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On farm trials on cotton fabric based protective masks for farmers

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ABSTRACT : In Haryana wheat and paddy are major crops, where threshing and winnowing are most tedious activities handled manually by swift hands of women. They face several health problems due to these operations. Protective garments provide protection to the wearer without having any adverse effect on their work. Occupational health problems of farm workers from Fatehabad district were identified through PRA technique. Major occupational health hazards faced by farmers with their existing clothing practices were breathing problems (87.50%) and skin allergies (85%). Keeping in mind, occupational health problems faced by farm workers, "On Farm Trials" were conducted at Krishi Vigyan Kendra, Fatehabad on use of protective masks of cotton fabric for minimizing occupational health hazards in threshing/winnowing. Four types of masks *i.e.* pleated mask, beak mask, scarf mask and capron were provided to 20 male and 20 female farmers during peak season of winnowing and threshing. The study highlighted that scarf mask and pleated masks were found highly suitable by female and male farmers, respectively. Perceived adoption feasibility was found 81.20 per cent for all protective masks. All the respondents reported that pleated masks increased the efficiency of users. Majority of the respondents (MS 2.37) found cambric fabric as most suitable for preparation of masks. All the respondents (MS 3.00) reported that initial cost of masks was low. Farmers preferred cambric cotton fabric rather than voile and poplin with thin elastic at sides of masks.

Key words : Feasibility, occupational health hazards, protective masks, recommended intervention

Agriculture sector continues to be an important component of Indian national economy. In rural India an over whelming number of women farmers are associated directly or indirectly in various activities of agriculture like production, processing and distribution, etc. They devote long hours in field as farm labourers but their contribution is not given due credit. Contribution of women workers in agricultural operations is not less than male workers except in ploughing. It has been observed that women are less likely to be involved in more mechanized and capital intensive form of agriculture geared to market oriented production. They undertake more labour intensive work that requires pain staking physical effort, patience and perseverance.

As per "World Health Organization" (WHO), an agricultural worker is any person engaged either permanently or temporarily in activities related to agriculture irrespective of legal status. India has world's largest number of agricultural workers as 58.4 per cent of population is based on agriculture. Most of the farmers have small land holding, therefore, activities like sowing, transplanting, weeding, harvesting, winnowing, threshing, etc. are performed manually. Both male and female

farmers work hand in hand during peak season.

As per "National Safety Council", agricultural workers are at increased risk for a variety of illness including respiratory disorders, dermatological conditions and acute allergies. This is because of exposure to extreme weather conditions, dust and husk, difficult working postures, lengthy working hours and use of hazardous agricultural tools, machinery, chemical, etc.

In Haryana wheat and paddy are major crops grown. Threshing and winnowing are most tedious activities handled by swift hands of women. They face several health problems and protective clothing was especially designed to shield or guard parts of the wearer which are exposed to machines/their moving parts and toxic and harmful chemical substances *i.e.* gases, liquids and particles etc. leading to respiratory problems, skin ailments and eye problems. Protective garments provide protection to the wearer without having any adverse effect on their work efficiency (Wenner and Arias, 2003). Keeping in mind various problems faced by farmers engaged in winnowing and threshing "On Farm Trials" on use of protective masks of cotton fabric for minimizing occupational health hazards in threshing/winnowing were conducted at Krishi Vigyan Kendra, Fatehabad. Female as well as male farmers were provided different protective masks made in cotton fabric for use during peak season of winnowing and threshing.

MATERIALS AND METHODS

Present study was conducted in Fatehabad district of Haryana state in two phases during 2013-2014 and 2014-2015.

Phase I

Identification of occupational health problems: Participatory rural appraisal technique was used by seasonal calendar and daily routine activities for identification of occupational health problems in agricultural activities from all six blocks of Fatehabad district. Subsequently, six villages namely Nagpur (Ratia), Gorakhpur (Bhuna), Shirdhan (Bhattoo), Bhuttan (Fatehabad), Akanweli (Tohana) and Meond from Jakhal block were selected. From all six villages ten elderly members comprising both men and women (1:1) from all sections of the villages were selected randomly. The information on occupational health problems faced by farmers in winnowing/threshing of different crops was gathered and compiled.

Phase II

On Farm Trials: For conducting "On Farm Trials" four types of protective masks *i.e.* beak mask, pleated mask, scarf mask and capron developed by scientists of AICRP, Department of Textile and Apparel Designing were provided to 40 farm workers (20 male and 20 female) for one month. On each type of mask, 20 trials were conducted on both female as well as male farmers in peak season of winnowing and threshing. Thus, total 40 trials were conducted in Dhani Bikaneri and grain market, Fatehabad. Suitability of each mask was worked out on six parameters namely (i) easy to wear (ii) easy to remove (iii) coverage of face (iv) fabric used (v) accessories used (vi) work comfort. Accordingly mean scores and ranks were assigned. Perceived adoption feasibility of masks was worked out on five attributes namely relative advantage, physical and cultural compatibility, simplicity complicity and triability. Perceived

feasibility index was calculated will be the formula given below:

$$\text{Perceived feasibility index: } \frac{E\ (RA + CC + PC + SC + T)}{P\ (RA + CC + PC + SC + T)} \times 100$$

Where;
RA: Relative advantage
CC: Cultural compatibility
PC: Physical compatibility
SC: Simplicity complexity
T: Trial ability

RESULTS AND DISCUSSION

Occupational health problems faced by farmers in winnowing and threshing of crops: Results regarding occupational health problems faced by farmers in winnowing and threshing of crops using existing clothing practices and recommended methods are depicted in Table 1. It can be observed that with existing clothing practices in threshing/winnowing majority (87.50) per cent farmers faced breathing problems followed by skin allergy (85%) and irritation in eyes (75%), while it was drastically reduced by using protective masks recommended by Krishi Vigyan Kendra intervention *i.e.* 25, 45 and 30 per cent, respectively. Seventy per cent of respondents reported pain in hand during peak season of winnowing/threshing and there was no change by using recommended masks. Half of the respondents (50%) faced problems of hair fall/ dry hair during threshing/winnowing with existing clothing practices which were reduced to 10 per cent by recommended methods. The results are in line with Dahiya *et al.,* 2015 and Gandhi *et al.,* 2014.

As depicted in Table 2 acceptability of masks was worked out after one month by end users on six parameters *i.e.* easy to wear, easy to remove, coverage of face, elastic used, fabric used and easy to work. Scarf mask was found highly suitable by female farmers with Mean Score 2.90 followed by pleated mask (2.30), capron (2.25) and beak mask was found least suitable scoring 1.15. This trend might be due to shape of scarf mask which looks like dupatta/cotton voile used by women farmers. However, it also covers head, face and neck area of users and women feel comfortable and compatible.

The data on acceptability of masks among male farmers is presented in Table 3. All the respondents (100%) reported that pleated mask was found highly suitable in winnowing/

Table 1. Occupational health problems faced by farmers in winnowing/threshing of crops n=40

Problems	Existing clothing practices		Recommended intervention	
	Frequency	Percentage	Frequency	Percentage
Headache	22	55.0	16	40.0
Skin allergy	34	85.0	18	45.0
Sun stroke	02	5.0	02	5.0
Giddiness	08	20.0	04	10.0
Breathing problem	35	87.5	10	25.0
Pain in hand	28	70.0	28	70.0
Pain in body	24	60.0	24	60.0
Irritation/redness eyes	30	75.0	12	30.0
Dry hair/hair fall	20	50.0	04	10.0
Vomiting	18	45.0	05	12.5

threshing after using for one month period. This trend was followed by beak mask with Mean Score 2.10, scarf mask (2.0) and least preferred mask was capron scoring 0.93, respectively by male farmers.

As depicted in Table 4 perceived advantages of scarf mask reported by female farmers were that it looks like dupatta and cotton voile, hence conventionally compatible (100%), easy to wear and remove (100%), economical (100%) and increased the work efficiency of users (100%). However half of the respondents (50 %) perceived that scarf mask reduces drudgery. The results are in consonance with Gandhi *et al.,* 2014.

Table 5 shows the perceived advantages of pleated mask as stated by male farmers. All the respondents (100%) reported that pleated masks were economical and increase work efficiency of users. 90 per cent users found that these protects from dust and husk inhalation, consistent in use 85 per cent and 75 per cent avoids allergies, itching and irritation as reported by 75 per cent respondents. However 32 per cent reported that these masks reduce drudgery faced by them in winnowing and threshing. Same results were reported by Gandhi *et al.,* 2014.

Table 6 depicts the suggestions given by users for modification in all the masks after using during peak season. Half of the respondents (50%) reported that elastic at sides of masks should be thin and covered with gathers/ pleats so that it does not irritate during long use in winnowing/threshing because hard/ thick elastic cause irritation on body parts. They also suggested that fabric should be blend of hosiery and cambric cotton rather than voile because these fabrics are thick and avoid penetration of dust and husk upto some extent. However, 45 per cent respondents also suggested that length should be increased so that head and neck must be covered during winnowing/ threshing of crops.

The data pertaining to acceptability of fabric for masks presented in Table 7 depicted that cambric was found most suitable and ranked I (Mean Score 2.37) followed by poplin

Table 2. Acceptability of masks by female farmers Trials =20

Mask	Response category						Total Score	**Mean Score**	Rank
	Highly Suitable (3)		Suitable (2)		Least Suitable (1)				
	F	(%)	F	(%)	F	(%)			
Scarf Mask	18 (54)	90	2 (4)	10	0 (0)	-	58	**2.90**	I
Beak mask	2 (6)	10	0 (0)	-	18 (18)	90	24	**1.15**	IV
Pleated mask	8 (24)	40	10 (20)	50	2 (2)	10	46	**2.30**	II
Capron	10 (30)	50	5 (10)	25	5 (5)	25	45	**2.25**	III

Table 3. Acceptability of different masks by male farmers Trials =20

Mask	Response category						Total Score	**Mean Score**	Rank
	Highly Suitable (3)		Suitable (2)		Least Suitable (1)				
	F	(%)	F	(%)	F	(%)			
Scarf Mask	5 (15)	25	10 (20)	50	5 (5)	25	40	**2.00**	III
Beak mask	10 (30)	50	2 (4)	10	8 (8)	40	42	**2.10**	II
Pleated mask	20 (60)	100	0 (0)	-	0 (0)	-	60	**3.00**	I
Capron	3 (9)	15	12 (24)	60	5 (5)	25	38	**0.93**	IV

Table 4. Advantages of scarf mask perceived by women farmers n=20

Advantage	Frequency	Percentage
Head cover protects from husk and dust	18	90
Protects from dust inhalation	12	60
Looks like dupatta and cotton voile, it is culturally compatible	20	100
Easy to wear and remove	20	100
Economical	20	100
Consistent in use	12	60
Avoids irritation, itching and allergies	15	75
Reduces drudgery	10	50
Increases work efficiency	20	100

Table 5. Advantages of pleated mask perceived by male farmers n=20

Advantage	Frequency	Percentage
Protects from dust and husk inhalation	18	90
Avoids allergies, itching and irritation	15	75
Easy to wear and maintain	10	50
Economical	20	100
Consistent in use	17	85
Increases work efficiency	20	100
Reduces drudgery	16	32

(2.33) and voile was found some what suitable scoring 1.92. It may be due to the reason that cambric fabric restricts dust inhalation as compared to voile and poplin fabric due to its medium thickness. Poplin is somewhat thick fabric which causes difficulty in breathing and voile is comparatively thin fabric which does not restrict dust/ husk inhalation during breathing.

Perusal of Table 8 depicted that perceived adoption feasibility of protective masks by users,

Table 6. Suggestions for modification of different masks by users n=40

Advantage	Frequency	Percentage
Elastic at sides of mask should be thin and covered with gathers/pleats	20	50
Fabric should be blend of hosiery and cambric cotton rather than voile	20	50
Length should be increased so that head and neck must be covered	18	45
Scarf mask should be coloured or printed voile	16	40

Table 7. Acceptability of fabric for masks by users n=40

Fabric	Attributes of masks* (Mean Score)						Rank
	Easy to wear	Easy to remove	Coverage of face	Protects from dust	Elastic used at sides of mask	Overall accept-ability	
Cambric	2.67	2.60	2.60	2.50	1.50	2.37	I
Voile	2.00	2.10	2.00	1.50	2.00	1.92	III
Poplin	2.52	2.54	2.50	2.00	2.10	2.33	II

* Most suitable (3) Suitable (2) Somewhat suitable (1)

Table 8. Perceived adoption feasibility of protective masks by users n=40

Attributes	Response category			WMS	MS
	Agree	Undecided	Disagree		
Relative advantage					
Low initial cost	40 (120)	-	-	120	3.00
Monetary benefit	20 (60)	8 (16)	12 (12)	88	2.20
Consistency of use	30 (90)	8 (16)	2 (2)	108	2.70
Time saving	32 (96)	2 (4)	6 (6)	106	2.65
Multiple use potential	40 (120)	-	-	120	3.00
PFI = (92%)					
Compatibility					
In accordance with norms and values	40 (120)	-	-	120	3.00
Interest and need based	28 (84)	2 (4)	10 (10)	98	2.45
Socially acceptable	22 (66)	2 (4)	6 (6)	76	1.90
According to existing practices	20 (60)	12 (24)	8 (8)	92	2.30
Can adopt independently	18 (54)	10 (20)	12 (12)	86	2.15
PFI = (78.66%)					
Simplicity/complexity					
Easy to understand	18 (54)	3 (6)	19 (19)	79	1.97
Easy to use	32 (96)	8 (16)	-	112	2.80
Resource simplicity	35 (105)	5 (10)	-	115	2.87
Reversible	10 (30)	10 (20)	20(20)	70	1.75
Increases efficiency	40 (120)	-	-	120	3.00
PFI = (82.86%)					
Trial ability					
Can communicate easily	20 (60)	10 (20)	10 (10)	90	2.25
Results are visible	37 (111)	3 (6)	-	117	2.92
Can be demonstrated	15 (45)	5 (10)	20 (20)	75	1.87
Can be tried at field level	10 (30)	10 (20)	20 (20)	70	1.75
Provision of modification	24 (72)	-	6 (6)	78	1.95
PFI = (71.5%)					
Overall AFI = (81.2%)					

which was found 81.2 per cent on five attributes. With regards to Relative advantage all the respondents reported that these masks were of low initial cost (Mean score 3), having multiple use potential (Mean score 3) and rank I. However perceived feasibility index was observed 92 per cent for relative advantage, compatibility index was found 78.66 per cent by users. Again, all the respondents reported that these masks were in accordance with norms and values (Mean score 3), technology is interesting and need based (Mean score 2.45), according to existing practices (Mean score 2.30). Regarding simplicity/ complexity, all the respondents reported that use of protective masks increased their work efficiency (Mean score 3), resource simplicity (Mean score 2.87) and easy to use (Mean score 2.80), respectively. Overall PFI for simplicity/ complexity was found 82.86 per cent. Trial ability attribute of the respondents was found 71.5 per cent. However, highest score was assigned to results are visible (Mean score 2.92) followed by 'Can communicate easily' (Mean score 2.25), 'Provision of modification' (Mean score 1.95), 'Can be demonstrated' (Mean score 1.87) and 'Can be tried at field level' (Mean score 1.75),

respectively. The results are in line with findings of Dahiya and Yadav, 2017.

CONCLUSION

Farmers face several health hazards/ problems in agricultural operations especially in winnowing and threshing. These operations are mostly handled by female farmers. On farm trials are crucial tool for testing and refinement for new technology developed for farmers. Four type of masks namely pleated, beak, scarf and capron were developed to reduce health problems. These were tested on 20 males and 20 female farmers at field level in peak season winnowing and threshing. Scarf mask and pleated masks were found most suitable by female and male farmers, respectively. Suggestions were given by the farmers to modify the masks after using for one month interval. Farmers preferred cambric cotton rather than voile and poplin with thin elastic at sides of masks. They perceived the technology as low initial cost, multiple uses potential and in accordance will norms and values.

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