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PSYCHOLOGICAL DETERMINANTS INFLUENCING CROP RESIDUE BURNING BEHAVIOUR AMONG FARMERS IN TELANGANA INDIA

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ABSTRACT

The present study quantitatively examined the psychological determinants influencing crop residue burning behaviour among farmers in paddy and cotton production systems. A total sample of 240 respondents was analyzed using descriptive statistics and correlation analysis to understand the role of key psychological constructs. The findings revealed that a majority of respondents exhibited high levels of perceived benefits (64.17%) and perceived emotions (72.92%), along with a very high level of perceived time pressure (77.92%), indicating strong reinforcement of burning behaviour due to convenience and urgency. In contrast, perceived value of burning was low among 78.33 percent of respondents, suggesting a declining long-term justification for the practice. Most determinants such as perceived barriers (90.42%), control (69.58%), norms (76.25%), beliefs (66.67%), and trust in extension services (50.00%) were concentrated in the medium category, reflecting a transitional stage in farmers' perception and decision-making. Environmental risk perception was relatively high (50.00%), yet it did not significantly deter the behaviour.

Correlation analysis indicated that Crop Residue Management Behaviour (CRMB) had weak direct associations with most psychological determinants, but strong interrelationships were observed among barriers, control, norms, beliefs, and time pressure (r ranging from 0.525 to 0.919), highlighting their collective influence. Negative associations of CRMB with value (r = -0.267), trust (r = -0.186), and environmental risk (r = -0.101) suggest that increasing awareness and perceived disadvantages may help reduce burning practices. The study concludes that residue burning is driven by a combination of psychological, social, and situational factors, requiring integrated interventions focusing on behavioural change, technological support, and institutional strengthening to promote sustainable residue management.

Keywords **:** Crop Residue Management Behaviour (CRMB), Psychological determinants, Perceived benefits, Time pressure, Environmental risk, Farmer behaviour, Correlation analysis.

Introduction

Crop residue burning (CRB) has emerged as a major environmental and agricultural concern across many developing countries, particularly in South Asia where intensive cereal-based cropping systems generate enormous quantities of crop residues every year. Crop residues refer to the plant materials such as straw, stalks, stubble and leaves that remain in agricultural fields after the harvest of economic produce. In cropping systems dominated by rice and wheat, farmers often resort to burning these residues

directly in the field to quickly clear the land for the next cropping season (Gupta, Sahai, Singh, Dixit, & Singh, 2004; Gadde, Bonnet, Menke, & Garivait, 2009). Although residue burning offers short-term benefits such as rapid field preparation and reduced labour requirements, it causes significant environmental degradation and contributes to severe air pollution (Lal, 2005; Pathak, Bhatia, & Jain, 2010).

In India, crop residue burning has become particularly prominent in intensively cultivated regions such as the Indo-Gangetic Plains, where mechanized harvesting and the rice–wheat cropping system produce large quantities of straw residues (Sidhu, Singh, Humphreys, & Jat, 2007; Jat, Singh, Gerard, & Bijarniya, 2014). The use of combine harvesters leaves a substantial portion of stubble and loose straw in the fields, which becomes difficult to manage manually or mechanically within the short time interval between harvesting and sowing the subsequent crop. As a result, many farmers prefer to burn the residues in situ because it is perceived as the quickest and least expensive method of clearing fields (Shyamsundar *et al*., 2019; Singh, Sidhu, & Singh, 2015). This practice is widely reported in rice-growing states and increasingly observed in other agricultural regions where crop intensification and mechanization are prevalent.

The environmental consequences of crop residue burning are severe and multifaceted. Burning agricultural residues releases large amounts of greenhouse gases such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which contribute to global climate change (Pathak *et al*., 2010; Jain, Bhatia, & Pathak, 2014). In addition, the combustion process emits harmful pollutants including particulate matter ($PM_{2.5}$ and PM_{10}), carbon monoxide, nitrogen oxides, and volatile organic compounds that significantly degrade air quality and pose serious health risks (Cusworth *et al*., 2023; Awasthi, Singh, Gargava, & Prasad, 2011).Intense air pollution during post-harvest seasons in northern India have been partly attributed to agricultural residue burning, which contributes to respiratory illnesses, reduced visibility and increased atmospheric pollution levels (Venkataraman *et al*., 2006; Sarkar, Singh, Chauhan, & Behera, 2018).

Apart from atmospheric pollution, crop residue burning adversely affects soil health and agricultural sustainability. Residue burning leads to the loss of valuable nutrients such as nitrogen, phosphorus, potassium and sulfur that are otherwise recycled into the soil when residues are incorporated (Lal, 2005; Singh *et al*., 2010). Burning also destroys beneficial soil microorganisms and reduces soil organic carbon, thereby weakening soil structure, decreasing moisture retention capacity and negatively affecting long-term soil fertility (Brady & Weil, 2008; Meena, Yadav, & Kumar, 2019). Consequently, the continued practice of crop residue burning undermines the sustainability of agricultural production systems and threatens ecological stability.

Despite the growing awareness of these environmental and agronomic impacts, crop residue burning continues to be widely practiced by farmers. The persistence of this practice cannot be explained solely by technological or economic constraints; rather, it reflects a complex interaction of psychological factors influencing farmers' decision-making processes (Shyamsundar *et al*., 2019; Singh *et al*., 2023). Farmers often perceive burning as an efficient and convenient method of residue disposal, particularly when alternative residue management technologies are costly or inaccessible (Jat *et al*., 2014; Keil, D'souza, & McDonald, 2019). In addition, labour shortages, rising production costs and limited time between cropping seasons further reinforce farmers' dependence on burning as a residue management strategy (Sidhu *et al*., 2007).

In recent years, researchers have increasingly emphasized the importance of psychological determinants in shaping farmers' environmental behaviors. Agricultural decision-making is not only influenced by external constraints but also by farmers' internal cognitive processes such as attitudes, perceptions, beliefs, motivations and values (Bandura, 1986; Rogers, 2003). These psychological factors influence how farmers interpret information, evaluate alternatives and ultimately decide whether to adopt or reject environmentally sustainable practices. Understanding these behavioral aspects is therefore crucial for designing effective interventions to reduce crop residue burning.

Behavioral science theories provide useful frameworks for examining the psychological drivers of farmers' actions. One widely applied model is the Theory of Planned Behavior, which proposes that human behavior is primarily determined by behavioral intentions shaped by attitudes, subjective norms and perceived behavioral control (Ajzen, 1991). Crop residue burning, farmers' attitudes toward burning, their perception of social pressure from peers or neighbors and their perceived ability to adopt alternative practices strongly influence their behavioral intentions (Sarkar *et al*., 2018). Farmers who believe that burning is socially acceptable and economically

advantageous may continue the practice despite environmental concerns.

Another theoretical perspective relevant to environmental behavior is the Value-Belief-Norm Theory, which highlights the role of personal values, ecological beliefs and moral norms in motivating pro-environmental actions (Stern, 2000). According to this theory, individuals who are aware of environmental consequences and feel a personal responsibility to protect the environment are more likely to engage in sustainable behaviors. In agricultural contexts, farmers' awareness of environmental degradation and climate change can influence their willingness to adopt sustainable residue management practices (Khatri-Chhetri, Aryal, Sapkota, & Khurana, 2017).

Similarly, the Health Belief Model explains how individuals' perceptions of health risks and benefits influence their behavioral choices (Rosenstock, 1974). When applied to crop residue burning, farmers' perceptions of the health impacts of smoke pollution, both on themselves and their communities, may influence their willingness to change their practices. However, if farmers perceive these risks as distant or insignificant, behavioral change may not occur even in the presence of awareness campaigns.

Social and cultural influences also play a significant role in shaping farmers' residue management practices. Farming communities often exhibit strong social networks where farmers observe and imitate the practices of their neighbors and peers. When residue burning becomes a common practice within a community, individual farmers may adopt it due to social conformity and peer influence (Rogers, 2003; Bandura, 1986). Such herd behavior reinforces the continuation of burning even among farmers who are aware of its negative consequences.

Furthermore, farmers' perceptions of risk and uncertainty strongly influence their adoption decisions. Many farmers hesitate to adopt alternative residue management practices because they perceive them as costly, risky or labour-intensive (Keil *et al*., 2019). Concerns regarding potential yield losses, machinery availability and operational challenges often discourage farmers from experimenting with new technologies. Therefore, understanding farmers' perceptions, motivations and psychological barriers is essential for designing policies that effectively encourage behavioral change.

Government and institutional interventions aimed at reducing crop residue burning have included regulatory bans, subsidies for residue management machinery and awareness campaigns promoting sustainable practices. Technologies such as the Happy Seeder, Super Straw Management System (SMS) and mulching techniques have been promoted to enable in-situ residue management (Sidhu *et al*., 2007; Jat *et al*., 2014). However, the adoption of these technologies remains uneven across regions and farming communities, suggesting that technological solutions alone are insufficient to address the problem.

In this context, integrating behavioral insights into agricultural policy and extension strategies becomes essential. Extension programs that address farmers' attitudes, beliefs and perceptions can play a vital role in promoting sustainable residue management. Participatory approaches, community-based awareness campaigns and behavioral interventions such as digital nudging may encourage farmers to reconsider residue burning practices and adopt environmentally responsible alternatives.

Therefore, understanding the psychological determinants influencing crop residue burning behavior among farmers is critical for designing effective strategies to reduce this environmentally harmful practice. By examining factors such as farmers' attitudes, environmental awareness, risk perceptions, social norms and behavioral intentions, researchers and policymakers can develop targeted interventions that address the underlying behavioral drivers of residue burning. Such an approach can contribute to sustainable agricultural development while mitigating environmental pollution and protecting public health.

Material and Methods

The present study adopts a systematic and theory-driven methodology to assess the psychological determinants influencing farmers' behaviour toward crop residue management practices. The methodology is grounded in established behavioural frameworks such as the Health Belief Model, Theory of Planned Behavior, Protection Motivation Theory and Value-Belief-Norm Theory, which provide a comprehensive basis for understanding individual perceptions, motivations, and decision-making processes. Based on these theoretical foundations, key psychological constructs such as perceived threats, benefits, barriers, control, norms, beliefs, emotions, environmental risk, trust, time pressure and value were identified and operationalized. A structured and validated measurement approach was followed, involving item generation, scaling, reliability testing, and statistical analysis to ensure accuracy and consistency of the findings. This methodological framework enables a holistic examination of the cognitive, emotional, and social factors shaping farmers' behaviour, thereby

providing robust insights for designing effective interventions and promoting sustainable crop residue management practices.

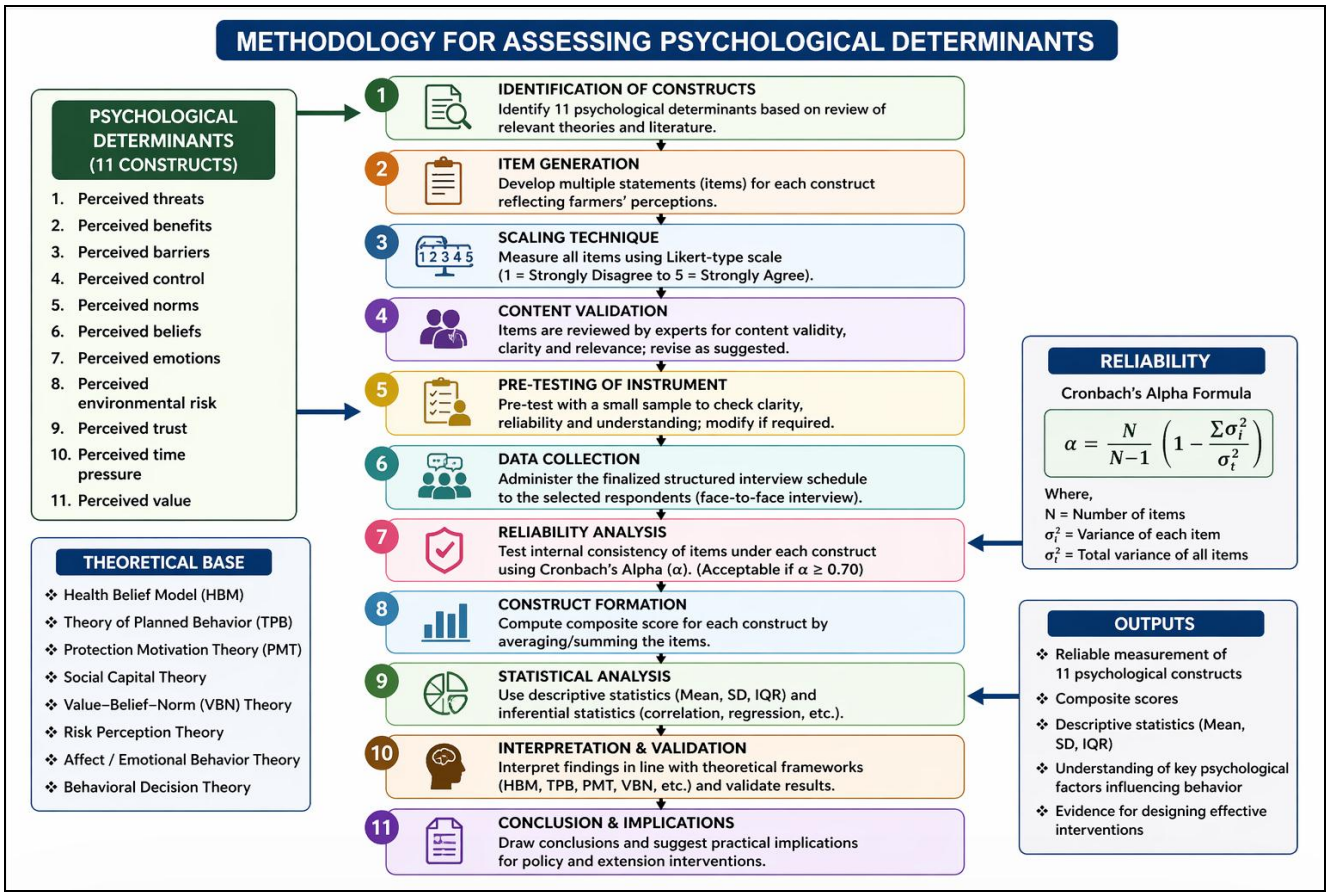

Fig. 1 : Conceptual model for psychological determinants for crop residue burning

Results and Discussion

Perceived threats

The table.1 on perceived threats reveals a high concentration of respondents in the medium category. Out of the total sample (N = 240), a substantial majority of respondents (74.17%) fall under the medium perceived threat category. In contrast, only few respondents (7.08%) are categorized under low perceived threats, while less than half of respondents (18.75%) fall into the high perceived threat category.

This indicates the dominance of the medium category suggests a clustering of responses around the central tendency, indicating low variability in perceived threat levels. The pattern may arise due to similar socio-economic conditions, shared environmental exposure or common information sources among respondents. It also implies that interventions or policies related to the issue may find relatively uniform receptiveness, though tailored strategies may still be required for the high-perception group.

Table 1 : Categorisation of respondents based on their perceived threats on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	13-17	17	7.08
2	Medium	18-21	178	74.17
3	High	22-25	45	18.75
Total			**240**	**100**

Perceived benefits

The distribution of respondents across categories of psychological determinants related to perceived benefits of burning shows a clear concentration in the higher range. A majority of respondents (64.17%) fall under the high category, followed by 28.75 percent in the medium category, while only a small proportion (7.08%) are in the low category. This indicates that most individuals strongly perceive burning as beneficial, suggesting a dominant positive psychological inclination toward the practice. The relatively small percentage in the low category reflects limited skepticism or resistance regarding the perceived advantages of burning.

The pattern highlights that the belief in the benefits of burning such as quick field clearance, pest control, and cost-effectiveness remains deeply embedded among respondents. Such strong psychological reinforcement can act as a major barrier to the adoption of sustainable alternatives, as individuals are more likely to continue practices, they perceive as advantageous. Therefore, interventions need to focus on reshaping these perceptions by emphasizing the long-term environmental and economic disadvantages of burning, while promoting viable and accessible alternatives. Behavioral change strategies, awareness campaigns, and demonstration of sustainable residue management practices will be crucial to gradually shift these entrenched beliefs.

Table 2 : Categorisation of respondents based on their perceived benefits on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	10-15	17	7.08
2	Medium	16-20	69	28.75
3	High	21-25	154	64.17
Total			**240**	**100**

Perceived Barriers

The distribution of respondents with respect to psychological determinants of perceived barriers to burning reveals a strong concentration in the medium category. A vast majority of respondents (90.42%) fall within the medium range, while only 5.00 percent and 4.58 percent are in the high and low categories, respectively. This indicates that most respondents perceive a moderate level of barriers associated with burning, suggesting neither a strong recognition of constraints nor a complete absence of perceived difficulties. The very small proportions in the high and low categories further reinforce the clustering of responses around the mid-level perception.

This pattern implies that although respondents are somewhat aware of the barriers to burning such as environmental concerns, regulatory restrictions, or health impacts these are not perceived as strong enough to discourage the practice entirely. The dominance of the medium category suggests a state of ambivalence, where barriers exist but are not compelling enough to override the perceived benefits. This highlights a critical gap for intervention, as strengthening awareness about the seriousness of these barriers and enforcing stricter regulations could shift perceptions toward the high category. Enhancing access to alternatives and increasing the perceived severity of consequences associated with burning may play a key role in discouraging the practice and promoting sustainable residue management.

Table 3 : Categorisation of respondents based on their perceived barriers on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	15-18	11	4.58
2	Medium	19-21	217	90.42
3	High	22-25	12	5.00
Total			**240**	**100**

Perceived control

The distribution of respondents based on psychological determinants of perceived control over burning indicates that a majority (69.58%) fall under the medium category, followed by 16.67 percent in the high category and 13.75 percent in the low category. This pattern suggests that most respondents perceive a moderate level of control over the practice of burning, implying that they feel somewhat control but not fully empowered to regulate or avoid it. The relatively balanced proportions in the low and high categories indicate variability in individuals' confidence and ability to manage or shift away from burning practices.

The dominance of the medium category highlights that respondents are in a transitional state regarding perceived control. While they may have some awareness of alternatives or regulatory frameworks, constraints such as limited access to machinery, labor shortages, time pressure, and financial limitations may restrict their ability to exercise full control. The presence of a notable proportion in the high category suggests that a segment of respondents feels capable of managing or avoiding burning, possibly due to better resource availability or awareness. Therefore, strengthening institutional support, improving access to residue management technologies, and enhancing capacity-building initiatives can help shift more respondents toward higher perceived control, ultimately reducing reliance on burning practices.

Table 4 : Categorisation of respondents based on their perceived control on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	16-18	33	13.75
2	Medium	19-21	167	69.58
3	High	22-25	40	16.67
Total			**240**	**100**

Perceived norms

The distribution of respondents with respect to psychological determinants of perceived norms on burning shows that a substantial majority (76.25%) fall

under the medium category, followed by 12.50 percent in the high category and 11.25 percent in the low category. This indicates that most respondents experience a moderate level of social influence regarding burning practices, suggesting that prevailing norms neither strongly enforce nor strongly discourage the behavior. The relatively smaller proportions in the high and low categories reflect that only a limited section of respondents perceives strong social pressure either in favor of or against burning.

The pattern implies that social norms surrounding burning are present but not deeply internalized or compelling enough to drive decisive behavioral change. Farmers may observe that burning is a common practice within their community, yet the absence of strong positive or negative reinforcement keeps their perception at a moderate level. The dominance of the medium category highlights an opportunity for intervention through community-based approaches, where strengthening collective awareness, peer influence, and social disapproval of burning can shift norms toward discouraging the practice. Encouraging farmer groups, local leaders, and extension systems to actively promote sustainable alternatives can help transform moderate social norms into stronger pro-environmental attitudes and behaviors.

Table 5 : Categorisation of respondents based on their perceived norms on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	16-18	27	11.25
2	Medium	19-21	183	76.25
3	High	22-25	30	12.50
Total			**240**	**100**

Perceived beliefs

The distribution of respondents with respect to psychological determinants of perceived beliefs on burning indicates that a majority (66.67%) fall under the medium category, followed by 20.83 percent in the high category and 12.50 percent in the low category. This suggests that most respondents hold moderately strong beliefs about burning, reflecting neither complete endorsement nor outright rejection of the practice. The relatively higher proportion in the high category compared to the low category indicates that a notable segment of respondents possesses strong belief systems that support burning, while a smaller group demonstrates weaker or less favorable beliefs.

This pattern highlights that beliefs regarding burning are somewhat established but not uniformly intense across all respondents. The dominance of the medium category suggests that many individuals may be influenced by a mix of traditional practices, experiential knowledge, and partial awareness of consequences. At the same time, the presence of a considerable high-category group implies that deeply rooted beliefs such as burning being necessary for quick land preparation or pest control still persist. These findings emphasize the need for targeted interventions aimed at reshaping belief systems through education, evidence-based demonstrations and extension efforts. Strengthening awareness about the long-term negative impacts of burning and promoting successful alternatives can gradually shift moderate and strong beliefs toward more sustainable agricultural practices.

Table 6 : Categorisation of respondents based on their perceived belief on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	14-17	30	12.50
2	Medium	18-21	160	66.67
3	High	22-25	50	20.83
Total			**240**	**100**

Perceived emotions

The distribution of respondents with respect to psychological determinants of perceived emotions on burning reveals a strong concentration in the high category. A significant majority (72.92%) fall within the high range, followed by 24.17 percent in the medium category, while only a very small proportion (2.92%) are in the low category. This clearly indicates that most respondents experience strong emotional associations with burning practices. The negligible percentage in the low category suggests that very few individuals exhibit weak or indifferent emotional responses toward burning.

This pattern implies that emotions play a crucial role in reinforcing the practice of burning. Feelings such as satisfaction from quick residue clearance, relief from labor and time constraints, or habitual attachment to traditional practices may strongly influence decision-making. The dominance of the high category suggests that these emotional drivers are deeply ingrained and may override rational considerations related to environmental or health impacts. Therefore, interventions aimed at reducing burning need to go beyond awareness and address emotional dimensions by promoting positive emotional associations with sustainable alternatives. Demonstrations, success stories, and community recognition for adopting eco-friendly practices can help reshape emotional responses and gradually shift behavior toward more sustainable residue management.

Table 7 : Categorisation of respondents based on their perceived emotions on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	10-15	07	2.92
2	Medium	16-20	58	24.17
3	High	21-25	175	72.92
Total			**240**	**100**

Perceived environment risk

The distribution of respondents regarding psychological determinants of perceived environmental risk on burning shows that half of the respondents (50.00%) fall under the high category, followed by 40.42 percent in the medium category and a smaller proportion of 9.58 percent in the low category. This indicates that a considerable majority recognize the environmental risks associated with burning, with a dominant inclination toward higher levels of risk perception. The relatively small percentage in the low category suggests that only a few respondents lack awareness or underestimate the environmental consequences of burning.

This pattern implies that awareness of environmental risks such as air pollution, soil degradation, and ecological imbalance is fairly well established among respondents. However, the coexistence of a substantial medium category indicates that for many individuals, this awareness may not be strong enough to fully influence behavior. Despite recognizing the risks, respondents may continue burning due to competing factors like perceived benefits, convenience, or lack of alternatives. This highlights a critical gap between knowledge and action. Therefore, interventions should focus not only on increasing awareness but also on translating risk perception into behavioral change through stricter enforcement of regulations, incentives for sustainable practices, and improved access to residue management technologies.

Table 8 : Categorisation of respondents based on their perceived environment risk

S.No.	Category	Class interval	Frequency	Percentage
1	Low	10-15	23	9.58
2	Medium	16-20	97	40.42
3	High	21-25	120	50.00
Total			**240**	**100**

Perceived trust in Extension services

The distribution of respondents regarding psychological determinants of perceived trust in extension services on burning shows that half of the respondents (50.00%) fall under the medium category, followed by 40.83 percent in the high category and 9.17 percent in the low category. This indicates that a majority of respondents have a moderate level of trust in extension services, while a substantial proportion demonstrates high trust. The relatively small percentage in the low category suggests that only a limited number of respondents exhibit skepticism or lack of confidence in the information and support provided by extension systems.

This pattern implies that extension services are reasonably credible and influential among respondents, but there is still scope to strengthen their impact. The dominance of the medium category suggests that while farmers recognize and rely on extension services to some extent, their trust is not strong enough to consistently drive behavioral change, particularly in discouraging burning practices. The presence of a considerable high-trust group highlights the potential of extension systems to act as effective change agents when their outreach is consistent, practical, and context-specific. Therefore, enhancing the quality of advisory services, increasing field-level engagement, and demonstrating successful alternatives to burning can further build trust and encourage wider adoption of sustainable residue management practices.

Table 9 : Categorisation of respondents based on their perceived trust in extension services

S.No.	Category	Class interval	Frequency	Percentage
1	Low	8-13	22	9.17
2	Medium	14-19	120	50.00
3	High	20-25	98	40.83
Total			**240**	**100**

Perceived time pressure

The distribution of respondents with respect to psychological determinants of perceived time pressure on burning shows a strong concentration in the high category. A substantial majority (77.92%) fall within the high range, followed by 15.00 percent in the medium category, while only 7.08 percent are in the low category. This clearly indicates that most respondents experience a high level of time pressure in relation to burning practices. The relatively small proportion in the low category suggests that very few respondents feel relaxed or unconstrained by time when making decisions about residue management.

This pattern implies that time pressure is a critical psychological factor driving the continuation of burning practices. Farmers often operate within narrow windows between harvesting and sowing of the next crop, which creates urgency and limits their ability to adopt alternative residue management methods that

may be more time-consuming. The dominance of the high category suggests that even if respondents are aware of the negative impacts of burning or available alternatives, the immediacy of time constraints compels them to continue the practice. Therefore, addressing time-related constraints is essential for reducing burning behavior. Interventions such as promoting quick and efficient residue management technologies, ensuring timely availability of machinery, and aligning institutional support with cropping schedules can help alleviate time pressure and encourage the adoption of sustainable practices.

Table 10 : Categorisation of respondents based on their perceived time pressure on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	16-18	17	7.08
2	Medium	19-21	36	15
3	High	22-25	187	77.92
Total			**240**	**100**

Perceived value

The distribution of respondents with respect to psychological determinants of perceived value on burning shows a clear dominance of the low category. A large majority of respondents (78.33%) fall within the low range, followed by 17.92 percent in the medium category, while only a very small proportion (3.75%) are in the high category. This indicates that most respondents assign relatively low overall value to burning practices, suggesting that they do not strongly perceive it as beneficial or worthwhile when considering broader outcomes.

This pattern implies a shift in perception where the perceived value of burning is diminishing among the majority, possibly due to increasing awareness of its negative environmental, health, and long-term agricultural impacts. Despite this, the presence of a medium category (17.92%) indicates that some respondents still recognize partial or situational value, likely linked to immediate benefits such as quick residue clearance or reduced labor requirements. The very small proportion in the high category further confirms that strong endorsement of burning is limited. These findings highlight an important opportunity for policy and extension interventions, as low perceived value can facilitate behavioral change. Strengthening access to viable alternatives and reinforcing the disadvantages of burning can accelerate the transition toward sustainable residue management practices.

Table 11 : Categorisation of respondents based on their perceived value on burning

S.No.	Category	Class interval	Frequency	Percentage
1	Low	10-15	188	78.33
2	Medium	16-20	43	17.92
3	High	21-25	09	3.75
Total			**240**	**100**

Table 12 : Summary of the psychological determinants according to their reliability

Psychological determinants	Cronbach alpha
perceived threats	0.843
perceived benefits	0.819
perceived barriers	0.818
perceived control	0.815
perceived norms	0.807
perceived beliefs	0.836
perceived emotions	0.896
perceived environment risk	0.891
perceived trust	0.839
perceived time pressure	0.811
perceived value	0.866

The reliability analysis using Cronbach's alpha demonstrates that all eleven psychological determinants included in the study possess a high degree of internal consistency, indicating that the measurement scales are robust and suitable for further analysis. The alpha values range from 0.807 to 0.896, which falls within the "good" to "very high" reliability categories, suggesting that the items within each construct are consistently measuring the same underlying concept.

Among the determinants, perceived emotions (α = 0.896) and perceived environmental risk (α = 0.891) exhibit the highest reliability, indicating that respondents showed a very consistent pattern in their responses to items related to emotional involvement and risk perception. This suggests that these constructs are well-defined and clearly understood by the respondents. Similarly, perceived value (α = 0.866), perceived threats (α = 0.843), perceived trust (α = 0.839), and perceived beliefs (α = 0.836) also demonstrate strong internal consistency, reflecting the reliability of these psychological dimensions in capturing respondents' perceptions.

Further, constructs such as perceived benefits (α = 0.819), perceived barriers (α = 0.818), perceived control (α = 0.815), and perceived time pressure (α = 0.811) show good reliability, indicating that although

the consistency is slightly lower compared to the top constructs, it is still well within acceptable limits. Perceived norms (α = 0.807), while recording the lowest value among all variables, still exceeds the recommended threshold, confirming that it is a dependable measure.

Overall, the consistency observed across all constructs suggests that the scale items are homogeneous and free from significant measurement error. This strengthens the credibility of the dataset and supports the use of these variables in subsequent analyses such as correlation and regression. The high reliability also implies that any relationships identified among these determinants and behavioural outcomes can be interpreted with greater confidence, thereby enhancing the overall validity of the study findings.

Table 13 : Mean Score of psychological determinants of crop residue burning in agriculture

S.No.	Psychological determinants	Mean Score
1	Perceived Threats	19.86722
2	Perceived Benefits	21.58506
3	Perceived Barriers	24.58921
4	Perceived Control	24.73029
5	Perceived Norms	24.76763
6	Perceived Beliefs	24.49793
7	Perceived Emotions	22.66805
8	Perceived Environment Risk	20.6805
9	Perceived Trust	20.0249
10	Perceived Time Pressure	24.88382
11	Perceived Value	12.77178

The mean score analysis of the eleven psychological determinants reveals important insights into the respondents' perceptions and behavioural tendencies.

Among all determinants, perceived time pressure (24.88) recorded the highest mean score, followed closely by perceived norms (24.77), perceived control (24.73), perceived barriers (24.59), and perceived beliefs (24.50). These high mean values indicate that respondents strongly experience time constraints, social influences, personal control, and structural barriers in decision-making. This suggests that situational and social factors play a dominant role in shaping behaviour.

Moderate mean scores were observed for perceived emotions (22.67) and perceived benefits (21.59), indicating that emotional involvement and perceived advantages are present but not as influential as structural and normative pressures. Similarly, perceived environmental risk (20.68), perceived trust (20.02), and perceived threats (19.87) fall within the mid-range, suggesting a moderate level of awareness and concern regarding risks, trust, and potential threats.

In contrast, perceived value (12.77) recorded a substantially lower mean score compared to all other determinants. This indicates that respondents place relatively less importance on value-related considerations, implying that economic or utility-based evaluations may not be the primary drivers of behaviour.

Overall, the findings suggest that external pressures (time, norms, barriers) and internal control-related factors are more dominant than cognitive evaluations (value, benefits) in influencing respondents. This highlights the need for interventions focusing on reducing time constraints, addressing barriers, and leveraging social norms to effectively influence behaviour.

Multiple regression of psychological determinants with dependent variable

The multiple regression analysis examined the influence of psychological and contextual factors on the dependent variable. The results indicate that only a few predictors significantly contributed to the model. Among them, emotions (β = 1.216, p = 0.001) showed a strong positive and highly significant effect, suggesting that higher emotional engagement leads to an increase in the outcome variable. In contrast, environmental risk perception (β = -1.556, p < 0.001) and trust (β = -1.051, p < 0.001) exhibited strong negative and highly significant influences, indicating that increased perception of environmental risks and higher levels of trust are associated with a decrease in the dependent variable. Perceived benefits (β = -0.580, p = 0.044) also showed a statistically significant but negative relationship, implying that greater perceived benefits may inversely affect the outcome, which may require contextual interpretation based on the study setting. Additionally, value (β = -0.824, p = 0.067) was found to be marginally significant at the 10 percent level.

On the other hand, variables such as threats, barriers, control, norms, beliefs, and time pressure were not statistically significant (p > 0.05), indicating that these factors do not have a meaningful influence on the dependent variable within this model. The relatively low standard errors for significant variables such as emotions, environmental risk, and trust suggest that their estimates are reliable, whereas higher standard errors for variables like control and norms indicate less precision. Overall, the findings highlight that emotional and risk-related perceptions play a crucial role in shaping the outcome, while several commonly assumed behavioral determinants do not show significant effects.

Table 14 : Multiple regression analysis of psychological determinants with dependent variable

Variable	Coefficient (β)	Standard Error	t-Statistic	P-value
Dependent variable	233.171	36.629	6.366***	0.000
Perceived Threats	0.593	0.483	1.228	0.221
Perceived Benefits	-0.580	0.286	-2.026*	0.044
Perceived Barriers	0.413	1.342	0.308	0.758
Perceived Control	-0.549	2.035	-0.270	0.788
Perceived Norms	0.459	2.142	0.214	0.831
Perceived Beliefs	0.210	0.977	0.215	0.830
Perceived Emotions	1.216	0.366	3.319***	0.001
Perceived Envi. Risk	-1.556	0.293	-5.304***	0.000
Perceived Trust	-1.051	0.259	-4.053***	0.000
Perceived Time Pressure	1.427	1.655	0.862	0.389
Perceived Value	-0.824	0.447	-1.842	0.067

R=91.55, R^2 = 0.74 *** Significant at 1% level (p < 0.01), *Significant at 5% level (p < 0.05)

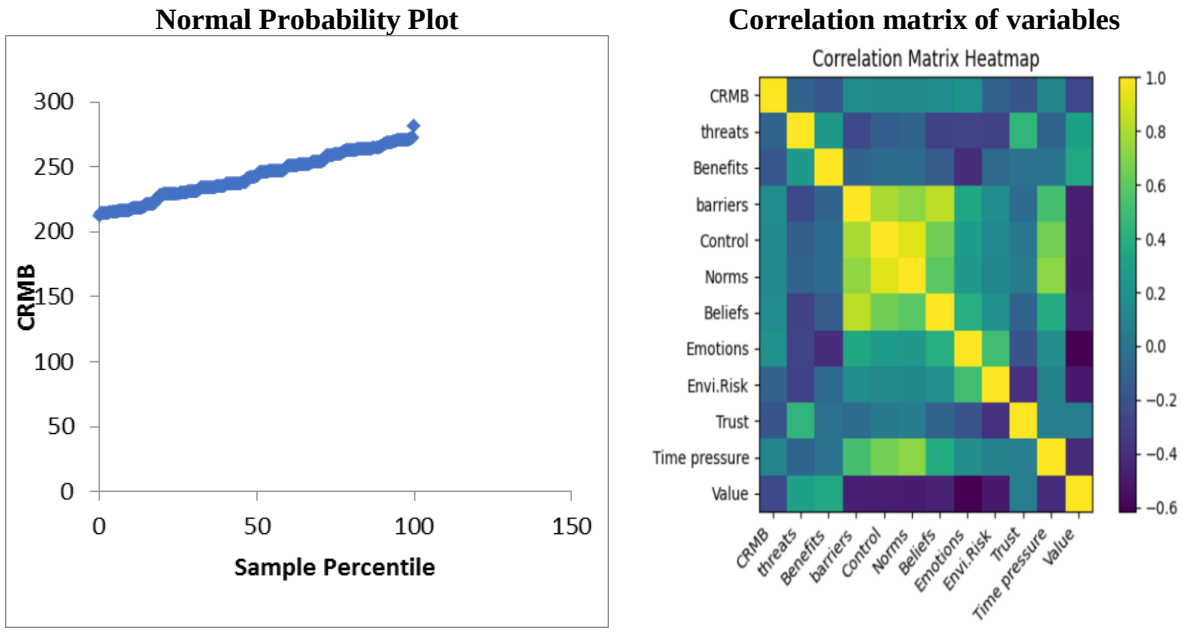

Fig. 2: Normal Probability Plot and Correlation Matrix of Variables

Conclusion

The overall analysis of psychological determinants of paddy and cotton residue burning reveals that farmers' behaviour is shaped by a complex interaction of cognitive, emotional, and situational factors rather than any single determinant. The categorization results indicate that perceived benefits and emotions related to burning are predominantly high, suggesting that farmers strongly associate burning with convenience, quick residue disposal, and immediate relief from operational constraints. Similarly, time pressure emerged as a critical determinant, with a majority experiencing high urgency due to tight cropping cycles, which compels them to adopt burning as the most feasible option. In contrast, perceived value of burning was found to be low for most respondents, indicating an increasing awareness that the long-term benefits of burning are limited despite its short-term advantages.

The medium dominance observed in determinants such as perceived barriers, control, norms, beliefs, and trust suggests that farmers are in a transitional phase of decision-making. They partially recognize constraints, social influences, and institutional support systems, but these are not yet strong enough to drive a complete shift away from burning practices. Environmental risk perception, although relatively high among respondents, does not consistently translate into behavioural change, highlighting a gap between awareness and action. This indicates that knowledge alone is insufficient to alter entrenched practices unless supported by enabling conditions and practical alternatives.

The correlation analysis further strengthens this understanding by showing that Crop Residue Management Behaviour (CRMB) has only weak direct associations with most psychological determinants, implying that behaviour is not influenced in isolation but through interlinked factors. Strong inter-correlations among variables such as barriers, control, norms, beliefs, and time pressure suggest the presence of a behavioural cluster that collectively reinforces burning practices. At the same time, variables like value, environmental risk, and emotions exhibit negative associations with CRMB, indicating their potential role in discouraging burning when effectively leveraged.

In conclusion, residue burning in paddy and cotton systems is not merely a result of lack of awareness but is deeply rooted in psychological perceptions, emotional drivers, and practical constraints. Therefore, interventions must adopt a holistic approach that simultaneously addresses time pressure, strengthens institutional trust, reshapes beliefs and norms, and enhances access to viable alternatives. Policies focusing only on awareness or regulation may have limited impact unless complemented by technological support, timely service delivery, and community-based behavioural change strategies. Such an integrated approach is essential to sustainably reduce residue burning and promote environmentally sound agricultural practices.

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