Dear Filatoi Manager,

With the increased demand for Filatoi's cotton yarn, we understand the need to optimize Filatoi's and the suppliers' productions per yarn size. Considering the demand requirements and production limitations per month, we analyze the yarn size (extra-fine, fine, medium, and coarse) per Filatoi and per six suppliers (Ambrosi, Bresciani, Castri, De Blasi, Estensi, and Giuliani). With our models and explanations below, we optimize the appropriate yarn sizes and calculate the appropriate production and transportation costs.

Base Model

For outsourcing production, we should buy 6,250 fine yarns from Ambrosi, 4,286 extra-fine yarns from Bresciani, 3,704 extra-fine yarns from Castri, 2,040 medium yarns from De Blasi, 3,846 extra-fine yarns from Estensi, and 7,143 medium yarns from Giuliani. For main production, we should produce 13,164 extra-fine, 19,750 fine, 18,817 medium, and 28,000 coarse yarns. Therefore, the production cost equals to $1,365,800.50 and the transportation cost equals to $16,743.83. We assume linearity because the objectives (production and transportation costs) are linear equations.

DECISION VARIABLES

Product bought from each supplier (Kg/month)

	Size			
Supplier	Extrafine	Fine	Medium	Coarse
Ambrosi	-	6,250	-	-
Bresciani	4,286	-	-	-
Castri	3,704	-	-	-
De Blasi	-	-	2,040	-
Estensi	3,846	-	-	-
Filatoi R.	**13,164**	**19,750**	**18,817**	**28,000**
Giuliani	-	-	7,143	-

OBJECTIVE FUNCTION

Total cost (production) ($)	**$ 1,365,800.50**	**$ 1,382,544.33**
Total cost (transportation) ($)	**$ 16,743.83**	

Possible Situations to Increase Production and Revenue

- Filatoi is considering to increase its spinning production by 600 hours/month. For the purpose of optimization without extra cost, we don't recommend upgrading the current spinning production. Since the situation is within the allowable increase and decrease of Filatoi's production constraint, we use the sensitivity shadow price of ($2.12). Though analysis, the additional cost is $229.41.

- Filatoi is considering to rent another spinning machine for medium size yarn. We recommend that you rent the machine because you will save cost. With the new machine, Filatoi's production can produce an additional 705.88 kg of yarn, which reduces the amount we buy from De Blasi. As a result of analyzing De Blasi's production and transportation savings against the new machine rental cost, the net cost is ($1,659).

- A new client is interested in purchasing up to 6,000 Kg / month of medium size yarn. If the expected number of orders is 6,000 Kg / month, Filatoi should at least charge $12.45 / Kg. However, the price is not fixed because the exact amount of order is not fixed. If the client decides to purchase less than 5,888 Kg / month, Filatoi should charge at least $12.3 / Kg.

Checking Assumptions +- 5%

If the internal cost of production changes within 5% range, our recommendations will change. From the sensitivity analysis, we noticed that the 5% range exceeds the allowable increase or decrease values for Filatoi's production of all yarn sizes except for the coarse category. Therefore, our recommendations might be susceptible to change. For De Balsi, 20% range is within the allowable increase or decrease limits. Therefore our recommendations wouldn't change in extreme cases.

Outsourcing

After presenting the proposed outsourcing plan to the owners of the Ambrosi mill, they complained that they can only produce medium and coarse size yarn for now. For producing fine size yarn, they stress that a one-time set-up cost will be inevitable. Ambrosi mill would like to maintain positive business relations with us, but the cost is a huge burden for them. Given the 1 year contract we currently have with our customers, we'd like to cover their set-up cost for up to $2367.65. If they ask more than this amount, we'll consider other production plans.

Overtime Possibility

Giuliani, a family-owned mill, is considering running an overtime shift, which would double their capacity. An overtime shift will increase the labor cost by only 13% during overtime. Since the salaries contribute to approximately 50% of the price Giuliani charges us for spinning yarn, we know the price will increase after they make this change. We take the increase yarn price and the possibility of double capacity into consideration to re-optimize our model. In the new model, 2040 Kg medium size yarn is produced at Giuliani during overtime and the total cost is saved by $207. We move the production of medium size yarn from De Blasi to Giuliani during the overtime period.

Please let us know if you have any further concerns.

Best regards,
Team 7 from MCG