Chapter 7
Data-Driven Decision Making and Virtual Farming in the Agricultural Metaverse

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ABSTRACT

Technology breakthroughs replacing long-standing methods are causing major changes in agriculture. Combining digital twins, virtual simulations, and data analytics, the agricultural metaverse may completely transform the food systems on Earth. Using virtual farming and data-driven decision-making, this study looks at ways to improve output, decrease risk, greater input efficiency, and sustainability. The research reveals the benefits of smart farming systems by way of a comparison between traditional farming techniques with those of precision farming, virtual farming, organic farming, and conventional farming by use of statistical analysis

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and controlled experiments. Predictive algorithms, real-time sensor data, and immersive virtual technologies enable agricultural operations growingly informed, effective, and sustainable.

1. INTRODUCTION

We are likely to see a lot of changes in farming as more and more sophisticated and immersive digital tools become accessible. This is one of the things that have happened because of the growth of digital technology. You may use technology like virtual reality (VR), augmented reality (AR), artificial intelligence (AI), and networked information platforms to construct the metaverse, a digital environment. People may work together in the metaverse, which is a digital place. We can do this with the help of these technologies. One of these technologies is the metaverse. There are a lot more instances out there (Canedo, 2016). This change is expected to happen in the metaverse in order to reach the aim of altering how farming is done, managed, and understood. The objective of this study is to illustrate how data-driven decision-making and virtual farming operate in the agricultural metaverse so that it can attain its goal. The results of this research should help develop smart agricultural ecosystems that will persist for both the current generation and the future one. The "agricultural metaverse" is a digital realm that is linked to the physical world of farming and connects the two. To develop this kind of setting, all of the following are brought together on one platform: real-time data on farming, interactive 3D models, and training tools that make you feel like you're there. This lets you create the environment. Putting all of these pieces together makes it possible to do this assignment. In this setting, a variety of different individuals may work together by using digital avatars. This is what makes it possible for them to operate together. This group includes politicians, farmers, researchers, and businesses that work with agri-tech. They could also communicate to advising systems that employ AI, copy farming cycles, and work with 3D representations of farms (Monteiro et al., 2018). They can use all of these talents. The metaverse might be seen as a multidimensional interface that makes it simpler to make choices, learn new things, and plan operations when you think about the food supply chain. Not only is it a digital image of the actual world, but it is also a picture of the real world that employs several dimensions.

One of the most essential things about this ecosystem is that consumers may make decisions based on the information they have. Farm sensors are continually gathering a lot of different kinds of data. This data tells us how wet the soil is, how healthy the crops are, whether there are bugs, and what the weather is like on the farms. These sensors, which have sensors embedded in, are always gathering data. They are always gathering information. After that, these data streams are combined