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THE ROLE OF TRANSPORT IN AGRICULTURE²²

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Abstract: *Transport systems play a major role in ensuring efficiency in agriculture. Their main function is to transport agricultural products from the farms to the markets and cities of the world. Effective logistics is the essential element in the management of goods passing from the origin to the final consumer. Transportation also affects national welfare. But what would happen if supplies stopped and problems arose in the supply chain?*

Transporting agricultural goods, whether by traditional or mechanized means, requires a suitable means of transport. In many regions, farmers and producers are located far from the places where their products are distributed, necessitating transport to collection points for storage or sale. Road transport is essential as it connects rural agrarian areas with industrial areas and urban consumers, ensuring efficient distribution of crops.

The future of logistics and agricultural transport must focus on innovation and technology, with an emphasis on sustainability and efficiency. The biggest challenge is the readiness for these changes. The transport sector needs to embrace innovation as it can have a significant impact on the environment. The implementation of new technologies can help reduce this impact.

Keywords: *transportation, agricultural goods, logistics, innovation, new technologies.*

INTRODUCTION

Transport infrastructure is a key component to the success of any country. It is the backbone of any economy and without it countries would not be able to transport people, goods and services from one place to another. Without efficient transportation systems and infrastructure, our cities would not be functional. Their sustainable development is also essential. It means a better way of life for us and for future generations. The idea of sustainability implies that economic growth, social cohesion and environmental protection go together and complement each other and is defined as development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs".(Source: NSI).

Geographic information systems (GIS) are changing society very quickly and in recent years have taken on an increasingly important role in the architecture of electronic management of administrations at the central and local level. GIS is a type of information system consisting of computer software and hardware, a database and users, which is used to input, store, manipulate, analyze and retrieve geographic data for the purpose of solving a variety of tasks in various fields -

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environmental management, transport, demography, public administration, business, etc. (Popov, A. 2012).

The substructure of GIS that specializes in transportation problems (GIS-T) is one of the fastest growing in the field of geographic information systems. It enables the analysis and visualization of spatial data, which enables the integration of geographic elements in transport planning and management. The benefits of using GIS in transportation are numerous, including improved efficiency, safety and sustainability.

The aim of this paper is to provide guidance and highlight the importance of designing an efficient urban transport infrastructure, whose main tasks need to be fulfilled:

- To indicate the potential areas of application of geographical information systems in the context of transport accessibility;
- To present the functional capabilities of a software product through which an efficient urban transport environment could be designed.

EXPOSITION

The transport plays key role in rural economy . He gives opportunity on the farmers yes invest more , yes increase the production you are and yes reach to international markets . Without reliable agricultural transport the expansion on business is hard feasible , so like everyone products must yes be transported , sent or delivered , for yes reached to the ultimate customer . The lack on effective transport from the farm to the market can yes brought to loss on big part from the production and to reduction on hers quality . In fact the reputation on the farmers and their business in large degree depend from this how theirs products everything transport .

The quality on goods and transport them are from decisively meaning for satisfaction on the buyer . It's worth it you are yes everything emphasize that the agricultural ones products everything differ from the industrial ones goods - they are bulky , easy spoiling mostly for consumption . Packaging and transport on such products must yes them protect from damage by time on the move . The processes on harvesting , threshing , screening , packaging , processing and storage are stages from the collection on the harvest which require precise control on the quality , for yes everything provided as itself quality on transported products as well as theirs availability .



Fig 1. Transportation of goods in agriculture

Some goods may be cheap to produce, but transporting them from remote regions or other countries can be expensive, ultimately raising the price for consumers. To increase their profits and reduce transport costs, farmers should focus on optimizing costs and improving exports. If produce cannot be exported or delivered to international markets, even a bumper crop can cause problems. In

order to meet customer expectations, it is crucial that goods are delivered on time and at competitive prices.

EXHIBITION

Transportation plays a key role in agriculture, ensuring that produce moves from farms to markets and processing plants. The main modes of transport include land and water, with trucks, trains, ships and barges being among the most used means of transport. Each of these modes of transport is critical to maintaining the supply chain of agricultural produce.

In addition, the transportation of agricultural machinery is essential for the expanding adoption of technology in agriculture. Farmers can easily move large machinery and equipment between different locations using specialized trailers and class 7 and 8 heavy-duty tractors. This facilitates logistics operations and contributes to the expansion of agricultural activities and related industries. However, there are trends towards finding greener alternatives to these heavy-duty vehicles, such as electric tractors and innovative transport methods that aim to modernize farming systems.

Among the new transport technologies in agriculture are:

- Self-driving tractors: Using GPS and artificial intelligence, these machines perform tasks like planting and harvesting completely autonomously. This results in significant fuel and resource savings, ensuring maximum efficiency without human intervention.
- Electric Vehicles (EV): The shift to sustainability is driving the deployment of electric tractors and other agricultural vehicles. Powered by renewable sources such as solar and wind power, these technologies are becoming more common and offer an alternative to traditional heavy-duty tractors.
- Automated harvesting systems: Robots and artificial intelligence are used to accurately identify and harvest ripe crops at the right time. These systems can work around the clock, which speeds up the harvesting process.
- Other innovations such as drones and robots are also seen as important technologies in modern agriculture.

With the need to feed a projected population of 10 billion by 2050, agricultural development is critical to fighting poverty and promoting shared prosperity. The success of the agricultural sector has a major impact on the local economy and strengthening the supply chain.

To meet the challenges, agricultural companies must manage farm-to-market logistics with precision. In the event of a supply chain disruption, for example due to climate issues or resource shortages, it is critical to have an action plan in place. Quick response and good planning can minimize delays and preserve productivity.

Digitization and innovation are becoming increasingly important for the successful strategies of agricultural companies. Technologies such as sensors, artificial intelligence and the Internet of Things (IoT) have the potential to revolutionize agriculture by offering solutions for more efficient resource management, process optimization and sustainability. Drones, real-time data and automation allow farming operations to be carried out with high precision, far surpassing traditional farming methods.

The technologies of the future create conditions for the so-called "smart agriculture", where every operation will be supported by modern technological solutions that will increase productivity and improve the sustainability of agricultural activities.



Fig.2 Use of drones in agriculture

The Internet of Things (IoT) has gained significant popularity in recent years, and it is expected that by 2030, the number of IoT devices worldwide will exceed 29 billion. Smart devices are becoming more common and sophisticated, and can now easily exchange data with each other. In the agricultural sector, IoT is also gaining momentum, with forecasts showing a significant increase in the market from \$27.1 billion in 2021 to \$84.5 billion in 2031, with an expected annual growth rate (CAGR) of 12.6% for the period 2022-2031.

This fast-growing technology has the potential to transform the transportation industry, regardless of the size of the companies that operate in it, from large transportation companies to small and startup businesses. To remain competitive, these companies must embrace innovation and implement IoT- based solutions . Such technologies include IoT -based GPS vehicle tracking devices and IoT sensors that allow logistics companies to monitor the status of their fleets and receive information about the conditions of transported goods.

IoT not only helps in better asset management but also plays a crucial role in solving supply chain problems. The technology provides real-time critical data on asset location and performance, enabling timely solutions when issues arise. This improves not only efficiency, but also security and transparency in transport processes.



Fig. 3 Using IoT-based GPS devices for vehicle tracking and IoT sensors

In the past, manufacturing was largely done by hand, but now automation, artificial intelligence (AI) and robotics are starting to make up for labor shortages. Robots are becoming

increasingly key in the logistics sector, facilitating the transportation of goods. Various transportation companies are looking for ways to integrate industrial robots to make their warehouse operations more open to new technological possibilities. This results in more precision farming that optimizes yields and reduces losses by applying resources exactly where and when they are needed. Automated transportation systems also optimize the agricultural value chain by ensuring faster and more reliable delivery of produce from farm to market, reducing losses and increasing profits.

Big data has enormous potential to improve the supply chain and play an essential role in the transformation of the agricultural sector. Distributors can use data to secure raw materials and strategically position themselves for maximum market advantage. Producers can optimize their production processes and better target their customer base, thanks to predictive analytics and advanced connectivity of the global agricultural network.

Big data also plays an important role in precision agriculture, helping to derive the information and analysis needed to make important decisions and address agricultural challenges. They make the entire supply chain more competitive and profitable, and the benefits are not limited to the top tiers. Farmers gain access to better knowledge and accurate advice, and consumers can enjoy greater variety and better quality. The stricter standards and traceability enabled by data connectivity in Industrial Internet of Things (IIoT) applications are increasing margins in the supply chain, improving quality and meeting the needs of domestic and international buyers.

New technologies are already changing the established standards in agriculture, as devices that were previously unaffordable are now widely used on farms around the world. As a result of technological advancements, transportation is also evolving. An example of innovation is Siemens' e- Highway concept , which allows trucks to receive electric power to travel long distances without the need to stop at charging stations.



Fig. 4. Application of the Industrial Internet of Things (IIoT)

Also, thanks to recent innovations in sensor technology, farmers have the option of using "reconnaissance drones" or unmanned aerial vehicles (UAVs) to survey the land for pests or to identify dry areas that require special attention. By providing accurate aerial imagery, including multispectral information, they help farmers make informed decisions about resource allocation by revealing aspects of plant health that cannot be seen with the naked eye.

CONCLUSION

With the growing interest in e-commerce, transport service providers are forced to work more efficiently and quickly to meet increasing consumer demand. They should process individual orders as soon as possible. This sector faces significant challenges as many logistics companies are still adapting to the new conditions. In order to remain competitive, it is important that they implement new technologies as they become more common. Farms can become more profitable, efficient and

safe, through sustainable farming based on modern devices, precision farming and automated systems.

In order to satisfy the demands of the customers, it is necessary to keep up with the technological advancement as it offers an easier and sustainable way to reach many of them. Many users now expect to be able to track the status of ordered products. With the increasing amount of data available, consumers prefer companies that meet their specific needs and offer a more transparent, innovation-driven supply chain.

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