

Research Article

LEATHER WASTE INTO VALUE ADDED LEATHER PRODUCTS: A WASTE TO WEALTH APPROACH

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ABSTRACT

Production of finished leather as well as leather goods create various types of cutting wastage, solid wastes, and effluents which lead to immense environmental and atmospheric pollution along with biological chain destruction. To keep pace with the rapid development of the up-to-date leather industry, various innovative techniques have been developed and these should be cost-effective and eco-friendly. This study aims to identify the methods to utilize the waste generated from the leather products industries as raw material and convert into value added leather products. Seven small market-demand leather products like Headphone Holder, Decorative Skull, Key Rings, Earring-set, Doggy Belt, Bottle Holder, and Bracelets were prepared from leather cutting wastages. The pattern making and cost calculation was evaluated in a systemic way. Small leather goods need to be acceptable in the national or international marketplace. To survive in the marketplace, the designers and manufacturers especially who manufacture small leather goods from leather wastage should know the costing method and also need to know its acceptance by releasing prototype samples of their goods in the marketplace. The whole study is going to give a new business idea to the young entrepreneur as well as it will work as a solution for reducing leather wastage and save the environment.

Keywords: *Cutting wastage, recycling, waste reduction, cost-effective, leather goods.*

Introduction

Manufacturing is one of the vital sectors in any society, irrespective of being a high or low-income economy (Fisher *et al.*, 2018). Leather products are one of the most traded products globally as well as the leather products trade is presently exceeding the US \$80 billion per year and which is anticipated to grow as there is an increase in population and urbanization of the countries (Sivaram and Barik 2019). In Asia, leather footwear is the fastest-growing share of the leather industry of China, Bangladesh, India, and Vietnam. Bangladesh meets about 10% total demand of the world leather market (Akter and Al-Mahfuz 2019) but China is the largest leather producing country in the world with over 6.2 billion square-feet of leather produced every year and representing more than 25% of the annual global leather production (GLIF 2020). In terms of

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Bangladesh, leather and allied leather industries are the leading manufacturing industries based on availability of raw material, geographical environment, and manpower as well as is favorable for the development of leather and leather products industry (Swarna and Mia 2018).

Leather has become an integral part of our lives; we use from bag to the shoes. We wear almost each and everything that we use can be replaced with leather. However, the leather goods industry every day providing different leather products such as bags, ladies' purses, wallets, shoes, belts, etcetera but the industry providing also a huge amount of leather wastage during production, and mostly the cutting department is responsible for it. Leather is the raw material in the cutting department for producing products which is also very expensive where too much wastage can damage the prospect of an industry. Generally, out of 1000 kg of rawhide, nearly 850 kg of solid wastes are produced from leather industries, and only 150 kg of the raw material is converted into leather products (Zafar 2020; Yorgancioglu *et al.*, 2020). With traditional cutting, only 50–60% of the material is actually used as products and by digital cutting solutions companies can use up to 10% more of it. The largest quantity of waste is generated at the cutting step during production in the industry. The cutting rate for leather's range 25-60% (Ruiz 2020). Some of the wastage generated due to poor grain of leather which is not applicable for quality products, some of them are obtained from the interlocked space and some of them from the allowance wastage from production etc. The cutting damages in the middle of the hides/skin can make leather impossible to use for larger leather products such as sofas. Holes, notches, and cuts make a skin useless for manufacturing leather. Suitable knives and well-trained staff can ensure a good leather yield (LCW 2021). Therefore, valorization of these industries leather cutting wastages several methods and processes is vital for the perspective of eco-benignity and with respect to converting into new value-added products (Yorgancioglu *et al.*, 2020).

The industry can utilize the wastage by making small leather goods depending on the demand of customers. Small leather goods manufacturers have to come forward to utilize the large amount of leather wastage produced in leather goods industries. In this paper we are reporting an approach to reduce the amount of leather wastage by manufacturing some market-demand leather goods from the leather wastage which leads to make a profitable business idea. The small and medium categories entrepreneurs can easily collect these types of waste materials from the leather products industry and start a business by making and selling market-demand small leather goods.

Materials and Methods

Cutting Wastage Collection

The wastages were collected from Accenture Footwear and Leather Products Limited, Munsipara, Hemayetpur, Savar, Dhaka, industry as shown in Fig. 1 and sort out based on cow, goat, or calfskin, etc. Based on the color and texture of leather wastage another sorts out also done to provide a great appearance and a classy outlook to the consumers as leather goods or products. Range of color and design widen the selection range, which encourage the prospective users to wear these products to use in a multitude of ways, be it fashionable or functional. Based on this thinking, the cutting wastages were another sorting based on color and jewelry fashion fact (Mamun *et al.*, 2019).



Fig. 1. Different types of leather wastages.

Reinforcement Materials

Pattern paper: Pattern is the 2D form of 3D object. Basically, pattern is the primary formational design which actually show the measurements, size, design or shapes of the product to the designer. Pattern can be use as pattern paper or as plastic material sheet.

Lining: Lining is basically textile cloth which is use to cover-up the flesh side of the leather & to provide comfort during wear or use.

Adhesive: Adhesive is the chemical base solution which is use to provide a better adhesion between the pieces of leather or between leather with other reinforcement material.

Thread: Thread is the material which is use to provide permanent bond into folding area or between the joining portion of the two pieces.

Rivet: Rivet is the material use to join into punched area of leather components with the help of hammer, it has 2 parts.

Screw Rivet: Screw Rivet is the updated form of rivet. Used to join leather components. But anyone can open or close two components by rotating the screw of it.

Square Ring: Square ring is a metallic material which is generally use to make a loop.

Keyring: Keyring is a circle shape metallic material use to hold keys.

Button: Button is the material use to join two components. For that, anyone can easily open or close the join.

Supporting Tools

NT-cutter/Knife: Generally, for pattern cutting or leather cutting, this hand tool is used.

Scissor: Scissor is use to cut lining material, foam, leather or excess thread of the product.

Hammer: Hammer is generally used to hammering on folding or joining area & also sometime to attaching rivets or buttons on the leather products.

Hole-Puncher: Hole-puncher are different by their diameter's measurement. Generally this tool is use to make hole on leather.

Sequential Operation of Different Parts of Headphone Holder

Visualization and planning of design of a headphone holder were done (Fig. 2). According to the design, the pattern was prepared and then measured the area of selected wastage as well as also cut the leather by knife according to the pattern from the selected wastage. After cutting, the area all leather components were measured. Then two pieces of leather were attached using adhesive

and stitch. After that, it was punched on the leather with the help of puncher and hammer and also cut the punched area as a small slit to make an opening.

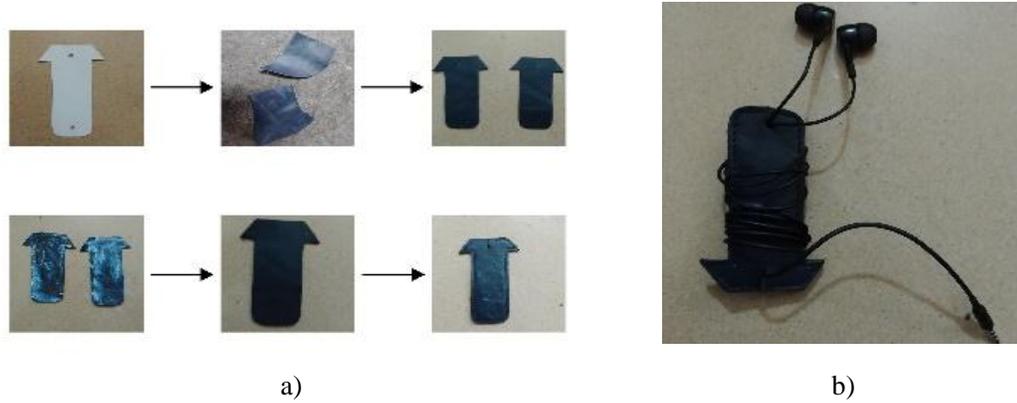


Fig. 2. Headphone holder (a) manufacturing process (b) final view.

Sequential Operation of Different Parts of Decorative Skull

Visualization and planning of design of a decorative skull were done (Fig. 3). According to the design, the pattern was made and then measured the area of selected wastage and also cut the leather by knife according to the pattern from the selected wastage. After cutting, the area of all leather components was measured. Then, it was punched on the leather with the help of puncher and hammer and then provide a hand-stitch into all punches area to make a 3D formation.

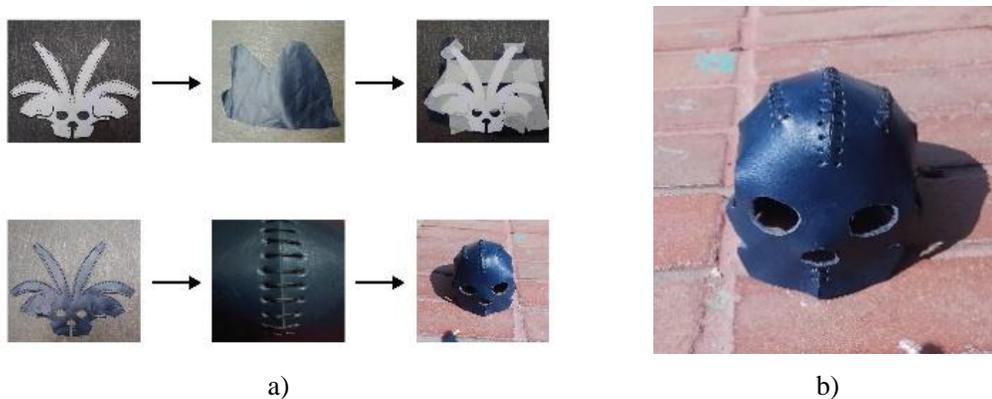


Fig. 3. Decorative Skull (a) manufacturing process (b) final view.

Sequential Operation of Different Parts of Leather Keyrings

The visualization and planning of two designs for leather keyrings were done (Fig. 4). According to the designs, the patterns were prepared and then measured the area of selected wastage and also cut the leather by knife according to the pattern from the selected wastage. After cutting, the area of all leather components was measured for each key ring separately. Then for the first one, two pieces of leather were attached by using adhesive and stitch. After that, it was punched on it with the help of puncher and hammer and attached a round ring & a keyring with it. On the other hand, for the second one, two pieces of leather were attached and foams using adhesive and folded the leather's

edge just up on the foams. After that, the loop was attached in the middle of two foams by applying adhesive and stitch. Finally, the attachment of a round-ring and also a key-ring was done.

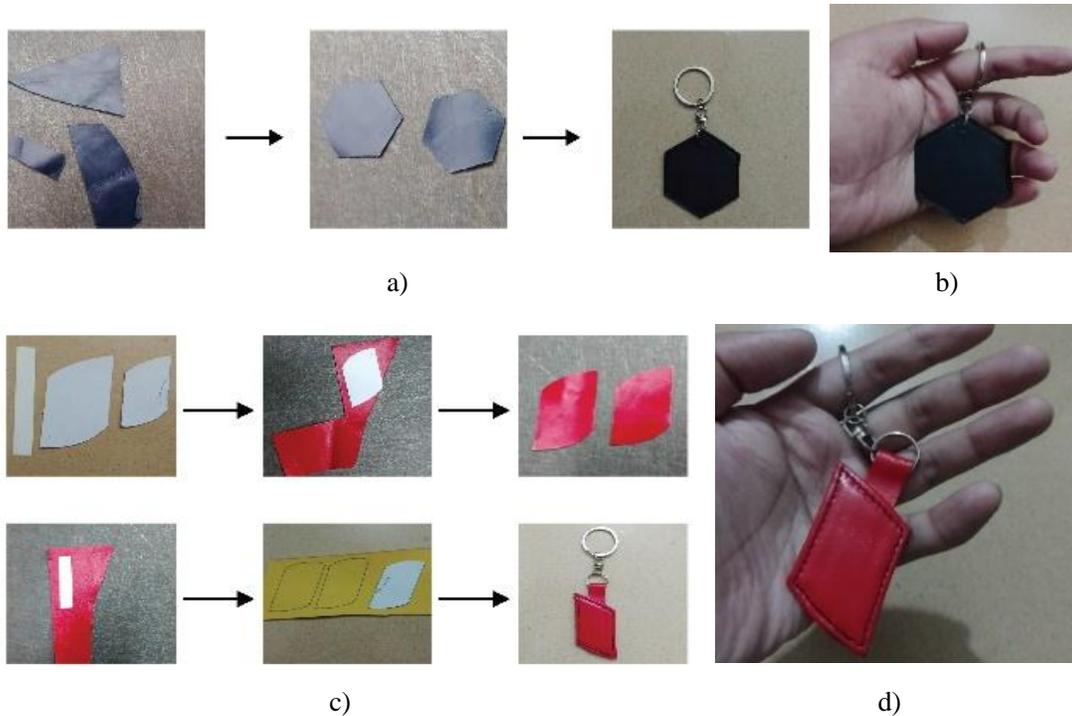


Fig. 4. Leather keyrings (a) manufacturing process of keyring-1 (b) final view of keyring-1 (c) manufacturing process of keyring-2 (d) final view of keyring-2.

Sequential Operation of Different Parts of Leather Earring-set

Visualization and planning of design for leather earring-set were done (Fig. 5). According to our design, the patterns were prepared and then measured the area of the selected wastage and also cut the leather by knife according to the pattern from the selected wastage. After cutting the area of all leather components was estimated. Then, the pieces of leather were attached using adhesive, punched on each with the help of a puncher and hammer successively. After that, a round ring & an earring were attached with each.

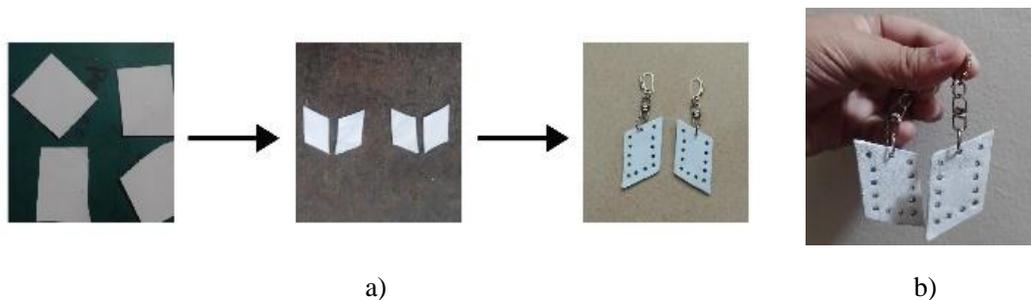


Fig. 5. Leather Earring-set (a) manufacturing process (b) final view.

Sequential Operation of Different Parts of Doggy Belt

Visualization and planning of design for a doggy belt was carried out (Fig. 6). According to our design, the pattern was prepared and then measured the area of selected wastage and also cut the leather by knife according to the patterns from the selected wastage. After cutting, the area of all leather components was measured. Then the punching on leather with the help of hammer and puncher was done. After punching, square rings attached to the punched area, and joined them by attaching rivets. Then the belt was made, attaching the belt with the front design by attaching rivets, and also attached two buttons on the belt.

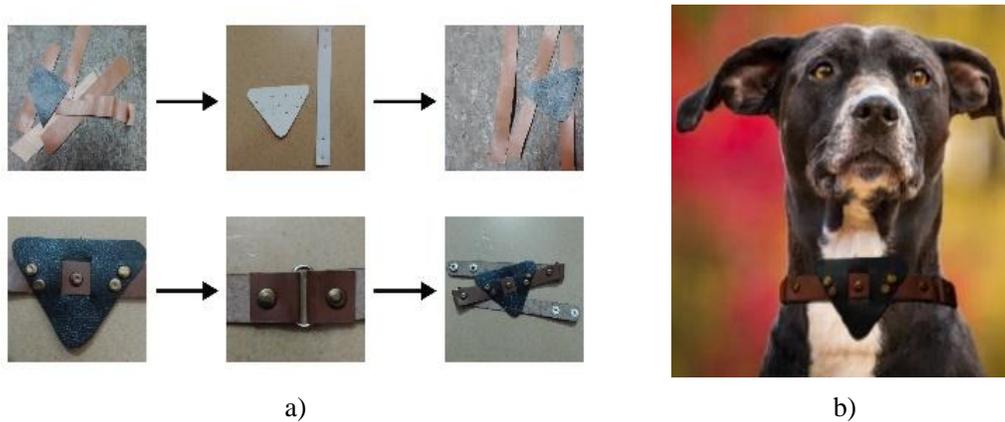


Fig. 6. Doggy Belt (a) manufacturing process (b) final view.

Sequential Operation of Different Parts of Bottle Holder

Visualization and planning of design for a bottle holder were done (Fig. 7). According to the design, the patterns were prepared and then measured the area of selected wastage and also cut the leather by knife according to the patterns from the selected wastage. After cutting, the area of all leather components was calculated and estimated. Then punching on leather with the help of hammer and puncher, attachment screw rivets to joined the cutting pieces were done. Finally, a button was attached to make the adjustable loop.

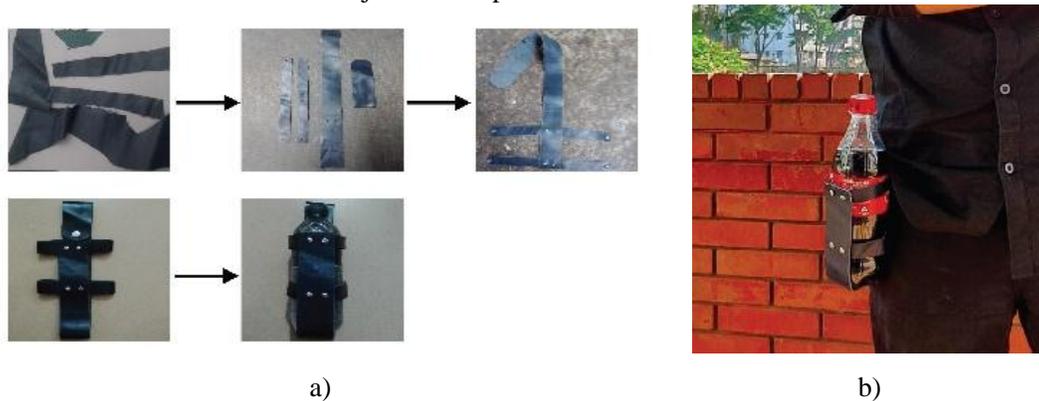


Fig. 7. Bottle Holder (a) manufacturing process (b) final view.

Sequential Operation of Different Parts of Leather Bracelets

The visualization and the preparation of two designs for leather bracelets were carried out (Fig. 8). According to our designs, the patterns were prepared and then measured the area of selected wastage and also cut the leather by knife according to the pattern from the selected wastage. After cutting, the measurement of the area of all leather components for each bracelet separately. Then for the first one, punching with the help of a hammer and a puncher on leather, decorations with the thin leather portions, and the attachment of the excess part by applying adhesive were done successively. Finally, some rivets were attached to it for decoration and a button for joining. On the other hand, for the other one, the punching on the leather with the help of puncher and hammer, attachment of square-rings and screw-rivets for the formation of chain were done sequentially. Finally, attachment of a button with the help of puncher and hammer for joining was done.

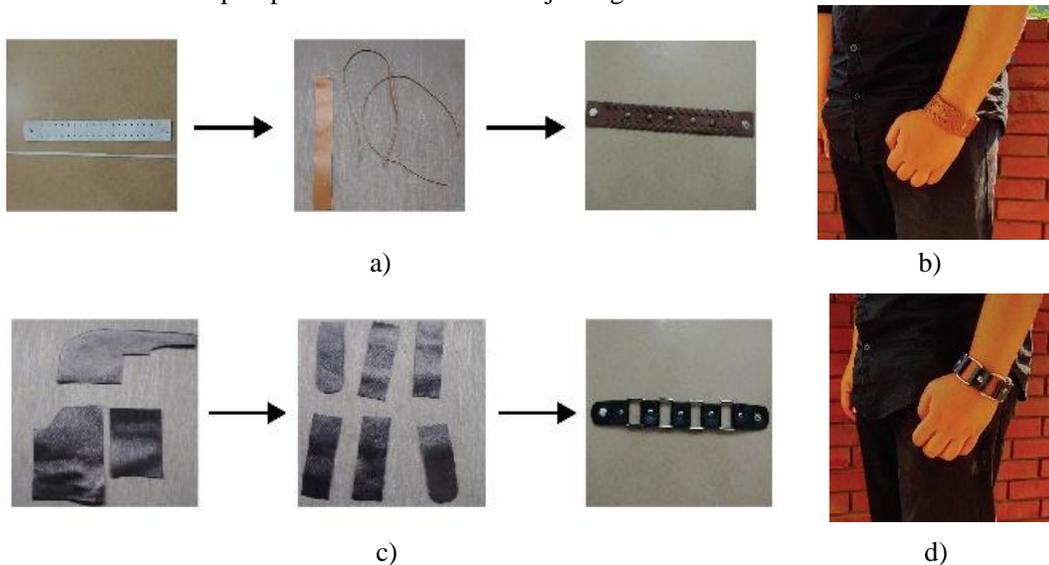


Fig. 8. Leather Bracelets (a) manufacturing process of leather bracelet-1 (b) final view of leather bracelet-1 (c) manufacturing process of leather bracelet-2 (d) final view of leather bracelet-2.

Results and Discussion

In proper designing, methods & technical skills play significant role. Applying simple procedure seven small leather goods were made from cutting leather wastages. Other market-demand leather goods like jewelry items also can be prepared from approach that stated in this paper.

The highest portion of leather wastage in leather and leather goods industries comes from the cutting room. Not all workers are always aware of maintaining cutting rules. If the cutting rules are followed properly, a large amount of leather can be saved from being wasted. Various types of small goods are possible to manufacture from wastage leather like ladies jewelry (Mamun *et al.*, 2019) decorative skull, key rings, earring-set etcetera. Manufacturing goods from wastage leather can be a profitable business. Small industries can run easily using leather wastage and also can reduce the disparity in using leather goods among the general. Manufacturing goods from wastage leather can create the scope for self-employment. In the following table 1, the previous wastage versus the amount of wastage after making this type of small leather goods are compared.

Table 1. Area of selected wastage vs the area of wastage after making of small leather goods.

Serial No.	Name of the product	Area of Selected wastage (square-foot)	Leather wastage used in product (square-foot)	Wastage amount after making product (square-foot)
01	Headphone Holder	0.068	0.054	0.014
02	Decorative Skull	0.512	0.483	0.029
03	Leather Keyring-1	0.108	0.082	0.026
04	Leather Keyring-2	0.083	0.065	0.018
05	Leather Earring-set	0.092	0.071	0.021
06	Doggy Belt	0.221	0.192	0.069
07	Bottle Holder	0.441	0.326	0.115
08	Leather Bracelet-1	0.167	0.122	0.045
09	Leather Bracelet-2	0.138	0.109	0.029
Total=		1.870	1.504	0.366

The selected total leather wastage area was = 1.870 square feet. On the other hand, the average wastage percentage from leather products industry, it is counted as 15 % wastage during the production of bag, wallet, belt, purse (Juel *et al.*, 2017).

However, the utilization of a total of 1.504 square-feet from 1.870 square feet of wastage leather to manufacture the small leather goods was accomplished in our works.

If, 1.870 square feet of leather wastage is 15% wastage

Then, 1.504 square-feet leather wastage is = $(15 \times 1.504) / 1.870 = 12.06\%$

So, the wastage reduces after making of small leather goods = 12.06%

And, wastage left now = $(15 - 12.06) \% = 2.94\%$

Generally, it could be an effective area to reduce the amount of leather wastage by making small leather goods from the leather wastage and also the goods can be used in our daily life. Although all cutting wastages cannot be fully utilized in manufacturing purposes but this approach can be reduced by nearly 12% cutting wastages which be considered as one of the eco-friendly approaches in terms of environmental remediation.

In the recent days it is a great opportunity for young entrepreneurs to start a new business but they need to know the acceptance of the product in the national as well as international market place. For that, every product should have a value and that value comes from the costing method. Therefore, before starting a business and launching a product with a large amount in the market place the costing system should be maintained with the acceptance of the product. The costing method of headphone holder is given in table 2 as an illustration.

Table 2. The costing method of headphone holder.

Serial No.	Material name	Quantity	Unit price (BDT)	Cost (BDT)
01	Leather	0.054 sqft	10	00.54
02	Thread	0.3 m	0.5	00.15
03	Adhesive (1 pot = 2700g)	5g	800	01.48
Total material cost				02.17 (~02.00)
Labour Cost (60 BDT/Hr)				08.00
20% overhead cost				00.43
Total Production Cost				12.60
70% Profit				08.82
5% Vat				00.63
Market price				22.08 (20 to 25 BDT)

The total material cost calculation was done using systemic approach. After that, the labor cost as well as overhead cost (additional cost in production) were included to get the total production cost. With total production cost, a percentage of profit and a percentage of the vat were included to calculate the market price of a product. In a similar manner costing calculation for rest of the manufactured products were done and the total material cost and market price for each good are presented in table 3.

Table 3. Material cost and market price of small leather goods.

Serial No.	Name of the product	Total material cost (BDT)	Market Price (BDT)
01	Headphone Holder	02.00	20.00 – 25.00
02	Decorative Skull	06.00	40.00 – 45.00
03	Leather Keyring-1	06.00	25.00 – 30.00
04	Leather Keyring-2	05.00	20.00 – 25.00
05	Leather Earring-set	06.00	20.00 – 25.00
06	Doggy Belt	07.00	25.00 – 30.00
07	Bottle Holder	08.00	45.00 – 50.00
08	Leather Bracelet-1	06.00	30.00 – 35.00
09	Leather Bracelet-2	09.00	45.00 – 50.00

Conclusion

The industry can utilize the wastage by making small market-demand leather goods. Small leather goods manufacturers have to come forward to utilize the large amount of leather wastage produced in leather goods industries. By making quality leather products from wastage leather

produced during goods production making profit is possible. Special facilities should be given to the entrepreneurs who want to set up new production and necessary steps should be taken to reduce wastage of leather and also to utilize the wastage leather. Self-employment can be achieved from using the proper use of leather wastage to making new goods. In this way the wastage of leather will be abated and the environment will also be eco-friendly. Further research required to development new techniques and approaches on utilization of leather wastages as value-added materials for other industries like food and agriculture.

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