

# Designing and Construction of Protective Clothing for Agricultural Workers

Gogoi N., Choudhury S., Gogoi M.

**Abstract**— To promote high degree of physical and mental health of the worker in workplace, use of protective clothing was thought to be very much important. Health status of Agricultural workers can be enhanced by using protective functional clothing as it is a means of prevention and control of occupational health hazards among various agro base activities. The study was conducted in Jorhat district of Assam to find out the occupational health hazards of worker engaged in various Agricultural activities and attempt was made to study their consciousness regarding their dressing pattern to combat their hazardous working condition. The primary data were collected with the help of questionnaire, a protective clothing kit was developed and acceptability of developed garments were analysed.

**Index Terms**— protective, health hazard, acceptability, workplace.

## I. INTRODUCTION

India has world's largest number of agricultural workers. Agriculture is the back bone of India economy. In India, 58.4 % of population depend on agriculture for their livelihood security. In Assam, both men and women are engaged in agricultural work and many health related problems like nausea, vomiting, headache, skin irritation etc are faced by them. The people in the state of Assam is basically depend on Agricultural activities mainly the production of paddy crops (rice) and other vegetables like wheat, lady's fingers, brinjal and other horticultural crops. They have to work in hazardous condition like exposure to sunlight, dust, dirt etc while performing different activities like weeding, harvesting, threshing, de-husking, cleaning and packaging of crops. Many of them were not aware about the harmful effect created by strong UV light of the Sun and other micro organisms mixed with soil and also dust particles. It is only protective clothing which protects individuals who are exposed to life threatening or hazardous environment during work. Keeping in view the above health related discomfort a study was carried out to develop protective clothing kit for Agricultural worker with the following objectives.

## II. OBJECTIVES OF THE STUDY:

1. To develop protective clothing.
2. To access the acceptability of developed garments.

**Dr. (Mrs.) Nabaneeta Gogoi**, Dept. of Textiles & Apparel Designing, College of Home Science, Assam Agricultural University, Jorhat-13, Ph. No. 94354-72166,

**Dr. (Mrs.) Swapna Choudhry**, Dept. of Textiles & Apparel Designing, College of Home Science, Assam Agricultural University, Jorhat-13, Ph. No. 98599-34878 **Dr. (Mrs.) Minti Gogoi**, Dept. of Textiles & Apparel Designing, College of Home Science, Assam Agricultural University, Jorhat-13, Ph. No. 98590-29037

## III. MATERIALS AND METHODS:

- **Selection of Area:** The study was conducted in Jorhat district of Assam.
- **Sample size and sampling techniques:** Sample size of 50 was selected by purposive sampling technique. Samples were taken to assess the suitability of developed protective
- **Clothing/accessories** for both male and female farm workers during agricultural activities.
- **Collection and analysis of data:** Data were collected in the work field by personal interview about different problems faced by worker with their existing dress pattern while working in the field.
- **Design development and pattern making for protective clothing:** Considering the work situation and the probable risk factor related to agricultural activities, three garments namely head dress ,apron, pant and were designed and developed .
- The fabric selected for the garments are plain cotton and viscose rayon blended material. The drafting instruction for the protective clothing kit was existing herewith.
- **Acceptability of developed designs: Acceptability of developed designs**
- **Analysis of data:** Acceptability of developed designs were analysed by using of data. Three different scores were given as 3 for highly suitable, 2 for suitable and 1 for somewhat suitable. Weighted mean score (WMS) were calculated from the number of respondent against each characteristics of functional features. Finally WMS were analysed for suitability level as in the following ranges: Highly suitable (H S): 2.34-3.00\*\*\*, Suitable(S): 1.67-2.33\*\*, Somewhat suitable 1 (SWS).00-1.66\*

$$WMS = \frac{\text{No of respondent} \times 3 (HS) + \text{No of respondent} \times 2 (S) + \text{No of respondent} \times 1 (S)}{\text{Total no of respondent}}$$

## Development of protective clothing kit:

(i) **Head dress:** Head dress is consisting five pieces designed to cover the head till the neck portion. It is round in shape from the forehead and slightly rounded at the top. A separate piece is attached to cover the front round shape. The piece is a combination of net and plain fabric of the same material of the head dress. Net covers the eyes and the nose and the other piece covers the mouth portion. Plain seam with interlocking is used to stitch it.

**The basic design features** of the head dress is a net attached to the front to cover the eyes and the nose. Bottom line of the head dress is slightly tapering and slanting towards the front neck line.

(ii) **Apron:** It is a full sleeve shirt with front opening is constructed with plain seam, finished with interlocking stitch.

Neckline is finished with facing. Two patch pockets with flap are attached on front side, at the hip level. Bottom fold is finished with machine stitch. Elastic is inserted at the bottom of the sleeve. Button and buttonhole are used as fastener. The basic features of the apron are round neck, front opening, elastic at bottom sleeve, patch pocket with flap.

(iii) **Pant:** a) **Construction details:** The pant is constructed with plain seam, finished with interlocking stitch. Elastic is inserted at waist and bottom line.

b) **Design features:** Straight pant with elastic at waist and ankle.

c) **Material selected:** Plain cotton and Viscose rayon blended material.

**Drafting instructions of the developed protective kit are given below**

Drafting Instructions:

**APRON**

Required Measurements:

- Round chest : 44"
- Shoulder width : 19"
- Round neck : 15"
- Full sleeve length : 24"
- Length of shirt : 30"

**Back:**

Construction details:

AB (Total length required) on fold)

AC = 1/2 of shoulder width

AD = 1/4 of Round Chest

DD' = 1/4 of Round Chest + 2"

For ease = 11"

BB' = DD'

Join D'B'

CE = 1" towards C

AA = 1/6 of round neck

AF = 1/2"

Join FA'

With onward curve and join A'E with straight line.

Join ED with a curve.

**Front-**

AB = 28 (length)

AC = 4" for placket opening

CC = AB

In BC'

Take from C 1/2 of cross back

Mark from C 1/2 cross back and mark CE = 9" (1/2 of the chest)

EF-1/4 of chest + 2" for ease

DF-perpendicular on EF

Go down 1" from D mark G

From C mark 2.4 (1/6 of round neck)

CI = 1/6 of round neck - 2.4

Join IH inward curve

Join AI inward curve

Take midpoint of GD and mark J.

From J take 1/2 in mark K

Join GKF' with arm hole curve take

FF'// to EC'

Join C'F'.

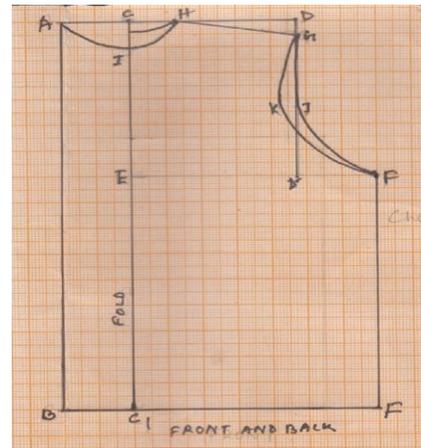


Fig 1: Apron(a and b)

**SLEEVE**

AB= Length on fold.

AC=1/4 of chest = 9"

CD=AB

Join BD

AB on fold

From A take 1/12=3" of chest towards

B then mark E'E' to AC

Join AE'

Take the middle point of AE' and mark F

From F take 1" mark G

Join AGE with outward curve

Take the middle point of FG mark H

Join AHE' with curve

From D take 1 1/2" inward

Mark I

Join E'I straight.

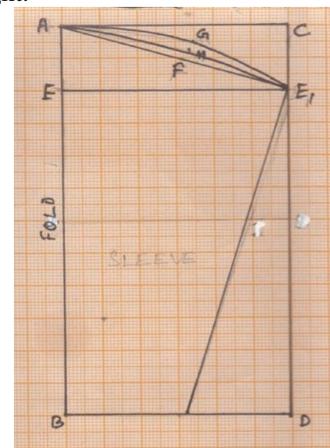


Fig 2 Sleeve

**PANT**

Measurements:

- Total length : 39.5"
- Crotch length : 14"
- Inside leg length : 29"
- Waist circumference : 24 (with elastic)
- Bottom circumference : 13 (with elastic)

**Front:**

BF= (1/2 Bottom-1")

Join DF with a curve for the inner leg

Join E<sub>1</sub>D with a curve for the fork line.

**Back :**

Join  $DE_1$  with a straight line.  
 G up 1" from  $E_1$ . Mark G.  
 Go out 1½" from D. Mark H, and 1" from F. Mark I.  
 Join IH with a slight inner curve and GH with a curve for the back fork line  
 Join AG with a straight line for the waist.

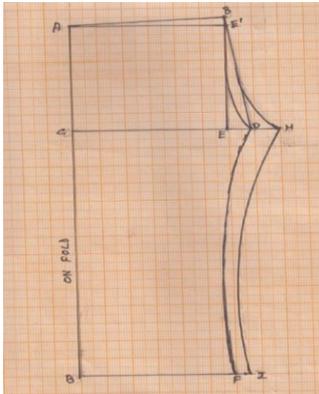


Fig 3: Pant

**HEAD DRESS**

The head gear consists of 5 pieces.

**No. 1. (Cut - 2)**

- AB = 11"
- BC = 10½"
- AE = 7"
- DC = 4"

Join ED with curve where the curve from D should be flat for 2 ½"

**No. 2(Cut-1)**

- ABCD is a rectangle where
- AC = 11" = BD
- AB = CD = 5"
- Slightly rounded at A and B

**No. 3. (Cut-1)**

- AB = 6"
- BD = 5"
- A and C is slightly rounded.

**No. 4. (Cut-1)**

- AB = 7"
- CE = 6"
- a curve
- Join AEB

**No. 5. (Net) AB=7"**

- CC' = 3"

Join AC'B with

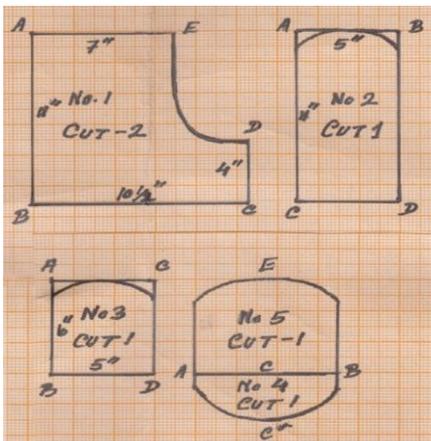


Fig 4: Head dress

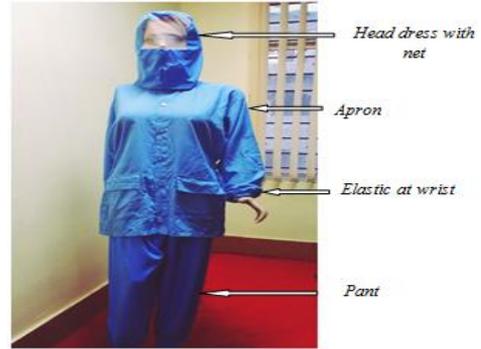


Plate1: Developed functional garments

IV. RESULT AND DISCUSSION:

The results of acceptability of functional features developed garments were summarized below:

Table I : Acceptability of designed protective kit for farm worker (cutting) N=30

Functional features of garments	Characteristics of functional features	Highly suitable 3	Suitable 2	Somewhat suitable 1	WMS
<b>Apron</b>					
Length	Adequate length	11	19	-	2.36***
	Comfortable to work				3.0**
Round neck	Protect arm from husk/dust	12	18	-	3.0**
Long sleeve	Protect from itching/cut				
Elasticized cuff		9	18	3	
Patch pocket with flap	Position of pocket				2.3
	Shape & size of the pocket for keeping necessary things.	10	20	-	2.6**
	Flap prevent accumulation	12	18	4	2.4**
		16	10	6	
		12	12		2.2
<b>Pant</b>					
Elasticized waist & ankle	Adequate length	14	16	-	2.46***
	Adequate crotch length				2.8**
	Protect from itching/cut	7	19	4	2.6**
	Comfortable to work	20	10	-	3.0**
	Easy to put on	18	12	-	2.56***
		17	13		

Suitability level: Highly suitable: 2.34-3.00\*\*\*, Suitable: 1.67-2.33\*, Somewhat suitable 1.00-1.66\*

## Designing and Construction of Protective Clothing for Agricultural Workers

The length of the apron was found highly suitable which showed weighted mean score 2.36. The long sleeves of the apron were found highly suitable to protect the arm from husk/dust (WMS-3.0), itching and cut (WMS-2.3). The patch pocket with flap was found to be suitable in all respect such as position of pocket (WMS-2.6), shape & size of the pocket for keeping necessary things (WMS-2.4) and the flap prevent accumulation scored WMS-2.2.

❖ The length of the pant scored highly suitable (WMS-2.46) for average workers. It has adequate crotch length showing WMS- 2.8 and was highly suitable (WMS-2.6) as the garment protects the legs of the wearer from itching and cut during cutting of paddy crops. The elastic at waist and ankle was also found highly suitable (WMS- 3.0) as it made the pant easy to put on and off. Hence the pant was found comfortable (WMS- 2.56) to wear by the workers engaged in harvesting activity.

❖ In place of mask, a head gear was developed which was found highly suitable to protect the head from dust (WMS – 2.93) and sunlight (WMS-2.3 ). The head dress found to be very easy to put on and put off. (WMS 2.46)

❖ The length of the head gear was found adequate. The net used in the front was also found highly suitable to protect eyes, nose and mouth which scored WMS -2.5 3, WMS -2.6 , WMS -2.56 respectively.

### V. DISCUSSION:

As result depicted in Table 2, the developed apron was found highly suitable by the wearer. The developed headgear was also found highly suitable and protect the head from sun. The net attached was able to prevent eyes from dust and dirt and easy to breath, so there was no adverse effect reported by the worker. The developed pant was also found comfortable by the wearer to work with.

### VI. CONCLUSION:

The people in the state of Assam is basically depend on Agricultural activities mainly the production of paddy crops (rice) and other vegetables. They have to work in hazardous activities while performing different activities. Many of them were not aware about the harmful effect created by strong UV light of Sun and other micro organism mixed with soil. They are dealing with heavy dirt & dust while performing agriculture activities. Protective clothing help to protect farmers from harsh climatic conditions while doing farm activities such as ploughing, sowing, weeding, pesticide application, threshing and harvesting. It also protect health from the dust particles, itching, pesticides, insects, UV radiation of the sun. The well designed protective clothing for the farm workers reduced their occupational health hazards and increased their work efficiency.

To overcome their occupational health hazard, protective clothing /accessories were designed and tested for their suitability and acceptability. Suitability assessment of designed protective clothing highlighted that all the functional features incorporated in the garments/ accessories were assessed to be highly suitable as they provided protection to

the wearer without causing any health problem or the hindrance while working.

Recommended protective clothing for pesticide applicators are Dress Jacket with hood and pyjama of water proof fabric (having lining of cotton hosiery fabric), Mask resistant to chemicals (Respirator particulate), Glasses/goggles, Sports shoes and Surgical gloves. Recommended protective clothing for threshing period are Apron with hood and full sleeves with elasticized cuffs (for males), Kameez with full sleeves preferably elasticized cuffs (for females), Pleated mask / beak mask, Glasses/goggles and Sports shoes.

Under the Plantation Labour Act, 1951, employers are required to provide ration, fuel, housing, maternity benefits and free medical, treatment to the workers, appoint welfare officers, make primary education compulsory for all and have crèches where there are more than 50 women employees

### REFERENCES

- [1] Gogoi, M(1997) Protective Clothing for Agricultural worker. Seuj Chinta.PP-39
- [2] Gupta, D.(2011) Functional clothing-Definition and Classification The Indian Journal of Fibre & Textile Research.vol-36.pp-321-326
- [3] .ILO/WHO, 1995 : Occupational safety and Health, retrieved from [www.agius.com/hew/resource/ohsilo.htm](http://www.agius.com/hew/resource/ohsilo.htm) dated 23.03.12