ECONOMIC PRODUCTION OPTIMIZATION BY FIBER BLENDING

Khaled Abdelmohsen Ahmed
Egyptian Spinning & Weaving Company
Sadat City, Egypt

Abstract

In today's competitive arena, organizations must use all possible means to maximize growth and profitability by focusing on cost saving and continuous development. Raw material is the cornerstone to produce optimal and economical yarns so this study will help manufacturers choose suitable varieties of cotton for blending to produce yarn with optimum characteristics enhanced to satisfy customer. In this study, different varieties of cotton fibers have been blended. The result showed that improve mechanical characteristics of yarns can be achieved through judicious fiber selection for the blend. In addition, it was found that Pima cotton is economical cotton to produce fine yarns with less impurities and imperfections. In general, Egyptian cotton has finest fiber and highest strength. It could be seen that resultant waste to produce one Kg yarn from Pima Cotton & Acala is 24 percent (C.F 1.32) while waste to produce one Kg yarn from Egyptian cotton (G87&G86) is 28 percent (C.F 1.38) .The result indicated that raw material cost reduced by 7% to 10%.

Introduction

The textile industry has an opportunity to alter the landscape in many countries. The textile sector is regarded as the engine of growth for many developing countries, since it accounts for around 45 percent of developed markets imports from the developing countries. On the other hand, competition is very hard, especially in traditional segments of industry such as spinning and conventional textile processing. Gaining more profit depends on minimizing the raw material cost of yarns.

In general, raw material forms nearly half of the yarn's total cost (in case of fine counts) and other cost factors such as labor, energy, capital, cost of machines and auxiliary parts forms the other half of the yarn cost .It is not possible or economical to depend upon a single variety of cotton to produce a particular yarn suitable for all application though out the year. The fine Extra-Long Staple cotton should be used for production of top quality yarns. Proper fiber blending can lead to substantial reduction in the cost of the yarn that's the way to keep spinners profitable and their customers satisfied.

Aim of work

Studying cost and quality comparison between different varieties of cotton fibers blended to produce yarn with optimum characteristics.

Materials and methods

Material

In this study Pima cotton "Grade 2" and Acala cotton "strict low middling SJV" These materials were blended to produce different yarns. Also, Egyptian cotton G87 "Good 7/8,3/8" and Egyptian cotton G86 "Good 3/8" were blended to produce different yarns. The physical properties of US Cotton and Egyptian cotton are cleared in table 1 and 2. Additionally, the Yarn analysis quality and cost comparison are shown in Figures (1P-5P) US cotton and Figures (1E-6E) Egyptian cotton.

Table 1.Physical properties of US Cotton

Variety		Extra Long Staple	Long Staple
Property		Pima	Acala
Upper Half Mean	mm	34.1	28.2
Uniformity	Index	88	84.6
Strength	g/tex	43	33.8
Elongation	%	6.4	5.4
Micronaire	µ/inch	4.1	4.68
Reflectance	Rd%	69.4	76.3
Yellowness	+b	12.1	10.8
Trash Area	%	0.24	0.15
Trash Count		19	18
Maturity	%	92	91
Hair - Weight	millitex	135	162
Neps	gr	90	158

Table 2.Physical properties of Egyptian cotton

Variety		Extra Long Staple	Long Staple
Property		G 87	G 86
Upper Half Mean	mm	34.6	32.5
Uniformity	Index	87.2	85.8
Strength	g/tex	43.7	44
Elongation	%	5	4.9
Micronaire	µ/inch	3.13	3.9
Reflectance	Rd%	73	75.3
Yellowness	+b	8.2	8.9
Trash Area	%	1.1	0.83
Trash Count		67	64
Maturity	%	81	78
Hair - Weight	millitex	123	153
Neps	gr	98	73

Results and Discussion

Following charts shows the properties of compact yarn Pima cotton and Pima & Acala (70/30)Egyptian cotton G87 and G87&G86 (70/30) Yarns with twist classified as weaving yarns.
Ne 80 Speed 17000 rpm k44 m/c
Ne 100 Speed 16000 rpm k44 m/c
Ne 115 Speed 15000 rpm k44 m/c
Ne 140 Speed 12500 rpm k44 m/c
Ne 160 Speed 11500 rpm k44, k46 m/c

US Cotton

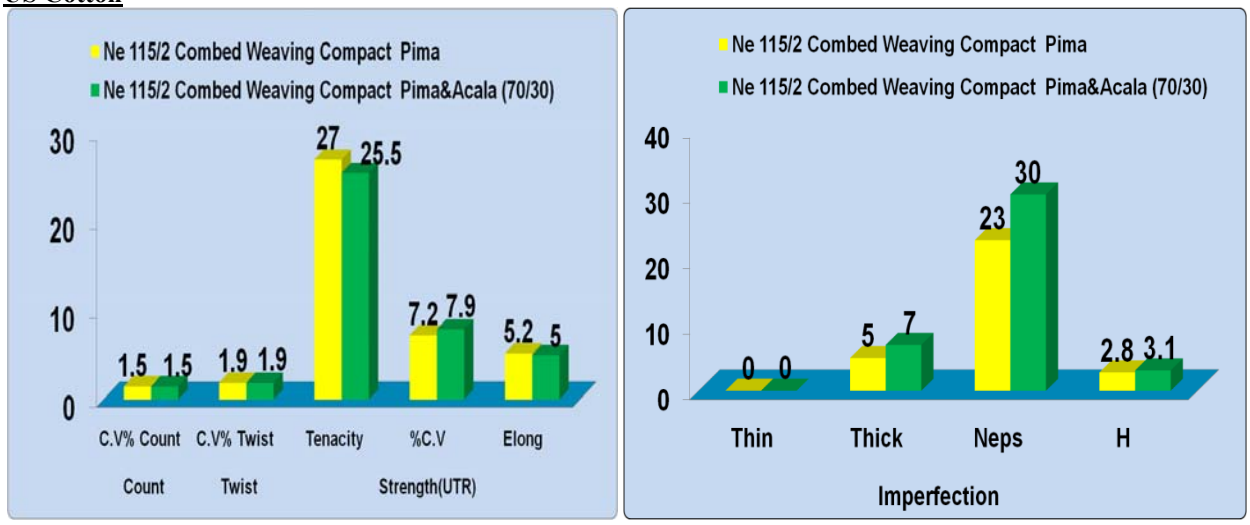

Figure 1P

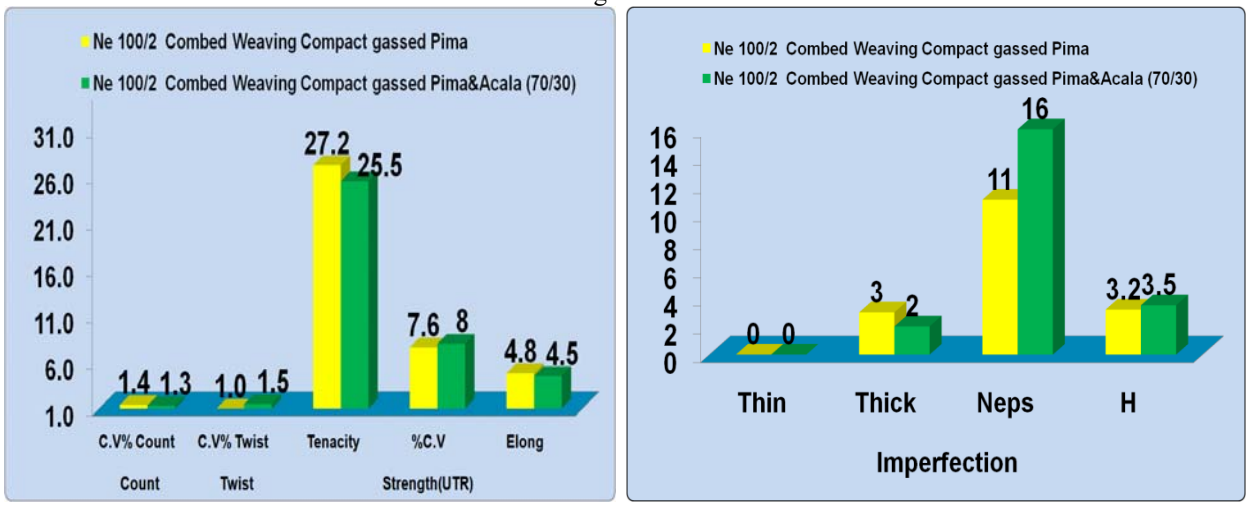

Figure 2P

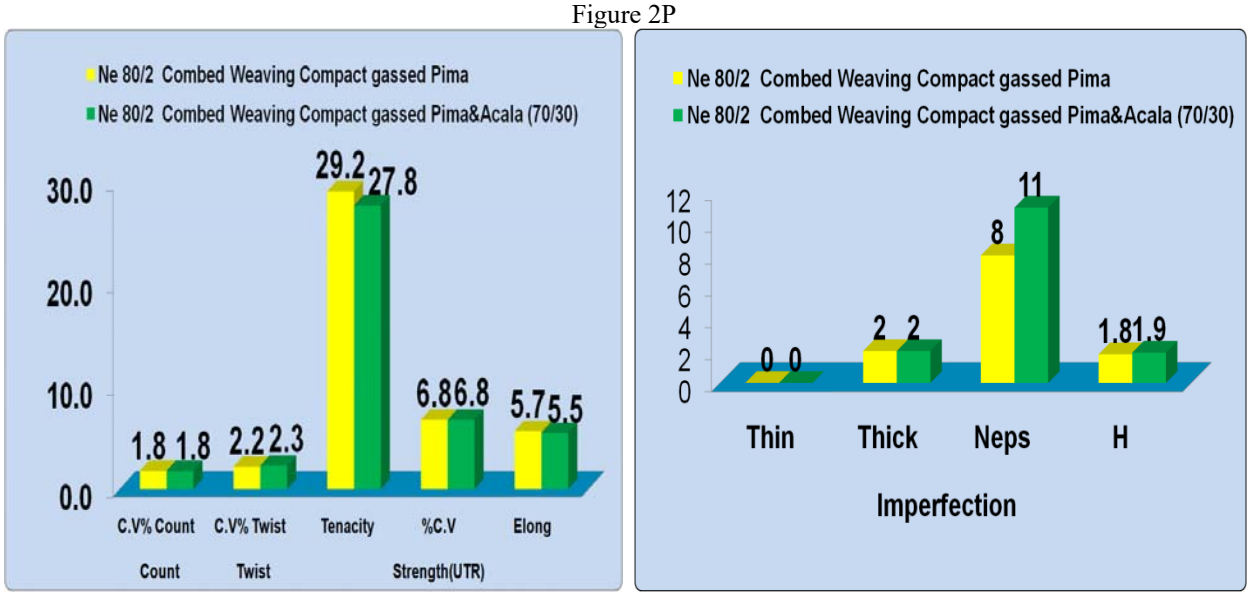

Figure 3P

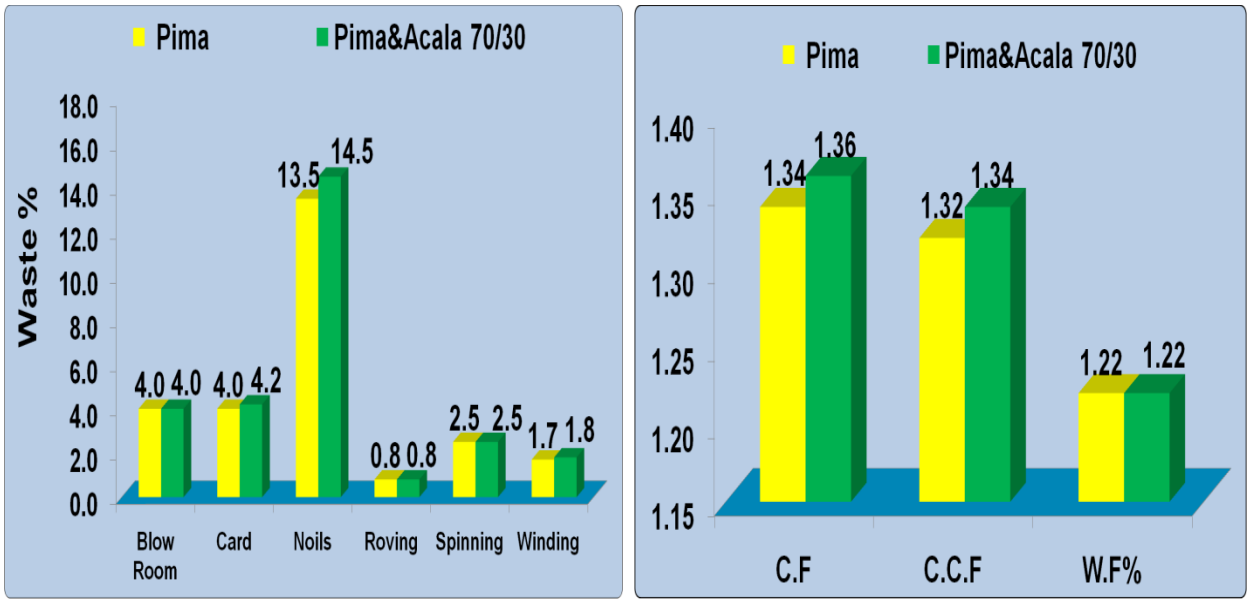

Figure 4P

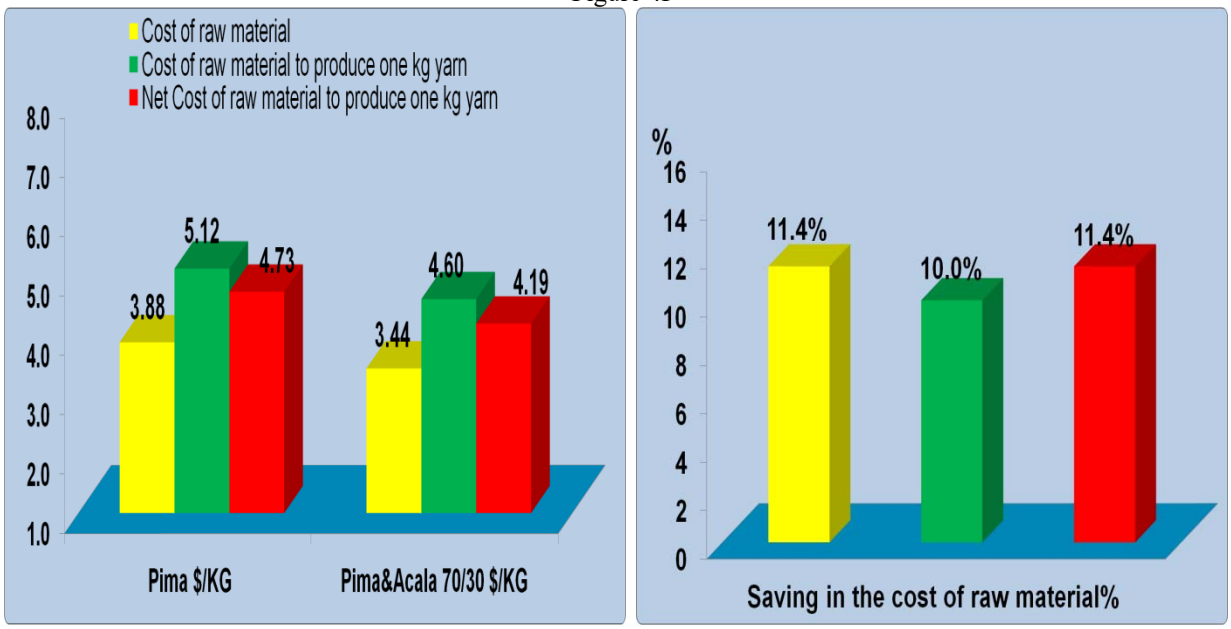

Figure 5P

Figures (1P-5P) Yarn analysis quality and cost comparison

These results indicate that yarns produced by fiber blending (Fig. 1P-3P) achieved same specification with little changes in neps and strength compared to yarns produced by pure pima fibers. By using blending fibers technique, (Fig. 4P) waste% increased by 1% in noils for pima blend compared to pure pima and C.C.F for pima blend 1.34 compared to 1.32 for pure pima. This reflected to the result in the cost of raw material which is easily noticed in the (Fig. 5P). A significant effect on improving the cost of raw material, the net saving in the cost of raw material to produce one Kg yarn is 11.4% in case pima blend which is easily noticed in the figure

Egyptian Cotton

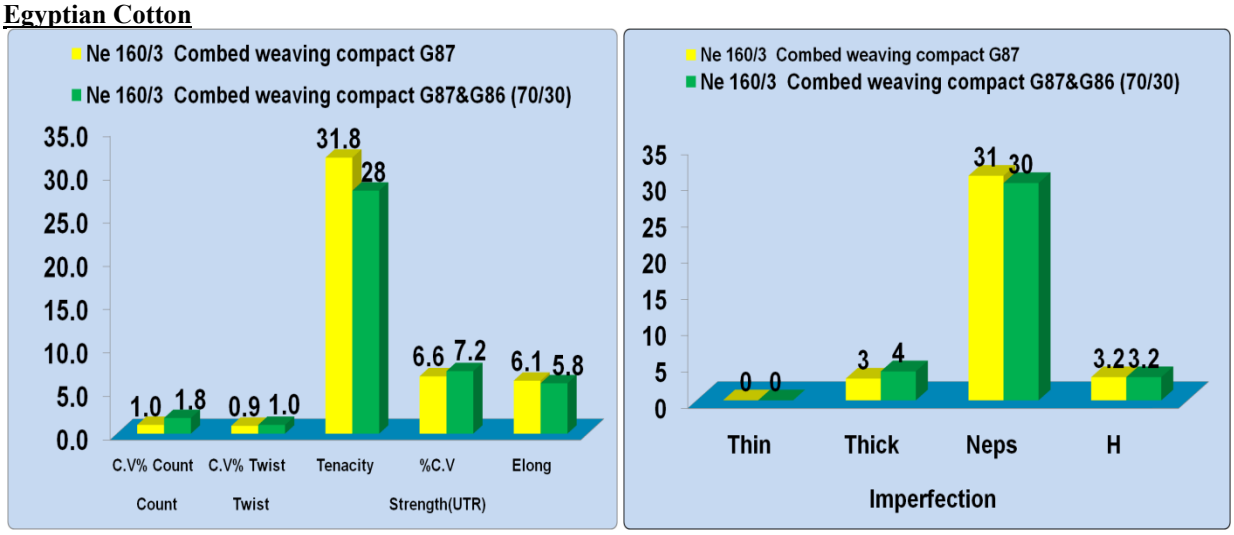

Figure 1E

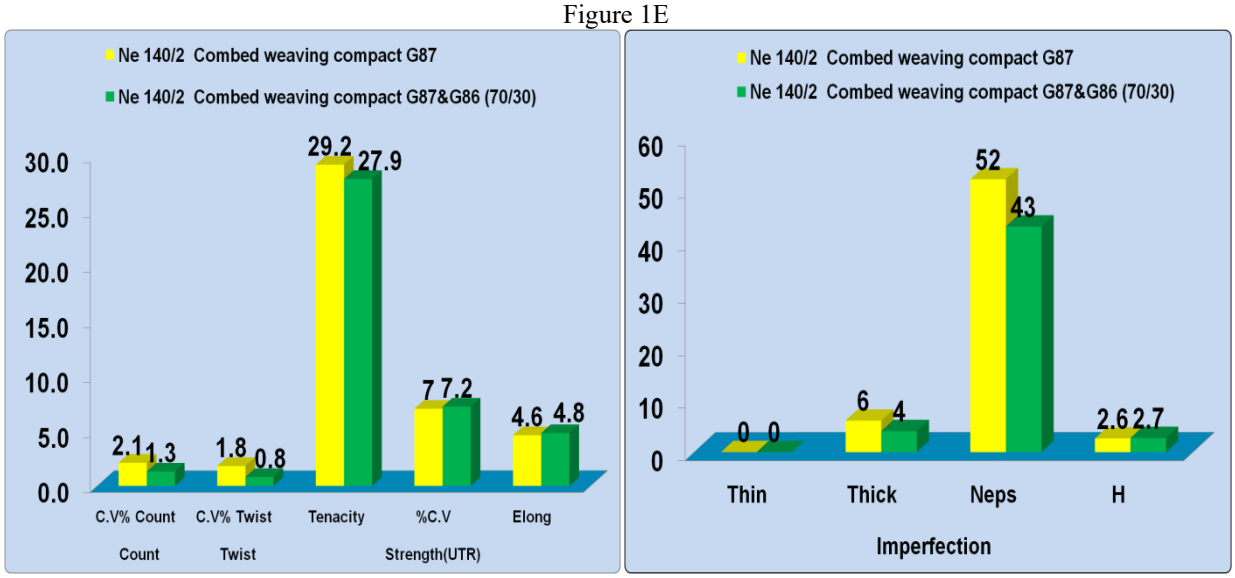

Figure 2E

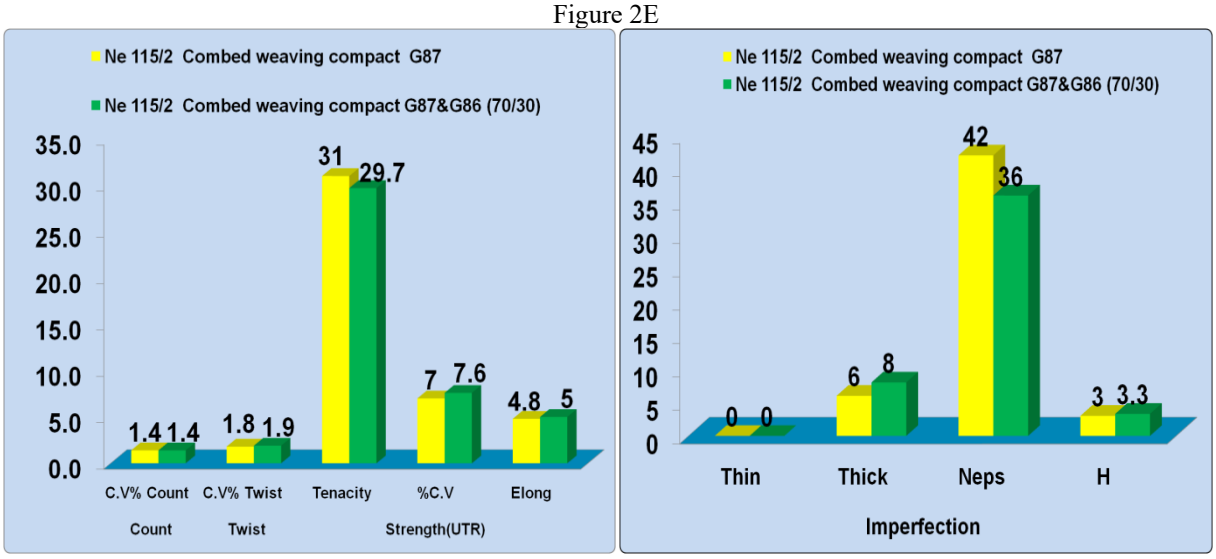

Figure 3E

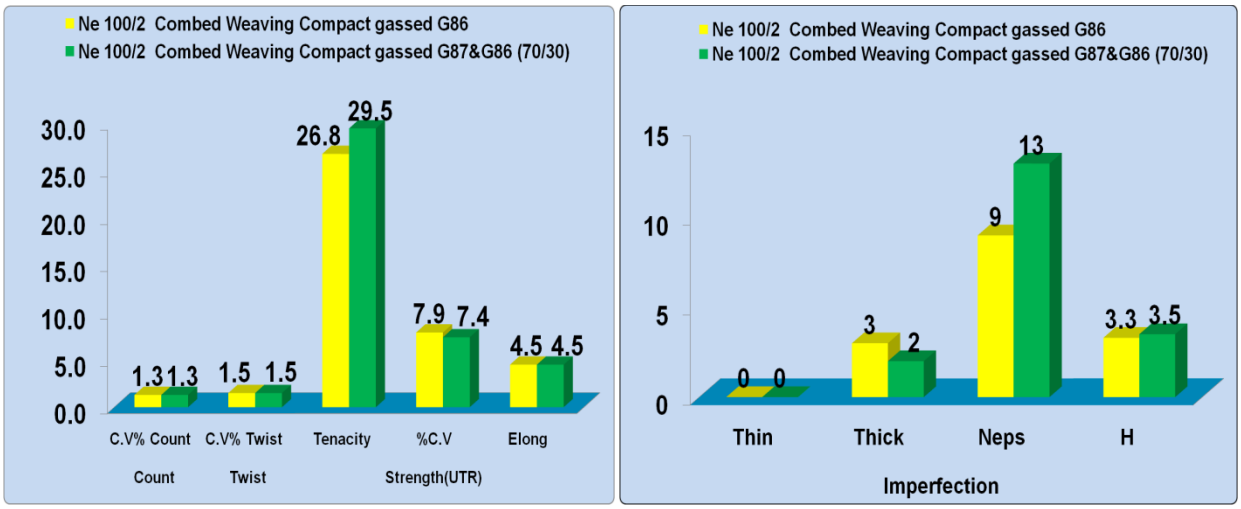

Figure 4E

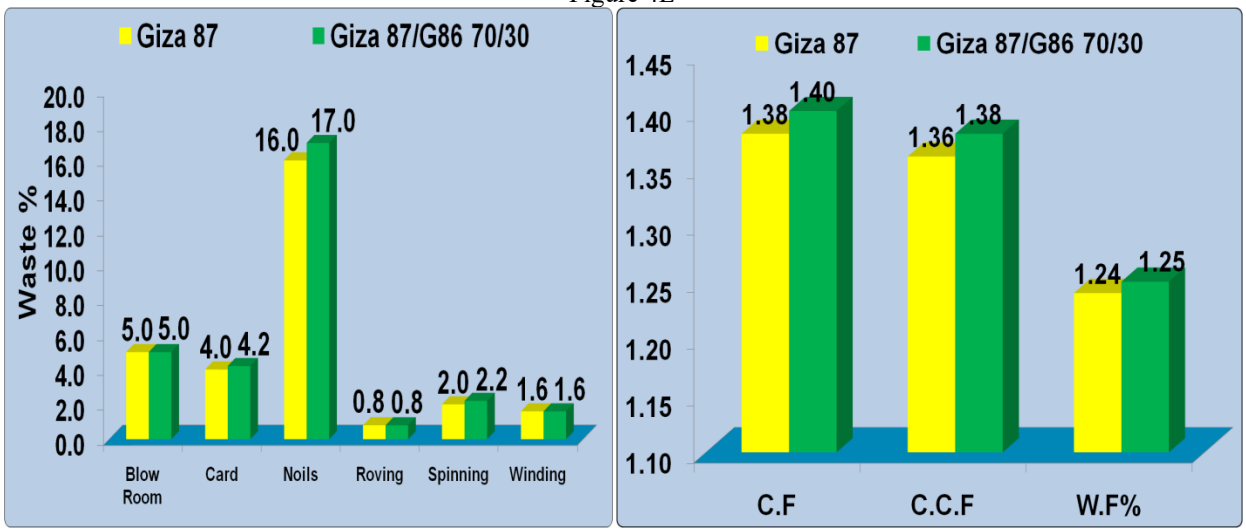

Figure 5E

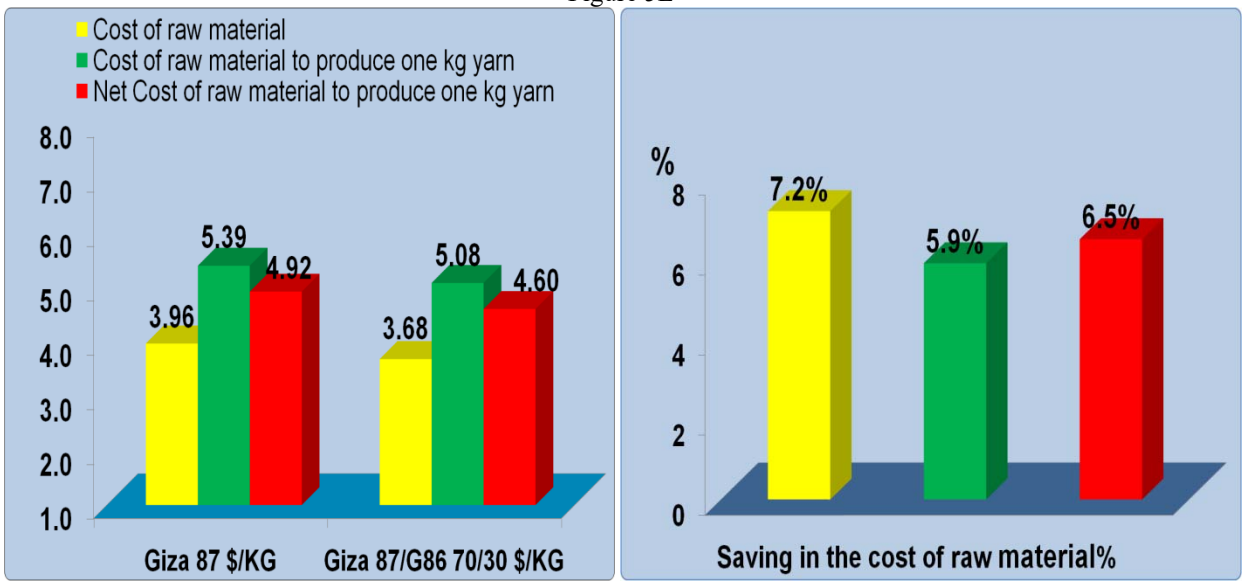

Figure 6E

Figures (1E-6E) Yarn analysis quality and cost comparison.

These results indicate that yarns produced by fiber blending (Fig. 1E-4E) enhance customer specification with improving the neps and reduces strength a little bit compared to yarns produced by pure Egyptian cotton fibers G87. This homogenous blend can be achieved by using fibers technique Table 2. Fig. 5E shows that waste% increase 1% in noils for Cotton blend compared to pure Egyptian cotton and C.C.F for Cotton blend 1.38 compared to 1.36 for pure Egyptian cotton. The results in Fig. 6E showed a significant effect on improving the cost of raw material and the net saving in the cost of raw material to produce one Kg yarn 6.5% in case Cotton blend

Recommendations

1-Right decision depend on end use of yarn Weaving, knitting, technical fabric, sewing threads
2-Select proper fibers to blend essential quality parameter such as the cotton's Fineness, length, strength, color and neps.
3-Control spinning process, Cotton lay down, Machines setting, Control the waste in the production process

Conclusions

We have demonstrated in this work by presenting different varieties of cotton fibers blended, it was clear that blended cotton yarns enhance customer specification however it has 7% to 10% cost reduction of raw material Our study has also yielded several interesting findings. Pima cotton is economical cotton to produce yarns Egyptian cotton has finest fiber and highest strength**.**

Acknowledgements

I am using this opportunity to express my gratitude to the Egyptian Spinning & Weaving Company and Modern nile for their contribution in providing raw materials, samples manufacturing and testing facilities. Special thanks to Dr. Prof. Alaa Arafa Badr and Dr. Ahmed hassanin Alexandria University, EGYPT for providing us valuable knowledge to complete this work

References

Cothren, J.T. 1999. Physiology of cotton plant. p. 207–268. *In* C.W. Smith and J.T. Cothren (eds.) Cotton: Origin, History, Technology, and Production. John Wiley & Sons, Inc., Danvers, MA.

Coplan, M. J., Some Effects of Blend on Structure, in "Proc. of Blend Fabrics and Their Impact on Military Textile Applications," Quartermaster Research & Engi. Center, Natick, MA, May 17-18, 1960

D. K_emenáková* and J. Militk_** *-Dept. of Textile Structures, **- Dept. of Textile Materials Technical University of Liberec, Halkova 6, 46117 Liberec, Czech Republic

Fundamentals of textiles and their care - Susheela Dautyagi

Johnson, N.L., Kotz, S., Kemp, A.W.: Univariate discrete distributions, Wiley, New York 1992.

Pan N., Chen K., Moneg C. J., Backer S.; 'Studying the Mechanical Properties of Blended Fibrous Structures Using a Simple Model', Textile Research Journal, Vol. 70(6), 2000 pp. 502-507