

Crop Residue Burning: Impacts on Air Quality, Health and Climate Change Modelling using Geospatial Technology: A Review

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ABSTRACT

Crop residue is a common source of air smog and poor air quality, which has adverse impacts with immediate short-term and long-term effects on human health at local, regional and global levels. Recently, crop exercises use mechanical harvesting machines in Indian rice and wheat farming systems. In the field of these methods, leave a large amount of plant residues. Burning the remains of the crop, there is a general view of destroying garbage after harvesting around the world. Crop Residue burning (CRB) is an important air pollution cause, with local, regional and global effects on air quality, public health and climate. Globally a broad range of studies has been conducted on almost all the aspects of CRB, including its particular types, on quantification of emissions and on calculating its numerous impacts. Hence, the object of this research is to studies published on related topic, articles, including literature relating to field measurements, laboratory studies and the impacts of CRB. Further, this review provides visions into the role of CRB and wildfire on air quality and health worldwide. The MODIS on-board the Terra (EOS AM-1) and Aqua (EOS PM-1) satellites is the important tool for identification of the CRB activities over the globe. The MODIS (Terra +Aqua) retrievals provide daily global aerosol optical depth (AOD), fine mode fraction (FMF) and Angstrom exponent (AE) over land. Based on a comparative study between AOD vs FMF and AOD vs AE, several researchers have examined the aerosol types like urban/industrial, CRB, dust, urban mixed etc. This review emphasis on literature findings concerning CRB emissions, the impacts on air quality, health and climate change. And its threats to atmospheric environment and climate change.

Keywords: CRB, Remote Sensing, GIS, Geospatial Technology, Crop Residue, MODIS, Air Smog, Air Quality;

1. INTRODUCTION

The easiest and most economical option is to manage the crop residue. Due to the lack of awareness or lack of appropriate technologies, it is usually practiced everywhere. Burning the crop residues not only affects the quality of the atmosphere, but also affects the climate and ultimately human health. Crop residues and biomass (forest

fires) are considered to be the main source of carbon dioxide, carbon monoxide, methane and nitrogen oxides¹. Combustion of biomass is a major source of gaseous contaminants such as carbon monoxide (CO), methane (CH₄), nitrogen oxides (NO_x) and hydrocarbon troposphere. It is also an important source of aerosol in the atmosphere, which potentially affects global air quality and climate. Impact of Rice crop burning on SPM level, SO₂ and ambient air study of the effect of combustion residues in and around Patiala, Punjab (India)². It was mentioned that NO₂ to increase SPM level, SO₂ and combustion month (October-November), the effects of weather parameters, especially in the direction of wind, rain, and atmospheric temperature. Most of the particulates provided by the burning of the crop, at least PM₁₀ and easily enter into the lungs, due to cardiovascular problems. Generally, farmers' cultivation of crop residues is burning up to clean up their farm, weed control and has pushed the farm, nutrient uplift agriculture or pastureland, but instead of water, it is like charcoal, liquor, gas in the form, energy can be used as production-productive, biogas.

Greenhouse gas emissions from Asian agriculture fire areas and their transportation in air, air and vital atmospheres were measured in May-June 2009(Li et al.). Residues of crops are produced after harvesting. The main reason for burning crop residues is due to the difficulty of gathering crop residues. If collected, these residues can be used in various forms in industrial / domestic fuel, food, packaging, bedding, wall construction and green manure etc. Many gases (SO₂, NO₂ and CO) etc. from combustion of crop residues also from greenhouse gases³. According to Jacobson et al., During combustion, due to the aerosol particles emitted, the global climate has short-term cooling, while many greenhouse gases can increase temperature (or cancellation of cooling) after several decades. Therefore, reducing combustion of biomass can cause short-term heat without long-term cooling or temperature change.

India is an agricultural country and produces a large amount of agricultural wastes. This number will increase in the future as there is a growing population, which is necessary to increase the productivity of agricultural waste. Biomass has been left in the agricultural residues area after grain production. Every year the crop residues are prepared in large quantities, during harvest, in the form of leaflets and in the form of leaf / top. Processing of agricultural products through milling also produces many waste. Agriculture is the main business of three-quarters of the working population. It is estimated that about 500-550 Mt are formed each year in the country. For domestic use and recycling, they are used for animal husbandry, soil exploration, biomass production, home stoves and fuel.

2. TYPES OF BIOMASS BURNING

Forest fire, Agricultural straw open burning, Wood and straw combustion as fuel:-

Forest fire

Forest fires are considered as the main source of carbon monoxide (CO), carbon dioxide (CO₂), volatile organic compounds (VOC), methane (CH₄), halogen compounds and nitrogen oxides (Andreae M.O.,1991). The number of fires increased almost the entire South and Southeast Asia region in winter and spring due to large forest fires during the dry seasons. During the monsoon of the summer, because of heavy rains, the number of fires in India and Indochina is very low, while in Siberia they do a lot because of seasonal forests and peat flames. In the eastern part of China, the number of fires increases, especially in winter and spring. In arid regions such as the Tibetan Plateau, central and western China, there is very little fire in the studies.

Biofuel

Biofuel is produced by live processes. Used for industrial or domestic energy sources, in assessing the effects of biofuels, they should be reminded that, basically, it can be renewed so that it is "refreshing", unlike burning fat. Biomass is more dependent on heat as the main source of energy for rural people in developing countries. In the developing world, the number of bio-fuel in the urban areas is unknown, but it may be significant that more than 50 years from 1950-2000, Fernandes et al. (2007) estimated a 70% increase in biofuel global use, that it is now savannah after the heat is the second largest biomass type in the world, but it is difficult to predict in the future

Agricultural/waste burning

Fossil fuel and waste disposal may be common in both rural and urban areas. For example, in other Brazilian cities, gum is the prime source of the PM. The purpose of the remaining planting is most biomass species but this release can be very high. Hawbaker et al., 2008 has had difficulty getting these small, small Firefox. According to the annual crop season, remaining investment can be consumed three times in a year. Most of the biomass is used for domestic purpose. Wood, , damages and sawdust - 44 percent of biomass energy, but any living organism produces biomass energy. In some biomass sources, agricultural products like plants and corn fruits can be included. Wood and wood are used to generate electricity; Electrical energy sources that do waste; Is not distributed by the services. Paper mills and saw mills have used electricity and their uses to make more use of their electricity production. However, when they use more energy, they need to buy extra power from services.

Major Studies

K.C. Thumaty, et al., (2015), Apart from the Indian part of the Gangetic plains of India mainly in Punjab and Haryana states, agricultural residues are burnt in the northern states of India for cooking. Moderate resolution

imaging spectroradiometer (MODIS) and Suomi National Polar-orbiting Partnership – Visible Infrared Imaging Radiometer Suite (Suomi NPP-VIRS) is using for Kharif Crop Season (September– November) 2014 in Punjab and Haryana states of India.

Comparative analysis of active fire detection of MODIS and VIIRS suggested that VIIRS is more sensitive with high identification potential. Because of 15,222 (MODIS) and 15,568 (VIIRS) locations from active fire of MODIS and VIIRS in the study area during September-November 2014.

P. Kumar et al., (2015) Nutrients estimate that there will be 3.85 million tonnes of organic carbon, 59,000 tonnes of nitrogen, 20,000 tonnes of phosphorus and 34,000 tonnes of potassium. It is also an adverse result of estimated nutrients in the soil, smoking emissions, which have added gas on the air like nitrogen oxide and ammonia, which can be due to severe air pollution. Indirectly crop residues is also contributing to ozone pollution. These smoky emissions may be lead to health threats, lungs, chronic bronitis and asthma.

W. Lai et al., (2017), The impact of air pollution due to the burning of agricultural residues on home cognitive health can be analysed by linking health information to remote health information along with remote sensing data. It is observed that a significant negative impact of fire on health is the effect: 5.1% is less in the normal cognition test in the county, with high frequencies of 55% and above (Ages 55 and above), and 11.8% Less things are remembered. This effect has been found among the respondents living in the countries below, but not Upwing County. Cognitive impact of agricultural fire means additional health costs that increase climate risk from climate change. To conduct the analysis, we add many datasets including remote sensing, air quality, agricultural production, meteorological data and fire data from health data, so that we know the fire point address: Remote sensing fire point comes from MODIS active fire product in Fire Information for Resource Management System in NASA.

L. Giglio et al., (2016), NASA's terra and aqua satellites has provided more than a decade of global fire data by two Moderate Resolution Imaging Spectroradiometer (MODIS). Here describe the improvements made to recognition algorithms and data-level products, which were implemented as part of the collection of land product reprocessing, which started in May 2015. The updated algorithm intends to address the borders celebrated with the previous archive 5 fire product, especially due to the fact that false alarms are cleared of small woods, and the lack of large fire hidden from thick smoke it occurs. Processing of ocean and other large water bodies has also been expanded to facilitate the monitoring of offshore gas pollution. Fire radiation power is using a glow-based approach, usually FRP decreases for all but relatively small degrees of high intensity fire pixels. We did a Stage-3 verification of Collection 5 and Collection 6 Terra MODIS Fire Products with a collection of reference

of Fire Maps obtained from images of more than 2500 high-resolution Advanced Space Benefit Thermal Emissions and Reflection radiometer (Aster).

3. MONITORING OF BIOMASS BURNING

W. Xu et al., (2017), The fast-changing dynamics of satellite-based terrestrial satellites and the Himawari-8 Advanced Himawari Imager (AHI) provide unmatched views of Asian and Australian lightning at 10 m pitches and heat sinks. Minimum 2 km spatial resolution. Developed a first-of-its-kind processing system to identify the active fire and repossess their fire radiative power (FRP) based on AHI data using Fire Thermal Anomaly (FTA) algorithm. (Geostationary Fire Anomaly (FTA)) and FRP retrieval method developed for use with Meteosat SEVIRI.

T. Zhang et al., (2017), VIIRS will show you how to detect and use the new Active Detection (AF) feature for use with the Space Sensor. In order to provide both AF notice and FRP (Fire Radiation Strength) both to the 375-meter I-Band and the first of 750 m M-band data to provide complete fire and FRP magnitude on fire (fire radiation power) . high-sensitivity I-band VIIRS data 'Sensitive to fire' has the ability to detect small active fire ($FRP \leq 1MW$), but this sensitivity can cause false alarms, which is often associated with man-made structures. To protect them by using 30 meters of worldwide coverage and an open road map mask.

Liu et al., (2016), It is important to assess the causes and effects of forest fires in the forest ecosystem. A simple algorithm for burning and Burned Area Extraction and Dating (BAED) has been developed to automatically date firefighting for the wound and for each burning cycle. The buried girth was pulled out of a two-phase method, which included determining the primary burning pixel size and the size of the patches that were continuously burned. ingredient Meteorological and Temperament is controlled by the General Index. The expected fire date for each fire is given when the difference between the observed NDVI and the predicted NDVI is predicted to increase three consecutive times.

C. Li et al., (2015), With the chemical composition of the particles of smoke emitted by the development of physical and water properties from wheat grains, the effects of relative humidity (RH) on these properties in the aerosol room have been investigated. Particles of smoke are made up of carbon dioxide and exotic salts (~ 25%). In the age, the inorganic salts of the inorganic salts are increased by PM1.0 due to the formation of sulphate and nitrate. Up by the chloride value. The reduction in the density of PM2.5 and PM 1.0 will gradually increase from 1.18 to 1.44 grams per cubic meter and within 4 hours 45% E 55% RH. However, according to the results obtained from both particle size analyzers of aerosol particle mass analysis (APM) and high density densities by structure can solve the problem of particle density analysis from the estimation. Density of smoke particles depends on relative humidity and aging. Size results will not be noticeable by age. General settings and processes The effect

of relative humidity on the aging of the smoke particles in the dark results in exhaust emissions in the aerosol room from burning wheat straw.

T. Liu et al., (2018), In many cities in India, air pollution is higher than national and international standards, and effective pollution control strategies require knowledge of the sources that cause air pollution and suffering variability. In this study, we investigated the impact of external combustion sources on Knik biomass matter (PM), surface visibility and optical depth (AOD) in 2013 from India's third 2007 year. In most populated cities Are you there We define a space in the atmosphere or "air hues" for the city using the orbital trajectory behind the HVSPLIT model. Fire Radiative Power (FRP) satellite can observe fire area after monsoon. The target before the monsoon and the monsoon fire up the national metropolitan areas of New Delhi and Bangalore and around Pune on the east side are the fire. We found that less important work in fiberglass air quality for individual works revealed the opposite, before the metric monsoon season, burning with outdoor light, three different air quality. In addition, we provide a 99% share of FRP since the post-spring monsoon flare to burn agriculture in the average fresh air of Delhi.

G. Serbin et al., (2009), Protection does not include a good amount of practice, often soil preparation, crop residues on the soil surface after harvesting and growing, usually improve soil organic soil (SOC) composition and reduce soil erosion. Remote-sensing methods have shown great promise in evaluating plant residues and have resulted in an estimated concentration of tillage. It is expected that the severity of tillage in C soil is greater than 4,200 soil and reflects 80 plant scavengers measuring the spectrum at 350 to 2500 nm wavelength region in the laboratory. Lignin Cellulose Absorption Index (LCA) Normal Difference Index Tilj (Anditiai) Normal Difference Senesent Plant Index (Andisviai) The six known remote senses have been used index spectrum Soil and SoC are affected for debris, so the spectral index, which is higher than the soil classification, is often less effective. Reflection on the spectrum The spectral index of the soil is similar to that of land resources, and in particular, the critical resource area. CAI shows the best soil and crop waste, followed by LCA and NDTI.

4. POLLUTANTS FROM BIOMASS BURNING

G. Serbin et al., (2009), Crop Residue can affect soil quality, global carbon balance and crop yield. This study was designed to evaluate samples of local and temporal diversity in three areas of northern China and three areas in the northeast. Based on the crop yield data on provinces and provinces, cereals, maize and wine - the most important source of trade is the mid-105.7 meter house with 92.8 meters and 12.9 million tons. In the average, 2008, 2009 and 2010, the SCCE was 46.4 million 42.4 meters and setting the NEC 95 MT, which was 49.7 lakh tonnes and 7.4 MT of cheerful and September production. From October to December, local views have been displayed in July. In September, the rest of the remaining 40.9 and 53.1 metric tons in the NC and NEC areas.

The remaining content should be evaluated properly with the user. Industry and industry policy makers use the remaining resources

G. Pouliot et al., (2012), Biomass burns as a major contributor in wind conditions because it has the effect of ozone and clinical problems. Burning, part of the individual section of the initial crop, the National Inventory Institute summarizes the summary of new perspectives to assess the outstanding homes for sensitive information and regional information. We will pay attention to later harvesting and deforestation to distribute thin colors, maize, cotton, rice, soyabean, donkeys and wheat. Estimates show that 5.8 million residential fire-weather acre and 53,000 smaller tonnes above the PM_{2.5} compared to the United States (Conceus). Production estimates for 2007 show that during the season, 6 million acres and PM 2.5 were being burnt in the rest of the country. To produce the material 58,000 small tones the first summit is being used with the results of the chemical transport model. The first module has been used to use operational artificial products for a harvest conference, a specific element from MacArth 2011, and estimated water estimate for the map map. The use of CMUE version 5 (beta release) is a complete construction of the chemical transport model for the October, October and 2006 predictions in September 2006, which is used in November 2006 for the use of survival water. Accept the specifications provided for the device, compared to a chemical transmission model for a few years, this can easily be a good way to reduce the snow at a lower cost. Finally the results were examined using the CMAQ5 beta version.

P Geetha and M Kokila, (2015), More or less all the cities of the world, air pollution in large cities leads to dirty air due to the use of rapidly growing vehicles. Citizenship is changing the lifestyle of people, as well as serious problems related to health and environmental harm. Hysplit4 simulation software, which is used to prevent pollution and concentration. Jadeees are common figures used to fight both conspiracies. The pollution is found in relation to weather data (air speed, direction, temperature), because pollution runs according to local air patterns and speeds Is. Meanwhile, the concept of continuity is artificial to assess the quantity of pollution in specific geological area. According to the presence of pollution, both plots are for special study areas. The production of these plants will help environmental experts to plan the industrial site, safe fireplace height for road planning. The paper has been estimated that the speed of pollution and the wind direction and the wind velocity. Plot plot for advanced PMLO in Coablotter has been planted. All pollution is normal. With these plants, cities planning and other buildings can be done effectively to establish industries. It will also help in the disaster management caused by air pollution.

C Daughtry and M Quemada, (2015), The crop residues reduce the agrochemicals in the soil and protect the soil and runoff water. The characteristics of the absorption associated with cellulose and lignin are different from crop residues and soil. Assess the effects of soil and crop residues on remotely estimated estimates of crop residues and propose a method for reducing these effects. Various crops and soil reflective spectra have been acquired in

the laboratory and analysts have expanded in the agricultural sector with a wide range of cover and moisture content of various crop residues. The slope of linear relations with cellulose absorption indicator was very sensitive to the position of moisture, while the residual index of the short wave infrared general structure has been reduced to a lesser extent. Indicators of water, which used to provide reliable estimation of water content, can be used to estimate the residual cover of the crop as per moisture conditions. Water in residues and soil in the soil not only changed the reflective signal but also changed the slopes of relations between the fraction of the residual cover and the spectral index. For the reliable estimation of the crop residual cover, the visual water content is necessary for change. According to the previous studies, according to the estimated estimates of the residual cover in the data set collected under the conditions of the area, using a multivariate linear model developed from laboratory experiment. Improvement on the basis of RWC enhanced the estimation of the cover of the residues from the CAI values and to the lesser extent from the CNRR. Changes in visible moisture limits the utility of NDTI to cover the crop residues. Water indices provide reliable estimates of crop residues and soil water content, can be used to estimate the residual cover of the right crop from moisture conditions. Thus, there is a need to check water indices using the available band for many existing satellite sensors, including Landsat-8, Sentinel-2 and Worldview 3.

V. Damien et. al., (2014) ,Two major application will be present in using near-infrared Hyperspectral imaging (NIR-HSI), which is to coincide with the Chemo-metrics to organize the components of the soil and to evaluate their limitations of eligibility. For the first time during the application, the ability to use NIR-HSI to filter the residues of plants such as roots and vegetables are shown in the soil. It is a method of estimating the levels of collagen storage during the second application of such functional strength and used bones. The current challenges of agricultural research focus on agricultural research and the consequences of root losses and soil residues, which are important in monitoring the development of root system and decrease in crop residues. In this context, a study was done to use NIR-HIS and Chemo-metric tools to separate soil remains and find and measure straws and roots. Y. Zhou et al., (2017), The temperature of biomass leads to loss of many gases and aerosols, which can damage air, weather and human health. on the basis of domestic and tropical grasslands, wood burning, animal burning, animal burning and waste, provincial-level work data, satellite data, and spring-release features in 2012, the heat associated with China's construction For the high biomass solution update (EF) 1 * 1-km² grid was generated using source-based surrogates based geographical system technology (GIS).

5. CONCLUSION

The review of available literature indications that the burning of waste from open crops causes emissions of air pollutants such as particles and gases and, ultimately, influences atmospheric quality and climate. Almost all researchers agreed that open burning of crop residues biomass significantly increases the level of particulate

matter, gaseous pollutants in atmosphere. Various research has been done using MODIS data for the monitoring of crop residue. The average size of an agricultural burn (plot) is usually much smaller compared to MODIS of 1 km² or 750 sq. m VIIRS footprint and there may be more than one active combustion ground fire in the footprint of the respective sensors. The pixel aggregation scheme for different scanning angles from the VIIRS nadir and the corresponding spatial sampling are different from those of MODIS, which can also add to the difference in the number of fire pixels detected by each sensor for the same area of interest.

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