

SMOG LOCKDOWN

Burning issue of stubble – Agro - Waste Management

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Acknowledgement:

- With Gratitude and reverence, I dedicate this paper to my Guru H.H. Sri Sir Ravishankar Ji, a Global Humanitarian and a spiritual leader, founder of Art of Living Organization, for the opportunity given to me to work as director projects in Sri Sri Institute of Agriculture sciences and Technology Trust (SSIAST Trust), one of the Trust founded under the Aegis of Art of Living.
- Thank my team in Punjab, Shri Devansh and others who are tirelessly working with farmers and enabling them to adopt the sustainable practices of Agro- waste management.
- Thank my Family – My son Abhishek for his continuous support to my work.

Abstract

Agro waste management has become a challenge, sustainable practice of handling this issue seems to be very far-fetched. Only Method of Disposing the Stubble easily seems to be burning. Farmers have no time nor the attitude to recycle the agro waste.

Globally, residue burning is significantly higher in Asia compared to other continents. The rice-wheat growing belt of South Asian countries is a global hotspot of stubble burning and the same is true for India. The north-western states, especially Punjab, Haryana and Uttar Pradesh witness the burning of paddy straw by farmers.

As per studies, over 500 million tonnes (MT) of crop residue is generated annually in India. The generation of crop residue is highest in Uttar Pradesh (60 MT), followed by Punjab (51 MT). Among various crops, cereals generate maximum residue (352 MT), followed by fibres (66 MT), oilseeds (29 MT), pulses (13 MT) and sugarcane (12 MT). Among cereals, rice alone contributes 33% to the crop residue.

The farmer's issue is a very peculiar one and no amount of Government intervention is able to contain it. Due to the half-hearted approach by all the concerned stakeholders, the problem is at its peak during the intermittent period between Kharif and Rabi season, i.e. October. The problem continues as by that time a lot of smog is in the air, choking the citizens, causing very poor visibility leading to lot of accidents in Delhi and surrounding areas, causing a number of flight cancellations etc. not taking in to account a lot of breathing disorders, fatigue and breathlessness reported by the citizens of Delhi.

Current cropping patterns in Punjab

82.2% of the total geographical area of Punjab is irrigated and the cropping intensity is 204%. The cropping pattern has shifted from cotton, maize, oilseeds and pulses to paddy. Paddy crop is considered being risk-free crop in terms of marketing, weather conditions and crop health. The irrigation requirement of paddy ranges from 150 – 200 cm, which is not fulfilled by rainfall. Hence the irrigation demand is fulfilled by tapping into groundwater.

Primary Crops grown now: Paddy and Wheat.

Farmers ignorance

Farmers are ignoring the input cost of the long duration varieties. After calculating the entire input cost and yield, farmers end up making less from long duration paddy.

Severe Ground water depletion has resulted in late sowing of paddy, leading to late harvest, leaving no time for the sowing of the 2nd crop – wheat in Rabi leading to resorting to quick disposal of stubble by burning which seems to be only solution in hand to race against time.

Catch 22 situation in Punjab and Haryana: Water scarcity leading to air pollution, air pollution leading to health hazards, health hazards leading to seeking again quick solution to end it by imposing fines and other measures to punish the farmers burning the stubble.

Is this the real issue and the real solution – this paper is aimed at a pragmatic look at the issues, stake holders response, seek real answers and solutions to this vexing problem.

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Introduction

How India breathes: Tale of two Halves (2017)

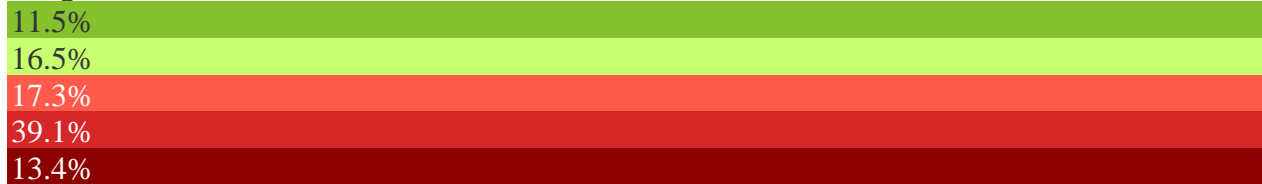
Chart shows % of days by air quality index.

A comparison of air quality in 2017 across 23 cities shows Gurgaon was the most polluted Indian city (in terms of median PM 2.5 concentration) while Bangalore was the cleanest. The country's most polluted cities were largely in North India.

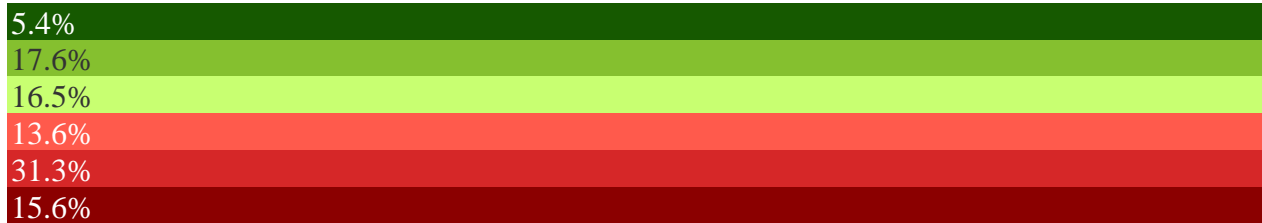
- Good
- Satisfactory
- Moderate
- Poor
- Very Poor
- Severe

North:

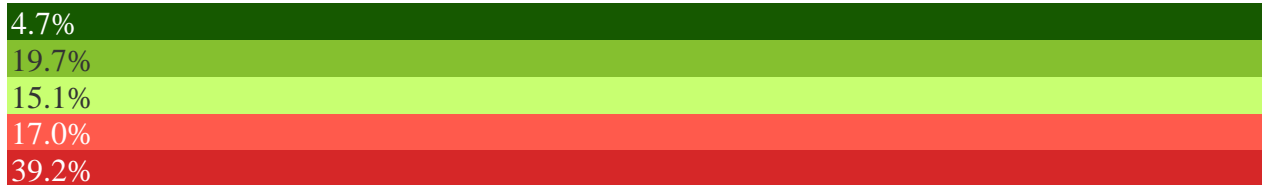
Gurgaon



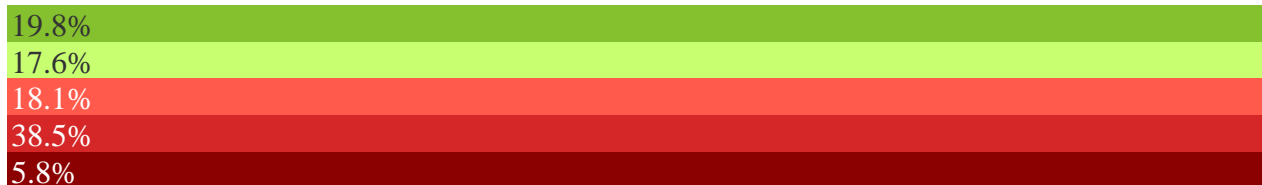
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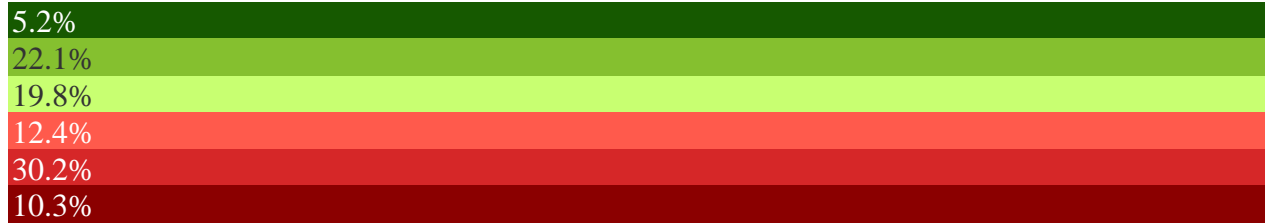
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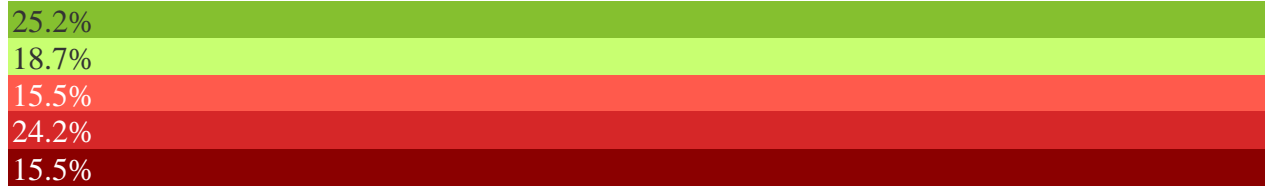
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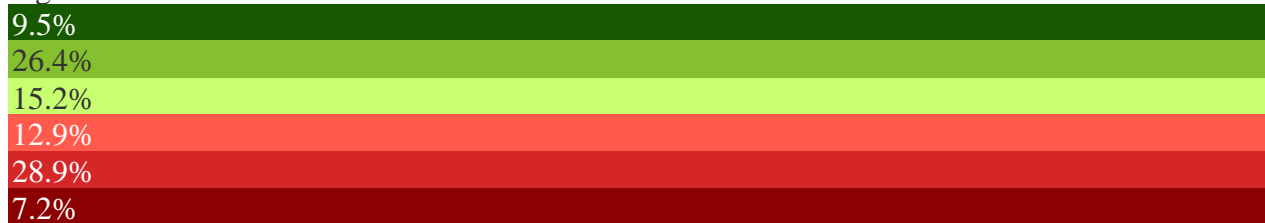
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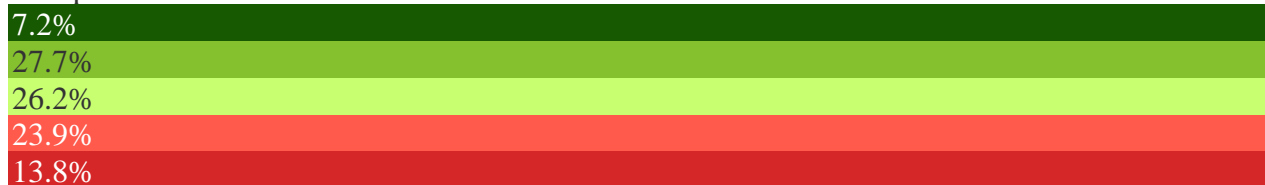
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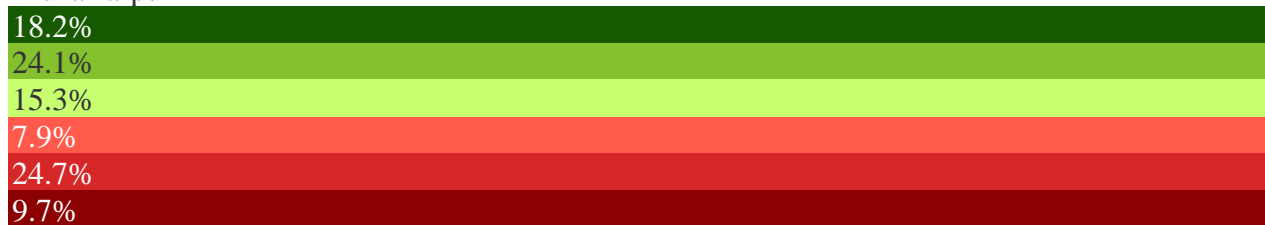
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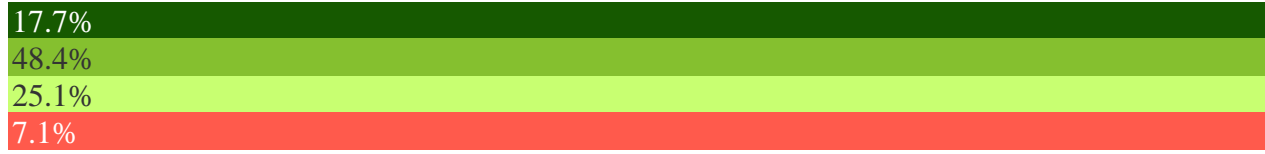
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Nagpur

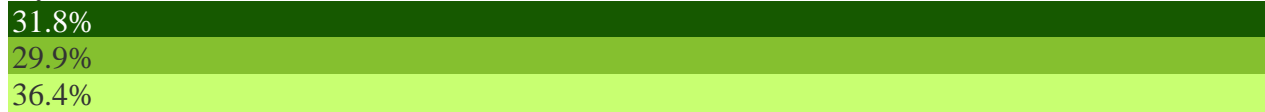


Panchkula



South

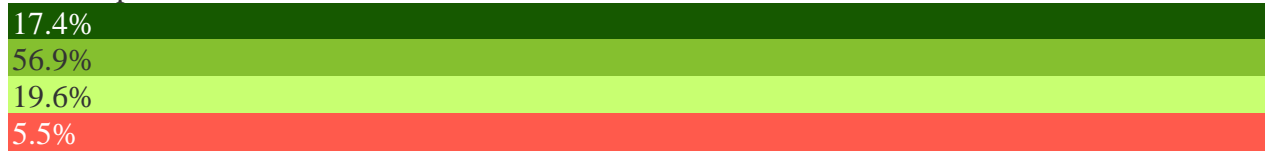
Hyderabad



Chennai



Visakhapatnam



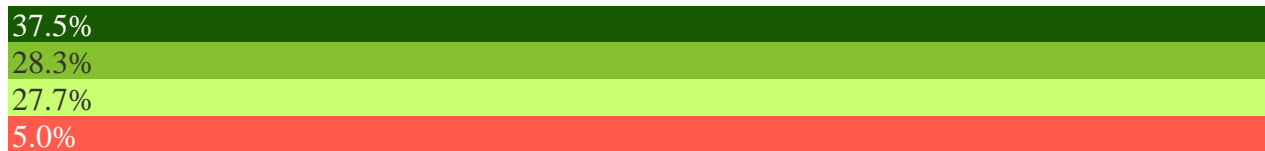
Thane



Chandrapur



Nashik



Aurangabad



Pune



Mumbai



Solapur



Tirupati



Bengaluru



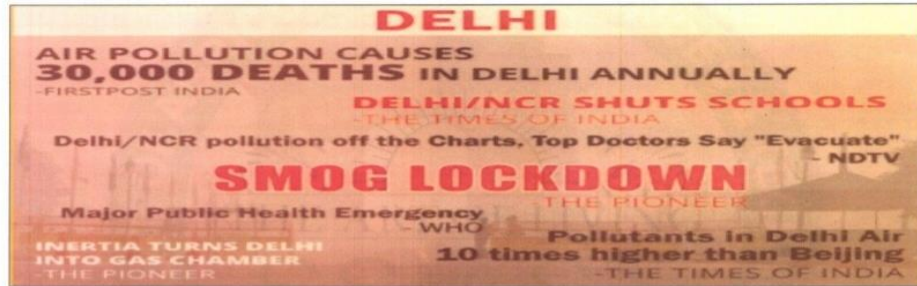
Source: CPCB; Hindustan Times Calculations Created with Data wrapper

North India is landlocked with still air and with very little chance of air circulation, except for the gusty / dusty strong wind blowing from the Rajasthan desert. Very hot blow of wind during the summer and very cold blow during the winter. This in contrast to South India, which is a peninsula, flanked by the Arabian Sea on the west, Bay of Bengal on the East and Indian ocean on the South. This is a very big advantage for the southern peninsula to get blown and rinsed by the winds and rain that normally occur very frequently.

As seen in the above chart how India breathes in the two halves. Of all the cities, Gurgaon in Delhi is the worst hit, Delhi is on a heap of garbage, the stubble burning by the farmers, the high pollution caused by the heavy vehicular traffic, the vast quantities of industrial and domestic emissions let of into the air chokes Delhi and other cities like Ahmedabad, Lucknow etc.

Delhi's peculiar problem: I was visiting Delhi on behalf of Art of Living along with our team to attend an organic fair in Delhi in November 2017.

Many participants from all over the country and other countries participated in the fair, the foreign participants were wearing mask then, which was very uncommon back in 2017. Come winter, Delhi not only shivers from severe cold but its citizens fall short of fresh and clean air.



SOLUTION for SMOG LOCKDOWN

for DELHI, NCR Region



To combat and keep a check on the issue the Delhi Government has taken the following measures as a part of the environmental policy to ensure clean air to the citizens.

1. It has banned the use of vehicles which are 15 years old and above
2. Brought in the ODD and EVEN rule i.e. vehicles with ODD Registration Numbers will ply on one day and the following day EVEN Registration numbers. This system seemed to work effectively.
3. The Yamuna Express Way with solar panels along the path for harnessing the renewable energy and vertical gardens to absorb the CO₂ emissions, was laid and opened for public very recently to ease traffic flow, reduce and absorb the pollution, conserve energy
4. A Swiss company has been employed to offer a sustainable solution to end this problem
5. Many companies continue to innovate to bring in air purifiers.
6. Blame game starts, farmers are blamed. Stricter measures to punish the preparators are discussed, legislation passed to curb this pollution but seldom these measures are practical to curb the pollution.

With the onset of spring and all this ordeal is forgotten as the reality is harsh and difficult to face and Delhi continues to bear the brunt again in winter.

Question: Is Delhi smog due to Stubble Burning? Vehicular pollution? Or Infrastructure development?

It is always cited that the stubble burning by the farmers of the state of Punjab and Haryana is the cause of the smog, pollution and the resulting poor air quality.

Globally, residue burning is significantly higher in Asia compared to other continents. The rice-wheat growing belt of South Asian countries is a global hotspot of stubble burning and the same is true for India. The north-western states, especially Punjab, Haryana and Uttar Pradesh witness the burning of paddy straw by farmers.

The farmer's issue is a very peculiar one and no amount of Government intervention is able to contain it. Due to the half-hearted approach by all the concerned stakeholders, the problem is at its peak during the intermittent period between Kharif and Rabi season, i.e. October. The problem continues as by that time a lot of smog is in the air, choking the citizens, causing very poor visibility leading to lot of accidents in Delhi and surrounding areas, causing a number of flight cancellations etc. not taking in to account a lot of breathing disorders, fatigue and breathlessness reported by the citizens of Delhi.

MAIN ISSUES

Depletion of ground water:

The level of groundwater utilization is relatively high in the river basins present in the North-Western region and parts of South India. The groundwater utilization is very high in the states of Punjab, Haryana, Rajasthan, and Tamil Nadu.

'Punjab' literally means five rivers. Due to the alluvial deposits, Punjab is one of the most fertile regions in India. Therefore, the land is highly suitable for agriculture with the presence of Sandy soil, Clay Soil, Peat Soil, Silt Soil and Loam soil. For the greater portion, Punjab is a massive, horizontal plateau of abundant alluvial soil originating among the main five rivers. Punjab is one of the prominent northern agrarian states of India. Its contribution to agriculture and Indian economy has been remarkable and it has made India self-reliant in food. Yet this riverine state, which is India's breadbasket, is quickly drying up.

Water level is going down by nearly one metre every year in Punjab and nearly 80% of the state's area is becoming a red zone because of the overuse of groundwater. Groundwater extraction in Punjab has already reached 150-200 metres in most places in central Punjab. If the present depletion continues, Punjab's groundwater is expected to drop below 300 metres by 2039, as per CGWB.

In most parts of the Punjab state, groundwater is being overexploited for irrigational purpose. Apart from this water scarcity or depletion problem, water quality is also being deteriorated and not suitable for drinking purpose.

The major cause of land degradation in Punjab is due to over-irrigation. Over-irrigation leads to waterlogging which in turn leads to an increase in alkalinity and salinity in the soil. Western Uttar Pradesh and Haryana also face land degradation due to over-irrigation.

Secondly, Punjab is mostly affected by floods compared to other hazards, such as earthquake, drought and tornados (PDMA, Punjab 2014; GOP, 2019), and its major population is directly or indirectly more susceptible to flash, urban and riverine flooding (PDMA, Punjab 2017).

TYPES OF HAZARDS THE DISTRICT IS PRONE TO:

TYPE OF HAZARDS	TIME OF OCCURRENCE	POTENTIAL IMPACT
Flood	June-September	Loss of life, livestock, crop and infrastructure
Drought	July-October	Damage to crops
Forest Fire	May-June and October-November	Environment Degradation
Stampede	During Festivals and melas	Loss to human life

Role of the Green Revolution

The green revolution led to high productivity of crops through adapted measures, such as

1. Increased area under farming
2. Double-cropping, which includes planting two crops rather than one each year
3. Adoption of High Yielding Variety of seeds
4. Highly increased use of inorganic fertilizers and pesticides
5. Improved irrigation facilities
6. Improved farm implements and crop protection measures ([Singh, 2000](#); [Brainerd and Menon, 2014](#)) and modifications in farm equipment.

There was a high investment in crop research, infrastructure, market development and appropriate policy support ([Pingali, 2012](#)). Efforts were made to improve the genetic component of traditional crops. This included selection for higher yield potential; wide adaptation to diverse environments; short growth duration; superior grain quality; resistance to biotic stress, insects, and pests; and resistance to abiotic stress, including drought and flooding ([Khush, 2001](#)). After the green revolution, the production of cereal crops tripled with only a 30% increase in the land area cultivated. Although the green revolution was beneficial for the shorter term, without the consideration of ecological principles, it has become detrimental and irreversible in the long run ([Clasen et al., 2019](#)). Efforts to recover from environmental damage would require extensive efforts, time and other resources as compared with the destruction of the environment. Green revolution's Impact on Agriculture and Environment, Pests and Pesticide, Water Consumption, Air Pollution, Impacts on Soil and Crop Production, Extinction of Indigenous Varieties of Crops, Food Consumption Pattern, Health-Related Impacts on the General Population, impacts on Farmers.

In conclusion, the effects of the green revolution are persisting. The green revolution, which was beneficial in ensuring food security, has unintended but harmful consequences on agriculture and human health. This requires new interventions to be tested and piloted before implementation, and continuous evaluation of the harms and benefits should guide the implementation. An already fragile food system is affected due to the aftermaths of the green revolution. The potential negative impacts are not part of the discourse as it can affect the narratives of development and prosperity. Developments introduced in the past, due to necessity, may not be sustainable in the future.

The ill effects have uniformly affected all regions in the world. Punjab is no exception.

1. Lack of proper planning of systematic groundwater extraction
2. Change in cropping pattern
3. Increase in number of tube wells
4. Decline in canal irrigated area in paddy-dominated Central Punjab
5. Decrease in average annual rainfall

Current cropping patterns in Punjab

82.2% of the total geographical area of Punjab is irrigated and the cropping intensity is 204%. The cropping pattern has shifted from cotton, maize, oilseeds and pulses to paddy. Paddy crop is considered being risk-free crop in terms of marketing, weather conditions and crop health. The irrigation requirement of paddy ranges from 150 – 200 cm, which is not fulfilled by rainfall. Hence the irrigation demand is fulfilled by tapping into groundwater.

Primary Crops grown now: Paddy and Wheat.

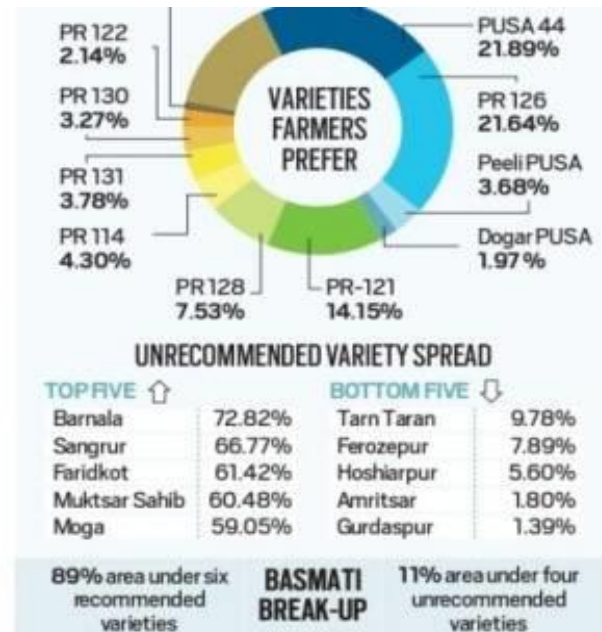
Increased Water Requirement

The biggest requirement is for the paddy crop which is grown in 22 districts of the state. Studies done by the Ludhiana-based Punjab Agriculture University (PAU) show that every kilogram of paddy requires roughly 5,000 litres of water. PAU's studies also highlight the fact that Punjab consumes fertilisers at 190.1 kg per hectare, much higher than the national average of 88.2 kg per hectare. Along with paddy, wheat (rabi crop) also requires heavy doses of fertilisers. Due to excess usage of chemical groundwater is severely damaged.

Farmers Love for Long duration crops



Farmers in Punjab had sown paddy, excluding Basmati, in 64 lakh acres this year. Out of this, around 24.40 lakh acres or 38 per cent was under the longer duration or non-recommended varieties. According to Punjab Agriculture University (PAU), 64 paddy varieties are sown in state, including 46 unrecommended which are mostly of long duration. PUSA 44, the most popular long duration variety was sown in 21.89 per cent area, which is marginally more than 21.64 per cent of PR 126, the most popular short duration paddy.



Indian express dated 20th Nov 2022 Jalandhar edition

Nearly 28 per cent of the sown area came under three highly unrecommended varieties, including PUSA 44 (21.89 per cent), Peeli PUSA (3.68 per cent) and Dogar PUSA (1.97 per cent). The other unrecommended varieties were sown in 10 per cent area including CR 112 (3.45 per cent) and Super 110 (1.13 per cent).

According to the data from Punjab Pollution Control Board (PPCB), Barnala had highest 72.82 per cent area under unrecommended long varieties, including 71.89 per cent under PUSA varieties. Sangrur was at second position with 66.77 per cent of the total 2.12 lakh hectares under long duration varieties such as PUSA 44 and Peeli PUSA.

Other districts where huge area was under long duration varieties included Faridkot, Muhtsar Sahib, Moga, Ludhiana, Mansa, Bathinda, Patiala and Fazilka where 61.42 per cent, 60.48 per cent, 59.05 per cent, 53.35 per cent, 51.65 per cent, 47.89 per cent, 42.28, and 41.14 per cent paddy area was under long duration crops, respectively.

Besides PR 126, the other popular recommended short varieties are PR-121 (14.15 per cent), PR 128 (7.53 per cent), PR 114 (4.30 per cent), PR 131 (3.78 per cent), PR 130 (3.27 per cent), PR 122 (2.14 per cent), PR 118 (1.08 per cent). The short duration paddy takes between 93 to 111 days to mature, while the longer duration ones take 130 days or more. The duration excludes the 25-30 day nursery period. The short duration varieties, on the other hand, yield about 30-31 quintals per acre experts at PAU, however, differ. They claim that different studies conducted by them has found that the average yield of long duration varieties is 32.6 quintals per acre against 30 to 31 quintals of short varieties.

But the farmers prefer longer duration (unrecommended) varieties give them more yield than the short duration varieties approved by the PAU. They claim that they get an yield ranging from 34 to 37 quintals per acre from long duration varieties.

Farmers ignorance

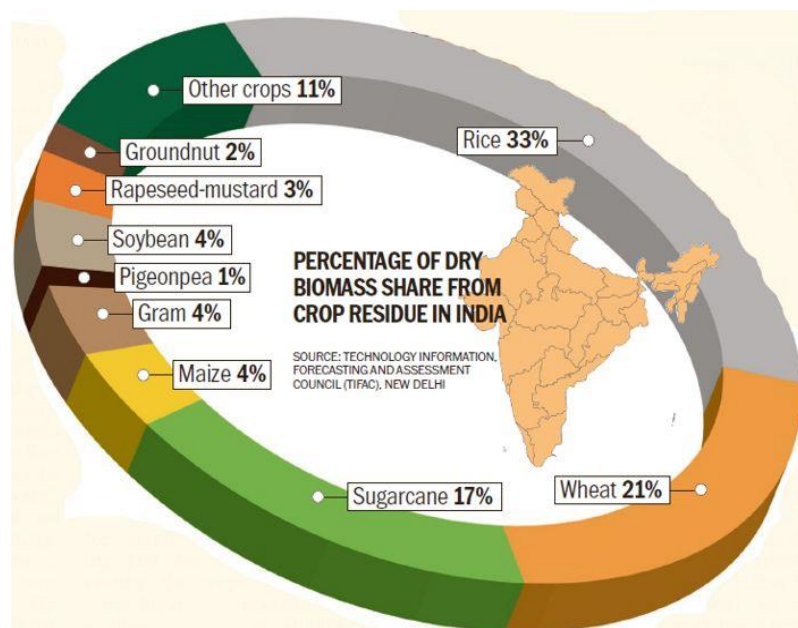
Farmers are ignoring the input cost of the long duration varieties. After calculating the entire input cost and yield, farmers end up making less from long duration paddy. Dr AS Dhatt, Director of Research, PAU, words in the Interview to I.E. Paddy crop needs flood irrigation once or twice a week depending upon the moisture content in the fields. An extra month in the field, means extra irrigation cost.

Also, the PUSA varieties are on an average around a foot longer than the shorter duration varieties and generate nearly 2 per cent more stubble in the same area. To discourage Punjab farmers from growing the long-duration paddy variety that has led to a rise in stubble burning incidents causing air pollution, IARI had discontinued breeder seed production of PUSA-44 three years back.

The Ground Reality

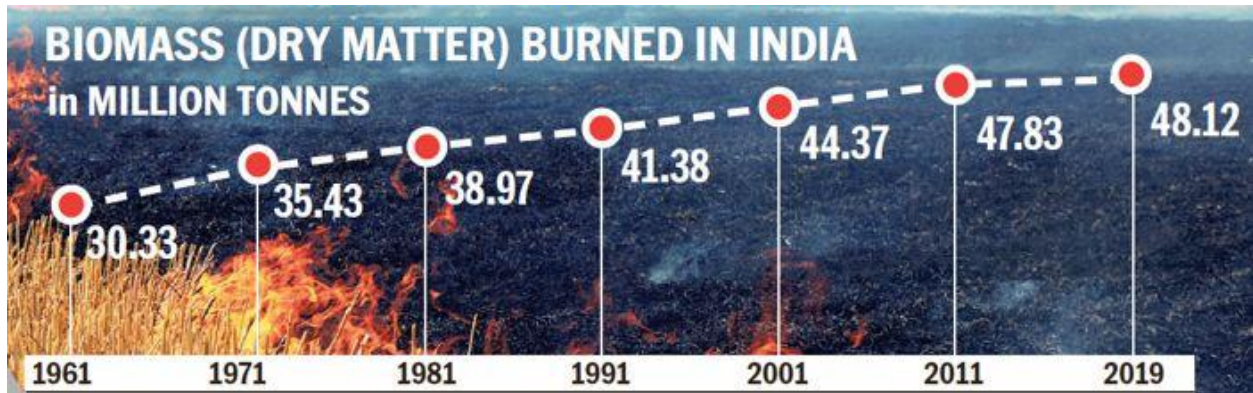
Lack of Crop Diversification

Punjab missed its crop diversification target in Kharif 2021, leading to enormous paddy residue generation. Estimates show that burning 1 tonne of paddy straw can result in the loss of around 5.5 kg Nitrogen, 2.3 kg Phosphorus, 25 kg Potassium and 1.2 kg Sulphur (other than organic carbon) content from the soil, apart from the loss of beneficial micro-organisms that are essential to maintain soil fertility.



As per studies, over 500 million tonnes (MT) of crop residue is generated annually in India. The generation of crop residue is highest in Uttar Pradesh (60 MT), followed by Punjab (51 MT). Among various crops, cereals generate maximum residue (352 MT), followed by fibres (66 MT), oilseeds (29 MT), pulses (13 MT) and sugarcane (12 MT). Among cereals, rice alone contributes 33% to the crop residue.

Most of the farmers in the rice-wheat growing region of the country use combine harvesters for planting and harvesting the crops. These harvesters generate a huge amount of stubble (around 9 tonnes per hectare) consisting of tall stalks, up to 30 cm high, which are difficult to incorporate into the soil.



Ref: tribune 30th December 2022.

Government Policies

The stringent Preservation of Subsoil Water Act, enacted in 2009, prevents the farmers in Punjab and Haryana from planting pre-monsoon paddy crop during April-June and they can only grow paddy around mid-June. Consequently, while they were able to harvest paddy by early October before the Act came into force, they are now only able to do it between late October and mid-November. This leaves them a shorter time window to harvest as well as prepare the field for the rabi crop (wheat), which is why they burn stubble instead of choosing eco-friendly options.

Further, paddy straw is not a preferred livestock feed in north-western India due to its high silica content. The bulky and fluffy nature of rice residue also makes it very difficult for storage. Earlier, brick kilns were one of the largest consumer of rice straw but, since 2019, due to implementation of the law regarding the utilisation of fly-ash for the manufacturing of bricks by the Ministry of Environment, Forest and Climate Change, the consumption of straw has been reduced drastically.

The government's response to stubble burning has ranged from a blanket ban with steep fines to subsidies on alternative technology for in-situ management of crop residue. Ever since the Central Sector Scheme on promoting in-situ management of crop residue was launched in 2018, the Union Ministry of Agriculture has spent around Rs 3 billion for distributing over two lakh subsidised machines to farmers in Punjab, Haryana, Uttar Pradesh and Delhi at a subsidised cost (offering a 50% discount to individual farmers and 80% discount to self-help groups). However, the majority of the farmers in the region, mostly small and marginal, continue to resist the use of in-situ machines for a number of reasons — mostly expenses and efficiency-related.

The approach of seeing stubble burning only through the prism of the agri sector, even though it touches upon other sectors such as environment, health and energy, would not help much, as exhibited by the slow progress of govt interventions. There is a need to promote integration that goes beyond disciplinary boundaries. Awareness campaigns should run parallel to the

implementation of a practical solution that empowers farmers not only technically, but also economically.

Causes of Failures :

1. Area under paddy continues to dominate the Kharif crop mix, leading to enormous paddy residue generation
2. Teething problems with in-situ crop residue management remain Ex-situ utilisation capacity has stalled in the state. Until a comprehensive ex-situ policy covering capacity addition and supply chain development is implemented, the ex-situ options would remain inadequately addressed.
3. The PUSA decomposer could become a game changer, but it has a long way to go
4. While the PUSA decomposer might be economically viable and eco-friendly, its potential needs to be demonstrated at a large scale for improving farmers' awareness and acceptance.
5. No change in Punjab's Kharif crop mix. Punjab missed its crop diversification target in Kharif 2021, leading to enormous paddy residue generation
6. PUSA 44, with a longer gestation period, remains a dominant variety in high-burn districts in Punjab
7. Sangrur district has the maximum number of Happy and Super Seeders, followed by Muktsar, Bathinda, and Mansa. Existing stocks of CRM machines are highly underutilised
8. Penetration of Happy Seeders and Super Seeders in a few high-burn districts such as Amritsar, Patiala and Ludhiana is far from the ideal requirement
9. Around 37% of the existing stock of Happy and Super Seeders in Punjab are privately owned. Only two of the 13 CHC operators said they were aware of the FARMS app. Happy Seeder is losing its popularity among farmers in Punjab.
10. Penetration of Happy Seeders and Super Seeders in a few high-burn districts such as Amritsar, Patiala and Ludhiana is far from the ideal requirement.
11. The CHC (rental) model has not caught the farmers' attention yet
12. On average, the fuel cost accounts for 25% of the cost associated with the operation of the Happy Seeder and Super Seeder. Increasing fuel prices can prove to be a significant barrier to crop residue management.

Ref: L. S. Kurinji and Srish Prakash - Why Paddy Stubble Continues to be Burnt in Punjab? Meeting Challenges with Solutions

Recommendations of FAO - Climate and Clean Air Coalition

Since 2019, the Food and Agriculture Organizations of the United Nations (FAO) has carried out a Climate and Clean Air Coalition project in Punjab to identify how crop residue can be used on farms and in other ways that are environmentally sustainable and economically viable for farmers and entrepreneurs. Project activities include:

- Identification and spatial definition of the amount of crop residues burnt in fields by district, including specific crop residue locations

- Identifying requirements for developing a crop residue supply chain and associated components to spur their further use
- Identifying feasible bioenergy technologies and the potential renewable energy that can be generated from crop residue

Other recommendations of FAO are as follows:

Educating and empowering the farming stakeholders are crucially important steps to make a significant impact. Farmers need continuous handholding by trained personnel at the village level for effective implementation and success of any interventions for curbing the menace of stubble burning. The mindset of the farmers needs to be changed by educating them about the cost-benefit aspects of utilising crop residue on agricultural land. Therefore, awareness campaigns should always run parallel to the implementation of a practical solution that empowers them not only technically, but also economically.

Assist small farmers: The focus should be on individual small-scale farmers who do not have the capacity to implement a long-lasting solution. Crop diversification in states such as Punjab and Haryana are a pressing requirement to move farmers away from unsustainable on-farm practices like stubble burning. Crops such as maize and pulses are not just water-efficient and well suited for the region, they would also support livestock by ensuring a regular supply of fodder. Strengthening the market infrastructure and information system and initiating better procurement policies for maize and pulses should be policy focus areas. Agriculture Initiative supports the development of integrated strategies for crop residue management that is grounded in robust evidence. This project's activities will provide essential groundwork to develop an effective value chain for crop residue

The project is also supporting efforts to estimate which bioenergy technologies are economically and environmentally feasible to produce renewable energy from available crop residue. The burning of crop residue wastes what could be a useful resource and potential source of income for farmers. Crop residue has many practical uses, including for the production of green energy, which would contribute significantly to India meeting its Nationally Determined Contribution (NDC) targets and combatting climate change. Other uses for crop residue include feed for livestock, electricity production, cooking fuel and the production of organic soil fertilizer. Due to the large annual volume, many different uses are needed to absorb the crop residue supply.

Initiative by IIT Roopar

Punjab to research on clean air, water, soil & waste management (join hands with IIT Roopar)
IIT- Roopar is setting up Sectoral Application Hub to bring solutions for stubble management, water quality improvement, mapping of hazardous substances in water/soil and their treatment, deployment of IoT based Cyber-Physical System (CPS) technologies in farming fields.
A Bathymetry facility has been set up at IIT-Ropar which comprises a remotely operated boat with ecosounder. This facility permits field measurement of sedimentation in reservoirs created upstream of dams. IIT Roopar has been looking at the regional groundwater contamination issues

viz. Uranium contamination of groundwater in Malwa region. IIT Roopar has also developed a technology to convert the paddy straw into acoustic boards.

Recommendations/Strategies of AOL

Art of Living has been working since 2017 on this issue by escalating it to the appropriate authorities from time to time and also engaging itself with farmer groups with workable solutions. I am directly involved in all these activities, hence this paper – accounting for my personal involvement and experiences as Director Projects of Sri sri Institute of Agriculture sciences and Technology Trust (SSIAST Trust) of AOL then and Director of the Agriculture vertical of social projects now.

Letter by Chairman SSIAST to the then Joint Secretary INM, New Delhi.



This followed by my meeting with Shri M.P Singh the then Joint Secretary, visit to Punjab – Chandigarh on 17-09-2017.



25th September, 2017

To,

Sri M.P. Singh,
Additional Secretary cum Financial commissioner,
Government of Punjab.

Subject: Rice Paddy Residue Burning in Punjab – Regd.

Dear Sir,

This is in response to your communication dated 15.09.2017 and also to meet with you in your office of our Smt Umamaheshwari from Sri Sri Institute Agricultural Sciences and Technology (SSIAST) trust of Bangalore.

In order to disintegrate post harvested paddy straw in the fields, we have three different types of very effective bio-processes.

In fact we have been vociferously training poor farmers in Natural farming methodology not to burn the agri - farm waste in the fields as this gives the farmer a golden opportunity to increase the organic carbon content in the fields, which is an essential ingredients in the soil for higher productivity and yields.

This procedure of agri farm waste in the fields is practically being adopted by all our farmers both to manage their Agri farm waste, for the robust growth of the crops and for higher yields.

The solution for the post-harvest paddy straw residue in the fields can be dealt with inoculums based decomposer in about 20 days of time.

The microbial consortia present in the Bio - Decomposer is rich consortia of native soil microorganism decomposes the paddy straw residue in just 20 days time.

The microbial consortia has bacteria, fungi, actinomycetes, Bacillus, pseudomonas and a high number of beneficial microorganism etc.

Strategies advocated and Recommended by the Art of Living give farmers a bouquet of choices along with suitable orientation and trainings. The Government of Punjab must seriously put effort to increase the ground water – which is the root cause of the issue of stubble burning.

Rain water and Storm water harvesting

Instead of imposing fines for stubble burning, water conservation techniques must be encouraged and made compulsory and such initiatives must be incentivised as this will tackle the root cause of the problem. No amount of other initiatives will work if the root cause of the problem is not addressed. Farmers need to be sensitized about the land, water and clean air management and educated especially on the various options available to them to manage the stubble.

Government of Punjab should rope in change agents to bring about the attitudinal changes in farmers.

Farmers must be incentivized for following the prescribed norms to dispose of the stubble

Early sowing in a different way: To check the fall in the water table, Punjab, in 2009, had become the first state to enact a law banning the sowing of rice before a stipulated date. The Punjab Preservation of Subsoil Water Act stipulates that ‘no farmer shall sow nursery of paddy before 10th day of May of the agricultural year or such other date as may be notified by the state government. Farmers in Punjab have been demanding to be allowed to go for early sowing.

We recommend Farmers to raise Nurseries with the pre monsoon showers with their choicest varieties and transplant after 30 to 40 days, this way time can be saved and the narrow window between harvesting paddy and sowing wheat can be extended thus enabling the farmers to manage the stubble in eco-friendly way.

What is Premonsoon showers: It is a mixture of dry and moist winds, whose intensity

gives rise to local storms, such as the occurrence of violent winds and heavy rain hailstorms. The pre-monsoon rain is also known as April rain or summer rain and it is formed due to the storm over the Bay of Bengal.



Ref: Farmers plant saplings in a paddy field.(Representative image, REUTERS/Amit Dave TPX IMAGES OF THE DAY

Pre-monsoon Sowing of Kharif Crops Begins, Paddy Acreage Up 27 Percent.

The sowing area has been reported mainly from West Bengal (11.25 lakh hectare), Telangana (7.45 lakh hectare), Odisha (3.13 lakh hectare), Assam (2.73 lakh hectare), Karnataka (1.64 lakh hectare) and Chhattisgarh (1.50 lakh hectare).

Paddy Farmers trained by Art of Living have switched over to setting up nurseries with the pre-monsoon showers in Kurnool, Nandyal districts of A.P.

Direct Sowing : Wet and drain the farm, maintain one inch water in the nursery or seed bed, as in the case of farmers of Kumbakonam. The famous Allangudi Perumal method which most of the farmers of that region follow. This not only reduces the consumption of large quantities of water but also the methodology of 50*50 method which is an improvised version over SRI method needs very less seeds . The seed cost is also drastically reduced. Conventionally 25 kgs of seed is required for an acre of land vs SRI method 2.5 kgs of seed is required Vs 50*50 method only 250 grams of seeds is sufficient for an acre of land. The farmers have witnessed good yield which has prompted farmers from other districts to adopt this method.

These farmers are associated with, felicitated and promoted by Art of Living



Seeds Sowing

- ¼ kg of fine variety or ½ kg bold variety seed for 1 Acre
- Treat the seed with Panchagavya or Beejamirthan
- Broadcast in 3 cent of nursery / seed bed




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Nursery /Seed bed Maintenance

- Wet and drain water for 5 days
- Maintain 1~2 inch Water in Nursery / Seed bed




Allangudi perumal, Ashokan, Nel Jayaraman – famous seed keeper and other are seen in the photo.

Ref: Photos shared by the farmer group leader Sri Ram on his visit to AOL ashram, Bangalore.

Empower farmers to be allowed to adopt eco-friendly ways :

Mulching:

ART OF LIVING IN PUNJAB AND OTHER PLACES

A. Mulching : Straw Mulching an effective tool to increase organic carbon, increase production.



B. Composting the stubble with the help of composting machines – AOL has raised donations for such machines.

C. SSIAST Trust also encourages farmers to compost the stubble using the bio enzyme and Jeevamruth - cost effective methods of composting.

Composting : AOL has successfully demonstrated the composting Jeevamruth and Garbage enzyme

1. Testimonials:

<https://www.facebook.com/100000643507972/videos/1569629416713595/?t=7>
<https://mail.google.com/mail/u/0?ui=2&ik=d4b7de4b2a&attid=0.1&permmsgid=msg-a:r-3680552197831254300&th=18099c038aad8eb&view=att&disp=safe&realattid=18099c0020cb73e65b31>

The above links are initiatives of AOL in Punjab to stop the farmers from burning stubble

References:

- A. Testimonials of farmers trained by Art of Living (AOL)farmers.
- B. Letter written to the then Joint Secretary INM by AOL.
- C. Photos shared by the farmer groups.
- D. Times of India Aug 24th 2017
- E. India education diary 22nd Aug 2017
- F. Ref: Farmers plant saplings in a paddy field.(Representative image, REUTERS/Amit Dave TPX IMAGES OF THE DAY
- G. Ref: tribune 30th December 2022
- H. Indian express dated 20th Nov 2022 Jalandhar edition
- I. Ref: L. S. Kurinji and Srish Prakash - Why Paddy Stubble Continues to be Burnt in Punjab? Meeting Challenges with Solutions
- J. Source: CPCB; Hindustan Times Calculations Created with Data wrapper
- K. [Pingali, 2012](#)
- L. [Khush, 2001](#)
- M. [Clasen et al., 2019](#)
- N. [Singh, 2000](#); [Brainerd and Menon, 2014](#)
- O. AOL letter to the then Join Secretary Agriculture, Punjab Shri. M.P. Singh