SALVAGE THE SELVEDGE!

Upcycling selvedge waste from industrial weaving, using handweaving techniques

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Bachelor of Fine Arts in Textile Design
Degree work number: 2019.4.06
2019-08-19
DEGREE PROJECT
Bachelor of Fine Arts in Textile Design
The Swedish School of Textiles
University of Borås
Sweden

TITLE
Salvage the selvedge! Upcycling selvedge waste from industrial weaving, using handweaving techniques

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DATE
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1.1 REPRESENTATIVE IMAGES OF WORK

**Fig. 1.** Piece 1: Rainbow, 97 x 97 cm.

**Fig. 2.** Piece 2: Square, 155 x 145 cm.

**Fig. 3.** Piece 3: Deflected double weave, 81 x 225 cm.
1.2. ABSTRACT

Waste is a big problem in the textile industry; one area of waste is cut off selvedges from the weaving industry. This degree work in textile design questions the need and motivation to produce fully new textiles, choosing instead to use waste material in order to create sustainable design. The work aims to apply waste selvedges in a textile design context by using it in handweaving, as both warp and weft. This project also explores food waste as dyestuff, dyeing selvedge waste with it, achieving a large variety of colours. Using selvedge waste in both warp and weft, along with dyeing using food waste, brought many possibilities in both technique and aesthetics, as well as expanding the sustainable perspective in textile design by challenging the use of waste from textile and food production. The result is three handwoven examples with varying expressions, created to bring inspiration for others to use waste selvedges as a material.

1.3. KEYWORDS

handweaving, weaving, upcycling, waste material, selvedge waste, natural dyeing, textile design
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2.1. INTRODUCTION TO THE FIELD

2.1.1. SUSTAINABILITY AND DESIGN

Sherburne (2009) lists waste as one of the top five things that are making the lifecycle of textiles and clothing unsustainable, the other being water, chemicals, asset stripping and transport. This includes both pre-consumer (from factory production) and post-consumer (used clothes, textiles, etc.) waste. Sherburne also argues that the designer has a responsibility to consider the life cycle and environmental impact of their designs.

Ten years later in 2019, climate change is an even more urgent issue, making sustainable thinking a crucial aspect of the designers work. Sherburne’s opinion is shared by Jongerius and Shouwenberg (2015), who suggest that there is a need for a new outlook on design, where the search for something new is not the most important aspect of design, but rather the context and human interaction of designed objects.

The exhibition Broken Nature at the XII Triennale Milano 2019 also lifts the designer’s role in sustainability issues, especially in “restorative design”: design helping the survival and betterment of the planet. Fondazione La Triennale di Milano (2019) argue that overconsumption is a large issue, and that environmental issues can not be solved just by limiting use of hazardous chemicals and choosing “sustainable” fibers and materials, but instead designers need to tackle the problems with overproduction and overconsumption.

Designer and environmentalist Babette Porcelijn argues designers are the ones who need to change the world in order to combat climate change, pollution and other issues (Frearson 2017). Science can tell us the facts, but it is designers that have the best chance of making things better, she says: ”It requires a paradigm shift – you have to rethink everything. It’s a design issue and a design challenge.” (Ibid.).

Because of the arguments listed above, this project focuses on redesign and upcycling, instead of using new materials.

Upcycling is defined by the Merriam-Webster online dictionary (2019) as to recycle (something) in such a way that the resulting product is of a higher value than the original item: to create an object of greater value from (a discarded object of lesser value). Downcycling is the opposite: to create something of a lesser value from discarded objects of higher value. These concepts are important methods in the area of designing with an ecologically sustainable intention. According to Edwards (2015), upcycling was popularised in the late 1990s and early 2000s; it has continued to be a popular concept, with many artists and designers exploring this field.

One area of pre-consumer waste is cut off selvedges (sometimes called dummy selvedges) from industrial weaving production (fig. 5). These selvedges are created when using some types of shuttleless weaving machines. When aiming to make sustainable textile art or design, this is a good alternative material to work with. Within the selvedges lies potential to create large scale designs with a particular look, making use of the fringed nature of the material.
Much of the research that has been carried out within zero waste design primarily focus on fashion design, for instance Rissanen and McQuillan (2016). There is plenty of room for more zero waste design research in the textile design field. One example of a textile design project in this area is Lara Wernert’s needle felted rugs made from wool selvedges (fig. 6), developed during her masters degree in conceptual textile design, and continued into the company 13RUGS (Wernert 2017).

Luisa Cevese’s Riedizioni collections also uses selvedges, and other types of waste from weaving mills, in combination with polyurethane, to create a new material called II (eleven), which is used to make bags (fig. 7) (Riedizioni 2019).
2.1.2. WEAVING

Deflected double weave is a weaving technique (fig. 8), with which it is possible to weave large scale rounded patterns (Van Der Hoogt 2019). Usually, there are two colours in both warp and weft direction, and these only weave together with the same colour, creating long floats in both directions (Ibid.).

Colour and weave effects (fig. 9) are patterns created when using contrasting coloured stripes in warp and weft, combined with a basic binding like plain weave or twill, making it possible to create many different patterns just by changing the order of the colours in warp or weft (Shenton 2014). Houndstooth is a common example of colour and weave.
2.2. MOTIVE AND IDEA DISCUSSION

Selvedge waste has been used in rag rugs, but in most examples found, a regular cotton warp has been used, resembling conventional rag rugs using rags from old clothing and other textiles. In this project, handweaving with selvedges in both warp and weft direction is explored, in an attempt to only use waste material, and to create a new type of expression. No previous examples of using selvedge waste in both warp and weft have been found, therefore this was decided to be a good path to explore.

The selvedge waste in this project was donated from Klässbols Linen Weaving Mill, a small family run company in Klässbol, Sweden. The company sells the selvedges in their factory outlet, for use in hobby projects, but produces more waste than they can sell. The selvedge waste used in this project is predominantly made of linen.

Conventional dyeing uses many chemicals and dyes that could be potentially harmful for the environment and the people working with them (Samanta, Basak & Chattopadhyay 2014). According to Roy Choudhury (2014), 200 tons of water could be polluted by harmful chemicals when dyeing and finishing 1 ton of fabric in a conventional way. Natural dyeing reduces the amount of chemicals needed, and can be done with plants or food waste (Lundin 2017). This project explores using food waste such as skins and peels for dyeing, in an effort to use what would otherwise be thrown away.

Emma Wessel (2014) used selvedge waste in combination with coloured natural rubber to create room dividers (fig. 6), in a concept that was placed in a public interior context. She makes great use of the waste material, showing off its qualities, with a shaggy, fringed expression, although in combination with a new material, whereas this project will only use waste material. The only added material in this work is linen thread for hemming.

Katarina Briedititis and Katarina Evans’s project Re Rag Rug (fig. 7) comprises 12 rugs developed during 12 months in 2012 and 2013 (Vessby 2013). The rugs are all made out of textile waste and excess, using different textile techniques, never weaving on a loom (Ibid.). This project is a good example of both upcycling and walking the line between art and design. Some of the rugs are made in complicated techniques that could be hard to duplicate and use in a bigger scale, limiting the work’s impact on the textile waste issue overall. The rugs are however a great source of inspiration and beautiful as single pieces. In this project, the aim is instead to create something out of waste in simpler techniques, that are easier to duplicate.

Josefin Gäfvert has the intention of raising her large, shuttle-woven rugs (fig. 8) to an art level (Gäfvert 2016), a concept that this project would like to borrow. Working with the starting point of a rug could be a way of making it easier for the viewer to relate to an art piece or design example, as the rug is a concept that is familiar to everyone, and not as abstract as the concept of “art” or “design”. Gäfvert uses different weaving techniques and dyeing methods (for example, ikat), creating bold pieces that take on old techniques and make them into something new.
Pasi Välimaa’s large black rya made from rags dyed black (fig. 10) gives a strong impression on the viewer because of its texture, large size and dark colour. If it was placed on the floor, it might have been experienced as a rug, but hanging it on a wall raises its value and makes it seem more like an art piece, and more luxurious. Its size is an important factor for the expression; looking at it raised the interest in making large pieces, becoming an inspiration to increase the size of the design examples in this work, to make a stronger impression.

Chanel tweed fabrics over the years, but especially the Autumn 2019 Ready-To-Wear collection (fig. 4) (Madsen 2019), were looked at for inspiration regarding textures, colour and weave, and how to bring a luxurious feeling to this project. The concept of luxury, or high quality, was important to this project, to show that it is possible to make good design and beautiful objects with material that would otherwise be considered trash; that upcycling can be made in a non-“DIY-looking” way; that waste material can be the raw material for something that looks just as good as something made from new material.

The projects mentioned above all demonstrate different ways of working with handweaving or other handmade techniques, with a focus on large scale objects that place themselves in the gap between art, crafts and design. Several of the projects deal with upcycling and waste material (Wessel, Brieditis and Evans and Välimaa). Brieditis & Evans, Gáfvert and Välimaa all use the rug as a starting-point, choosing to display it in a non-traditional way, forcing the rug be experienced as something more than just a everyday use object put on the floor.
2.3. AIM

The aim of this work is to expand the sustainable perspective in textile design by challenging the use of waste from textile and food production, by using naturally dyed waste selvedges in weave design.
3.1. DESIGN METHOD & DESIGN OF EXPERIMENTS

Ordoñez, et. al. (2012) describe the traditional design process as starting with exploration, continuing on into idea generation, and then as a funnel, alternating between elaboration and reduction until the ideas are finally narrowed down to a finished product or idea. A new, expanded design process specific to designing with waste material is proposed by Ordoñez, et al. suggesting a “pre-process”, where the waste material’s properties are analysed, after which ideas for what it can be used for are generated. Furthermore, the ideas should be screened and evaluated before the traditional design process can start (Ibid.).

This method is used, starting with analysing the properties and possibilities of the material (linen selvedge waste) and making a mindmap; then continuing on with the idea generation process by brainstorming, as described by Jones (1992).

Three moodboards are put together: one focusing on texture, one on colour, and one on black and white examples.

Sketching is done by hand (on paper) and in the weaving software Weavepoint.

Bindings and colour effects are worked through methodically by making samples, both in a loom and in a weaving frame, to see what ideas are most successful.

The dyeing methods and recipes used in this project where mostly found in Lina Sofia Lundin's book Naturlig färgning (Natural Dyeing) (2017). The natural dyeing is worked through carefully, making all the dye baths in a similar manner, exploring the colour variety that can be created.
3.2. DEVELOPMENT & DESIGN RATIONALE

3.2.1. PRE-STUDY: WEAVING

The aim of the pre-study was to try if using waste selvedges in the warp direction in a regular handloom was possible, to explore some different bindings and colour and weave effects, and to examine if natural dyeing could be used to give the waste material a greater variety of colours.

First, a simple warp that consisted of both selvedges and linen yarn was put up (fig. 15). This first sample warp used black and light grey selvedges in varying repeats that were chosen to be able to try different colour and weave effects. The density was one thread per centimeter and the reed used was 10/10. The warp had a straight draft, and the bindings were tabby, hopsack and 4 x 4 even faced twill: this made it possible to create colour effects like houndstooth, stripes in different directions (log cabin effect) and a star effect.

One piece of the first sample was cut off and washed in a washing machine at 40 degrees. This made the sample very shaggy and a substantial amount of fibres came loose in the washing machine; machine washing of the selvedges was therefore ruled out.

The second sample warp (fig. 16) was made with the intention of exploring deflected double weave and consisted of blue, white and unbleached selvedges, which were chosen for their contrasting colours, that were different to those in the first sample warp. The density was 1.3 threads per centimeter and the reed used was 13/10. After weaving about half of the warp, the tie-up was changed to instead make it possible to weave honeycomb, and after that, changed again for overshot.
3.2.2. PRE-STUDY: NATURAL DYEING AND COLOUR

Because of the limited selection of colours in the waste material, and to be able to choose the colours more freely, it was decided to try dyeing the selvedges. To keep with the sustainable nature of the project, natural dyeing was chosen.

Bleached and unbleached selvedges were first used. Half of the selvedges were mordanted with alum and half were not mordanted. As guessed, the mordanted pieces of material generally got a stronger colour than the ones that were not mordanted. After the first dye bath, light grey selvedges were added, to bring greater variety of the out-coming colours. The dyeing was all made hot, in a pot, with the exception of the black beans, where the dye bath was not heated, but instead the selvedges were left to soak for three to four days in a jar in a window.

List of dye materials (fig. 17-18):
• Yellow onion peels (yellow hues)
• Beetroot peels (not succesful)
• Carrot greens (cool, light green and yellow shades)
• Avocado peels and pits (soft pink hues)
• Madder (not food waste, but gives a strong pink/red colour)
• Black rice boiling water (not succesful)
• Turmeric (strong yellow shades)
• Red cabbage (soft blue hues)
• Black bean soaking water (purple hues)

3.2.3. PRE-STUDY: CONCLUSION

The conclusion from the pre-study was that using waste selvedges in the warp in a regular handloom was not only doable, but could create a promising textile, with many possibilities to explore. Taking advantage of the thickness of the selvedges, large pieces could be created quite easily. Key points to bring forward from the pre-study were: colour and weave effects, deflected double weave and natural dyeing.
Fig. 18. Natural dye sample chart
3.2.4. A SELECTION OF SAMPLES AND SKETCHES THAT WERE NOT DEVELOPED FURTHER

Fig. 19.
Moodboard (top) and some of the many quick sketches that were made.

The black and white sketches are mostly connected to the black and white sample at the bottom of the picture to the right.

Fig. 20.
Some smaller samples made on frames and in looms.

Ideas explored included mixing regular yarn and selvedges, and making a tartan-like pattern.

Fig. 21.
Some smaller samples made on frames.

Star effect (colour and weave) with multiple colours (left).

Ikat warp dyeing (top right).

Ikat dyeing both warp and weft (bottom right)

Fig. 22. Rainbow + black sketches

Fig. 23. Black and white sketches

Fig. 24. An attempt to make a very sparse weave.
3.3. DEVELOPMENT OF FINAL EXAMPLES

3.3.1. DEVELOPMENT OF "RAINBOW"

After having done the first natural dyeing trials, the dyed selvedges were laid out as a gradient (fig. 25). This was really pleasing to the eye, therefore it was decided to keep most of the colours and make an example that showed off the colour variety that can be created with natural dyeing, in a gradient or "rainbow", instead of picking just a few colours. The order of the colours was chosen to make the colour shifting seem smooth and natural, choosing pink and blue as the edge colours in the final piece, as there was not really a good purple colour to tie these together.

An early idea was to create a pattern or colour and weave effect on top of the gradient, but this was ruled out in favour of using stronger contrast patterns in the other two examples, to bring some variety by having one softer piece. An early sample using the dyed selvedges was fig. 26, where the gradient was the same in both directions, using a simple plain weave, to give equal space to the warp and weft.

Fig. 25. Selvedge rainbow

Fig. 26. Woven natural dye sample
This principle was applied to a larger piece, about 1 x 1 meter. It was woven by hand on a vertical frame. Selections from the natural dyeing samples were made, removing colours that were too dull or too similar to each other. One side was brushed with a metal brush, to bring out the fringes as much as possible, to show the fact that this material, waste selvedges, can be made to look very similar to a tufted or knotted carpet. This also took advantage of the softness and bulk of the material. The other side was not brushed, allowing the binding to take the focus, showing the effect of the gradient and letting warp and weft take the same amount of space. There is no front or back side, rather are both sides important to show the potential to create different expressions from the material.

Fig. 27. After warping

Fig. 28. Weaving the final piece

Fig. 29. Detail of brushed side
3.3.2. DEVELOPMENT OF "SQUARE"
After analysing the colour and weave effects made in the first sample warp (fig. 30) these conclusions were made: the most successful and clear patterns were the log cabin pattern (stripes in horizontal and vertical direction) and the dots. Other patterns, such as the star effect and houndstooth, seemed blurry and unclear, because of the material's fringes.

Early sketches (fig. 31) focused on blocks with different colour and weave patterns, only adding a little bit of colour. However, these were not developed further as they felt too stiff and rigid because of the lack of colour and the square nature of the pattern. Instead, the focus would be on adding more colour and making something more random, flowing and more fun.

Fig. 30. Detail of first sample
Fig. 31. Early sketches
After making a small sample trying this (fig. 32), a warp with alternating stripes in black, white and black-and-white selvedges was used for this example. The piece consists of three narrow (50 cm) parts that form a square when put together.

To tie the three examples together, in addition to the black and white, dyed selvedges were included both in warp and weft (fig. 34). All colours in the piece are naturally dyed, except black, white and lime green. In order to create a less stiff and more playful piece, the planning beforehand was limited, and most decisions were made during weaving, adding colours, changing the binding etc, viewing the weaving of the final piece as a sort of experimental workshop in itself, not knowing what the full piece would look like beforehand.

Hopsack was the main binding, but some twill variations were also used. This greater variation created a more flowing and more fun piece. Some parts were brushed, taking advantage of the material’s fringes, to create varying textures in the same piece - both fluffy and more flat, also adding to the playfulness and making the textile more interesting to look at – the viewer can continue finding new aspects of the textile when they keep looking at it.

Fig. 32. Woven sample, 24 x 40 cm.  
Fig. 33. Final sketch before weaving.  
Fig. 34. Detail of finished piece.
3.3.3. DEVELOPMENT OF "DEFLECTED DOUBLE WEAVE"

The sample where deflected double weave was used was considered promising, because of the large graphic pattern that was created (fig. 36). Therefore, it was decided that one of the pieces should showcase the possibilities of deflected double weave, i.e. large, rounded, graphic patterns (which can be hard to achieve in shaft weaving using other bindings), that could have a big variation, when woven on a computer aided loom with many shafts (in this case, 22 shafts were used (fig. 38)).

Many sketches and samples were made, on paper as well as in the weaving software Weavepoint (fig. 35), before it was decided on a final design. The final design has a large scale pattern that changes throughout the width and length of the piece, to keep the viewer’s interest, and making the piece stand out, as well as making it appear to have a more modern, designed look. This was done by using a pointed threading and a computer aided handloom with 24 shafts. The fringes were kept long at the bottom, to enhance and show off the material.

White, black and blue selvedges were used, because these were some of the colours that were plentiful in the supplied waste material, and to give a strong contrast, to amplify the effect of the pattern. To tie the three examples together, some naturally dyed selvedges were sewn into some of the shapes in the pattern (fig. 37), and added to the bottom fringe. Before doing this, sketches were made in Photoshop to try out some different placements of the colour.

Fig. 36. Detail of sample.
Fig. 37. Detail of finished piece.

Fig. 35. Some variants made during the development in Weavepoint, with scale models.
4.1. RESULT

4.1.1. RAINBOW
Plain weave, 97 x 97 cm (excluding fringe).

Fig. 39. Unbrushed side.

Fig. 40. Brushed side.
4.1.2. SQUARE
Hopsack, twill variations.
155 x 145 cm, or as three separate pieces 50 x 145 cm each.
4.1.3. DEFLECTED DOUBLE WEAVE
Deflected double weave, 81 x 225 cm (excluding fringe)

Fig. 43. Detail

Fig. 44. Full piece
4.2. PRESENTATION

Deflected double weave is presented half-hanging, with the bottom fringes laying slightly on the floor. Keeping the fringe but hanging it in this way is a way to show the viewer the origin of the material, but not having it be the focus point.

Rainbow is presented hanging at an angle, to allow easy viewing of both sides.

Square is placed flat on a low podium, resembling a rug but elevated, both literally and figuratively.

Fig. 45. Image from the exhibition at The Swedish Museum of Textiles, Borås
4.3. CONCLUSION

The task of making it possible to use waste selvedges in the warp direction in a regular handloom was successful. The selvedges were a bit difficult to handle, and had a tendency to become tangled. However, it was easier than suspected both to set up the warp and to weave. The most difficult binding to weave was plain weave, as the selvedges got more tangled when the floats were shorter, making it more difficult to get a good shed when pushing down the treadles. When spacing the warp threads out more, the weaving is easier as they do not tangle as much. One thread per centimeter was found ideal to create both a fairly stable fabric, that was fairly easy to weave. Even if the tangling is a problem, the thickness of the selvedges builds the weave quickly, still making the weaving fairly effective.

It was also found that in the supplied material, there were selvedges with shorter and longer fringes. The shorter fringed selvedges were concluded to be more suitable to use in the warp direction, since the selvedges with longer fringe got tangled much easier, which made it more difficult to weave. However, the length of the fringes did not influence the difficulty of weft insertion, making them suitable to use in the weft.

Dyeing the selvedge waste with food waste and natural dye was found successful, creating a large variety of colours. The colour fastness however, was not tested and it is not known how good the dyes keep their shade when exposed to light, moisture, etcetera. This could be considered a problem, or it could be looked at as an advantage or a design variable, making the textiles change through time.

Upcycling waste selvedges as the material in this work means reducing waste, that would otherwise just have been thrown away, instead of having to buy newly produced yarn, thus making this work sustainable. The use of natural dyes in the work also brings a sustainable aspect, by making use of food waste, and limiting the use of chemicals compared to conventional dyeing.

If this project was to be continued, a next step could be to explore even more bindings and techniques. Some kind of 3D-weaving would be an interesting opportunity to explore, to show even more variety in what can be created from this material. A few small samples using ikat dyeing were made, but this was not explored further as it was considered a too large sidetrack to delve into in this project, but it has potential to be further explored in the future.

4.4. DISCUSSION

The success of handweaving using waste selvedges in both warp and weft direction brings many design possibilities in handweaving and textile design. There is great potential in this material, which should be explored further.

One limitation is that the selvedges probably are difficult to use, both as warp and weft, in weaving machines, since they are so thick and fringed, limiting their use to handweaving. Another issue is that the selvedges shed a lot of loose fibers, which means a lot of dust. This could be a problem, especially if the finished object will be placed in a home environment. During the process of dyeing the selvedges using natural dyes, some fibres where shed, limiting the amount of dust created after dyeing.

The “Cradle to cradle” philosophy was developed by McDonough and Braungart (2002), suggesting that in order to achieve sustainability, all products should fit into one of two cycles: a biological cycle (returning to nature by composting) or an industrial cycle (where the material is industrially recycled and used again). After having served their purpose, the pieces developed in this project could be downcycled, and used as stuffing in a pillow or similar. Mechanical separation which would allow redesign would also be possible. After this, I propose returning the material to nature by composting it, which is possible thanks to it being made solely from natural fiber (flax).

Comparing this work to Re Rag Rug by Brieditis and Evans (Vessby 2013), this work uses less variation in technique and instead focuses on handweaving, exploring it extensively. This makes this work less varied in expression and aesthetics than Re Rag Rug, but it is a good base for researching hand weaving with selvedge waste further.

Ideas from this work, if further developed, could be a small puzzle piece in the new, sustainable design thinking described by Fondazione La Triennale di Milano (2019) and Porcelijn (Frearson 2017).

My wish is that this work would show other people working in the textile field that selvedge waste can have many uses and expressions in design and handicraft, and that it is possible to make this waste material look luxurious, so less of it would have to be thrown away with no use.
5. REFERENCES


6. IMAGES

Figure 1-4, 29, 37, 39-45: Photographed by Jan Berg

Figure 5, 14-27, 30-36, 38: Photographed or drawn by the author.

Figure 6-7, 10-13: Removed for copyright reasons.

Figure 8-9: Screenshots from Weavepoint

Figure 28: Photographed by Marjan Kooroshnia