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National Policy

for

Management of Crop Residues (NPMCR)



Government of India
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National Policy for Management of Crop Residues (NPMCR)

1. Introduction:

1.1 India accounts for about 2.4 % of the world's geographical area and 4.2% of its water resources, but supports about 17.6% of its population which highlights the fact that our natural resources are under considerable strain. The need for providing foodgrains for a growing population, while sustaining the natural resource base, has emerged as one of our main challenges. Foodgrain are a major source of energy and are thus vital for food and nutritional security. As such, food grains would continue to be the main pillar of food security and out of various crops grown, rice, wheat, and pulses are still part of the staple diet of most of the rural population.

1.2 As per available estimates {Directorate of Economics & Statistics, MOA, DAC, New Delhi (final estimate-2012-13)}, India produced about 93.51 million tons (Mt) of wheat, 105.24 Mt of rice, 22.26 Mt of maize, 16.03 Mt of millets (jowar, bajra, ragi and small millet), 341.20 Mt of sugarcane, 7.79 Mt of fiber crops (jute, mesta, cotton), 18.34 Mt of pulses and 30.94 Mt of oilseed crops. Out of various crops grown, rice, wheat and sugarcane are prone to crop residue burning. These crops are preferred by farmers since they provide higher economic return, as compared to other crops. State-wise details of crop residue generated, residue surplus and crop residue burned are given in Annexure-I.

1.3 Harvesting of various crops generates large volume of residues both on and off farm. Ministry of New and Renewable Energy estimated that about 500 Mt of crop residues are generated annually. The generation of crop residues is highest in Uttar Pradesh (60 Mt), followed by Punjab (51 Mt) and Maharashtra (46 Mt). Among different crops, cereals generate maximum residues (352 Mt), followed by fibres (66 Mt), oilseeds (29 Mt), pulses (13 Mt) and sugarcane (12 Mt). Cereal crops (rice, wheat, maize, millets) contribute 70%, while rice crop alone contributes 34% to the crop residues. Sugarcane residues consisting of top and leaves generate 12 Mt, i.e., 2% of the crop residues in India.

1.4 Crop residues are primarily used as bedding material for animals, livestock feed, soil mulching, bio-gas generation, bio-manure/compost, thatching for rural homes, mushroom cultivation, biomass energy production, fuel for domestic and industrial use, etc. However, a large portion of crop residue is burnt 'on-farm' primarily to clean the field for sowing the next crop. The problem of 'on-farm' burning of crop residues is intensifying in recent years due to shortage of human labour, high cost of removing the crop residue from the field and mechanized harvesting of crops. As per available estimates, burning of crop residues is predominant in four states, namely, Haryana, Punjab, Uttar Pradesh & West Bengal.

2 Adverse effect of crop residue burning:

2.1 **Loss of nutrients:** It is estimated that burning of one tonne of rice straw accounts for loss of 5.5 kg Nitrogen, 2.3 kg phosphorus, 25 kg potassium and 1.2 kg sulphur besides, organic carbon. Generally crop residues of different crops contain 80% of Nitrogen (N), 25% of Phosphorus (P), 50% of Sulphur (S) and 20% of Potassium(K). If the crop residue is incorporated or retained in the soil itself, it gets enriched, particularly with organic C and N.

2.2 **Impact on soil properties:** Heat from burning residues elevates soil temperature causing death of beneficial soil organisms. Frequent residue burning leads to complete loss of microbial population and reduces level of N and C in the top 0-15 cm soil profile, which is important for crop root development.

2.3 **Emission of greenhouse and other gases:** Crop residues burning is a potential source of Green House Gases (GHGs) and other chemically and radiative important trace gases and aerosols such as CH₄, CO, N₂O, NO_x and other hydrocarbons. It is estimated that upon burning, Carbon (C) present in rice straw is emitted as CO₂(70% of Carbon present), CO (7%) and CH₄(0.66%) while 2.09% of Nitrogen (N) in straw is emitted as N₂O. Besides, burning of crop residue also emits large amount of particulates that are composed of wide variety of organic and inorganic species. Many of the pollutants found in large quantities in biomass smoke are known or suspected carcinogens and could lead to various air borne/lung

diseases. State-wise area under rice, wheat and sugarcane along with crops prone to burning in each state are given in **Annexure-II**.

3.0 National Policy for Management of Crop Residue (NPMCR):

3.1 The situation demands that an appropriate policy package of technical and policy interventions for crop residues management is formulated for adoption by the States. Accordingly, "**National Policy for Management of Crop Residue (NPMCR)**" has following major objectives:

- Control of burning of crop residue to prevent environmental degradation and loss of soil nutrients and minerals by promotion of in-situ management (incorporation in soil, mulching, baling/binding for use as domestic/industrial fuel, fodder) of crop residue;
- Diversified use of crop residue for various purposes like charcoal gasification, power generation, as industrial raw material for production of bio-ethanol, packing material, paper/board/panel industry, composting and mushroom cultivation etc.;
- Capacity building and awareness about ill effects of crop residue burning and its effective utilization and management; and
- Formulation and implementation of suitable law and legislative/policy measures to curb burning of crop residue.

4. Strategy:

4.1 The strategy inter-alia comprises:-

- a) Promotion of technologies for optimum utilization and in-situ management of crop residue to prevent loss of invaluable soil nutrients, minerals and improvement of general soil health;
- b) Promotion of diversified uses of crop residue for various purposes viz. power generation, as industrial raw material for production of bio-ethanol, packing material for fruits & vegetables and glassware, utilization for paper/ board/panel industry, biogas generation/composting and mushroom cultivation in Public Private Partnership (PPP) mode;

- c) Capacity building of various stakeholders including farmers and extension functionaries under crop development programmes and organization of field level demonstrations on management of crop residues in all programmes/schemes;
- d) Promotion of adaptive research for management of crop residue and development of machineries for effective utilization of such residues; and
- e) Formulation and implementation of necessary policy measures for control of crop residue burning through suitable laws/ legislation/ executive orders etc.

5. Interventions to curb crop residue burning:

Various interventions to curb crop residue burning are listed below for adoption:

5.1 Technological interventions:

- a) Incorporation of crop residue into soils through adoption of conservation agriculture practices to prevent soil erosion from wind & water and to augment the soil moisture;
- b) Promotion of use of crop residue for preparation of bio enriched compost/vermin compost and its utilization as farm yard manure;
- c) Use of crop residue for cultivation of mushroom particularly *Agaricus bisporus* (white button mushroom) and *Volvriella Volvacea* (straw mushroom);
- d) Incentivize purchase of happy seeder/ turbo seeder / shredder/ baling machines and zero- seed-cum-fertilizer drill to facilitate in-situ management of crop residue and retaining the straw as surface mulching;
- e) Extending subsidy to the farmers for hiring resource conservation machineries from Custom Hiring Center/Agriculture Service Center and promotion of establishment of new CHS/ASC to ensure availability of such machines to the farmers at the time of crop harvesting.

5.2 Diversified uses of crop residue:

- a) Promotion of various interventions under ongoing schemes/programmes for diversified use of crop residue as fuel for power plants, production of cellulosic ethanol, etc. in Public Private Partnership (PPP) mode;

- b) Promotion and encouragement of use of crop residue/rice straw in paper/board/panel and packing material;
- c) Promotion of collection of crop residue for feed, brick making, etc. and extending subsidy for transport of crop residue to fodder deficient areas.

5.3 Capacity building and awareness generation:

- a) Organising training of farmers for creating awareness about effects of crop residue burning, adoption of conservation agriculture practices and resource conservation technology through all ongoing State/Centre Sector Schemes;
- b) Creation of awareness about various measures to prevent crop residue burning through mass media, print media, etc. just before the harvesting seasons;
- c) Establishing self-help groups and providing subsidy to unemployed youth for establishment of custom hiring centres to enhance the availability of resource conservation machinery;
- d) Self certification by farmers to not resort to crop residue burning need to further certified by Gram Pradhan/ Sarpanchas as an additional condition while availing crop loan/agricultural credit from financial institutions;
- e) Demonstrations of crop residue management technology on a large scale by the State Department of Agriculture and other Government Institutions by organising on-farm demonstrations to create awareness and dissemination of various technologies and organising field days under ongoing programmes/schemes.

5.4 Pilot studies on management of crop residue:

- a) Development of appropriate and cost effective farm machinery to facilitate collection, volume reduction, transportation and application of residues;
- b) Modifying combine harvester to collect finely chopped crop residues by use of twin cutter bar type combine harvester for harvesting of top portion of crop for grain recovery and a lower cutter bar for straw harvesting at a suitable height and windrowing should be developed for proper management of straw; and
- c) Use of satellite based remote sensing technologies to monitor crop residue management, with active involvement of National Remote Sensing Agency (NRSA) and CPCB of MoEF&CC.

5.5 Laws and legislation to curb crop residue burning:

- a) As per Seventh Schedule of the Constitution of India, subject of agriculture falls under the purview of the State Governments, therefore, it is for the State Governments to take necessary steps to curb the practice of crop residue burning. Accordingly, States, namely; Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu and Uttar Pradesh should bring suitable law/rules/order for prevention/banning of the practice of crop residue burning as per policy and priority of the State. Accordingly, State Government may identify an agency or authority to implement such an order to abate, prevent and ban the practice of crop residue burning;
- b) Incentivizing establishment of projects aiming at utilization of crop residues as raw materials by entitling them to all benefits as permissible under the Fiscal Incentives for Industrial Promotion schemes/programmes in the respective State; and
- c) Ministry of Environment, Forests & Climate Change (MoEF&CC) may issue an advisory to various State Governments and Union Territories to curb this nuisance of crop residue burning.

6. Financial resource mobilization for management of crop residue:

6.1 Management of crop residues involves a multidisciplinary approach and therefore, fund mobilization for this purpose has to come from various Ministries, such as MoEF&CC, MoA, MoRD, etc. MoA (DAC) provides financial support to State Governments through various on-going schemes/ programmes for the interventions required to curb crop residue burning. For example, Governments of Haryana and Punjab have proposed under Annual Work Plan of RKVY for seeking central assistance for providing machineries (happy seeder/turbo seeder/shredder/ baling machines & zero-seed-cum-fertilizer drill) to the farmers to facilitate in-situ management of crop residue and retaining the straw as surface mulching. Other Ministries & State Governments may also take up similar steps to curb practice of crop residue burning.

6.2 State Governments may identify various need based, location specific interventions suitable to particular agro-ecological zones for management of crop

residues and implement the same under the Annual Work Plan (AWP) of various ongoing schemes/programmes/missions of DAC. Besides, State can also avail financial assistance from Rashtriya Krishi Vikas Yojana (RKVY), which provides flexibility to the states for taking up any components/interventions required for holistic and integrated development of agriculture including management of crop residue.

7. Monitoring Mechanism:

7.1 It is mainly for State Governments to identify various interventions, formulate a suitable work plan, and monitor its implementation by multidisciplinary team of Officers.

7.2 At national level, the issue of management of crop residue will be monitored at regular intervals especially before each crop harvesting season to ensure effective implementation of proactive measures to curb the practice of burning of crop residue.

Annexure-I**State-wise crop residue generated, residue surplus and burned**

(Crop residue in Million Tonne)

S.N.	States	Residue generation*	Residue surplus*	Residue burned\$
1.	Andhra Pradesh	43.89	6.96	2.73
2.	Arunachal Pradesh	0.40	0.07	0.04
3.	Assam	11.43	2.34	0.73
4.	Bihar	25.29	5.08	3.19
5.	Chhattisgarh	11.25	2.12	0.83
6.	Goa	0.57	0.14	0.04
7.	Gujarat	28.73	8.90	3.81
8.	Haryana	27.83	11.22	9.08
9.	Himachal Pradesh	2.85	1.03	0.41
10.	Jammu & Kashmir	1.59	0.28	0.89
11.	Jharkhand	3.61	0.89	1.10
12.	Karnataka	33.94	8.98	5.66
13.	Kerala	9.74	5.07	0.22
14.	Madhya Pradesh	33.18	10.22	1.91
15.	Maharashtra	46.45	14.67	7.42
16.	Manipur	0.90	0.11	0.07
17.	Meghalaya	0.51	0.09	0.05
18.	Mizoram	0.06	0.01	0.01
19.	Nagaland	0.49	0.09	0.08
20.	Orissa	20.07	3.68	1.34
21.	Punjab	50.75	24.83	19.65
22.	Rajasthan	29.32	8.52	1.78
23.	Sikkim	0.15	0.02	0.01
24.	Tamil Nadu	19.93	7.05	4.08
25.	Tripura	0.04	0.02	0.02
26.	Uttarakhand	2.86	0.63	0.78
27.	Uttar Pradesh	59.97	13.53	21.92
28.	West Bengal	35.93	4.29	4.96
	Total	501.73	140.84	92.81

Source: * Ministry of New & Renewable Energy (MNRE, 2009), Govt. of India, New Delhi
 \$ Pathak Himanshu et.al (2010), Senior Scientist, C.E.S. & C.R., IARI, New Delhi

Annexure-II**State-wise major cropped area under rice, wheat and sugarcane -Crops prone to residue burning****(Area in thousand ha.)**

Sl. No.	Name of States	Area under major cereal crops and sugarcane			
		Rice	Wheat	Sugarcane	Crops prone to residue burning
1.	Andhra Pradesh	3628.0	8.0	196.0	Rice & Sugarcane
2.	Assam	2488.2	33.9	28.9	In jhum areas, plants, & bushes are burnt
3.	Bihar	3298.9	2207.7	250.3	Rice , wheat and Sugarcane
4.	Chhattisgarh	3784.8	101.2	13.5	Rice
5.	Gujarat	701.0	1024.0	176.0	Rice and wheat
6.	Haryana	1215.0	2497.0	101.0	Rice, Wheat & Sugarcane
7.	Himachal Pradesh	76.9	364.2	1.9	No crop residue is burnt
8.	Jammu & Kashmir	261.7	290.0	0.0	No crop residue is burnt
9.	Jharkhand	1414.5	164.3	6.7	No crop residue is burnt
10.	Karnataka	1278.0	225.0	425.0	Rice and Sugarcane
11.	Kerala	197.3	0.0	1.7	No crop residue is burnt
12.	Madhya Pradesh	1882.6	5300.0	59.5	Rice and wheat
13.	Maharashtra	1557.0	773.0	933.0	Rice and Sugarcane
14.	Odisha	4022.8	1.0	14.5	No crop residue is burnt
15.	Punjab	2845.0	3512.0	83.0	Rice, Wheat and Sugarcane
16.	Rajasthan	125.6	3063.2	5.5	No crop residue is burnt
17.	Tamil Nadu	1493.1	0.0	347.2	Rice and Sugarcane
18.	Uttarakhand	262.8	358.1	109.9	Rice and wheat
19.	Uttar Pradesh	5861.0	9734.0	2212.0	Rice, Wheat and Sugarcane
20.	West Bengal	5444.3	321.6	16.1	Rice
21.	Others	915.4	25.1	17.2	No crop residue is burnt
Total		42753.9	30003.3	4998.9	
Total (million ha.)		42.75	30.00	4.99	

Source: Directorate of Economics & Statistics, MOA, DAC, New Delhi (final estimate-2012-13).