

Comparing the Profit Margin of Textiles Woven on a Hand Loom and Automatic Loom in the Textile Industry: Case of Buldan City

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Abstract

The ever-changing senses of consumption and the fashion factor in the world have caused an ongoing increase in the demand for hand woven textiles in recent years. Therefore the prices of hand woven textiles, where the supply is limited, are on the rise. It is known that Buldan city, one of the centers of hand woven production in Anatolia, has significant commercial potential in this respect. The purpose of this study is to provide an insight into the industry by comparing the profit margin of products woven on hand looms and automatic looms in the textile industry in Buldan city and to raise awareness regarding the importance of production on hand looms. "Scarf", which is the textile item most produced in Buldan, was selected for study. In the study the unit costs of scarves woven with insect silk, floss silk, cotton and linen yarn, which are widely used in production, on hand looms and automatic looms were calculated and profit margins obtained from average sales prices were compared. At the end of the study, it was seen that the profit margin of hand woven textiles was almost twice as high as those woven on automatic looms.

Key words: woven fabric, hand loom, automatic loom, profit margin, Buldan city.

home-workshop-family union has contributed much to the passing down of hand weaving [1, 2].

When the textile industry, which developed in 1955, played havoc with weaving as minor handicrafts, weavers tried to find a personal solution in mechanisation against technology. Following that period, hand looms decreased rapidly while automatic looms gradually increased [3].

In Buldan the industrialisation process started with medium-sized enterprise raw clothing production at 1.000 km/year in the city in the 1990s. Due to the increase in the number of factories in the following years, hand weaving faced the risk of disappearance [4].

According to inventory work conducted in 2009, 45 units of hand looms, 127

units of semi-automatic looms and 102 units of automatic looms are in operation in the city [5].

Materials and method

In the study the purpose was to calculate the unit costs of scarves woven with insect silk, floss silk, cotton and linen yarn on hand and automatic looms, as well as to compare profit margins calculated from average sales prices using data received from Buldan Weavers Cooperative No: S.S. 1.

The values of scarves used within the scope of the study are given in **Table 1**.

In this study cost and profit margin calculations based on the quantity of scarves

Introduction

In Anatolia, Denizli and its surroundings are one of the centers where weaving is a constant source of income. And it is known that one of the main centres of weaving in Denizli is Buldan city.

The home-workshop union, which is one of the traditional characteristics of Buldan hand weaving, exists today to keep craft production of the Middle Ages alive. The weaving loom is usually placed in the corner of a patio or in an adjoining extension of a house. This structure of the home-workshop-family union has begun to change in recent years. However, the

Table 1. Technical data of fabrics.

Type of yarn filament	Insect silk	Floss silk	Cotton	Linen
Basic weight, g/m ²	200	250	286	300
Number of warp threads	1350			
Width, cm	90			
Length, cm	180			
Yarn count, dtex	333		1000	1656

Table 2. Monthly scarf output; *Automatic looms allow two scarves to be woven at the same time.

Loom		Insect silk	Floss silk	Cotton	Linen
Hand	Weaving time, minute	130	45	25	35
	Monthly output, unit (Monthly working time / processing time)	83	240	432	309
Automatic	Weaving time, minute	12	10	5	8
	Monthly output, unit * (Monthly working time / processing time) × 2	1.800	2.160	4.320	2.700

Table 3. Total weaving preparation cost (\$/month); * manually, ** automated.

		Loom							
		Hand				Automatic			
		Insect silk	Floss silk	Cotton	Linen	Insect silk	Floss silk	Cotton	Linen
Weaving preparation, hour	a) Warp	6	4	3	4	7	6	4	5
	b) Drawing in	7	4	3	3	7	6	2	3
	c) Combing	3.3	3	2	2	3	3	2	2.5
	d) Knotting	1*				1**			
Weaving preparation labor hourly rate, \$	a) Warp	50.00	35.00	15.00	17.50	125.00	75.00	50.00	50.00
	b) Drawing in	75.00	50.00	90.00	45.00	125.00	100.00	75.00	90.00
	c) Combing	75.00	45.00	35.00	40.00	75.00	50.00	45.00	50.00
	d) Knotting	12.50*				20.00**			
Weaving preparation cost (weaving preparation hour × labor hourly rate)	a) Warp	300.00	105.00	45.00	70.00	875.00	450.00	200.00	250.00
	b) Drawing in	525.00	200.00	270.00	135.00	875.00	600.00	150.00	270.00
	c) Combing	247.50	135.00	70.00	80.00	225.00	150.00	90.00	125.00
	d) Knotting	12.50*				20.00**			
	Total weaving preparation cost, \$/month	1,085.00	452.50	397.50	297.50	1,995.00	1,220.00	460.00	665.00

Table 4. Total raw material costs (\$/month).

	Loom							
	Hand				Automatic			
	Insect silk	Floss silk	Cotton	Linen	Insect silk	Floss silk	Cotton	Linen
Yarn consumption, gram	200	250	286	300	200	250	286	300
Yarn price (1.000 grams), \$	150.00	12.50	5.00	8.50	150.00	12.50	5.00	8.50
Unit cost of yarn, \$ [(yarn price/1000 grams) × yarn consumption]	30.00	3.13	1.43	2.55	30.00	3.13	1.43	2.55
Monthly output, unit	83	240	432	309	1.800	2.160	4.320	2.700
Total raw material cost, \$/month (unit cost of yarn × monthly output)	2,490.00	751.20	617.76	787.95	54,000.00	6,780.80	6,177.60	6,885.00

that a worker can produce on a hand or automatic loom in a month under normal working conditions constitute the limit of the research.

It was established that the following six cost items were available in the production of scarves woven on hand and automatic looms according to data received from Buldan Weavers Cooperative No: S.S. 1:

- Weaving preparation cost (warp, drawing in, combing, knotting)
- Yarn cost
- Labour
- Amortisation
- Energy (electricity)
- Other general expenses and unaccountable cost items (10% of total cost).

Results and discussion

Monthly output

Article no: 63 of Labour Act no: 4857 states that the weekly working time is 45 hours, equally distributed among the working days unless otherwise stated. Accordingly the daily working time will be 7.5 hours in a workplace which operates 6 days a week. With reference to

that, the monthly normal working time of a worker in minutes is calculated as follows:

Monthly normal working time

$$\begin{aligned}
 &4 \text{ weeks} \times 45 \text{ hours} = \\
 &= 180 \text{ hours} \times 60 \text{ minutes} = \\
 &= \mathbf{10.800 \text{ minutes/month}}
 \end{aligned}$$

Considering the monthly working time of a worker, monthly scarf outputs calculated for hand and automatic looms are given in **Table 2**.

Weaving preparation cost (warp, drawing in, combing, knotting)

The monthly total weaving preparation costs (warp, drawing in, combing, knot-

ting) of scarves woven calculated for hand and automatic looms are given in **Table 3**.

Raw material cost (yarn cost)

The monthly total raw material (yarn) costs of scarves woven on hand and automatic looms are calculated in **Table 4**.

Labour cost

The monthly total labour (weaving process) costs of scarves woven on hand and automatic looms are calculated in **Table 5**.

Amortisation cost

It was established that the average cost of a hand loom was \$750 and its economic life 5 years according to data received from Buldan Weavers Cooperative No: S.S. 1. In the light of such data, the monthly amortisation costs of production

Table 5. Total labour (weaving process) costs (\$/month).

Loom		Insect silk	Floss silk	Cotton	Linen
Hand	Monthly output, unit	83	240	432	309
	Weaving process cost, \$/unit	7.50	5.00	2.00	4.00
	Total weaving cost, \$/Ay, (monthly output × weaving process cost)	622.50	1,200.00	864.00	1,236.00
Automatic	Weaving process cost, \$/worker (minimum wage of a worker in 2013)	595.00			
	Total weaving cost, \$/month	595.00			

Table 6. Hand loom – total amortisation costs (\$/month).

	Insect silk	Floss silk	Cotton	Linen
Total amortization cost, \$/month: (loom cost/5 years)/12 months	12.50			

Table 7. Automatic loom – total amortisation costs, \$/month.

	Insect silk	Floss silk	Cotton	Linen
Total amortisation cost (\$/month): (loom cost/5 years)/12 months	250.00			

Table 8. Automatic loom – total energy costs, \$/month.

	Insect silk	Floss silk	Cotton	Linen
Total energy cost (\$/month)	150.00			

on hand looms are shown in **Table 6** (see page 16).

It was established that the average cost of an automatic loom was \$15.000 and its economic life 5 years according to data received from Buldan Weavers Cooperative No: S.S. 1. In the light of such data, the monthly amortisation costs of production on automatic looms are given in **Table 7**.

Energy (electricity) cost

As production on hand looms is performed based on manpower, there is no energy cost at the end of production. The monthly energy (electricity) costs of production on automatic looms are given in **Table 8**.

Profit margin calculations

In this study, the possible costs of scarves woven with insect silk, floss silk, cotton and linen yarns on hand and automatic

looms are calculated under five main titles in **Tables 3, 4, 5, 6, 7** and **8**. And in the following **Table 9**, the purpose is to establish the unit profit margin by combining the possible costs calculated and by comparing the unit costs and possible sales prices.

In the left part of **Table 9**, firstly five cost items constituting the cost of scarf production on hand looms were combined. Then 10% of “**Other General Expenses and Unaccountable Cost**” items was added to the total cost stated. And then the “**Total Cost**” figures and “**Unit Costs**” were calculated. Finally the “**Average Sales Price**” and “**Unit Profit**” were compared and the “**Unit Profit Margin**” calculated.

It was calculated that the unit profit margin of scarves woven on hand looms with “**Insect Silk**” was 63%, with “**Floss**

Silk” 63%, with “**Cotton**” 52% and with “**Linen**” 45%.

In the right part of **Table 9** firstly the five cost items constituting the cost of scarf production on automatic looms were combined. Then 10% of “**Other General Expenses and Unaccountable Cost**” items was added to the total cost stated. And then the “**Total Cost**” figures and “**Unit Costs**” were calculated. Finally the “**Average Sales Price**” and “**Unit Profit**” were compared and the “**Unit Profit Margin**” calculated.

It was calculated that the unit profit margin of scarves woven on automatic looms with “**Insect Silk**” was 23%, with “**Floss Silk**” 17%, with “**Cotton**” 22% and with “**Linen**” 27%.

Conclusions

In Buldan city, which is one of the centers of weaving in Anatolia, there are two different types of production: hand looms and automatic looms. It is observed that there has been a significant decrease in production on hand looms recently. Weaving on hand looms, which is a difficult type of production, is not in demand as an occupation by young people in the region. Therefore it is expected that this occupation, which is learned through the master-apprentice system, will be among the disappearing occupations soon. Therefore it is necessary to raise awareness in the region in order to save hand weaving from this situation and to hand it down to the next generations.

Table 9. Unit profit margin calculation table for the scarves woven in hand and automatic looms.

	Hand loom				Automatic loom			
	Insect silk	Floss silk	Cotton	Linen	Insect silk	Floss silk	Cotton	Linen
1. Total weaving preparation cost, \$	1.085.00	452.50	397.50	297.50	1.995.00	1.220.00	460.00	665.00
2. Total raw material cost, \$	2.490.00	751.20	617.76	787.95	54.000.00	6.780.80	6.177.60	6.885.00
3. Total weaving cost, \$	622.50	1.200.00	864.00	1.236.00	595.00			
4. Total amortisation cost, \$	12.50				250.00			
5. Total energy cost, \$	-				150.00			
Subtotal	4,210.00	2,416.20	1,891.76	2,333.95	56.990.00	8.995.80	7.632.60	8.545.00
6. Other general expenses and unaccountable cost items (subtotal × 0.10)	421.00	241.62	189.18	233.40	5.699.00	899.58	763.26	854.50
Total cost, \$/month	4,631.00	2,657.82	2,080.94	2,567.35	62.689.00	9.895.38	8.395.86	9.399.50
Monthly output, unit	83	240	432	309	1.800	2.160	4.320	2.700
Unit cost, \$ (Total cost/monthly output)	55.80	11.07	4.82	8.31	34.83	4.58	1.94	3.48
Average sales price, \$ (Buldan weavers cooperative No: S.S. 1)	150.00	30.00	10.00	15.00	45.00	5.50	2.50	4.75
Unit profit, \$ (average sales price – unit cost)	94.20	18.93	5.18	6.69	10.17	0.92	0.56	1.27
Unit profit margin, % (unit profit/average sales price) × 100	63	63	52	45	23	17	22	27

It is observed that the demand for hand woven textiles has been constantly on the rise due to the ever-changing preferences of consumers in recent years. Therefore the prices of hand woven textiles, where the supply is limited, are on the rise. The purpose of this study was to provide an insight into the industry by comparing the profit margin of products woven on hand looms and automatic looms and to raise awareness regarding the importance of production on hand looms.

The “Scarf”, which is the textile item most produced in Buldan, was preferred in application study. Herein the unit costs of scarves woven with insect silk, floss silk, cotton and linen yarn, which are widely used in production on hand and automatic looms were calculated and the profit margins calculated by comparing the average sales prices.

While the unit profit margin of scarves woven with “**Insect Silk**” on hand looms was calculated as 63%, it was 23% for automatic looms. While the unit profit margin of scarves woven with “**Floss Silk**” on hand looms was calculated as 63% again, it was 17% for automatic looms. Whereas the unit profit margin of scarves woven with “**Cotton**” on hand looms was calculated as 52%, it was 22% for automatic looms. Finally while the unit profit margin of scarves woven with “**Linen**” on hand looms was calculated as 45%, it was 27% for automatic looms.

As is seen from the results of the study, the profit margin of hand woven textiles was almost twice as high as for textiles woven on automatic looms. This situation shows that the hand weaving industry is appealing and promising.

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INSTITUTE OF BIOPOLYMERS AND CHEMICAL FIBRES

LABORATORY OF BIODEGRADATION

The Laboratory of Biodegradation operates within the structure of the Institute of Biopolymers and Chemical Fibres. It is a modern laboratory with a certificate of accreditation according to Standard PN-EN/ISO/IEC-17025: 2005 (a quality system) bestowed by the Polish Accreditation Centre (PCA). The laboratory works at a global level and can cooperate with many institutions that produce, process and investigate polymeric materials. Thanks to its modern equipment, the Laboratory of Biodegradation can maintain cooperation with Polish and foreign research centers as well as manufacturers and be helpful in assessing the biodegradability of polymeric materials and textiles.

The Laboratory of Biodegradation assesses the susceptibility of polymeric and textile materials to biological degradation caused by microorganisms occurring in the natural environment (soil, compost and water medium). The testing of biodegradation is carried out in oxygen using innovative methods like respirometric testing with the continuous reading of the CO₂ delivered. The laboratory's modern MICRO-OXYMAX RESPIROMETER is used for carrying out tests in accordance with International Standards.



The methodology of biodegradability testing has been prepared on the basis of the following standards:

- **testing in aqueous medium:** 'Determination of the ultimate aerobic biodegradability of plastic materials and textiles in an aqueous medium. A method of analysing the carbon dioxide evolved' (PN-EN ISO 14 852: 2007, and PN-EN ISO 8192: 2007)
- **testing in compost medium:** 'Determination of the degree of disintegration of plastic materials and textiles under simulated composting conditions in a laboratory-scale test. A method of determining the weight loss' (PN-EN ISO 20 200: 2007, PN-EN ISO 14 045: 2005, and PN-EN ISO 14 806: 2010)
- **testing in soil medium:** 'Determination of the degree of disintegration of plastic materials and textiles under simulated soil conditions in a laboratory-scale test. A method of determining the weight loss' (PN-EN ISO 11 266: 1997, PN-EN ISO 11 721-1: 2002, and PN-EN ISO 11 721-2: 2002).



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1997, PN-EN ISO 11 721-1: 2002, and PN-EN ISO 11 721-2: 2002).

The following methods are applied in the assessment of biodegradation: gel chromatography (GPC), infrared spectroscopy (IR), thermogravimetric analysis (TGA) and scanning electron microscopy (SEM).

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