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Full Length Research Paper

Planet Agriculture: Global Commons Natural resources, Climate change, Models & Vision to Feed Hungry Planet

M.B. Dastagiri and L. Bhavigna

[1]Principal Scientist, ICAR-National Academy of Agricultural Research Management, Rajendranagar, Hyderabad-500030. India.
[2]Young Professional, ICAR-NAARM, Rajendranagar, Hyderabad-500030.

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Natural resources depletion and Climate change impact on the planet could conceivably lead to human extinction. Demographer's projects that increasing population and consumption are placing record demands on agriculture and natural resources. Globally, food security is major concern. The study researches dynamics of natural resources, climate change and vision to feed hungry planet. The land available for cultivation is 11.6% only. Developing countries using more water to agriculture whereas developed countries to Industry. Agriculture intensification and deforestation have serious environmental impacts. The major sources of pollutants are industrial waste, illegal dumping of solid waste and poor agricultural practices. World population would require 70% increase in overall production by 2050. The planet vision is food for growth, food for peace, food for planet, food for health and food for economic opportunities. Climate change effects oxygen depression, ice melts, global warming, floods, droughts, extinction of animals, plants, birds and biodiversity. Researchers need to estimate the exchange ratio of oxygen and Co_2 between plants and animals, birds, humans then how to bring more area under agriculture is the future step to solve planet environment safety. The study suggest strategies for planet agriculture are; satellite farming, geo-intelligence, climate smart agriculture, factory farming, organic farming, digital technologies.

Keywords: Planet, agriculture, environment, food security, models, vision.

INTRODUCTION

International Astronomical Union (IAU), 2001 and 2006 General Assembly defined a planet is an astronomical body orbiting a star. Earth is an only planet to harbor life. Earth's surface is roofed 71% with water, mostly by oceans (J. J. O'Connor and E. F. Robertson, May 2019). The rest 29% is land constitutes continents and islands. These two have number of lakes, rivers and erstwhile water sources which contribute hydrosphere. The polar regions of earth mainly covered by ice including Antarctic ice sheet and Arctic sea ice pack. Earth plane one-eighth portion suitable for humans to live, three-quarters is covered by oceans and one-quarter as land. 50 percent of land is desert (14%) (M. C. Peel, 2007) high mountains (27%),

*Corresponding Author's Email: dgiri_mb@yahoo.co.in

(Convention on Biological Diversity,2007) or other unsuitable terrains.

UN 2006, projects in 2050, Earth's human population will reach 9.2 billion in 2050 and most of the growth would be in in developing nations. The density of population is more in Asia. Of the world land mass, 68% in Northern hemisphere. So far, humans in space are on the International Space Station (Abel Mendez, 20). From Earth in 1970, by Apollo Mission 13, humans have traveled highest distance is 400,171 km (248,655 mi), (National Aeronautics and Space Administration, (NASA), November 2015).

Annenberg Foundation, 2017 reported that in 2000, out of total earth's land only 37 per cent was Agricultural land, 11 per cent used for crops. And remaining balance ¼ is pasture land, which includes forage crops land and grazing land. During 21st century, Demographers projects that earth population will reach 10 billion but the available land and new area to bring under cultivation is limited. This leads to many nations to feed growing population, requirement of food, fuel, and fiber from limited land, water, and labor and need to practice intensification of agriculture.

The United Nations FAO to help governments with land-use planning has developed based on physical parameters like climate, soil, and topography called Agro-Ecological Zoning system that characterizes land's suitability for agriculture. Based on these parameters data it estimates is ¾ of earth surface is not suitable for rain fed crops and only 3.5 percent suitable for crops without constraints (Annenberg Foundation, 2017).

Satellite farming or Precision agriculture (PA), is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops. This has been enabled by the advent of GPS and GNSS. As a management tool satellite images are used to characterize a farmer's fields in detail, often used in combination with GIS, to allow more intensive and efficient cultivation practices (McBratney et.al.,2005, Whelan, B.M. et.al.,2003, *Reina Giulio,2018).*

Planet is an integrated aerospace and data analytics company by operates earth-imaging satellites and collect of information about our changing planet. Decision makers in business, governments use Planet's data to develop new technologies, deliver business outcomes, power research, and solve the world's toughest challenges (planet.com,2019).

Some review of literature on planet agriculture:

An important step towards tackling climate change is working on the global warming factors – primarily the anthropogenic based carbon emissions. 'Carbon pollution limits are necessary to prevent climate change from damaging the global economy' has been an established truth which facilitated the climate financing.

Brown, A. D (2003) discusses present dimensions of human impact on the planet, and reported that could conceivably lead to human extinction. This is a direct consequence of human population size and its technological sophistication, neither of which would have been possible without agriculture.

John Bellamy Foster (1994) stated that as of now world has more food than needed to feed world population. The capacity to increase agricultural yields on available land, in the meantime, may be limited by dependency on agricultural chemicals-pesticides and fertilizers in most modern agriculture and by the need for water.

Jonathan A. Foley, et.al., (2011) stated that increasing population and consumption are placing record demands on agriculture and natural resources. On a global scale, a billion people are chronically malnourished while agricultural systems are degrading land, water, biodiversity and climate.

Lal (2015), to combat climate change, we have to sequester carbon from atmosphere and must store it to long lived pools. Strategies to increase soil carbon pool comprises of carbon sequestration through conservation agriculture, integrated nutrient management, agroforestry etc. With proper management, 75-100 parts per million of CO2 can be stored in soil and forestry systems.

Michael Huston (1995) stated that conservative economists may be far ahead of the environmental community in their plans for a sustainable future that will save the Earth's bio-diversity and environmental quality. The biggest environmental challenge of the century – Climate Change – is hitting hard on the human lives with increase in the onset of rising temperatures. Global warming has become an alarming atmospheric deviation, has turned into an unprecedented truth and environmental change is one of the problems that need to be addressed.

Tripathi et al., 2016 stated that Living life beyond our means, with burning huge amounts of fossil fuels, breeding huge amounts of methane producing livestock and cutting down swathes of forests, thereby, reducing the natural absorption of carbon dioxide has disturbed the balance of our planet, mother earth. The technology revolution could however provide a strategy to deal with climate change. Adaptation in various societal sectors to the influence of climate change is now considered inevitable.

William C. Clark (1989) mentioned that the World Commission on Environment and Development (WCED), Sustainable development thus reflects a choice of values for managing planet earth in which equity matters - equity among peoples around the world today, equity between parents and their grandchildren.

The study researches present dimensions of anthropogenic impact, Natural resources dynamics and climate change on the planet and sustainability global food security in future. Global food production must grow substantially at the same time, environment and planet must be safe.

The specific Objectives are

1. To analyze the components, status and extent of use of planet resources.

Table 1. Land distribution scenario in the planet and different countries

S. NO.	COUNTRY	CULTIVATED LAND (KM^2)	CULTIVABLE LAND (KM^2)	STABLE CROPS (KM^2)	ALTERNATIVE LANDS (KM^2)	TOTAL FIELD (KM^2)
	World	17,235,800 (11.6)	15,749,300 (10.6)	1,549,600 (1)	131,701,100 (88.4)	149,000,000
1	India	1,891,761 (57)	1,753,694 (52.8)	138,067 (4.2)	1,395,502(43)	3,287,263
2	Nigeria	412,938 (44.7)	344,577 (37.3)	68,361 (7.4)	510,830 (55.3)	923,768
3	Indonesia	478,055 (25.1)	247,598 (13)	230,457 (12.1)	1,426,514 (74.9)	1,904,569
4	United States	1,681,826 (17.1)	1,652,028 (16.8)	29,798 (0.3)	8,151,691 (82.9)	9,833,517
5	Argentina	397,598 (14.3)	386,476 (13.9)	11,122 (0.4)	2,382.802 (85.7)	2,780,400
6	China	1,238,013 (12.9)	1,084,461 (11.3)	153,552 (1.6)	8,358,947 (87.1)	9,596,960
7	Brazil	800,485 (9.4)	732,359 (8.6)	68,126 (0.8)	7,715,285 (90.6)	8,515,770
8	Russia	1,265,267 (7.4)	1,248,169 (7.3)	17,098 (0.1)	15,832,975 (92.6)	17,098,242
9	Australia	487,695 (6.3)	479,954 (6.2)	7,741 (0.1)	7,253,525 (93.7)	7,741,220
10	Canada	519,205 (5.2)	469,281 (4.7)	49,924 (0.5)	9,465,465 (94.8)	9,984,670

Source: *CIA World Fact book. Figures in brackets represents %*

2. To study the climate zones, pollutants, effects and planet safety.
3. To analyze the land, water, atmosphere, population of planet and usage in agriculture
4. To study the successful agricultural global models, policies, strategies and vision to feed hungry planet
5. To suggest strategies and policies to keep planet safe for future generation

DATA AND METHODOLOGY

The research study analyzed the human impact on the planet, climate change, food security, and planet safety. The global agricultural successful models, policies in general and continents (6) and country wise (61) in particular were analyzed. The continents selected are Europe (29 countries), North America (3 countries namely, the USA, Mexico and Canada), Asia (13 countries including China), South America (8 countries), Africa (7 countries), and Australia. The data on land and water distribution, climatic zones and their vegetation, climate effects and constraints, pollutants, population, farmers, BPL people, demand and supply global projections, successful models, policies collected and planet vision formulated. The data sources are CIA World fact book, United States Geological Survey, meteoblue Index mundi, FAO, OECD, U.S. Environmental Protection Agency and EPA United States Environmental Protection Agency, cigar, brand South Africa, Encyclopeadia, World Bank, WEF, CGIAR, UNO. The growth rates, percentages, policy analysis, ecological analysis, meta-analysis, new approaches and planet vision formulated. Planet policies and food security analyzed for the future. Delphi survey method used to validate the results made from secondary data (Dalkey and Helmer, 1963).

RESULTS AND DISCUSSION

About Planet

a) Land: On the planet, land is occupied 30%and remaining 70% is occupied by the water. 31% percent of the land surface is covered by forests which contribute a major part to the earth's environment. Land distribution scenario in the planet and different countries shown in Table1. The results show that out of the total land, 11.6% is considered to be cultivated land i.e., the land that can be used for agriculture. Among various countries, India has a majority share (57%) of cultivated land, Followed by Nigeria (44.7%), Indonesia (25.1%), Argentina (14.3%) in the total area. The study concludes that the land available for cultivation is 11.6% only.

b) Water: Water occupies 80% of the planet's surface. Water is the main source of irrigation too. On the earth in general there are two types of water are salt water and fresh water. Distribution of water sources on the planet shown in Table 2. Oceans 96.5%, Ice and Snow 1.76%, ground water 1.69% of total water. The ground water available for cultivation is less i.e. 1.76%, hence agriculture depend more monsoon.

Table.2. Distribution of water sources on the planet

SOURCE	VOLUME OF WATER (KM^3)	% TOTAL WATER	% SALT WATER	% FRESH WATER
Oceans	1,338,000,000	96.5	99.0	
Ice and Snow	24,364,000	1.76		69.6
Groundwater	23,400,000	1.69	0.95	30.1
Saline Lakes	85,400	0.0062	0.0063	
Fresh water Lakes	91,000	0.0066		0.26
Atmosphere	12,900	0.00093		0.037
Rivers	2,120	0.00015		0.0061

Source: United States Geological Survey, Eakins B.W. and G.F. Sharman 2010, Peter H. Gleick 1993, Harder Ben,2013

Table 3. Top 10 countries with more water sources and usage

COUNTRY	TOTAL RENEWABLE WATER RESOURCES (KM^3)	PERCENTAGE OF WATER WITHDRAWALS BY SECTOR		
		DOMESTIC	AGRICULTURE	INDUSTRY
represents %.				
Brazil	8,233	987.96 (12%)	6586.4 (80%)	658.64 (8%)
Russia	4,508	1081.92 (24%)	1172.08 (26%)	2254 (50%)
United States	3,069	403.26 (13.14%)	1216.85(39.65%)	1448.56(47.20%)
Canada	2,902	220.84 (7.61%)	355.20 (12.24%)	2325.93(80.15%)
China	2,840	350.46 (12.34%)	1832.65(64.53%)	656.89(23.13%)
Colombia	2,132	1257.88 (59%)	788.84 (37%)	85.28 (4%)
European Union	2,057	367.79 (17.88%)	610.92 (29.70%)	1059.54(51.49%)
Indonesia	2,019	234.00 (11.59%)	1652.95(81.87%)	131.84 (6.53%)
Peru	1,913	229.56 (12%)	1530.4 (80%)	153.04 (8%)
India	1,911	1727.73(90.41%)	140.64 (7.36%)	42.61 (2.23%)

Source: *Indexmundi: Figures in brackets*

i) TOP 10 countries with more water sources and usage:

Top 10 countries with more water sources and usage in different sectors shown in Table 3. Indonesia (81%) is the using highest water for agriculture followed by Brazil and Peru (80%), China (64.53%). India (7.36%) and Canada (12.24%) are using the least. Contrastingly, developed countries such as Canada (80.15%), EU (51.49%), Russia (50%), USA (47.20%), are using more water to Industry. India (2.23%), Peru (8%), Colombia (4%)is the least. Developing countries using more water to agriculture whereas developed countries are using more to Industry.

c) Climatic Zones of the World: The Climatic Zones of the World and their temperature, climate and vegetation are shown Table 4. Polar Zone has vegetation of lichens, grass, boreal forest; Temperate zone has vegetation of Deciduous forests, warm temperate forests and useful for crops grown; Subtropical zone has evergreen forests, and Tropical Zone has Evergreen forests, savannah useful for cultivation of dryland crops. United Nations Framework Convention on Climate Change (UNFCCC) on global warming in future trying to limit global average temperature below 2^0C hence all countries should change existing methods from fossil to renewable energy, to reduce emissions by carbon taxing. The study found that temperate, subtropical and tropical zones are useful for cultivation.

i). Climate and soil/terrain constraints by region: Region wise climate and soil/terrain distribution constraints are shown in Figure 1. In USA, EU and Japan regions in which productivity is higher than demand because of intensification. In such regions land is withdrawn from cultivation and kept under deminimus. Contrastingly, in developing countries land is converted for agriculture. Another 30 percent of the world's land area is forested. The

Table 4. Climatic Zones of the World and their vegetation

CLIMATIC ZONE	AREA	AVERAGE TEMPERATURE	PRECIPITATION	CLIMATE	VEGETATION
Polar Zone	60° to 90° North and South latitude	-47 to 0°C	Variable, mostly in the form of snow	Ice climate (average temperature of the warmest month below 0°C), and tundra climate (average temperature of the warmest month between 0 und 10°C)	Polar area: scarce Tundra: moss, lichens, grass, boreal forest with conifer wood
Temperate zone	40° to 60° North andSouth latitude	0 to 20°C	average 800 mm	Warm and cold temperate	Deciduous forests, warm temperate forests, savannah
Subtropical zone	25° to 40° North and South latitude	>20 to 35°C	Dry, winter humidity and always wet areas	Tropic summer, non-tropic winter	Semi-deciduous or evergreen forests, hardwood forests with winter rain, savannah, pasture land, semi-desert, warm temperate moist forests, nemoral deciduous forests.
Tropical zone	23.5° north to 23.5° southern latitude (near the equator)	>20 to 30°C	Rain is defined by seasonal shift and its trade winds	Humid to warm. Often precipitation (humid), sometimes (short) drought. daily changes in temperature are immense compared to annual changes of daily averages.	Evergreen forests, savannah

Source :meteoblue

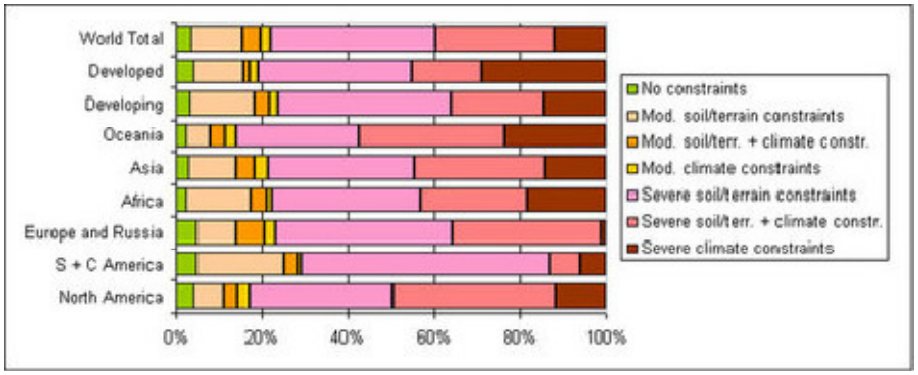

Figure 1. Climate and soil/terrain distribution constraints by region © 2000. International Institute for Applied Systems Analysis and FAO

study conclude that agriculture intensification and deforestation have serious environmental impacts.

ii). Environmental Pollutants: Environmental Pollutants and reasons for pollution are presented in Table 5. The major pollutants are soil, water and air pollutants. The major sources of these pollutants are industrial run off and waste, illegal dumping of solid waste and poor agricultural practices. The study found that the major pollutants are soil, water and air.

Table 5: Environmental Pollutants and reasons for pollution

TYPES OF POLLUTION	POLLUTANTS	REASON FOR POLLUTION
Soil Pollutants	Chemical pesticides and herbicides, organic chemicals. Chromium(Cr), Cadmium(Cd), Copper (Cu) andzinc(Zn). Tars and oils, biologically active compounds, radioactive materials, asbestos and toxic gases	improper dumping of household, littering of industrial waste materials,landfill leakage and poor agricultural practices.
Air Pollutants	Lead(Mb), Nitrogen oxides(NO,NO_2), Particulate Matter, Ozone(O_3), Carbon monoxide(CO), Sulphur dioxide (SO_2)	incineration of solid wastes and transportation, industrial processes that result in generation of heat and power, burning of fossil fuels.
Water Pollutants	Nitrates (NO^{-3}), Fecal Coliform, Mercury(Hg), bacterial pollution and phosphorous (P)	Improper dumping of solid waste, industrial waste and agricultural runoff, improper sewage treatment plants,
Noise Pollution	Sound that is more than 70Db is found to effect the normal life of most of the living organisms. Such sounds are considered to cause noise pollutions.	sounds generated by vehicles, trains, aircraft, industrial manufacturing, constructions, vehicle alarms or even loud music.

Source: U.S. Environmental Protection Agency, World Health Organization

Table 6: Greenhouse gases, their sources and percentage

GASES	SOURCE OF GREENHOUSE GASES	PERCENTAGE
Carbon-di-oxide (CO2)	Fossil fuel and industrial process, land clearing for agriculture, deforestation, Automobile usage	76%
Methane (CH4)	Inaccurate waste management, excessive agricultural activities, biomass burning and disproportionate energy use.	16%
Nitrous oxide (N2O)	Excessive agricultural activities, such as more chemical fertilizers, pesticides and insecticides, combustion of fossil fuels.	6%
Fluorinated Gases (F-gases)	Excessive use of consumer products that include in release of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6) and refrigeration, Industrial processes	2%

Source: EPA United States Environmental Protection Agency.

iii) Greenhouse gases: Greenhouse gases, their sources and percentage are shown in Table 6. The major greenhouse gas emissions are Co2 (76%) which is due to Fossil fuel and industrial process direct human-induced impacts on forestry, CH4 (76%) due to Over agricultural activities, waste management, N20 6% due to over agricultural activities, and F-gases (2%) due to industrial process.

d) Population and Farmers: The most populated countries and their percentage of farmers and BPL people presented in Table7. The world population reached 7.7 billion during 2018-19. The most populated countries are China, India and United States. The most farmers populated countries are China, Pakistan, India, and Nigeria. The highest percentage of BPL people found in Nigeria (46.0%), Mexico (43.6%), Brazil (26.5%), and Pakistan (24.3%).

e) Planet and Food security: The UN global key factors which influence on food security beyond 2050 are presented in table 8. Based on 2008 medium variant, by 2050, The demand for cereals projected 3 billion tones for human and animal feed. UN projects that in 2050, 9.1 billion world population would require 70% increase in overall production and in developing countries almost double between 2005-07 and 2050. Annual cereal production has to grow 1billon and animal production 200 million tons by 2050, 70 percent of which from developing countries. By 2050 the pressure on agriculture to produce more would decrease beyond 2050. The study conclude that global agriculture need to grow 0.4 percent per year from 2050 to 2080 which is possible.

Table 7: Most populated countries and their farmers and BPL people 2018

COUNTRY	TOTAL POPULATION	FARMERS POPULATION (in crores)	BELOW POVERTY LINE POPULATION PERCENTAGE
World	7.7 billion	223.65	
China	1.38 billion	42.5	3.1%
India	1.29 billion	9.84	21.9%
United states	3.29 million	2.02	12.3%
Indonesia	2.62 million	4.90	10.6%
Brazil	2.08 million	4.34	26.5%
Pakistan	2.07 million	11.3	24.3%
Nigeria	1.95 million	7.13	46.0%
Bangladesh	1.59 million	1.00	24.3%
Russia	1.42 million	6.4	13.2%
Mexico	1.01 million	0.20	43.6%

Source: CIA, The World Factbook.

Table 8. Global key variables beyond 2050 which influence on food security

KEY VARIABLES	2100	2080	2050	2005
Meat, production (million tonnes)		524	455	258
Cereals, production (million tonnes)		3182	3009	2068
Oil crops (oil. equiv.), Food (kg/cap)		16.9	16.2	12.1
Meat, food (kg/capita)		55.4	49.4	38.7
Cereals, food (kg/capita)		161	160	158
Population (million)- UN 2010 revision	10125	9969	9306	6584
Population (million)- UN 2008 revision	9202	9414	9150	6592

Demand and Supply projections (OECD & FAO):

The demand and supply of major agricultural crops for 2025 are presented in Table 9. In developing countries for 2025, the demand growth rates for wheat (1.27%) and sugar (2.49%) higher than supply growth rates where as in other countries in other crops reverse trend was observed. Similarly, the demand of meats (pig meat, poultry meat, sheep meat, beef and veal) were for marginally more than supply in developing countries. But in case of developed and OECD countries the trend was reverse. Hence, they developing countries focus on strategies to meet wheat, maize, soybean and meats. And developed countries must focus on sugar demand. To me at global demand of rice, globe has to develop new strategy and new policies.

f) UN Vision on Agriculture:

UN Vision: Harvey, 2016 reported that to battle climate change and food security, global agriculture need profound transformation. WEF, 2010; new vision for agriculture (NVA) is that agriculture has to deliver food security, environmental sustainability and economic opportunity.

FAO vision: (FAO, 2016)stated that “Hunger, poverty and climate change need to be addressed collectively”.

CGIAR and FAO vision: Global knowledge institutions through continuous innovations enabling National Agricultural Research and Education System (NARES) to adapt.

In fact, global agriculture needs new vision is that “food security, poverty and climate change to be handled together. This is required exchanging new ideas, collaboration between international and national institutions. In future, the more pressure on already stressed agriculture because of rising demand scarce resources, volatility, uncertainty and gamble with monsoons. WEF, 2013 reported that over 870 million people persist persistently hungry and malnourished**.**

Table 9: Supply and Demand Projections of Dominant Agriculture crops (2018-2025) (million tonnes)

Crops	2018		2025		Growth rate of Projected (%)	
	C	P	C	P	C	P
World						
Beef And Meat	70.89	Mt cwe	77.77	70.60	1.33	77.46
Pig meat	121.53	Mt cwe	131.00	121.34	1.08	130.8
Poultry Meat	119.32	Mt rtc	131.26	119.32	1.37	131.26
Sheep Meat	15.08	Mt cwe	17.44	15.11	2.10	17.43
SUGAR						
World	178.16	181.93	204.74	210.03	2.01	2.07
Developed countries	46.74	41.94	48.58	43.95	0.55	0.67
Developing countries	131.42	140	156.16	166.09	2.49	2.47
SOYBEAN						
World	334.92	334.72	393.87	393.89	2.34	2.35
Developed countries	88.67	125.97	93.41	135.87	0.75	1.09
Developing countries	246.25	208.76	300.46	258.02	2.88	3.07
RICE						
World	519	517.7	563.2	562.6	1.17	1.20
Developed countries	18.9	18.4	19.4	19.1	0.37	0.53
Developing countries	500.1	499.3	543.8	543.5	1.20	1.22
MAIZE						
World	1060.1	1048.5	1143.4	1146	1.09	1.28
Developed countries	474.2	507.9	492.2	541.5	0.53	0.92
Developing countries	585.9	540.5	651.2	604.5	1.52	1.61
WHEAT						
World	740.4	739.8	789.6	791.3	0.92	0.97
Developed countries	273.4	383.2	279.5	403.3	0.32	0.73
Developing countries	467	356.5	510.1	388	1.27	1.22

Note: Mt-Metric tonnes, C-Consumption, P-Production, Accessed on 3rd June, 2017.
Source: "OECD-FAO Agricultural Outlook", OECD Agriculture statistics-database, FAO/OECD (2016).

A New Approach:

Global, regional, national leaders have to make their own vision and action oriented partnership collaboration and network in in Asia, Africa and Latin America. Over 250 organizations focus must be on these actions and strategies. Complementing and accelerating these activities by global platforms including the G8 and the G20.

g) Global Policy Models Transformation in Agriculture: Europe, North America, Asia, Latin America, Africa, Australia continents and World Government Polices which transformed agriculture are shown in table 10. The results conclude that, In Europe, market oriented demand-driven agriculture. The North American Model transformed to decouple key support programs, market demand agriculture, income supports, countercyclical program. Market driven agriculture, Farm Household Allowance Program and Targeted payments models in Australia. The Latin America model is Green Revolution model, genetically modified (GM) crops and run by transnational corporations. Agriculture runs by donors (USAID, World Bank, Gate Foundation) in Africa. In Asia, agriculture revolution took place due to seed and technologies. Bill and Melinda Gates Foundation focus on agricultural development in Sub-Saharan Africa and South Asia. Worldwide in agriculture marketed oriented reforms and support reforms being transformed.

i) Continent wise Countries Successful agricultural models

The Continent Wise Countries Successful agricultural models and Strategies are presented in Table11. The results show that the successful models of USA, Canada, Mexico, India, China, Israel, Brazil, South Africa, Australia, UK, Germany, Russia, Sweden, Switzerland are Industrial

Table 10. Agricultural policies continent-wise which transformed global agriculture

SL. NO	CONTINENT/ COUNTRY	POLICIES AND REMARKS
	World Government Policy	Worldwide and all emerging economies was taken policy to suspend or reduce the import tariffs on food commodities.
	Global Livestock policy	• Livestock policies in the Africa and sub-Saharan Africa countries are livestock development policy in Ethiopia (1992), Meat Commission in Kenya, National Livestock Development Policy of Kenya (1980), Livestock Policy of Tanzania (1983), etc. • Similarly, livestock policies in China areprivatization of livestock sector, Subsidies to large producers, Consumption rationing policy in 2000, Feed policy in 1999 etc., • In the USA, The Agricultural Act of 2014 (2014 Farm Bill), Farm Act 2008, The Farm Security and Rural Investment Act of 2002, Mandatory Price Reporting (MPR) program in April 2001 etc., • Alike in India, the livestock polices are Prevention of Cruelty to Animals (Regulation of Livestock Markets) Rules (2017), Animal Welfare Act (2011), National Livestock Policy (2013), etc. • The European Union established a law and policies, Animal Health Law in 2016, New Slaughter Regulation in 2013 etc.
1	Asia	The Asian Green revolution model focuses further on seed and technologies and expanded access to market.
2	Africa andSub Saharan (7 countries)	In Africa, agriculture was developed assistance provided by donors like DFID. USAID, World Bank, OECD, Bill Gates Foundations etc.
3	The North American Continent (United States of America, Mexico, Canada)	• The elections majorly depend on farmer's votes (1.4%) in the USA. • Zero interest rates to farmers • Focus on Market Income • 2014-18 budget, Farm Bill account 489 Billion $ • Crop Insurance Program • Price loss coverage • Fixed direct payments 1990-2013 • Counter cyclic payments • Direct Payment 2002, 2008 • Farm Bill, 1995
4	South America(Brazil, Argentina, Bolivia, Colombia,Chile, Ecuador Mexico, Uruguay)	• Subsidized Credit • Agricultural Insurance and Subsidies • Rural Credit and MSN Price Guarantee • Separate ministries MAPA- MDA-Small Scale Farmers, Commercial Agriculture. • Removed agricultural taxing which resulted in doubled Productivity in crops, and tripled in livestock's.
5	China	In the world, china is the largest producer and consumer, importer andexporter of most of the agriculture produces. Policies like Tariff rate quotas, Tariffs, direct payments and Market intervention have been adopted to help the farmers. Compared to the average world support price, China provides 20 % of the higher minimum support price (MSP).
6	European Union (29 countries)	For the development of agricultural sector, the European Union under took many policies. The entire union has adopted the common agricultural policy (CAU). After WTO it is offering price dismantling, direct subsidies, Border (exports subsidies and import duties),direct payment, domestic (buying), and many more market support measures.
7	Australia	• Farm Household Allowance Program • Tax Concessions • Disaster Assistance • Targeted payments • Market Oriented Agriculture (Low import duties)

Source: MB. Dastagiri (2017)-Global Agricultural Vision, European Scientific Journal

Table 11: Continent wise Countries Successful agricultural models and Strategies

CONTINENT	COUNTRY	SUCCESSFUL AGRICULTURE MODEL	STRATEGY
North America	USA	Industrial agriculture	Large-scale monoculture, heavy use of chemical fertilizers and pesticides, and meat production in CAFOs (confined animal feeding operations) to improve the yield. But it leads to pollution and loss of soil fertility.
	Canada	Value-added production	Consumer-oriented products are driving more export growth that increases more income for the farming sector. Farmers are advised to grow crops that increase the economic value of a commodity through production processes.
	Mexico	Commercial Agriculture	Most of the crops grown are exported to the U.S.A. So, the farmers are advised to go crops that are of more commercial value in the international market.
Asia	India	Mixed and Multiple Agriculture	The multiple farming. Other allied activities are also employed besides farming that produce a substantial income to the farmers. Integrated Farming Models (IFS Models)
	China	Intensive Cropping	Management of nitrogen fertilizer is the main approach to obtain a targeted grain yield and protein concentration. This technique is used here to increase the rice yields. Also IFS system is employed along with organic farming in few regions of China.
	Israel	Precision agriculture	Advanced data-collection and analysis technologies for more efficient and productive farming. Using the latest data collected new technologies are improved based on the situation and demand.
Latin America	Brazil	The incentive system for low-carbon agriculture	ABC Programme - provides low-interest loans for sustainable agricultural practices; no-till agriculture; degraded pasture renovation; Integration farming system (crops+livestock+forest); commercial forests development; biological nitrogen fixation; and treatment of animal wastes. To reduce greenhouse gas emissions by 160 million tonnes of carbon dioxide equivalent annually by 2020.
Africa	South Africa	Dual agricultural economy	Both well-developed commercial farming and more subsistence-based production is practiced in the deep rural areas. Agricultural activities range from intensive crop production to mixed farming in winter rainfall and high summer rainfall areas.
Australia	Australia	Conservation farming, Ley farming	Increase cropping system diversity and crop rotations. Sustainable agriculture production system to protect the soil from erosion and degradation, improve its quality and biodiversity, and contribute to the preservation of the natural resources, water and air, while optimizing yields.

Table 11: Continue

Europe	UK	Mechanized Agriculture	In U.K farm labor are scarce to found as more employment is found in industrial sector. So, farming became more mechanized. It increases production, efficiency and per man productivity. It modifies social structure in Rural Areas and leads to Commercial Agriculture. In total it results in better use of land, increases farm income, reduces fodder area and enlarges food area.
	Germany	Smart Farming	Digital technologies enabling efficient and resource-saving farming. Digitalization brings producers and consumers closer together. Also it helps the farmers to adopt new technologies and to diagnose the plant diseases.
	Russia	Market-oriented system	After the Soviet Union collectivized its agricultural sector during the Stalin years and until the 1980s, most agricultural land in Russia was in state ownership, and the transition to a market-oriented economy had to start with privatization of land and farm assets. The decisions regarding investment, production and distribution are guided by the price signals created by the forces of supply and demand.
	Sweden	Modern farming	It includes fertilization and mechanization, that make high yields possible although soils are generally poor and the cold climate renders the growing season much shorter than elsewhere in Europe.
	Switzerland	Organic farming	Use of organic in place of chemicals to increase the soil fertility that in turns improve the yield naturally. It helps in conserving the soil nutrients and fertility.
World most producing countries	China	Intensive Farming	
	India	Mixed and Multiple Agriculture	
	USA	Industrial agriculture	
	Brazil	The incentive system for low-carbon agriculture	

Source: The authors synthesized from the sources: israel21c, cigar, brand south africa, Department of Agriculture and Rural Development (Northern Ireland) The Scottish Government, 4liberty.eu, agriculture in Russia, national encyclopedia, FAO.

agriculture, Value-added production, Commercial Agriculture, Mixed and Multiple Agriculture, Intensive Cropping, Precision agriculture, The incentive system for low-carbon agriculture, Dual agricultural economy, Conservation farming, Ley farming, Mechanized Agriculture, Smart Farming, Market-oriented system, Modern farming and Organic farming respectively. But World most producing countries are China, India, USA and Brazil.

i) Planet Agriculture Vision:

Future planet agriculture vision must live in four strands:

Food for peace: International agricultural research should be preventing future conflicts among local, regional and internationally over scarce resources of water, land and food.

Food for growth: Many countries on the globe depend on agriculture is in rural areas. Hence increased rural prosperity is fundamental to national economic growth. This will ensure peace, food and living standards in all countries.

Table 12. International Think Tank Institutions: Vision and Strategy

Sl No	Institution	Vision
1	UNO	Food for hungry world, peace
2	WTO	Free Trade, Favor consumer, Trade rules & regulations
3	WB &IMF	Zero interest, financial viability, AOI Agriculture growth for the poor : an agenda for development
4	OECD	Enabling pro-poor Growth through agriculture
5	USAID	Aid to LDC's, Linking producers to markets
6	DFID	Growth and poverty reduction
7	CGIAR	Global partnership for sustainable development
8	Bill & Melinda Gates	Agriculture development in Sub-Saharan Africa and South Asia
9	IFPRI	Innovative Research programs
10	CGIAR	Global agricultural innovation network
11	G 20, G77, G7	Need to address Hunger, poverty and climate change together. It must be a research intelligence think tank.

Food for planet: research into sustainable farming systems precursor for the conservation and augmentation of the earth's life support systems on the planet.

Food for health: Nutritional Food and health go hand in hand. The health of land, water, plants. Animals and Humans indivisible.

Food for Economic opportunities: Of late globally, farmer's economic opportunities are primary concern particularly tropical countries and their survival is more important.

i) Global Agricultural Vision:

World Economic Forum partners in 2009, framed The New Vision for Agriculture (NVA), Future world demands to be achieved through sustainable agriculture simultaneously deliver food security, environmental sustainability and economic opportunity.

- Global Agricultural Vision is changing from removal of Hunger, Poverty, Food Security, Nutritional Security, Climate Change to Economic Opportunities/income security
- Researchers, policy makers, governments or think tank institutes are unable to capture and suggest the effect of agricultural policies on production, inflation, poverty and farmer's welfare.

ii) International Think Tank Institutions and Planet Agriculture:

The international think tack institutions and their visions and strategy cited in Table12. It shows that Food for hungry world, peace; Free trade, Agriculture growth for the poor, Growth and poverty reduction, Global partnership for sustainable development, Global agricultural innovation network. The think tank institutions they are trying to solve their best to keep planet safe. The Think Tank for Food to nourish India/planet

CONCLUSIONS

Planet is consisting of land, water and atmosphere. The study researches present dimensions of human impact on the planet and meet the world's future food security, sustainability, climate safety and make planet vision. On the planet 30% is occupied by the land and remaining 70% is occupied by the water. 31% percent of the land surface is covered by forests which contribute a major part to the earth's environment. Land distribution scenario in the planet shown that out of the total land 11.6% the land that can be used for agriculture. Among various countries India has a majority share (57%) of cultivated land in the total area. Followed by Nigeria (44.7%), Indonesia (25.1%), Argentina (14.3%). Distribution of water sources on the planet shown that Oceans 96.5%, Ice and Snow 1.76%, ground water 1.69% of total water. Among top 10 countries, Indonesia (81%) is the using highest water for agriculture followed by Brazil and Peru (80%), China (64.53%). Contrastingly, developed countries such as Canada (80.15%), EU (51.49%), Russia (50%), USA (47.20%), are using more water to Industry. India (2.23%), Peru (8%), Colombia (4%)is the least. The Climatic Zones of the World and their temperature, climate and vegetation are shown that Temperate zone, Subtropical zone and tropical zones useful for cultivation of dryland crops.

Agricultural intensification and deforestation has serious environmental impacts. Land conversion is a major cause of deforestation. Clearing forests for agriculture alters

ecosystems which enable sequestering carbon or absorbing floodwaters. 30 percent of the world's land area is forested. The major pollutants are soil, water and air pollutants. The major sources of these pollutants are industrial run off and waste, illegal dumping of solid waste and poor agricultural practices. The major greenhouse gas emissions are Co_2 (76%) due to Fossil fuel and industrial process direct human-induced impacts on forestry, CH_4 (76%) due to Over agricultural activities, waste management, N_20 6% due to over agricultural activities, and F-gases (2%) due to industrial process. The most populated countries are China, India and United States. The most farmers populated countries are China, Pakistan, India, and Nigeria. The highest percentage of BPL people found in Nigeria (46.0%), Mexico (43.6%), Brazil (26.5%), and Pakistan.

UN projects that in 2050, 9.1 billion world population would require 70% increase in overall production and in developing countries almost double between 2005-07 and 2050. By 2050 the pressure on agriculture to produce more would decrease beyond 2050. The study conclude that global agriculture need to grow 0.4 percent per year from 2050 to 2080 which is possible.

Worldwide continent agriculture transformed by marketed oriented reforms and support reforms in Europe, North America and Australia. In Latin America agriculture transformed by genetically modified (GM) crops and transnational corporations. In Africa Agriculture runs by donors (USAID, World Bank, Gate Foundation). In Asia, due to seed and technologies. Worldwide agriculture transformed by marketed reforms and support reforms, Transnational corporations and donors.

The Continent Wise Countries Successful agricultural models and Strategies show that the successful models of USA, Canada, Mexico, India, China, Israel, Brazil, South Africa, Australia, UK, Germany, Russia, Sweden, Switzerland are Industrial agriculture, Value-added production, Commercial Agriculture, Mixed and Multiple Agriculture, Intensive Cropping, Precision agriculture, The incentive system for low-carbon agriculture, Dual agricultural economy, Conservation farming, Ley farming, Mechanized Agriculture, Smart Farming, Market-oriented system, Modern farming and Organic farming respectively.

Global Agricultural Vision is changing from removal of Hunger, Poverty, Food Security, Nutritional Security, Climate Change to Economic Opportunities/income security. The international think tack institutions and their visions and strategy shows that Food for hungry world, peace; Free trade, Agriculture growth for the poor, Growth and poverty reduction, Global partnership for sustainable development, Global agricultural innovation network. Planet Vision is that overall approach would reside on: Food for peace, Food for growth, Food for planet, Food for health and Food for economic opportunities. But world most producing countries are China, India, USA and Brazil and they need to produce more at the same time planet environment be safe. The study conclude that agriculture intensification and deforestation have serious environmental impacts. The effects of environmental pollutants include oxygen depression, global warming, floods, droughts, extinction of animals, plants, birds and biodiversity. These all violate human rights of future generation and survival. Researchers need to estimate the exchange ratio of oxygen and Co_2 between plants and animals, birds, humans then how to bring more area under agriculture is the future step to solve planet environment safety. The study suggest strategies for planet agriculture are; satellite farming, geo-intelligence, climate smart agriculture, factory farming, organic farming, digital technologies. United Nations Framework Convention on Climate Change (UNFCCC) on global warming in future trying to limit global average temperature below 2^0c hence all countries should change existing methods fossils to renewable energy, to reduce emissions by carbon taxing. Global vision advocates that in future agricultural development as a global agenda and global efforts. The think tank institutions should stop anthropogenic based carbon emissions of different countries to keep planet safe.

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