

# Hand Weaving: Crafting Progressive Path for a Sustainable Future

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## Abstract

India has rich craft heritage of hand-woven textiles that have had strong historic, social and cultural relevance. In today's era, use of technology and digitization is growing in every sphere of life and as a consequence hand craft skills are getting languished. Hand-weaving, a craft for which Indian textiles were renowned world over has lost prominence with time. The textiles that were woven with great skill and patience are now being mass produced on power looms with minimal effort and in much lesser time. The traditional hand weavers are making exodus to alternative means of employment. In such a scenario, hand weaving craft needs to be redirected to be able to subsume products that find greater social and-economic relevance in extremely dynamic market environment. The hand crafted aspect of hand-weaving should be made an opportunity to explore unseen areas that are not possible with mechanized working. Hand weaving can be a wonderful means of reusing and up-cycling soft and pliable waste to convert it into products of value. The possibility of delicate and sensitive manual handling of materials makes the craft special and advantageous than regular machine weaving. There have been efforts around using leather scraps, fabric cuttings from garment production, waste embroidery threads, waste papers, starting and end of warp sheet, waste leno selvedge from automatic looms as weft material to be woven with finer but stronger warp. One of the challenges in using this waste is to first process it into thin, linear strips of considerable length, either by tearing waste pieces straight or cutting in circular spiral that may be opened to get the linear strand. The preferred weave is plain weave as it imparts required strength to the woven fabric and also keeps the thick weft in place. The fabric, thus woven, is unique as-the irregular thickness of weft gives a distinctive texture and it allows combining of very different materials. Proper sorting of waste according to material, size color and texture improves the quality and aesthetics of the woven fabric. Interesting hand-crafted woven surfaces may be achieved with prior planning of colors, yarn count, weaves, materials or their combinations. The fabric woven is heavy weight and use of unconventional materials renders it varying characteristics that make it suitable for a variety of applications, from apparels to accessories to furnishings. A cohesive and collective effort in this direction may help in creating economic and social change at rural and urban level as it has the potential to provide sustainable design solution to reuse the waste and at the same time support economy by sustaining employment for the existing hand weavers.

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## Introduction

Traditional crafts and processes have always had great significance in the social, economic and cultural build-up of the Indian society (Jayakar and Irwin, 1956; Barnard, 1989). They wove together the threads of society by catering to daily life needs of people and communities (Chattopadhyay, 1975). These crafts have inherently been sustainable in nature and have combined skill with artistic expressions. However, post industrialisation and globalisation, there has been a complete transformation in the methods of production and patterns of consumption. There is an evident shift from hand-made to machine made wherein the traditional crafts are fast losing relevance; and handloom weaving is no exception to this widely observed trend (Jayakar and Irwin, 1956; Barnard, 1989; Chisti and Jain, 2000). The craft of hand weaving may remain germane in today's time if things are viewed from a renewed perspective, making the best utilisation of its distinctive features. It is a green production method that draws its movement from human skill and energy and its handcrafted aspect should be made an opportunity to explore areas that are not possible with mechanized working. The possibility of delicate and sensitive manual handling of materials makes it special and advantageous than regular machine weaving. The craft becomes more relevant if it can reuse and up-cycle soft and pliable waste and convert it into products of value. A few case studies discussed in this paper explore creative experimentation with some waste materials that have successfully begun to make a mark in the sector. The paper explores design solution that is both environmentally and socially relevant and has the potential to promote progressive sustenance of the craft. This quite reiterates the objective of 'making futures' conference that talks about 'crafting a sustainable modernity' and support responsible engagement with craft and society.

### Hand weaving: a sustainable production technique

Hand weaving is an age-old technique that has been closely linked to clothing needs as well as cultural aspiration of communities. These might appear obsolete in today's technology driven world; however, it offers a gamut of benefits that may promote sustainable development, both from environmental as well as social perspective (Chattopadhyay, 1975). It is a green process – it does not require fuel or electricity as is manually driven and does not cause any sort of pollution, making it an environmental friendly method for fabric production. Handloom has a simplistic design, is indigenously made and is easy to install. It does not require heavy investments to purchase; as well as to set-up as is the case with power looms. Thus, working with handlooms gives the weaver a lot of financial ease to start-up his own work. As far as designing is concerned, hand weaving gives the weaver a lot of creative space to work around, as wefts can be manually manipulated to create a variety of designs. There can be play of different colours, yarn thickness, weft insertion technique, alternative materials and their combinations to create interesting patterns and the complexity of design varies with skill of the weaver. This allows each product to be uniquely hand crafted and be different; product customization is one of the major benefits of hand weaving as variations in weft patterns and colours can be handled easily with each product. The craft has all the desired attributes for promoting makers culture, and at the same time, it still is an important means of livelihood for weaver families practicing the craft past many generations. All these features make it an ideal ground for design intervention; and a sustainable model of working can be built around it.

### Hand weaving: Current scenario

Hand weaving has enjoyed a lot of support from Indian government during the past many decades, in form of subsidies, cluster development schemes and policies, state emporiums, promotion as cottage industry; however the current situation is not very encouraging. The information from field as well as the report by

Government of India: Ministry of Textiles (2015)' indicate that the traditional hand weavers are making exodus to alternative means of livelihood options due to following reasons:

- There is tough competition from power-loom and mill made sector, and the hand woven fabric occupies a small share of the total production. The textiles that were woven with great skill and patience are now being mass-produced on power looms with minimal effort and in much lesser time. The production from traditional hand weaving method is decreasing year by year as semi-mechanised looms with manual weft insertion are taking its place.
- Traditional weaving requires a lot of manual labour and returns are not proportionate to the effort and time put in. The markets are uncoordinated and it is difficult to reach out to the prospective customer. Many times anomaly in hand crafted pieces are considered as imperfections implying inferior quality. As most of the weavers do not have direct access to the market, middlemen often take advantage by not giving them the fair price and paying them only after their product is sold.
- Younger generation does not perceive value in handcraft as technology and globalisation has highly impacted their thought process as well as lifestyle. They wish to seek white-collar jobs over sweating it out in workshops; they do not see traditional work in high regard, and as a consequence, they are being averse to traditional work.

As a combined influence of varied factors, there has been significant attenuation in the handloom sector and the trend is continuing. There needs to be clear economic patterns supporting its sustenance and it should be lucrative enough for the newer generations to take up the craft. The absence of any such incentive is one of the prime reasons the sector is crippling in spite of huge government support and policies to promote handloom weaving. It is gradually going to decay further unless some meaningful purpose is associated with it.

### **Hand weaving... An opportunity**

The handcrafted aspect of hand weaving should be made an opportunity to explore creative areas that are not possible with mechanised working. Hand weaving can be a wonderful means of reusing and up-cycling soft and pliable waste to convert it into products of value. It may be relevant in today's scenario if there is evident product differentiation, aesthetically as well as functionally. This would help the craft to reposition itself instead of competing with less labour oriented and faster methods of fabric production.

The possibility of delicate and sensitive handling of materials makes the craft special and advantageous than regular machine weaving. It opens up the creative window to experiment with unconventional materials that are pliable yet require high material handling or are delicate enough to be used otherwise. There could be a range of materials such as those which lack strength or are too bulky to handle or available in short lengths etc. that can be explored with it. It may enable weaving of unique materials thus producing fabrics with distinct characteristics. The sustainability quotient of the product is further enhanced if the chosen material is collected from waste.

As an Associate Professor in the Soft material Design Department at Indian Institute of Crafts & Design (IICD)<sup>i</sup>, I get opportunity to experiment with variety of waste in coherence with this ideology and concept. There has been a conscious effort to sensitize students and make them aware of the social benefits and the creative possibilities with this craft technique through woven samples, classroom assignments, and academic projects. Experiments are being performed using chicken feather, leather scraps, fabric cuttings from garment production, waste embroidery threads, waste papers, on loom warp wastage, waste leno selvedge from automatic looms as weft material to be woven with finer but stronger warp. This paper is a compilation of three case studies that started as classroom projects, based on this philosophy of reusing through hand weaving,

and have been pursued by students beyond their course duration; and have been able to bring in positive movement in the sector.

### **CASE 1: Chicken feather**

Chicken (Fig.1.1) is a popular food item that is consumed globally. The non-consumable parts of the chicken are passed on as waste and require a proper system of disposal. This, however, is a neglected area in many of the developing countries and the waste ends up adding to water and land pollution; thereby posing serious health hazard by becoming breeding ground for infections. With the rising consumption of chicken as a food item, the waste is also increasing proportionately. However, it was realised that, the chicken feathers from this waste appear to be a promising textile material on account of their many properties. Radhesh Agrahari (IICD student) worked on this material as his final year project in 2013.

As Belarmino et al. (2012) state, chicken feather comprises more than 90 per cent protein, the major part being beta-keratin, a fibrous and insoluble structural protein broadly cross-linked by disulfide bonds. It has a honeycomb like cross-section with many air pockets with a lot of void space in these pockets. As a result chicken feather fibre has certain characteristics that make it a desirable material for hand-weaving:

- It is soft, pliable and has good draping properties
- It has good thermal retention property as air gets trapped in the air pockets of the fibre and acts as thermal insulator.
- It has good resilience owing to the air pockets and helical structure
- It is lightweight due to its hollow structure. It has low density compared to wool.
- It is difficult to process by machine as fibre elongation at break is very low in spite of tenacity being very good. It breaks very easily during mechanical processing. Also the length of fibres varies within a feather - it ranges from 1-4.5 cm depending on its position on rachis, the central stem.

Since chicken feathers constitute 5-7 per cent of body weight of a chicken, it is an important by-product of the poultry industry. It becomes even more important since it is a low-cost and well-supplied material, not limited by geographical boundaries. Thus hand spinning and hand weaving can be useful techniques that can add value to otherwise waste material.

### **Process of reclaiming chicken feather fibre from waste**

The chicken waste (Fig.1.2) needs initial processing before being able to get it into usable form. This requires collection and cleaning of waste, separation of feather and subsequent separation of fibres from feathers. It involves a number of steps to be able to reclaim clean chicken feather fibres from waste.

The first step is to collect waste, i.e. feathers are collected from slaughterhouses. It is a difficult work since these feathers are all smeared with blood and along with feathers is flesh and skin. The immediate next step is to thoroughly wash this waste (Fig.1.3) to remove traces of blood in order to make it appropriate for handling. Thereafter the waste is sorted and segregated as tail, neck, wings and chest feathers, depending upon the body part these are reclaimed from. These vary in quality; tail feathers being the longest and finest. The feathers are repeatedly boiled and steamed (Fig.1.4) for sanitization in an open container. This is important as otherwise it might pose serious health hazard not only to the worker but also to end user. Unlike wool, this fibre may be treated at higher temperature without adversely affecting its properties (Belarmino et al., 2012).

This waste is then soaked into a natural mild detergent, soap nut, (Fig.1.5) for 2-3 hrs. In the process, skin becomes tender and the feathers can be easily separated by pulling. The feathers are crudely separated

(Fig.1.6) from the rest of waste that is dumped in composts for decomposition; however minuscule pieces of skin and flesh remain adhered to the feathers. This requires further treatment of the feathers. The feathers are treated with different textile auxiliaries; each step making it cleaner and whiter (Fig.1.7a-f). It takes six to seven steps to make it suitable for use as textile material.

After final washing, the feathers are dried (Fig.1.8a-c) - these are spread on the ground during noon, making the best use of solar energy, and it takes 3-4 hrs for it to completely dry. During the drying process, the fibres are conditioned from time to time to prevent them from sticking. This allows fibres to open up and make them fluffier. Clean chicken feathers are then ready for use as well as for further processing depending on the size and quality of feathers.

In the whole process, water consumption is high and various textile auxiliaries are used, both natural as well as chemical, therefore, it is important to have an effluent treatment plant to be able to tactfully use the resources without harming the environment.



*Fig.1.1 Chicken with golden feathers*



*Fig1.2 Chicken waste*



*Fig.1.3 Washing*



*Fig. 1.4 Boiling & sanitization*



Fig.1.5 Soaking in mild detergent



Fig.1.6 Separation of feathers



(a)



(b)



(c)



(d)



(e)



(f)

Fig.1.7a-f Washing with textile

auxiliaries (different steps)

The smaller feathers (Fig.1.9) require different handling than the longer ones. Smaller feathers, mainly from neck and chest yield very short fibres, so these feathers may be used as such for weaving. 3-4 feathers are tied in a bunch (Fig.1.10) and then knotted onto weft yarn in a manner that it resembles chenille yarn. This yarn when inserted as weft (Fig.1.11) in a horizontal rug loom, gives it unique pile texture (Fig.1.12).



Fig.1.9 Small feathers



Fig.1.10 Tying bunch of feathers

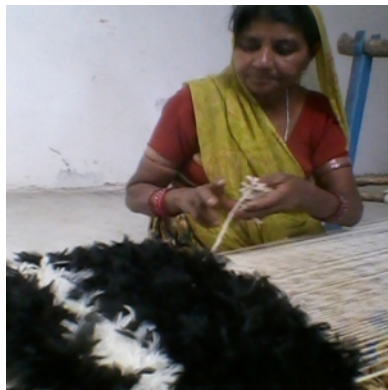


Fig.1.11 Hand weaving



Fig.1.12 Pile rug

The fibres may be separated from the feathers with further processing and spun into yarn. This may be done by clipping fibres from the stem (Fig.1.13). Alternatively, the feathers are ground to weaken the stem and break it. As a result, the fibres get separated. These fibres have varying length, as in a feather; fibre length reduces from base to tip. The fibres are very light in weight and are hollow; hence difficult to spin in machine (Belarmino et al. 2012). The fibres can be converted into yarn through hand spinning (Fig.1.15, 1.16); however it has to be blended (Fig.1.14) with small percentage of cotton or wool, ranging 10-20 per cent, to make it spinnable. This yarn is used in weft as it lacks the strength that warp yarns require to withstand weaving stress. The warp may be taken as merino wool, and the hand spun chicken feather fibre yarn is inserted as weft. This requires hand-weaving process (Fig.1.17) as chicken feather fibre yarn is quite low in strength and requires high handling to avoid breakages in the process. The fabric woven has resultant 30-40 per cent chicken feather fibre in its composition.



Fig.1.13 Separating chicken feather fibres, Fig.1.14 Fibre blending, Fig.1.15 Hand spinning, Fig.1.16 Yarn

The fabric thus woven has unique characteristics.

- Hand comparable to Pashmina
- Very light weight, soft & supple
- Excellent drape
- Very good warmth retention
- Improved resistance to insects / silver fish
- Hand crafted from waste
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The working on chicken waste started as small project but now it has begun to make a social impact. The work is being done and marketed under the brand 'Khanak' and around twenty-five hand weavers are benefiting from it. It is also providing employment to village women involved in spinning process. The shawls and stoles (Fig.1.18) produced are not only being sold in high-end domestic market, but also exported.

### CASE 2: Leather waste

The waste from production of leather seat covers for automobiles is another such material that was experimented in hand weaving as was taken forward by IICD student Pikashi Jain in her graduation project 2016 with 'Quality Leather Automobiles'<sup>2</sup>. The cutting of patterns (Fig.12.1) from hides leads to high waste generation that amounts to 30-35 per cent. This is on account of limited size of hides and defects/ marks that are unavoidable but lead to rejections.



Fig.2.1 Leather seat cover patterns



Fig.2.2 Leather waste

The leather scrap may be segregated into primarily three sizes – small, medium and large (Fig.2.3). These scraps are considered as waste and sold at throwaway prices ranging from Rs.200/kg for 6” X 12” pieces to Rs.70/kg for less than 4” X 4” pieces. The larger pieces can be used to make smaller items but the small and medium pieces are difficult to reuse. Leather is pliable and stable, and physical properties such as high tensile strength and good resistance to tear and flexing make it unique. Leather may be used in weft if the scrap pieces can readily be converted into thin linear strips of considerable length. This can easily be done by laser cutting the pieces in spiral that may be opened to get thin strips with width ranging from 3-8mm (Fig.2.4).



Fig.2.3 Leather scrap – small, medium, large pieces



Fig.2.4 Leather strips after laser cutting

These leather strips may be inserted as weft (Fig.2.5) along with regular wefts to create interesting textures. The warp has to be strong enough to be able to hold the leather weft, which is much heavier and thicker. The leather strip is to be cut after every insertion (Fig.2.6) keeping a little extra than the reed space on both the edges.



Fig.2.5 Hand weaving with leather strips



Fig.2.6 Leather strip cut after every insertion

Interesting handcrafted patterns and textures (Fig.2.7a-d) may be created with warp colour patterns, weaves, different colour leather weft and combination of weft of different materials, colours and counts. The weaves should be such that it gives required strength to the woven fabric and sufficient binding to the leather strip.

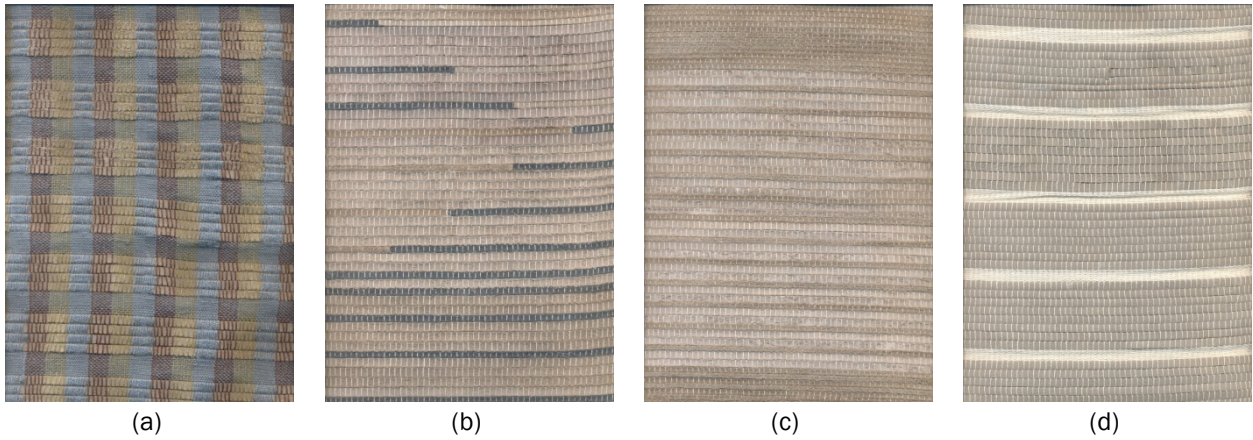


Fig.2.7a-d Woven fabric samples

The fabric woven is heavy weight but use of unconventional materials renders it varying characteristics that make it suitable for a variety of applications in accessories and furnishings.

It may be interesting to use it in cushions, bags, floor mats, rugs etc. However, the products should not require frequent washing, as these may be dry-cleaned only. The fabric woven is stable but requires proper edge finishing for not letting it unravel and increase product longevity. As the fabric is quite rugged and has good strength, it may be put to uses that require it to be strong and stable. The fabric thus woven has distinctive texture and is aesthetically appealing. The image shows some of the cushions made by hand weaving leather waste (Fig.2.8).

This can be a good opportunity to promote hand weaving and in the process waste is also put to sustainable use.



Fig.2.8 Cushions from leather Waste

### CASE 3: Garment Production waste

India is one of the prominent and established textile and garment producers in the world. This industry is quite important for progressive growth of the country, according to a study by ASSOCHAM<sup>3</sup>, it is the second largest sector that provides employment to the people (Economic Times 2017). In past few decades, textile sector has witnessed a trend of forward integration of fabric manufacturing units. The existing fabric production set-ups are fast incorporating garment-manufacturing facility so that they are able to produce finished and value-added end products. The government of India is also giving higher incentives to garment exporters to promote exports (Suneja, 2017); however in the process, huge amount of fabric waste (Fig.3.1) is generated. With fabric consumption efficiency for a garment ranging from 80-95 per cent; fabric that inevitably goes waste ranges from 5-20 per cent (Jennings, 2011). In addition to fabric scraps from regular cutting, there is lot of waste generated owing to accessory (Fig.3.2), thread (Fig.3.3), fabric and garment rejections. The rejections may be due to defects, improper quality or colour matching, wrongly cut fabric pieces etc. The industry being quite fragmented and unorganised, there is no proper system of waste disposal and it majorly adds to pollution.



Fig.3.1 Waste fabric cuttings



Fig.3.2 Rejected Piping



Fig.3.3 Rejected threads

Usage of garment export house waste in hand weaving was undertaken by IICD student, Bhavya Goenka, in her graduation project 2017, in which she designed a range of garments and bags. The irregular fabric pieces (Fig.3.4) are converted into linear strips (Fig.3.5) by stitching them along the grain line and then tearing these along the warp direction to get strips (Fig.3.6) of required width. This is then wound as ball till it becomes of size that may be handled easily. Rejects already in linear form could readily be used as weft. Interesting colour patterns and textures may be achieved with appealing warp arrangements (of colour & count) and different weaves. Different weights may be achieved by varying width of fabric strips. The woven fabric, thus, is quite thick and may be put to various uses from out wear garments to bags and furnishings.



Fig.3.4 Garment cutting waste



Fig.3.5 Tearing of fabric scraps



Fig.3.6 Fabric strips



Fig.3.7 Hand Weaving



Fig.3.8 Zerowaste Patterns



Fig.3.9 Stay Stitch

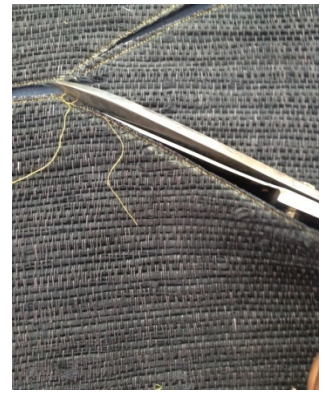


Fig.3.10 Cutting

Though there have been past practices to make low cost floor mats by hand weaving using old discarded cloths but this project is an effort to take it further by developing a range of good value marketable products using garment production waste. It is important to sort the waste and plan specifications properly prior to weaving.

Once the fabric is woven (Fig.3.7), patterns for the garments are done in a manner that no further cutting waste is generated (Fig.3.8). The weft fringe, if on selvage, is used as a design feature in the garments. Since the woven fabric has tendency to unravel, stay stitch is put on each pattern piece after the patterns are marked (Fig.3.9). Then the fabric is cut (Fig.3.10) and sewn together to make garments for winter wear as shown in the images (Fig.3.11a-c). There is a whole range of bags (Fig.3.12a-c) being made from such fabric as well.



(a)



(b)



(c)

Fig.3.11a-c Garments



(a)  
Fig.3.12a-c Bags

(b)

(c)

These products are now being produced under the label 'Iro-Iro' and are currently being exported to Japan. This initiative has helped in sustenance of five hand-weavers families and has provided employment to local women along with up-cycling of waste.

### Conclusion

With renewed orientation, the age old craft of hand weaving has not only found relevance in the current day scenario, but also has potential to become a means for supporting sustainable development of the society. A cohesive and collaborative effort in this direction might help in creating economic and social change at rural and urban level by providing sustainable design solution to reuse the waste and at the same time support economy by sustaining employment for the existing hand weavers, thus crafting a sustainable modernity.

### Endnotes

<sup>1</sup>Indian Institute of Crafts & Design (IICD) was set-up to realize the potential of the craft sector and to foster innovation and creative thinking for well-crafted quality products, effective strategies and efficient processes towards a better quality of life for artisans. The institute has been continually working with the craft sector and various stakeholders with a vision to making it more competitive and customer oriented. The institute aims to develop and foster young professionals who can act as change agents for the sector and bring in positive growth. IICD renders quality craft education with considerable focus on practical training & experience with the artisans, and better design intervention for their products. It has been actively involved in the study and research of crafts to bring in product innovation so as to be able to uplift crafts in making it part of creative economy.

It majorly has material based specialization:

- Soft Material Design - textile, leather, paper
- Hard Material Design – wood, stone, metal
- Fired Material Design – ceramic, glass, terracotta
- Fashion Design

<sup>2</sup>Quality Leather Automobiles (QLA) was a Indian subsidiary of 'Q Leather Automotive s.r.l', Italy, a leather manufacturing company that made leather seat covers for automotive industry, operational in Pune from 2015-16

<sup>3</sup> 'The Associated Chambers of Commerce & Industry of India' (ASSOCHAM) is an apex trade association of India, working as an important interface between industry, government and various stakeholders to promote domestic as well as international trade and linkages.

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