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Research Article

Synthetic Agricultural Inputs and Its Impact on Foodgrains and Human Health

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Abstract

The objective of this paper is to investigate the use of chemical inputs (fertilizer and pesticides) in the agriculture sector and its impact on human health concerning the availability of food grains, the prevalence of under-nourishment people, and non-communicable diseases worldwide. Inadequate food, unhealthy and low-nutrient food are some of the major reasons for decreasing children's and adults' health wellness. The use of fertilisers can increase crop output and yields but also create environmental pollution. Worldwide, use of chemical fertilizer has increased from 137.18 million tonnes in 2001 to 200.57 million tonnes in 2020. Pesticide elements control and protect plants against visible and invisible pests, which can negatively impact biodiversity and farmers' and/or workers' health, excessive use of pesticides indirectly affects food, and food becomes poisonous. This study found that, in 2020 worldwide, the share of use of insecticides, herbicides, fungicides, bactericides, and other pesticides in total pesticide was found to be 17.57%, 57.28%, 24.8%, and 0.28% respectively. The average growth rate of fertilizer use (1.88%) was higher than pesticides use (1.68%) in the agriculture sector worldwide. The per capita net availability of food grain was 347.10 kg per annum and 0.95 kg per day in the world during 2001. The food grain per capita availability is 394.58 kg per annum and 1.08 kg per day in 2020. Worldwide, under-nourished people declined from 13.1% (815.7 million) in 2001 to 9.8% (767.9 million) in 2021, which indicates that one (1) in every nine (9) people still has insufficient food to survive an active and healthy life. Interestingly, this study came to the conclusion that the use of chemical inputs in agriculture has increased per capita net availability of foodgrain, and as a result, the number of undernourished individuals has decreased. On the contrary, the rate of non-communicable diseases and utilization of chemical inputs in agriculture is constantly increasing in the world during the study period.

Key Words: food security; nutrition; health; undernourishment; non-communicable diseases; synthetic agriculture inputs

1.Introduction

The 2030 Agenda for Sustainable Development, adopted by all United Nations Members that includes 17 Sustainable Development Goals (SDGs). The second goal of Sustainable Development is zero hunger- pledges to end hunger, achieve food, nutrition security, and sustainable agriculture development (UN 2019). The third goal of the SDGs is to promote good health and well-being for all ages. It is planned to create a 'hunger-free world' by 2030. Agriculture and allied sectors are the leading food security and nutrition instruments (UN 2019). The main objective is to improve food access to all people and to a malnutrition-free society. Food security and nutrition are the leading indicators of a healthy, secure and prosperous human being. Every country worldwide has been working to achieve this goal within a timeline. Agriculture is essential to enable a healthy diet for all. The rapid population growth, overutilization of chemical inputs in agriculture, decreasing soil quality, changes in climate conditions, inadequate storage facilities, and imbalance in biodiversity are the main obstacles to food security and the zero-hunger goal (Anya et al. 2012; UN 2022).

Food that we eat in daily life contains nourishing substances called nutrients. Nutritional foods have five main factors: carbohydrates, fat, protein, vitamins, and minerals. In 2019-20, total food grain production in the world reached 30.85 billion tonnes (FAO 2023). The average annual growth rate of food grains production and population worldwide was 2.15% and 1.23%, respectively, from 2001 to 2020 (FAO 2023; UNPD 2023). The food grain production grew higher than the population. However, the World is facing the privilege of undernourishment, malnutrition among children (below 5 years), obesity in the adult population, and anemia among women. The challenges of ending hunger, food insecurity, and nutrition problems of all kinds are rising worldwide (FAO 2022). Use of chemical inputs are

increasing in all countries to obtain high production and provide food quickly, and its adverse effects on biodiversity, environment, climate, human life, and health (Rohr et. al 2019; EU, Sarkar et. al 2021). The incidence of non-communicable diseases continuously increases worldwide with the increasing use of chemical inputs (Paolo et. al 2020; Aliyu Ahmad et al. 2020). The present paper focuses on the correlation between the utilization of chemical inputs and its impact on food grain availability, under-nourishment, and non-communicable diseases worldwide.

2. Material and Methods

This section of the study focuses on the sources and research methods. The methodology covers various indicators of the study, area and duration, data sources, various parametric and non-parametric statistical techniques.

Coverage

The geographical coverage of this study covers worldwide data related to study variables. This paper aims to analyze the use of synthetic agricultural inputs and their impact on food grains and human health. For this purpose, we have covered all countries' data on various variables, like synthetic fertilizer consumption, synthetic pesticide use, and three dimensions of health as per capita net food grain availability, undernourishment, and non-communicable diseases worldwide. This study covers data on 20 years (2001 to 2020) and we study the correlation between synthetic inputs in agriculture and its impact on human health and foodgrain.

Data Source

We have taken data on various variables like synthetic agriculture inputs and human health variables from the Global Change Data Labs - Our World in Data database, the World Bank, and Food and Agriculture Organization (FAO).

Data Analysis

In accordance with the objective of the study, the data was collected and tabulated using the MS-Excel and SPSS software. The parametric statistical tool namely the Karl Pearson's Coefficient of Correlation and the non-parametric tools like percentage, growth rate, etc. were used to achieve the study objectives and analyze synthetic agricultural inputs and their impact on food grains and human health. The line graph, bar graph, etc., were used in this study to visualize the results.

Non-Parametric Tool

We have used the following Eq. (1) to calculate year on year (Y-o-Y) growth rate

$$Y = (Y_1 - Y_2/Y_2) \times 100 - - - - - - - - (1)$$

Were, denotes Y-o-Y growth rate, denotes final years value, denotes previous years value

Parametric Statistical Tool

In order to calculate the correlation between variable, we have used Karl-Pearson's correlation coefficient (r). We have taken synthetic agricultural inputs (fertilizer and pesticide), food availability, malnutrition, and non-communicable diseases as study variables. This correlation coefficient measures the strength and the direction of a linear relationship between two variables. The formula for r is given below in Eq. (2) (Agrwal BL, 1996).

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - \sum Y^2}} - - - - - - - (2)$$

The range of the correlation coefficient is -1 to 1, If x and y have a strong positive linear correlation, 'r' is close to 1. If x and y have a strong negative linear correlation, 'r' is close to -1. If there is no linear correlation or a weak linear correlation, 'r' is close to 0.

3.Results and Discussion

This section of the present study deals with the empirical results and discussion based on the various parameters which are related to agriculture inputs and human health. In this study, we focused on the global scenario of chemical inputs used by the agriculture sector, i.e., chemical fertilizers, insecticides, herbicides, fungicides, bactericides, and other pesticides, and their utilization trends. However, it impacts on foodgrain availability, undernourishment, and non-communicable diseases globally. Additionally, we have analyzed the correlation between synthetic input utilization in the agriculture and its impacts on human health.

Global Use of Synthetic Fertilizers in the Agriculture Sector:

In order to nourish growing plants, fertilisers have been crucial. It is estimated that just under half of the people alive today depend on synthetic fertilizers (Vince Gaia, 2012; Ehsan Elahi, et al. 2019). Fertilizers can increase crop productivity and yields, and increasing crop yields can reduce the land that we use for agriculture (Jacquet et al. 2022). In contrast, synthetic fertilisers damage the environment in terms of soil and water pollution (Jorge et al. 2020; Lata Rani et al. 2021).

Year	Nitrogen (N)	Y-0-Y (%)	Phosphate (P_2O_5)	Y-0-Y (%)	Potash (K_2O)	Y-0-Y (%)	Total (N.P.K)	Y-0-Y (%)
2001	81.73	-	32.95	-	22.50	-	137.18	-
2002	84.42	3.30	34.07	3.39	23.21	3.16	141.70	3.30
2003	87.16	3.25	35.31	3.66	24.52	5.66	147.01	3.74
2004	89.48	2.65	37.61	6.50	27.53	12.26	154.62	5.18
2005	90.08	0.68	37.84	0.62	27.20	-1.19	155.14	0.33
2006	93.01	3.25	39.28	3.80	27.15	-0.20	159.45	2.78
2007	96.37	3.61	38.89	-0.99	31.38	15.58	166.65	4.52
2008	94.78	-1.65	34.89	-10.27	26.70	-14.92	156.38	-6.16
2009	97.35	2.70	38.18	9.41	22.81	-14.55	158.35	1.25
2010	101.45	4.22	43.22	13.21	29.42	28.96	174.10	9.95

Year	Nitrogen (N)	Y-0-Y (%)	Phosphate (P_2O_5)	Y-0-Y (%)	Potash (K_2O)	Y-0-Y (%)	Total (N.P.K)	Y-0-Y (%)
2011	105.06	3.56	44.11	2.05	31.86	8.29	181.04	3.98
2012	105.14	0.07	43.60	-1.17	31.41	-1.41	180.15	-0.49
2013	106.79	1.57	44.22	1.43	32.88	4.70	183.90	2.08
2014	107.90	1.04	44.40	0.42	36.23	10.18	188.55	2.53
2015	106.60	-1.20	43.89	-1.15	35.89	-0.94	186.39	-1.14
2016	107.67	1.01	43.59	-0.68	36.73	2.33	188.00	0.86
2017	109.87	2.04	45.05	3.34	38.99	6.17	193.93	3.15
2018	108.40	-1.34	44.26	-1.76	39.00	0.01	191.67	-1.16
2019	108.45	0.05	43.82	-0.98	37.34	-4.25	189.63	-1.06
2020	113.29	4.46	48.12	9.80	39.15	4.85	200.57	5.77
C.G.R.%	**2.31**	-	**1.69**	-	**2.98**	-	**1.88**	-

Table 1: Global Trends of Synthetic Fertilizer Consumption in Agricultural Sector

Most countries in the world overuse fertilizers, it impacts leading to the runoff of nutrients into water systems and ecosystems and hence creates the pollution. Also, excessive use of fertilizers requires additional land and it's also have an adverse effect on environmental health. The excessive use of fertilization creates problems of soil salinity, accumulation of heavy metal, water eutrophication, and accumulation of nitrate. However, agriculture production benefits from feeding a growing population while reducing the environmental damage (Serpil Savci, 2012). The three elements that every plant needs most for nourishment are nitrate (N), phosphorus (P), and potash (K). As a result, N.P.K. is increasingly used in agricultural areas to boost production globally. The total amount of synthetic fertiliser (NPK) used in agriculture in 2001 was 13.71 million tonnes. More specifically, in 2001, the world consumed 8.17 million tonnes of nitrogen, 3.29 million tonnes of phosphorus, and 2.25 billion tonnes of potash, respectively. The world's consumption of chemical fertilisers increased to up to 20.05 million tonnes in 2020 in response to higher agricultural production. In 2020, 11.32 million tonnes, 4.81 million tonnes, and 3.91 billion tonnes of nitrate, phosphorus, and potash were consumed, respectively. In comparison to the year before, the yearly growth rate of nitrogen consumption was negative in 2008, 2015, and 2018. From 2001 to 2020, the average annual growth rate of the total consumption of chemical fertilisers was 1.88%, followed by 2.31% for nitrogen, 1.69% for phosphorus, and 2.98% for potash. The growth rate of Potash consumption was high than Nitrogen and phosphorus consumption. Worldwide chemical fertilizer use per cropland area was 103.71 kilograms per hectare in 2001 and increased to 146.40 kilograms per hectare in 2020.

Use of Synthetic Pesticides in Agriculture Around the World:

Pesticides control and protect plants against visible and invisible pests, including herbicides, insecticides, fungicides, and other substances used to control pests. Pesticides, in various forms, have been used for millennia in agriculture. Pesticides have often been produced artificially. They can be necessary to protect crops and farmers' produce and increase crop yields. However, pesticides can also negatively impact biodiversity and farmers' and workers' health (EPA 2023). Excess pesticide use affects food, which becomes poison (WHO 2022). Global pesticide use increased from 2001 to 2020 by 24.21% (i.e. 24,39,806 tonnes) in 2020. The use of herbicides in agriculture for weed management continually increased, reaching up to 13,97,465 tonnes in 2020. The share of insecticides, herbicides, fungicides & bactericides, and other pesticides in total pesticide use was 17.57%, 57.28%, 24.87%, and 0.28%, respectively, in 2020 worldwide. The herbicides used a compound growth rate (2.51%) was more than the other pesticides from 2001 to 2020. The average amount of fertiliser used worldwide increased at a rate of 1.88% between 2001 and 2020, which is higher than the compound growth rate of total pesticide use, which was 1.68%.

Global Net Per Capita Foodgrains Availability:

Every human being needs food grains as part of their daily diet. Cereals and pulses are included in the food grain. Cereals provide a good source of carbohydrates, and pulses are the main protein source. Protein protects against a variety of diseases, but carbohydrates are necessary to supply the daily required energy (Gulati et al. 2021). Each individual must consume enough food grains to meet their nutritional needs and provide food security. According to the data, the global availability of food grains per person was 347.10 kg per year and 0.95 kg per day in 2001, but this amount increased from the previous year's 394.58 kg per year to 1.08 kg per day in 2020. The net availability of cereals per person grew from 338.06 kg per year and 0.93 kg per day in 2000 to 383.09 kg per year and 1.05 kg per day in 2020. Similar to this, the net availability of pulses per person worldwide grew from 9.05 kg per year and 0.02 kg per day in 2000 to 11.48 kg per year and 0.03 kg per day in 2020.

Year	Cereal		Pulses		Foodgrain			
	Kg/ Day	Kg/ Annum	Kg/ Day	Kg/ Annum	Kg/ Day	Y-o-Y (%)	Kg/ Annum	Y-o-Y (%)
2001	0.93	338.06	0.02	9.05	0.95	-	347.10	-
2002	0.89	325.58	0.03	9.24	0.92	-3.16	334.82	-3.54

Year	Cereal		Pulses		Foodgrain			
	Kg/ Day	Kg/ Annum	Kg/ Day	Kg/ Annum	Kg/ Day	Y-o-Y (%)	Kg/ Annum	Y-o-Y (%)
2003	0.89	324.58	0.03	9.31	0.91	-1.09	333.88	-0.28
2004	0.97	353.21	0.03	9.27	0.99	8.79	362.49	8.57
2005	0.95	345.92	0.03	9.39	0.97	-2.02	355.30	-1.98
2006	0.93	339.95	0.03	9.22	0.96	-1.03	349.17	-1.73
2007	0.96	349.21	0.03	9.23	0.98	2.08	358.44	2.65
2008	1.01	370.41	0.03	9.28	1.04	6.12	379.69	5.93
2009	0.99	361.26	0.03	9.40	1.02	-1.92	370.66	-2.38
2010	0.97	353.18	0.03	10.30	1.00	-1.96	363.48	-1.94
2011	1.00	366.16	0.03	9.95	1.03	3.00	376.11	3.47
2012	0.98	357.95	0.03	10.43	1.01	-1.94	368.38	-2.06
2013	1.05	381.64	0.03	10.88	1.08	6.93	392.51	6.55
2014	1.05	383.97	0.03	10.52	1.08	0.00	394.49	0.50
2015	1.05	382.67	0.03	10.37	1.08	0.00	393.04	-0.37
2016	1.07	388.77	0.03	11.20	1.10	1.85	399.97	1.76
2017	1.07	390.79	0.03	12.51	1.10	0.00	403.30	0.83
2018	1.04	379.35	0.03	11.80	1.07	-2.73	391.15	-3.01
2019	1.05	382.79	0.03	10.94	1.08	0.93	393.73	0.66
2020	1.05	383.09	0.03	11.48	1.08	0.00	394.58	0.22
CGR %	**0.90**	**0.90**	**0.58**	**1.50**	**0.93**	-	**0.92**	-

Source: World Bank, and Food and Agriculture Organization (FAO).

Table 2: Global Trends of Net per Capita Foodgrain Availability

Prevalence of Undernourishment in the World:

Health level shows individuals' and households' economic, physical, and social access to nutrient diet. The proportions of different nutrients contained vary among foods. Hunger is measured by under-nourishment status, indicating the incompetence to obtain adequate food to meet nutritional requirements (Gulati et.al 2021; Marie et.al 2018). The prevalence of undernourishment is an estimate of the proportion of the population whose habitual food consumption is inadequate to deliver the dietary energy levels required to maintain a normally active and healthy life.

According to Figure 2, the number of undernourished individuals decreased from 13.1% (815.7 million) in 2001 to 9.8% (767.9 million) in 2021, meaning that one (1) out of every nine (9) people worldwide still lacks access to enough food for an active and healthy life. Interestingly, the majority of them are from developing nations, and between 2015 and 2019, the prevalence of undernourishment has increased.

Global Trends of Non-Communicable Disease Burden (NCDS):

Nearly 74.0% of all deaths worldwide were caused by non-communicable diseases, which also include chronic lung disease, diabetes, cancer, and heart disease (WHO 2022). The burden is increasing the number of individuals, households, and communities afflicted is continuously growing. They include unhealthy diet, smoking and harmful drinking of alcohol, obesity, blood pressure, blood sugar, raised cholesterol, and insufficient physical activity (FAO 2017). Unhealthy diets and/or chemical food are major causes of non-communicable diseases (Zarean and Poursafa 2019, Budreviciute et al. 2020; Patel et al. 2023).

Year	Non-Communicable Disease	Y-O-Y (%)	Share in Total Diseases	Y-O-Y (%)
2001	1287.48	-	48.81	-
2002	1306.23	1.46	49.53	1.48

Year	Non-Communicable Disease	Y-O-Y (%)	Share in Total Diseases	Y-O-Y (%)
2003	1322.63	1.26	50.23	1.41
2004	1335.03	0.94	50.61	0.77
2005	1354.90	1.49	51.54	1.84
2006	1363.88	0.66	52.31	1.49
2007	1377.30	0.98	53.12	1.55
2008	1396.45	1.39	53.75	1.17
2009	1408.71	0.88	54.81	1.98
2010	1426.53	1.27	55.37	1.01
2011	1443.32	1.18	56.51	2.07
2012	1460.68	1.20	57.41	1.59
2013	1478.92	1.25	58.30	1.54
2014	1496.70	1.20	59.15	1.47
2015	1522.73	1.74	60.11	1.62
2016	1546.15	1.54	61.10	1.64
2017	1567.39	1.37	62.02	1.51
2018	1593.36	1.66	62.99	1.56
2019	1620.16	1.68	63.84	1.34
C.G.R.%	**1.24**	-	**1.53**	-

Source: OurWorldInData.org. Retrieved from: https://ourworldindata.org/burden-of-disease (Value)

Table 3: Global Trends of Total Non-Communicable Disease

We observed that the non-communicable diseases and their threat causes an increase in the likelihood of hospitalization or death from Corona pandemic in all age groups (WHO 2022). From Table 3, Worldwide total non-communicable diseases were at 1287.48 million in 2001. In 2019, the globally non-communicable disease increased to 1620.16 million by a positive 1.24% compound growth rate. Similarly, the share of non-communicable diseases in total diseases was 48.8% in 2001, and it increased to 63.84% in 2019 worldwide. Communicable diseases average annual growth share in total diseases average annual growth was 1.53% and which was higher than the non-communicable disease. While the non-communicable diseases annual growth was high in 2015, nearly 1.74%, and low in 2006, i.e., 0.66% compared to the previous year during the study period.

Correlation Analysis between Synthetic Agricultural Inputs and Health:

We have evaluated the correlation between synthetic agricultural inputs and various variables like foodgrain availability, undernourishment, and non-communicable diseases by using parametric tool namely the Karl Pearson's coefficient of correlation (by using in Eq. 2). It was observed there are close correlations between chemical inputs used in agriculture and health issues. The chemical inputs negatively or positively affect biodiversity, food quality, and human health directly and indirectly. We have used Karl Pearson's correlation coefficient method in this study to measure the strength and direction of the relationship between the utilization of chemical inputs and health dimensions.

Variables	Value of *r*	Conclusion
X: Chemical Inputs	-	-
Y_1: Food Grain Availability	0.892	Strong Positive
Y_2: Undernourishment People	- 0.945	Strong Negative
Y_3: Non-Communicable Diseases	0.859	Strong Positive
Source: Authors Calculation		

Table 4: Correlation between the Use of Synthetic Agricultural Inputs with Various Variables

The value of correlation coefficient of 0.892 and indicates a strong positive correlation between the utilization of synthetic agricultural inputs in agriculture and per capita net availability of food grains. It means that high utilizations of synthetic agricultural inputs in agriculture results into the high net availability of food grains globally and vice versa.

The value of correlation coefficient of -0.945 and shows a strong negative correlation between the utilization of synthetic agricultural inputs in agriculture and the prevalence of undernourished people. Meaning, as synthetic agricultural inputs have increased it results into the decrease in number of undernourished people and vice versa.

The value of correlation coefficient of 0.859 and it indicates a strong positive correlation between the utilization of synthetic agricultural inputs in agriculture and the prevalence of non-communicable diseases. The rate of non-communicable diseases increases with the use of synthetic agricultural inputs in agriculture and vice versa.

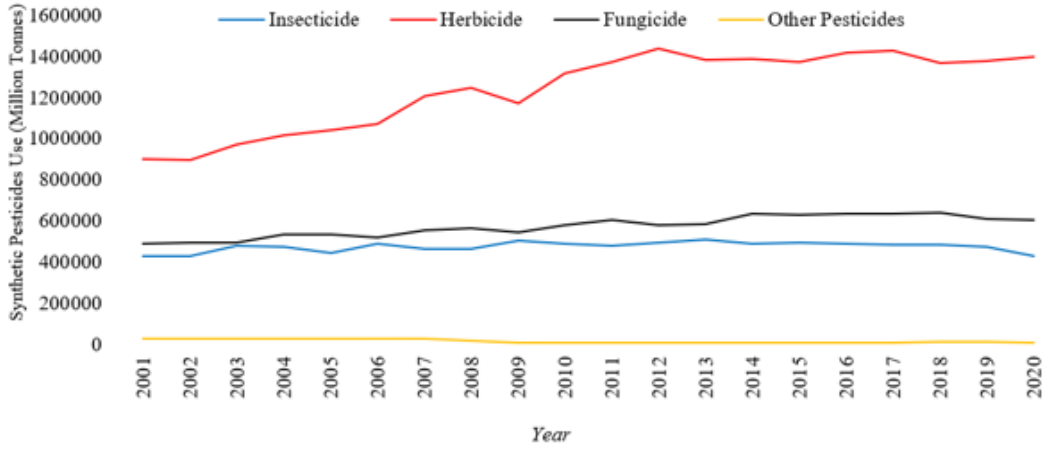

Figure 1: Global Trends of Synthetic Pesticides Use in Agriculture (Million Tonnes)

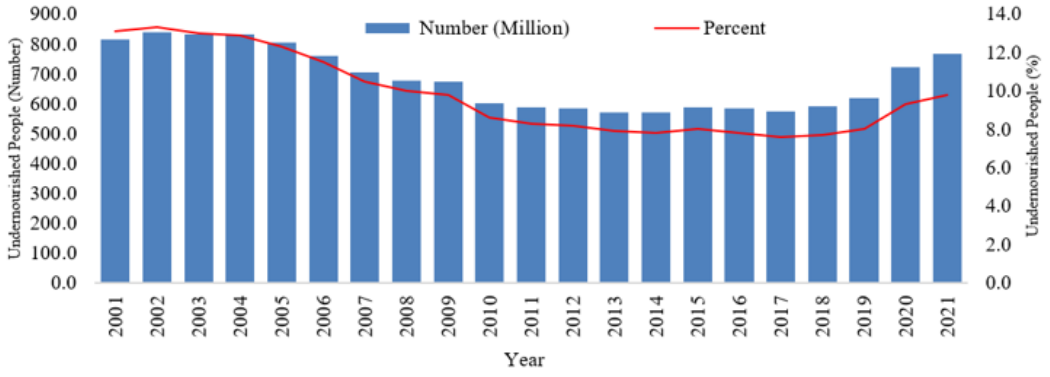

Figure 2: Global Trends of Undernourished People (Number and Percentage)

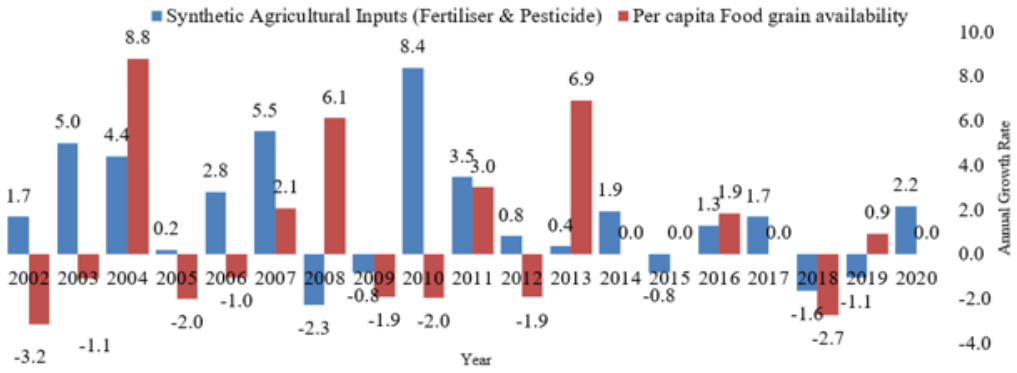

Figure 3: Global Annual Growth Rate of Synthetic Agricultural Inputs Use and Net Per Capita Foodgrains Availability

Figure 3 indicates the global annual growth rate of synthetic agricultural inputs utilization and the availability of per capita food grains during the last twenty years from 2000. During the study period, it was observed that the growth rate of chemical inputs utilization in agriculture is higher than the per capita availability of food grains globally. Except for some years like 2005, 2006, 2009, 2010, 2012, and 2018, the annual growth rate of per capita foodgrain availability was negative, however the growth rate of synthetic agricultural inputs use was positive, which was 2.2% in 2020.

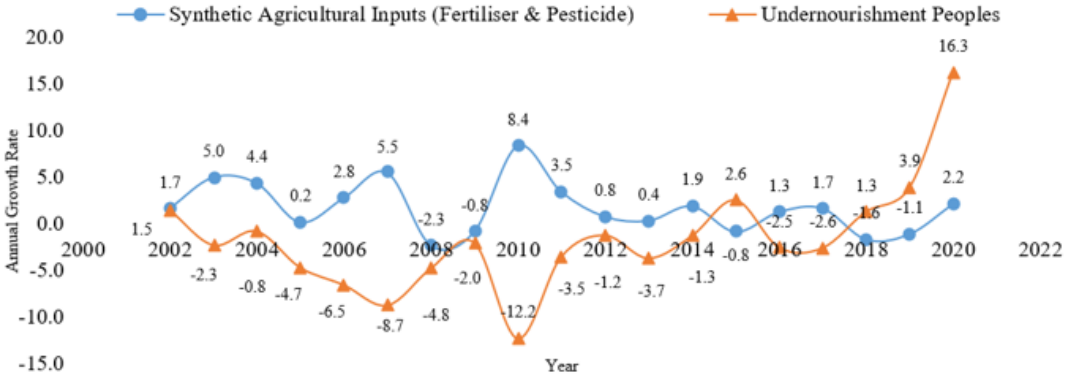

Figure 4: Global Annual Growth Rate of Synthetic Agricultural Inputs Use and Prevalence of Undernourishment Peoples

Figure 4 indicates the annual growth rate of synthetic agricultural inputs utilization and under-nourishment people in the World from 2000 to 2020. From 2000 to 2016, the annual growth of synthetic agricultural inputs utilization in agriculture was higher than the annual growth rate of undernourished people. However, after 2016, the annual growth rate of undernourished people in the World was higher than that of synthetic agricultural inputs utilization is 16.3% in the year 2020.

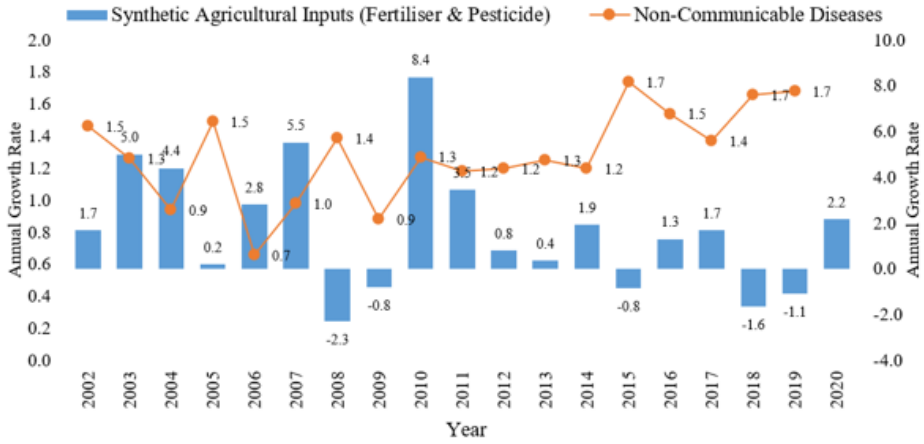

Figure 5: Global Annual Growth Rate of Synthetic Agricultural Inputs Use and Prevalence of Non-Communicable Diseases

Figure 5 shows the annual growth rate of synthetic agricultural inputs utilization and non-communicable diseases in the World for the last twenty years. From 2011 to 2020, the growth rate of non-communicable diseases was higher than synthetic agricultural inputs utilization in agriculture. During the study period, the annual growth of synthetic agricultural inputs was negative for some years, but most of the years it was observed to be positive and stood at 2.2% in 2020. Conversely, the global status of annual growth rate of non-communicable diseases was continuously increasing from the year of 2011 to 2020 and it was 1.7% in 2020.

Conclusion

In this study, we investigated global trends in synthetic agricultural inputs use, food grains' availability, undernourishment prevalence, non-communicable diseases, and associated impacts on human health. In order to find synthetic agriculture input's use-related externalities, we have practically examined correlations between synthetic agriculture inputs and various health indicators, such as foodgrain availability, the prevalence of undernourishment, and non-communicable diseases. Insecticides, herbicides, fungicides & bactericides, and other pesticides made up 17.57%, 57.28%, 24.8%, and 0.28%, respectively, of all pesticides used in the globe in 2020. Global agriculture industry's average growth rate of fertilizer usage (1.88%) was more significant than pesticide use (1.68%). In the World in the year of 2001, the per capita net availability of foodgrain was 347.10 kg per year and 0.95 kg per day, showing a rise from the previous year's per capita availability of 394.58 kg per year and 1.08 kg per day in 2020.

In the World, undernourished individuals decreased from 13.1% (815.7 million) in 2001 to 9.8%

(767.9 million) in 2021, meaning that one in nine people still does not have enough food to live an active and healthy life. This study showed that the net availability of food grains grew along with the per capita growth in the usage of synthetic agricultural inputs in agriculture, and the number of undernourished individuals declined. Contrarily, during the study period, the rate of non-communicable diseases has steadily risen along with the global use of synthetic agricultural inputs in agriculture.

Providing nutritious and adequate food to the growing population has become a necessity for all the countries in the World. However, synthetic agricultural inputs in agriculture are increasing daily and it negatively impacting the biodiversity, environment, climate, human life, and health. It also results into changes in temperature and rainfall pattern and which has negative impact on agriculture and hence affecting on food availability. Besides, synthetic agricultural inputs in agriculture are increasing to protect crops from climate change. Due to the excess use of synthetic agricultural inputs, the chemical residue in the food is more than the adequate limit. Therefore, the health of people is negatively affected. In the future, protecting the environment and biodiversity and satisfying the World's hunger will be a big challenge in front of us.

Abbreviation

SDG: Sustainable Development Goals, UN: United Nation, FAO: Food and Agriculture Organization, WHO: World Health Organization, EPA: Environmental Protection Agency

Declaration

The Authors declared that there is no conflict of interest or any other financial interest.

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