

# Women and crop residue burning in Nepal



## The issue

Crop residue burning refers to farmers regularly and periodically burning post-harvest biomass and excess vegetation in cultivated fields, mostly in preparation for sowing the next crop. This process is becoming increasingly common in Nepal's Terai region as a quick and cheap way to clear fields after cereal harvests.

This practice, which follows the wheat and rice harvesting periods, contributes heavily to atmospheric pollution in the Indo-Gangetic Plain, contributing to regional haze, affecting air quality in cities, and aggravating winter fog. It is a primary source of black carbon in Nepal. It contributes to increased levels of carbon dioxide in the atmosphere, which can then trigger adverse environmental impacts such as rising temperatures and changing rainfall patterns. This can result in crop failure, which ultimately affects food security and could lead to forced migration and associated issues.

Crop residue burning is a steadily growing problem across the Indo-Gangetic Plain. Not all of its drivers (see Figure 1) can be classified as necessarily negative, which is why this widespread practice warrants a multi-sectoral approach to identify and alleviate the drivers and adverse impacts as well as to establish mechanisms to promote alternative practices.

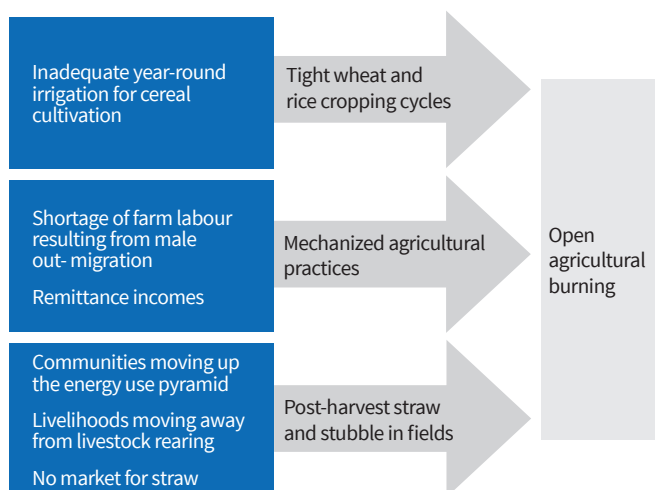
## Contributing factors

**Tight harvesting schedule:** Inadequate year-round irrigation for cereal cultivation means that farmers depend on the monsoon for two consecutive crop cycles annually. Farmers harvest rice in October/November, plant wheat within the month and harvest it in April/May. The dependency on rain-fed irrigation makes the turnaround time very tight. Farmers consequently resort to clearing the land of crop stubble through the quickest and cheapest way they know: setting the residue in newly harvested fields alight.

**Limited field hands:** The migration of youth, particularly men, for employment has resulted in a severe shortage of labour and increased workload on women. This means that the majority of farming households resort to burning crop stubble after harvesting. Figure 2 illustrates the correlation between the advent of combine harvesters and the incidence of crop residue burning.

**Crop stubble unaddressed by agri-mechanization:** With the increase in remittances there is an increasing trend of mechanized agriculture both because of severe labour shortages, as well as increased affordability of farming families. This has led to the widespread use of combine harvesters, which – unlike manual harvests – cut cereal crops higher up on the stalks and leave more plant stubble in fields.

**FIGURE 1** DRIVERS OF CROP RESIDUE BURNING

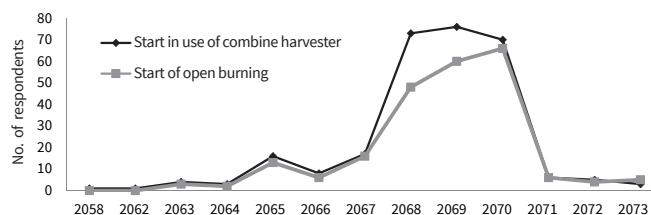


This stubble is coarse and unlikely to decompose in time for the subsequent planting season, so such land areas are increasingly cleared out by burning.

**Steady decline in animal husbandry:** Traditionally, farming households would practise small-scale agriculture and livestock rearing. They would harvest cereals by hand, cutting close to the ground to make maximum use of the agriculture residue. Farmers would use the straw as fodder or bedding for their animals, or mix it into dung cakes for use as cooking fuel. With limited human resources and the conversion and loss of common grazing lands, more and more farming households are opting to discontinue animal husbandry, which means there is no use for the post-harvest residue.

**Lack of straw management system:** There is neither a reliable market for the post-harvest straw nor an alternative method of straw disposal following mechanization. Farmers appear to resort to the easier option of setting the stubble alight over ploughing the stubble back into the field or allowing it to decompose to use as mulch.

**FIGURE 2** MECHANIZATION AND OPEN BURNING



**Shift in energy use:** There is a steady decline in farming households using straw to make dung cakes for domestic cooking. Communities are moving up the energy use pyramid, progressing from the more polluting fuelwood and dung cakes to LPG and even electricity. They do not value straw or other agriculture residues as sources of energy.

## Myth or fact?

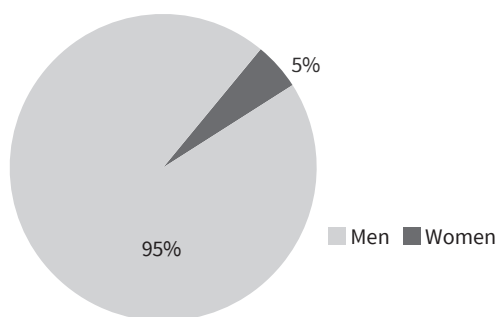
<p><b>Belief</b></p> <p>Crop residue burning is good for both plants and the soil as it helps control pests, weeds, and diseases. The ash works as a fertilizer.</p>	<p><b>Myth</b></p> <p>Crop residue burning contributes to soil degradation from loss of nutrients and organic matter. The fires kill plants and insects that are good for the land. Crop residue burning also precipitates soil erosion, which prompts the need for additional fertilizer and soil management inputs.</p>
<p><b>Belief</b></p> <p>Farmers feel crop residue burning is the cheapest and most practical option; they feel there is no alternative.</p>	<p><b>Fact</b></p> <p>Use of combine harvester leaves stubble rooted to the ground and straw scattered all over the field. It is very expensive to pay someone to collect the straw. With no livestock-related needs or functioning markets for straw, there is seemingly no alternative but to burn it.</p>



## The feminization of agriculture in Nepal

Almost 95% of Nepalis out-migrating in 2016/17 were men. This is radically changing rural socio-cultural dynamics. In addition to their regular productive and reproductive responsibilities, women in agricultural communities have found themselves taking on the responsibilities of the missing menfolk too, managing agricultural systems as de-facto household heads. They are consciously making major decisions related to farming practices to cope with the shortage of men, including making investments to improve existing farming practices and to harness new techniques and technologies such as combine harvesters. In Nepal, this phenomena has been very pronounced, indicating the feminization of agriculture across the country.

**FIGURE 3** TOTAL LABOUR MIGRANTS BY GENDER, 2016/17

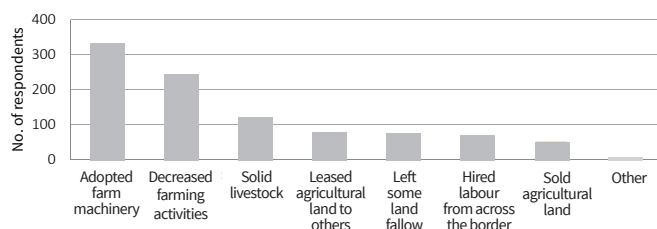


Source: Ministry of Labour and Employment (2018)

## Women, mechanization, and crop residue burning

This feminization of agriculture is altering production practices in Nepal. Women are taking charge but also have to adapt to the new non-traditional community dynamics and actively manage farms differently (as shown in Figure 4). Remittance income has enabled women to purchase machinery, discontinue animal husbandry, and transition from fuel wood to cleaner cooking fuels such as LPG. The remittance money coming into households reinforces these coping mechanisms, increasing overall access and affordability. These are progressive changes that increase women's decision-making abilities and autonomy. They also reduce the drudgery that have plagued women of farming households for countless generations.

**FIGURE 4** HOW WOMEN ARE COPING WITH LABOUR SHORTAGES



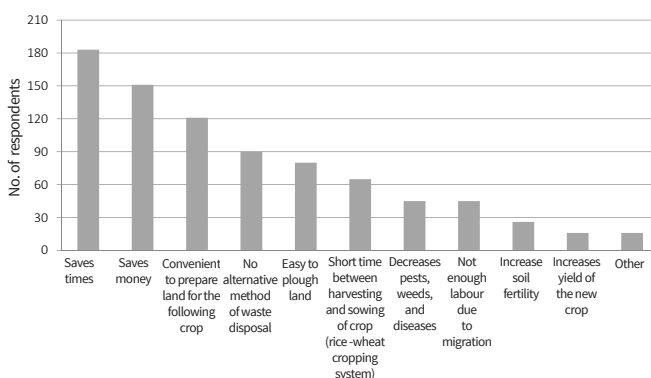
## Persisting with a harmful practice

The mechanization of agriculture has changed agricultural and livelihood practices for the better, but post-harvest stubble is a by-product of mechanization and is at the heart of the crop residue burning issue.

Research indicates that women understand that crop residue burning harms the health of their families, the environment, and soil productivity in the long run. They point out how the fires obliterate many beneficial plants and insects. They face first-hand the heavy smoke that envelopes the air during the process, and they are aware of the soot that remains in the air and pervades their homes for up to two weeks after the fires.

Yet, they continue to manage post-harvest crop residue by setting the stubble alight. Figure 5 indicates that women cite time and money savings, greater convenience, and lack of alternative straw disposal methods as the primary reasons for resorting to crop residue burning.

**FIGURE 5** REASONS FOR BURNING STRAW



## Promoting “no burn” alternatives

### BUILDING FARMERS' CAPACITIES

- Raise awareness of the negative impacts of crop residue burning on human health and the environment through media campaigns and community awareness programmes.
- Provide training on managing crop residue through alternatives such as ploughing stubble back into the soil, and making biochar, compost manure, biofuels, etc.

### INTRODUCING IMPROVED AGRICULTURAL PRACTICES

- Incorporating crop residue into the soil positively impacts the microbial population and increases nutrients in the soil. Not burning crop residue prevents significant air pollution, retains soil nutrients, and increases soil organic matter, leading to improved agricultural productivity.

## Crop residue burning's impact on health, especially that of women and children

- Open agricultural burning can lead to inflammation of the eyes and respiratory disorders. Over time, this could lead to asthma and heart and lung disease.
  - About 90% of all deaths associated with outdoor air pollution occur in developing countries (WHO).
  - A 2016 UNICEF report estimates that 500,000 children globally succumb to air pollution-related pneumonia each year.
  - Studies also correlate exposure to high levels of pollution to higher rates of prenatal complications and lower birth weight.
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- Conservation agriculture can counter resource degradation and introduce resource efficiency. Local governments and development practitioners can work with farmers to strengthen knowledge- and information-sharing mechanisms.
- PROMOTING APPROPRIATE MECHANIZATION**
- Improved mechanization should be promoted to clear crop waste by planting wheat seeds among rice stubbles or cut the stubble and mix it into the soil. Balers/choppers can be used to manage post-harvest straw.
  - Mechanization packages should be developed, such as the mandatory purchase of a Happy Seeder, straw chopper, or baler when buying a combine harvester. The Happy Seeder is a machine that cuts and lifts rice straw, sows the wheat seed, and deposits the straw on top of it as mulch, making residue burning unnecessary.
- EXPLORING STRAW MANAGEMENT OPTIONS**
- A 2015 study by Punjab Agricultural University in India suggests that straw as livestock feed and/or bedding material can help improve the quality and quantity of milk as it contributes to animal comfort and udder and leg health.

- A functional straw market with reasonable prices can be found for the excess straw. In the absence of such a market, government or non-government guarantees to purchase the extra straw could be explored. A simple, alternative solution would be to provide subsidies for farmers to collect and not burn the straw in the field.

## PROVIDING POLICY SUPPORT

- Crop residue burning can be discouraged through strong policy interventions, with incentives for appropriate mechanization and developing markets for straw and disincentives for crop burning.

## Way forward

- All government and non-governmental stakeholders including development initiatives, agribusinesses, and farmers need to achieve a better understanding of the drivers and negative implications of crop residue burning on human and environmental wellbeing.
- Government and non-governmental stakeholders need to understand how the use of agriculture mechanization can be optimized, identify possible ways to minimize post-harvest stubble, and harness alternative uses of the post-harvest straw.
- Local- and national-level regulations need to be devised and enforced on the basis of enhanced stakeholder comprehension about crop residue burning and its implications and drivers, as well as more efficient crop residue management practices. This knowledge is vital for all farming communities, and especially for women who are custodians of their farms and communities.
- Nepal's government and non-governmental stakeholders can enable essential knowledge transfer about this multifaceted issue: how to gradually reduce the practice of crop residue burning, devise efficient implementation measures, and develop frameworks which curtail this practice.

The content here is primarily based on a 2018 ICIMOD study of three Terai districts in Nepal: Nawalparasi, Rupandehi, and Kapilvastu.

## For further information

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