

Green Fashion Trend Strategy via Zero Waste using Biofinished Cellulosic Fabrics

Alaa A. Elsayed

Textile and clothing, Home Economics Department Faculty of Women for Arts, Science and Education, Ain Shams University, Cairo Egypt, Alaa.elsayed@women.asu.edu.eg

Wafaa A. Elsayed

Textile and clothing, Home Economics Department Faculty of Women for Arts, Science and Education, Ain Shams University, Cairo Egypt

Maha M. T. Eladwi

Textile and clothing, Home Economics Department Faculty of Women for Arts, Science and Education, Ain Shams University, Cairo Egypt

Rania N. Shaker

Textile and clothing, Home Economics Department Faculty of Women for Arts, Science and Education, Ain Shams University, Cairo Egypt, mozo2008.rn@gmail.com

Abstract:

Zero waste design technique of garment production was adopted to implement sustainable green fashion trend using biofinished cellulosic fabrics. **Objective:** The aim of this work is to design and apply green fashion designs for women using biofinished cellulosic fabric finished via acid cellulose enzyme and applying zero waste technique i.e., cut and drape technique. **Method:** Five sustainable fashion designs created for women between (20-40) years old were drawn and implemented taking into consideration zero waste design techniques, cut and drape, best fit and appearance, as well as elimination waste of cutting process, functional, aesthetical, elements and principles was evaluated. **Results:** The 5 designs designed, were implemented taking into consideration zero waste technique (cut & drape). The technique itself as well as fitting and appearance were evaluated by questionnaire sheet. Each of the applied designs fulfilled the criteria (Visual Appearance- Garment fit- Sustainability- Manufacturability) of zero waste technique. **Recommendation:** It is recommended to use the technique as it seems to be feasible, ecological, and economically in mass production and may social benefits could be realized.

Keywords:

Green fashion- Cotton
fabric- Zero waste-
Biopolishing- Fashion
design

Paper received 25th March 2023, Accepted 19th June 2023, Published 1st of July 2023

I- Introduction:

Fashion expression is constantly evolving towards new directions. It is a state of mind such as a spirit, whisper, scream, knowing wink and a smile, translating self-esteem into a personal style. [1]

Textile and clothing industry is 2nd largest contributor in industrial pollution, so the green fashion is coming as a new trend, refers to all clothing that has been manufactured using environmentally friendly processes. It includes organic textiles, means clothes that have been made with a minimum use of chemicals and with minimum damage to the environment to achieve better prices, decent working conditions, local sustainability and fair terms for farmers and workers in the developing world. [1] [2]

Fashion designers apply green fashion trend in

clothing making process focusing to decrease harmful side effects of fashion industry using sustainable materials and renewable source energy, eco-chic design, textile recycling, clothing reuse options, and zero-waste fashion. For that the new trend to apply in fashion production is creative pattern cutting via apply creative strategies (zero waste) to cut, drape, or manipulate pattern when producing a prototype for a certain garment design. [3]

The aim of this work is to design and apply green fashion designs for women using biofinished cellulosic fabric finished via acid cellulose enzyme and applying zero waste technique i.e., cut and drape technique.

II- Experimental Work

Five fashion designs for women between (20-40)

years old were designed and implemented using zero waste techniques.

2.1. Materials used:

- Cotton fabric 100% with different fabric constructions, supplied by El mahala – Textile factories -Egypt, was used.
- Cellulase enzyme – chemicals supplied by Heliopolis Printex factory – Elobour city - Egypt, were used.
- Sewing Equipment – Sewing threads-embroidery strips, appliques, and ribbons (local market), were used.

2.2. Methods:

- Biopolishing:

Cotton fabric was finished using cellulase enzyme (2 g/l) at 50°C for 30 min, followed by rinsing and drying. [4] [5] [6]

- Zero waste techniques:

Cut and drape using zero waste technique were applied to the finished fabrics.[7] [8]

- Questionnaire sheet:

Questionnaire sheet was designed, judged, evaluated, and analyzed as showed in fig. (1)

The research required the construction of a questionnaire to evaluate the implemented and proposed designs.

Zero-waste fashion refers to the items of clothing that produce little or no fabric waste in their production.

Zero-waste pattern cutting (ZWPC) is an approach, a concept and a design philosophy that aims to utilize the whole area of fabric within a given length for making one or more garments.

Bio-polishing is a finishing process that enhances fabric quality by decreasing the pilling tendency and fuzziness of (cellulose) fabrics.

Please read the questionnaire statements and register your response by marking (✓) what is consistent with your opinion according to the five levels of the questionnaire terms {very agree (5), agree (4), agree to some extents (3) do not agree (2), do not agree at all (1)}.

Please do not leave any words unmarked and attached to the design photo questionnaire.

1. Job:
2. Specialty:
3. Years of specialization experience:
4. Workplace:
5. Date:

Finally, many thanks and appreciation for your cooperation

		First design	Second design	Third design	Fourth design	Fifth design
The functional aspect	1-The design fits the women’s age from (20-40) Year.					
	2-The design fits the sizes of (36-48) size.					
	3-The chosen technology achieved satisfied level in design and application.					
	4- The design is suitable to be a marketable product.					
	Overall acceptability of the aspect.					
The aesthetic aspect	1-The design shows aesthetic touches.					
	2- The technology added an aesthetic dimension helped to produce trendy design.					
	3-Design keeps up fashion recent trends.					
	Overall acceptability of the aspect.					
Elements of fashion	1-Overall acceptability of fashion design elements. (line-shape-color-texture)					
Principle of fashion	1-Overall acceptability of fashion design principles. (Balance-proportion-emphasis-harmony-rhythm)					

Fig. (1): Questionnaire sheet

2.3. Zero waste patterns:

The designs and their patterns are showed as

following:

2.3.1. zero waste pattern No. {1}



Fig. (2) zero waste pattern No. {1}

Pattern width: 70cm

Pattern length: 3.8m

Technique: Zero waste Cut & Drape

The pattern as showed in fig. (2) divided to six parts, just slash the horizontal lines to obtain design cuts.

The zero waste technique was implemented by (3.8m) length of biofinished cotton gauze fabric with (70cm) width. Firstly, 2pieces of (80cm) length cut and folded to make each side of upper front and back opened Japanese sleeve cuts. Secondly, 4 pieces of (55cm) length attached and

gathered to sew the skirt with upper cuts.

Consumption calculations [9]:

Fabric total consumption to make the dress: (3.8m)

Fabric wastage: Total – Used = Waste

$$3.8m - 3.8m = 0 m$$

Total consumption: Total - Waste = Used

$$3.8m - 0m = (3.8m) \text{ used}$$

Zero waste percentage = $\frac{\text{Used}}{\text{Total}} \times 100 = \frac{3.8m}{3.8m} \times 100 = 100\%$

2.3.2. zero waste pattern No. {2}

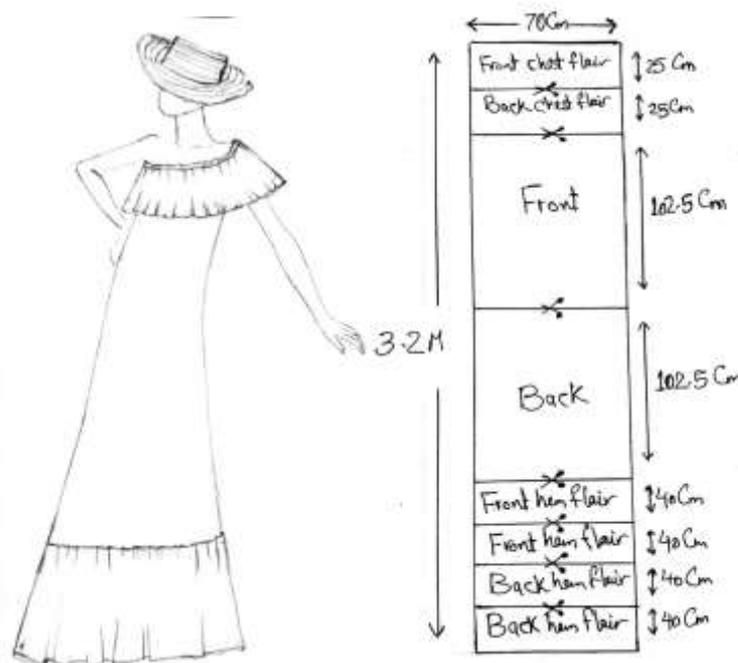


Fig. (3) zero waste pattern No. {2}

Pattern width: 70cm

Pattern length: 3.2m

Technique: Zero waste Cut & Drape

The pattern as showed in fig. (3) divided to eight parts, just slash the horizontal lines to obtain design cuts.

The zero waste technique was implemented by (3.2m) length of biofinished cotton gauze fabric with (70cm) width. The main front and back parts made by 2 pieces of (102.5 cm) length, 2 pieces of (25cm) length attached then sew at the upper of the

dress and 4 pieces of (40cm) length sew and gathered at the hem of dress.

Consumption calculations [9]:

Fabric total consumption to make the dress: (3.2m)

Fabric wastage: Total – Used = Waste

$$3.2\text{m} - 3.2\text{m} = 0\text{ m}$$

Total consumption: Total - Waste = Used

$$3.2\text{m} - 0\text{m} = (3.2\text{m}) \text{ used}$$

Zero waste percentage = Used/Total × 100 =

$$3.2\text{m}/3.2\text{m} \times 100 = 100\%$$

2.3.3. zero waste pattern No. {3}

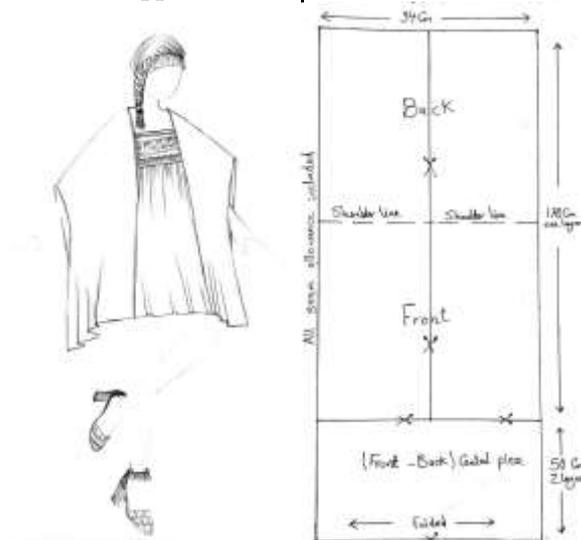


Fig. (4) zero waste pattern No. {3}

Pattern width: 94cm

Pattern length: 2.7m

Technique: Zero waste Cut & Drape

The pattern as showed in fig. (4) divided to four parts, just slash vertical and horizontal lines to obtain design cuts.

The zero waste technique was implemented with (2.7m) length of biofinished cotton fabric with (94cm) width. The main front and back center cuts made by 2 pieces of (50cm) length and one piece of (170cm) separated lengthly to make the main sides

of dress.

Consumption calculations [9]:

Fabric total consumption to make the dress: (2.7m)

Fabric wastage: Total – Used = Waste

$$2.7\text{m} - 2.7\text{m} = 0\text{ m}$$

Total consumption: Total - Waste = Used

$$2.7\text{m} - 0\text{m} = (2.7\text{m}) \text{ used}$$

Zero waste percentage = Used/Total × 100 =

$$2.7\text{m}/2.7\text{m} \times 100 = 100\%$$

2.3.4. zero waste pattern No. {4}



Fig. (5) zero waste pattern No. {4}

Pattern width: 94cm

Pattern length: 3.2m

Technique: Zero waste Cut & Drape

The pattern as showed in fig. (5) divided to two parts, just slash the horizontal lines to obtain design cuts.

The zero waste technique was implemented with (3.2m) length of biofinished cotton fabric with (94cm) width. The front and back parts made by 2 pieces of (160cm) length.

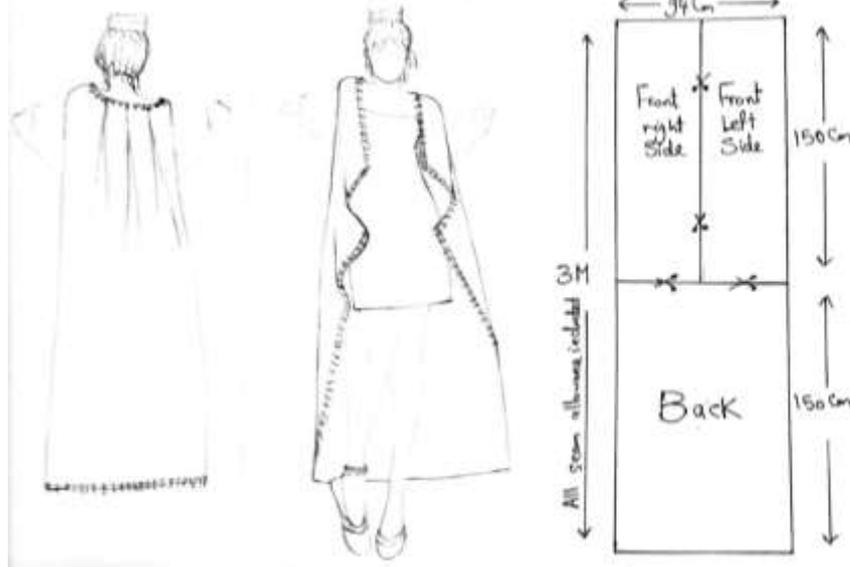


Fig. (6) zero waste pattern No. {5}

Pattern width: 94cm

Pattern length: 3m

Technique: Zero waste Cut & Drape

The pattern as showed in fig. (6) divided to three parts, just slash vertical and horizontal lines to obtain design cuts.

The zero waste technique was implemented with (3m) length of biofinished cotton fabric with (94cm) width. The front and back parts made by 2 pieces of (150cm), one of them for back and the second separated lengthly for front two sides

Consumption calculations [9]:

Fabric total consumption to make the dress:(3m)

3.1 Product No. {1}

Consumption calculations [9]:

Fabric total consumption to make the dress: (3.2m)

Fabric wastage: Total – Used = Waste
 $3.2m - 3.2m = 0m$

Total consumption: Total - Waste = Used
 $3.2m - 0m = (3.2m)$ used

Zero waste percentage= Used/ Total $\times 100 = 3.2m/3.2m \times 100 = 100\%$

2.3.5. zero waste pattern No. {5}

Fabric wastage: Total – Used = Waste

$3m - 3m = 0m$

Total consumption: Total - Waste = Used

$3m - 0m = (3m)$ used

Zero waste percentage =Used/Total $\times 100 = 3m/3m \times 100 = 100\%$

Discussion:

The five zero waste designs drawn taking into considerations elements and principles of fashion design. The following criteria of zero waste technique was implemented (Visual Appearance- Garment fit- Sustainability- Manufacturability). [3]

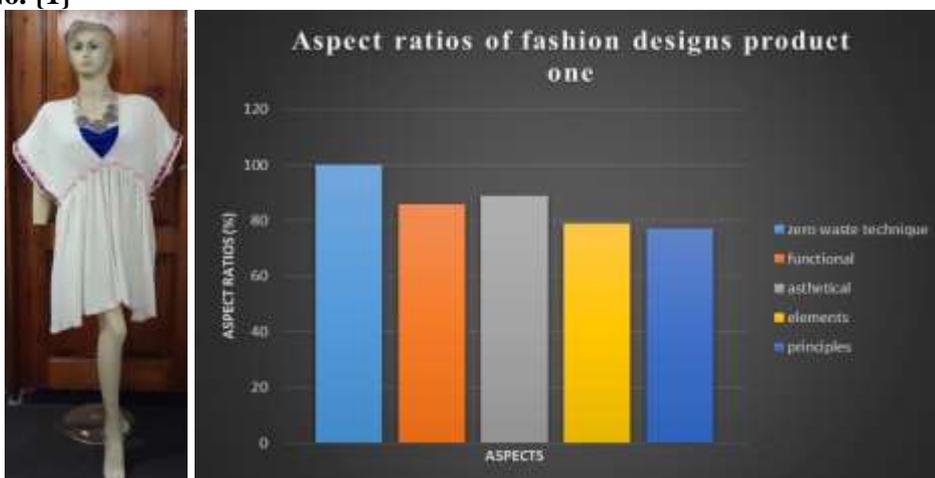


Fig. (7): Aspect ratios of fashion design in product one

Used fabric: Biofinished Cotton Gauze Fabric

Textile construction: Plain {1/1} open structure

Finishing: Softening Enzyme

Technique: Zero waste Cut & Drape

Consumption calculations: Zero waste percent =

$$\text{Used/ Total} \times 100 = 3.8\text{m}/3.8\text{m} \times 100 = 100\%$$

Fig. (7) shows the aspect ratios of fashion design in product one, the outfit of the product represents simple wide fitting design with symmetrical lines appear on V-neck which allow ease the dress & undress during usage. The Japanese sleeves attached with wide gathered skirt at ampeir cut line giving loose calm feminine look which helping in increase the functional aspect to 86% as showed in the fig. (7). According to the functional aspect, the outfit represents morning and beach times summer

3.2. Product No. {2}

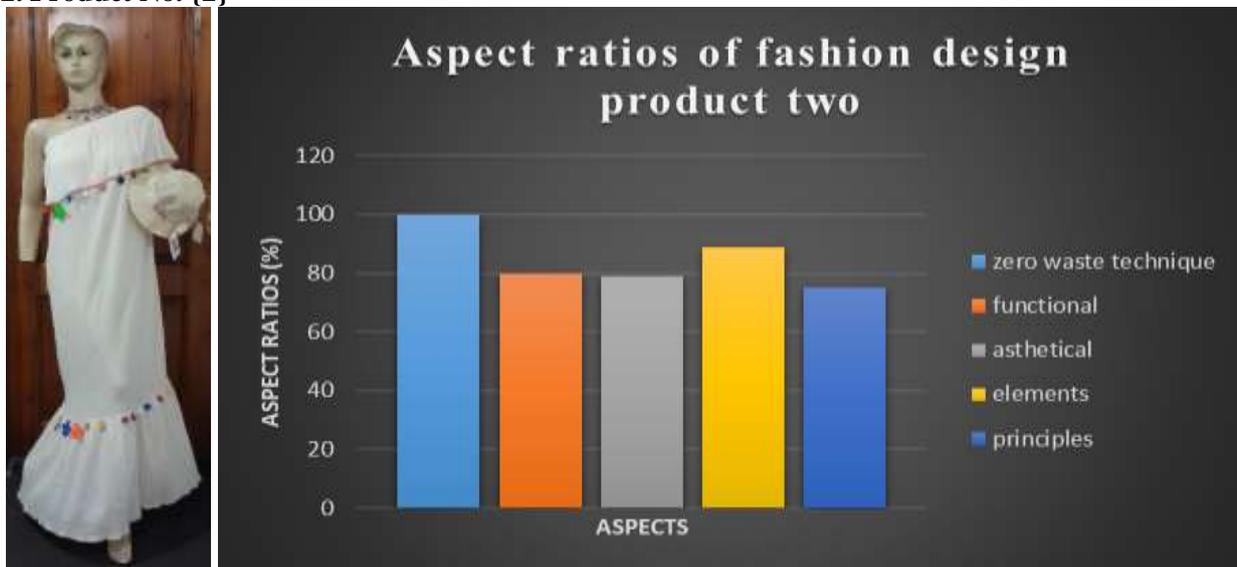


Fig. (8): Aspect ratios of fashion design in product two

Used fabric: Biofinished Cotton Gauze Fabric

Textile construction: Plain {1/1} open structure

Finishing: Softening Enzyme

Technique: Zero waste Cut & Drape

Consumption calculations: Zero waste percent =

$$\text{Used/Total} \times 100 = 3.2\text{m}/3.2\text{m} \times 100 = 100\%$$

Fig. (8) shows the aspect ratios of fashion design in product two, the outfit of the product represents long simple drop off shoulder dress with mixed diagonal and curved lines which giving interest and attracting eyes to whole design. Two gathered cuts added, one with elastic band at chest and the other gathered with the dress under knees producing obvious repeated harmony with decorative colored added as wooden units to giving good transition giving aesthetic aspect with 79% as showed in fig.

dress.

Decorative colored bands(strips) added on sleeve hem attracts eye with feeling of good rhythm, the repetition of the same colors represents in hem sewing threads enhance the harmony leads to reach trendy look which give 89% as showed in the fig. (7).

As showed in fig. (7), the elements of the design of the product implemented showed 79% and the principles of design showed 77% respect to zero waste product which showed 100%.

So, the overall analysis of the implemented product as showed in the fig. (7) mentioned the following sequences of the aspects with respect to the product such as: aesthetical > functional > elements > principles.

(8). According to the functional aspects, this outfit represents a dress style which can wear without shoulder or with armholes, also able to wear with one shoulder style supporting the concept of having different looks of the same item which help to increase the functional aspect to 80% as showed in fig. (8).

As showed in fig. (8), the elements of the design of the product implemented showed 89% and the principles of design showed 75% with respect to zero waste product which showed 100%.

So, the overall analysis of the implemented product as showed in the fig. (8) mentioned the following sequences of the aspects with respect to the product such as: elements > functional > aesthetical > principles.

3.3. Product No. {3}

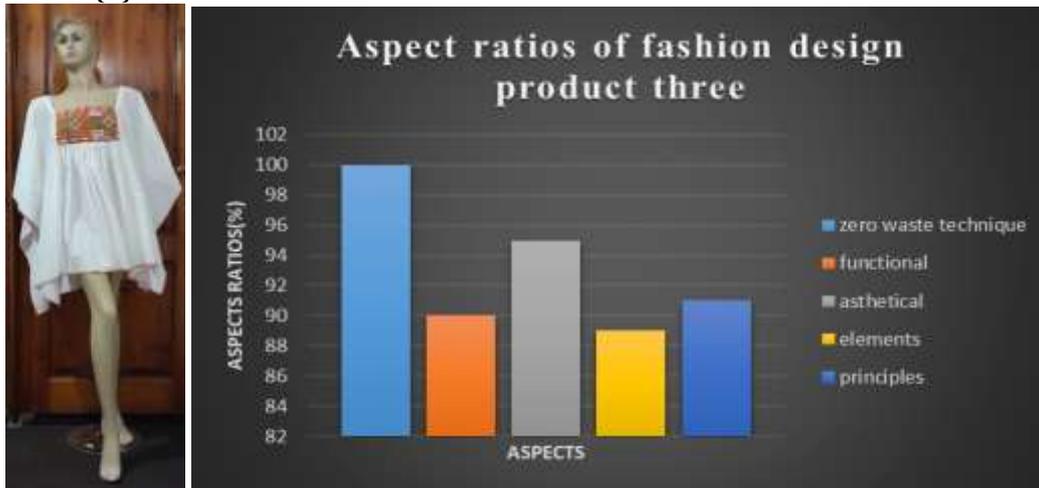


Fig. (9): Aspect ratios of fashion design in product three

Used fabric: Biofinished Cotton Fabric

Textile construction: Plain {1/1}

Finishing: Softening Enzyme

Technique: Zero waste Cut & Drape

Consumption calculations: Zero waste percent = $\text{Used/Total} \times 100 = 2.7\text{m}/2.7\text{m} \times 100 = 100\%$

Fig. (9) shows the aspect ratios of fashion design product in three, the outfit represents semi traditional short dress (tunic) design with glamour wide colored handmade trimming band gives central and radial spirit of interest and nice attraction giving high aesthetic aspect leads to reach trendy look which give 95% as showed in the fig. (9). According to the functional aspects, this outfit represents a tunic with symmetrical rectangular neck opening mixed with design vertical cut lines

and fabric gathered lines suggest continuous movement and creating pleasant look. Wide fitting, wide neck opening and opened Japanese sleeves give comfort and ease to wearer with looseness look which help to increase the functional aspect to 90% as showed in fig. (9).

As showed in fig. (9), the elements of the design of the product implemented showed 89% and the principles of design showed 91% respect to zero waste product which showed 100%.

So, the overall analysis of the implemented product as showed in the fig. (9) mentioned the following sequences of the aspects with respect to the product such as: asthetical > principles > functional > elements.

3.4. Product No. {4}

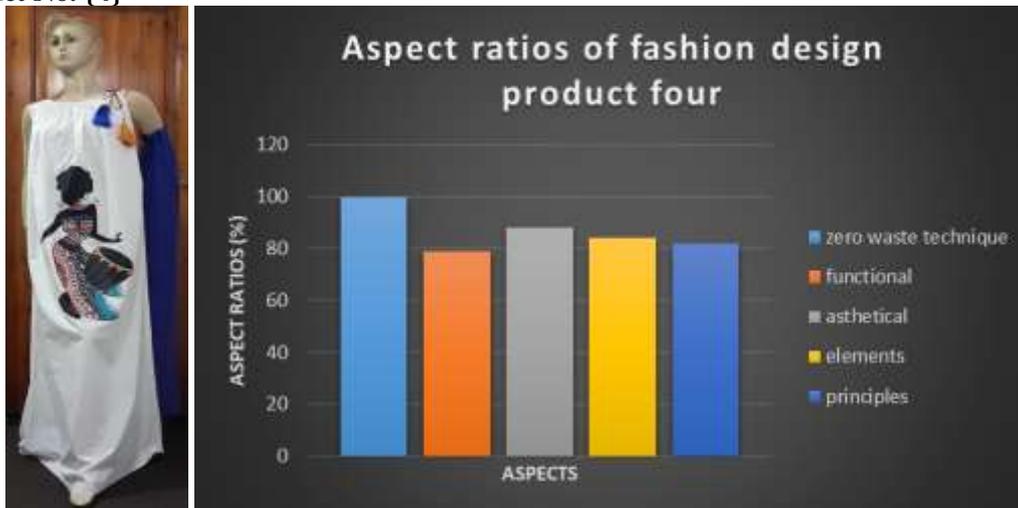


Fig. (10): Aspect ratios of fashion design in product four

Used fabric: Biofinished Cotton Fabric

Textile construction: Plain {1/1}

Finishing: Softening Enzyme

Technique: Zero waste Cut & Drape

Consumption calculations: Zero waste percent = $\text{Used/Total} \times 100 = 3.2\text{m}/3.2\text{m} \times 100 = 100\%$

Fig. (10) shows the aspect ratios of fashion design product four, the outfit represents long semi-A-line

dress style with semicircular gathered fabric neckline and tasseled tie represent simple feminine and smooth look with functional aspect 79% as showed in fig. (10).

According to asthetical aspect, transfer printing applied, photo of painted drummer girl with joyful and obvious contrast mixed colors gives pleasant look. Matching between necktie tassels colors and

colors of printing emphasize with eyes move up and down to reach trendy look which give aesthetical aspect with 88% as showed in fig. (10). As showed in fig. (10), the elements of the design of the product implemented showed 84% and the principles of design showed 82% respect to zero

3.5. Product No. {5}



Fig. (11): Aspect ratios of fashion design in product five

Used fabric: Biofinished Cotton Fabric

Textile construction: Plain {1/1}

Finishing: Softening Enzyme

Technique: Zero waste Cut & Drape

Consumption calculations: Zero waste percent = $\frac{\text{Used}}{\text{Total}} \times 100 = \frac{3\text{m}}{3\text{m}} \times 100 = 100\%$

Fig. (11) shows the aspect ratios of fashion design product five, the outfit with long wide opened cape with symmetrical simple design cuts, simple opened front with degradable length sides drapes and back with three fitting double pleats which give the feeling of looseness and draping represents the functional aspect with 79% as showed in fig. (11).

According to aesthetical aspect, cape borders decorated with colored tasseled strips (bands) and

waste product which showed 100%.

So, the overall analysis of the implemented product as showed in the fig. (10) mentioned the following sequences of the aspects with respect to the product such as: aesthetical > functional > elements > principles.

back painted with musical notes signs with the same colors of tassels which represent cheerful feminine look. The drapes, pleats and colors give eye balancing and emphasize design unity which give aesthetical aspect with 90% as showed in fig. (11).

As showed in fig. (11), the elements of the design of the product implemented showed 85% and the principles of design showed 83% respect to zero waste product which showed 100%.

So, the overall analysis of the implemented product as showed in the fig. (11) mentioned the following sequences of the aspects with respect to the product such as: aesthetical > elements > principles > functional.

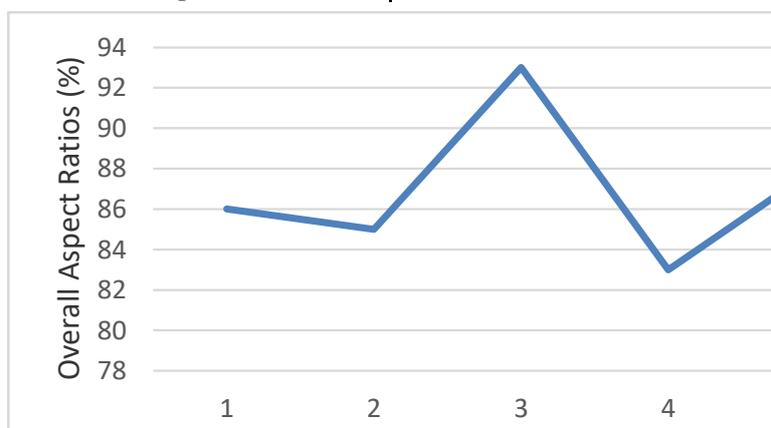


Fig. (12): Overall aspect ratios of products

Fig. (12) showed the overall analyses data of all products. Product three was the best one with 93% as a zero waste implemented product.

Conclusion:

Five designs were designed, then implemented taking into consideration zero waste technique (cut & drape). The technique itself as well as fitting and

appearance were evaluated by questionnaire sheet. Each one of the applied designs fulfilled the criteria (Visual Appearance- Garment fit- Sustainability- Manufacturability) of zero waste technique.

It is recommended to use the technique as it seems to be feasible, ecological, and economically in mass production and may social benefits could be realized.

References:

- 1- Naznin, K.& Barkat, R. (2018). Reusing Crafted Fabric and Zero Waste Fashion Approaches, *International Journal of Scientific & Engineering Research*, 9(9), 909-911
- 2- Mintel, 2009. Ethical Clothing –UK-2009. Mintel International Group Limited.
- 3- Nursari, F., & Djamal, F.H. (2019). Implementing Zero Waste Fashion in Apparel Design, 6 th Bandung Creative Movement International Conference in Creative Industries, 98-104.
- 4- Gübitz, G. M., Cavaco-Paulo, A. (2001). Biotechnology in the textile industry- perspectives for the new millennium. *Journal of Biotechnology*, 89(2-3), 89-90.
- 5- Mojsov, K. (2015). Comparison between conventional chemical processes and bioprocesses in cotton fabrics, *Tekstilna industrija*, 62 (1), 21-25
- 6- Mojsov, K., Janevski, A., Andronikov, K., Jordeva, S., Golomeova, S. &Gaber, S. (2020), Enzymatic Treatments for Cotton, *Tekstilna Industrija*, 68 (2), 12-17
- 7- Gupta, L. H. (2020). Achieving Sustainability through Zero Waste Fashion-A Review, *Current World Environment*,15 (2), 154-162.
- 8- Elahe Saeidi, V. W. (2015) "Precious Cut: A Practice-Based Research TowardZero-Waste Design by Exploring Creative PatternCutting Methods and Draping Techniques," , *International Textile and Apparel Association (ITAA) Annual Conference Proceedings*, Ames.
- 9- Pingki, Moni & Hasnine, Shamsad & Rahman, Md. (2019). An Experiment to Create Zero Wastage Clothing by Stitching and Slashing Technique. *International Journal of Scientific & Engineering Research*, 8 (1).