AGROTEXTILE SYSTEMS - STRATEGIC ELEMENTS FOR SUSTAINABLE DEVELOPMENT OF THE AGRICULTURE

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*"Agriculture is the backbone of our country; Textile can be the backbone of Agriculture?" Today, agriculture and horticulture has realized the need of tomorrow and opting for various technologies to get higher overall yield, quality and tasty agro-products. This review works as an introduction about the *agro-textile* products available currently to bang the agriculture. This gives the idea about the properties and classification of the agrotextile products.*

Keywords: agrotextiles, property, application.

INTRODUCTION

Textiles and clothing is a diverse sector that plays an important role in the European manufacturing industry. In 2017, the overall size of the Textile & Clothing industry in the EU-28 represents a turnover of €181 billion and investments of €4.9 billion. Thanks to a revival of the EU activity, the 176,400 T&C companies still employ over 1.7 million workers. EU external trade was more dynamic than the previous year with almost €48 billion of T&C products exported and €112 billion imported from third markets (Euratex, 2016).

The sector, playing a crucial role in the economy and social well-being, has undergone radical change recently to maintain its competitiveness by moving towards high value-added products (EC, Textiles and clothing in the EU).

Innovation is the key of success for textiles' companies, just as in other economic field (McAdam and McClelland, 2002). One of the segments of this industry that has received significant attention across the world is technical textiles. Technical or engineered textiles are defined as products that are used for functional purposes. These textiles have applications in multiple areas of economic activity, such as aerospace, shipping, sports, agriculture, defense and health care (Wazir Advisors Pvt. Ltd. and FICCI, 2016). Messe Frankfurt divides technical textiles into following twelve categories (fig. 1).

Figure 1. Twelve main categories of technical textiles [Source: www.messefrankfurt.com]

Agro-textile is a crucial and emerging sector among all the twelve sectors of technical textiles, which are also known as Agrotech or Agro textiles. In more detailed definition *textiles for agriculture are used for crop protection, fertilization, aquaculture, horticulture and forestry.*

Agro Textile market is expected to reach over US\$ 14,363.2 Mn by 2025 at a CAGR of 5.5% from 2017 to 2025. The worldwide agro textile market was evaluated at US\$ 8,921.9 Mn for the year 2016 (Credence Research, 2016).

Figure 2. Different agro-textile products; source: <http://agrotextile.com/agro-textile-products.html>

REVIEW ON AGRO TEXTILE PRODUCTS

Sustainable development is a response to the current global challenges of climate change, atmospheric pollution, the risk of resource depletion and threats to biodiversity, but also to the economic growth problem, which is in contrast to the idea of protecting the environment and resources. In this context, the circular economy is considered a practical solution to the global trend of exhaustion natural resources. Circular economy as a concept based, for industrial ecology, cradle to cradle philosophy, biomimicry, and natural capitalism (Fontel, 2017).

“Agrotextiles” gives multidimensional views and solutions to the problems being faced by agro industry.

Today agro textile plays a significant role to control environment for crop production, eliminate variations in climate, weather change and generate optimum condition for plant growth. Adopting the high-tech farming technique, where textile structures are used, could enhance quality and overall yield of agro-products.

Agriculture is also an important user of products from end-use sectors such as geotextiles for drainage and land reclamation, protective clothing for employers who have to handle sprays and hazardous equipment, transport textiles for tractors and lorries, conveyor, belts, hoses, filters and construction of silos, tank and piping (Horrocks and Anand, 2016).

The main process used for technical textiles are: knitting, weaving, braiding, nonwoven etc. (Palamutcu and Devrent, 2017; Bharamkar, 2013) (figure 3).

Figure 3. Textile surface types, used in agro textiles

There are many techniques to produce nonwoven fabrics: needle-punched nonwovens, stitch-bonded nonwovens, thermally bonded nonwovens, hydro entangled nonwovens, spun bonded nonwovens, Wet nonwovens (<https://fashionarun.page.tl/AGRICULTURAL-TEXTILES.htm>; Desai).

There are many ways and techniques to produce technical textile, specialty literature has provided the following methods to manufacture technical textile: thermo-forming, three dimensional weaving, three dimensional knitting, fabrics produced using nanotechnology, heat-set synthetics, finishing treatments

Various innovations in industry, such as induction of advanced materials have opened up potentials for innovation in shading and crop protection, including capillary nonwovens, floating covers, and textiles incorporating pesticides, fertilizers, superabsorbent polymers and seeds which are expected to drive market growth over the next eight years (Agro Textiles Market Analysis, 2018 - 2025).

The usages of fibres in the technical textile area are not only the high functional fibres alone, but also the natural (due to bio-degradability and compatibility), table 1 (Sadik, 2017).

Table 1. Fibers for technical textile

Fibre used in technical textiles	% of usage
Regular fibres	69
High tenacity fibres	28
High performance fibres	2
Special performance fibres	1
TOTAL	100

Classification of Agrotextile Products

Agrotextile products can be classified based on three categories (Kruthika, 2017; Sarwar, 2016; Global Agro Textiles Market 2018; Agrawal, 2013):

- Based on fabric production: woven, knitted, non woven;
- Based on the area of application:
 - Agriculture: sunlight/wind/weed/protection; water retention, physical damage protection
 - Horticulture: ultraviolet radiation/wind/bird/insect protection;
 - Forestry: soil protection, weed protection for tree plantation;
 - Aquaculture: fishnets, antifouling nets, ultraviolet radiation protection;
 - Animal husbandry: belts for animal identification, filtering milk.
- Based on the products: shade nets, windshield nets, bird protection nets, crop covers, plant nets, root ball nets, anti-insect nets, harvesting nets, mulch mats/ground covers, anti-hail nets, finishing nets, turf reinforcement/protection nets, pallet net covers, woven sacks/bags, leno bags.

The global Agro Textiles market has been classified on the basis of product type into:

- Shade net,
- Mulch mat,
- Ground cover,
- Crop cover,
- Insect net,
- Pond liners.

Properties Required for Agro Products

- Resistance to solar-radiation: the product should withstand solar radiation according to the external environment without creating harm to crops;
- Resistance to weather: with respect to the climatic changes product must work in effect for production;
- Resistance to ultraviolet radiation: product should avoid the degradation of molecular chains due to ultraviolet rays and keep them away;
- Retention of water: the water poured is to be segregated and let the crop to absorb whenever it is essential;
- Biodegradability: as the products are placed over and under the crops it is important to have biodegradable property;
- Weight of the product: in order to let the crops grow without disturbance less weight materials to be selected;
- Resistance to microorganisms: to protect the living being around the crop field it should resist microorganisms;
- Construction of material: stable constructions is essential for long life of product.

Advantage of Textile Used in Agriculture

- Increase crop production;
- Avoid the soil from drying out;
- Decrease the requirement of fertilizers, pesticides and water;
- They make product quality better;
- Increase the early maturing of crops and non-seasonal plants;
- Protects from climatic changes and its effect.

CONCLUSION

The study shows the basic introduction regarding agro textile products and their role in the sustainable development of agriculture, environmental protection and human health.

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