1000 m^2 cell 5 tone CO2 is produced. Electricity generation should be done at no green land. The house located near wood, cooler is unnecessary. But the house located near solar mega system, cooler is necessary at summer.

Fossil Fuel is Burned Out Soon

Estimated amount of buried fossil;

Billion tone

Fossil	buried amount	yearly use	year
Natural gas	2769	46	60
Oil	1730	41	42
Coal	9090	75	121

When fossil is burned out, we need not worry about global warming. We must worry how can we live civilized life. How can we drive car, air plane, and agriculture machine. How can we generate electricity. How can we make plastic. We must save the consumption of fossil. We should not spend precious fossil for the elimination of NOx, NP. We must depend on wood.

Electricity Generation Should be done by Coal [18]

IPCC asking electricity generation by oil and natural gas than coal, because coal generates more CO_2 than oil. But I think coal is better for the generation of electricity to save the consumption of oil. Global warming is caused by the heat and not by CO_2 when we compare buried amount, coal (132 years) is 3 times as much as oil (42 years) and natural gas (60 years). We can manufacture many kind of chemical and plastic from oil. Oil is more convenient as transportation fuels. Therefore oil and natural gas are 3 times more precious than coal. Price of coal is 1/3 of oil. Therefor we can generate electricity by coal at low price. The price of electricity is very important for the competition of productive industry. The year of oil scare is coming in 50 years. Then we must do liquefaction of coal to get liquid fuel for transportation. In this process, about half energy of coal is lost. We can enjoy our civilized life longer by saving the consumption of oil and natural gas.

Summary

Global warming can be protected by promotion of CO_2 assimilation.
CO_2 assimilation is promoted by the increase of nutrient nitrogen and phosphorous.
NOx is main source of nitrogen fertilizer.
P and N in waste water are main sources of phosphorous, nitrogen fertilizer.
NOx produced by burning should be released as it is.
NP in waste water should be released as it is.
Increase of NP concentration of sea water increase the growth of plankton.
Increase of plankton growth increase the fish production and protect global warming.

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