

Dr. Sreenivasan prepared this report for the ICAC. He presents a birds' eye view on novel applications and value addition of lint and creating wealth from comber noil and linters, which are considered as mill waste. The report basically highlights the major value-addition possibilities and prospects of all the predominant forms of cotton fibres that grow on cotton seeds. Needless to mention, cotton lint is a highly valued commodity and is used by the industry for various purposes. The mill waste, comber noil fibres are seldom wasted and like lint are also traded internationally and also in domestic markets, but linter wastage is a major international concern. Dr. Sreenivasan points out that though the global annual production of linters is 5.0 to 5.2 million tonnes, only 1.0 million tonnes are extracted and used. A conservative estimate shows that the annual value of the unused linters of 4.0 to 4.2 million tonnes is about US\$ 5.0 to 6.0 billion; which means that we have been ignoring the potential value of a precious cellulosic commodity, mostly because of the lack of national policies that could have otherwise captured the untapped potential of linters. Why are linters not extracted? Why are they allowed to be wasted? The simple answer is that though globally 75% of cotton seeds are crushed for oil extraction, most countries follow unscientific methods to directly crush seeds without extracting linters and hulls. Dr. Sreenivasan mentions the Indian case as an example, wherein "hardly 10% of ginned seeds undergo the rigorous processing to extract invaluable constituents (linter, hulls etc.), and the rest 90% seeds are directly crushed for oil extraction". Estimates show that India may have been wasting linters worth at least US\$ 1.0 billion annually because of unscientific seed processing. Calculations also show that the annual wastage of linters in Africa could be about US\$ 250 to 300 million. Linters are also wasted in USA, China, Benin, Greece, Pakistan, Argentina, Burkina Faso, Australia, Cote d'ivoire etc. Dr. Sreenivasan emphasizes the urgent need to devise a highly energy efficient or an alternate novel cost-effective mechanism to extract linters. He recommends the development of appropriate sized delinters capable of serving the ginning industry all through the year for extraction of linters from its seed.

For thousands of years man has tested and tried natural fibres such as flax, hemp, jute, coir, abaca, ramie, sisal, banana fibres, pineapple fibres, alpaca, angora, camel hair, cashmere, mohair, silk, wool etc. These fibres are valuable but contribute very less to the global fabric requirements. Cotton remains the undisputed leader of all the natural fibres, because there is no other fibre on earth that comes anywhere close to the virtues of cotton fibres relating to human comfort and fibre needs. Cotton fibres are almost pure cellulose. They are most skin friendly of all the fibres known to mankind. Cotton fibres are 100% natural and biodegradable. It is for these premium properties that cotton fibres are preferred over synthetic fibres.

For more than 7000 years cotton has been considered as white gold across the world. The fibres not only clothed the world but also provided comfort in bedding and mattresses. All parts of the plant including seeds and stalks have a commercial value. Cotton lint is mainly used for textile yarns, fabrics, garments, non-woven, industrial textiles and medical textiles; linters and comber noil are used to make absorbent cotton, pulp & paper, regenerated cellulose, micro crystalline cellulose, nano cellulose, modified cellulose, non-woven, carbon fibres, viscose, lyocell and high tenacity rayons. Seeds are crushed for cooking oil, the resultant seedcake is used as animal feed and hulls are used as animal feed and for peptone production. Cotton stalks are used to manufacture particle boards, hard/ fibre boards, pulp and paper, extruded products such as briquets, pellets and compressed blocks and to grow mushrooms. Cotton ginning waste is used for soil application, livestock feed, fuel and extruded products. Cotton plant biomass and cotton ginning waste serve as valuable raw material for composting.

This report also describes innovative textile cotton applications as wellbeing and health textiles, for moisture management, wound dressing fabric, flame retardant textiles, super hydrophobic textile, self-cleaning textiles, protective textiles and multi-functional textiles. The part on self-cleaning textiles is indeed fascinating, wherein cotton fabrics would not need water and detergents for cleaning. Instead, fabrics coated with nanoparticles of TiO_2 and SiO_2 in the presence of ZnO_2 get self-cleaned with exposure to UV light by disintegration of organic stains into water and CO_2 . Fabrics with mono layers of porphyrin compounds on anatase- coated cotton fabric get self-cleaned when exposed to visible light -very innovative and novel indeed! These technologies could mean a lot to the environment because they could save tremendous amounts of water and reduce detergent pollution.

-Keshav R Kranthi