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Implementation of applied science in land exploitation

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Abstract :

The main purpose of this paper is to emphasize the benefits of using applied science to maximize land utilization. The population of the world is increasing at a steady pace and in turn, raising the demand for everyday essentials but the supply to counteract that is not up to the expectation in tackling the situation. With present technologies, we can estimate the availability of unutilized lands and make use of these lands to boost up the supply that's required to meet the current demand.

Keywords :*Data Science, Precision Farming, Remote Sensing, RIPPA Robot, Urban Agriculture*

1. Introduction :

Data Science is the methodology used to analyze the data available and predict the future of the elements within the data. It involves a series of steps to finally predict the behavior: Collecting data, Class-labeling, Data cleansing/Data scrubbing, Data balancing, and/or Data shuffling. The data collected can range from traditional to big data based on which steps are to be performed. With Data Science being an effective method both to analyze and predict, it can be radical for effective utilization of land.

Everyday consumer products starting from food, shelter, fuel, and many others are produced from the Land. As we all know, the land is not an inexhaustible resource and so efficient utilization of land should be well planned to meet the steadily increasing population.

The majority of any land is utilized for shelter, agriculture, animal farming, consumer stores, and others. However, the incessant demand for food production is never-ending. With such requirements ahead, the only option to increase the supply is a better utilization of the available land. That's exactly where Data science comes into the picture. Applying Data science in such a scenario will change the way land can be utilized. With present technological advancements, it is possible to decipher a vast amount of data and analyze it for diverse purposes.

1.1.Methodology:

For illustration, this can be done by analyzing satellite images, which is formally called Remote Sensing. Here, a model created from the satellite data is subjected against a dataset of choice to give insights on the visualization of land use. By implementing different deep learning techniques, the model can be improvised for accuracy.

For an instance of land, the State or any private organization can initiate this very method and then collect the details regarding the classification and exploitation of that land. With the data collected, the land utilization can then be segregated depending on its usage like into residential area, idle lands, infertile/barren lands, etc., and can focus on analyzing its scope for betterment [1]. The same can be communicated to the citizens to ensure co-operation from their end.

Looking into the segregated lands, we have:

1.1.1.Housing Lands :

With the implementation of Data Science techniques, the local organizations can collect the housing data and blueprints of different houses from the area. Based on this information, a convenient approach can be designed in such a way that the unutilized space from the houses can be used to address food insecurities by growing vegetables, millets, etc., or towards improving the environment like planting greeneries. Basically, by processing the gathered data we can tackle major food insecurities and pollution. And with this the production of food will be increased at least for the individuals, making the land utilization efficient.

This approach has been proven to be working with the likes of New York, where the urban agriculture movement has introduced a lot of good things. The New York City has been able to produce fresh food and the transportation of it in intra-city regions has been made easier and faster. Urban agriculture did also increase the production of food thereby addressing the demand. In addition, it led to the reduced pollution, caused by the rush hour traffic.

1.1.2.Unutilized lands :

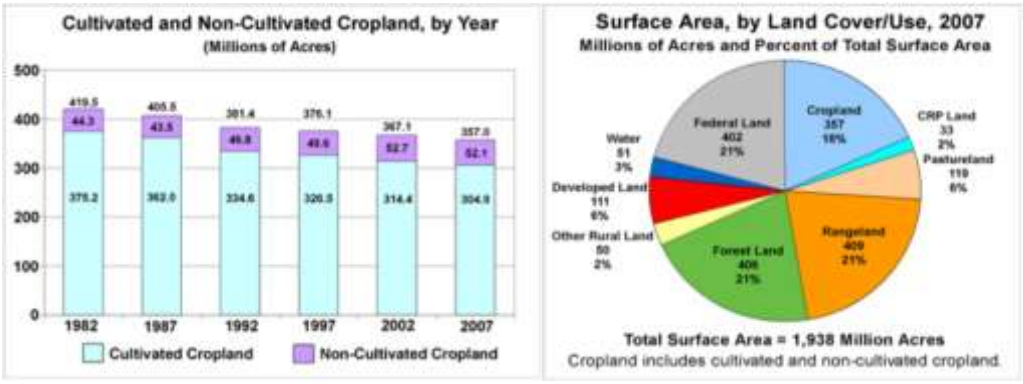

Figure 1: Land Coverage statistics

As per the data collected by the Natural Resources Conservation Service (USDA), the cultivated lands are decreasing gradually from year to year(Fig.1) and it can be inferred that the cultivable lands are being transformed into non-cultivated use cases. In this scenario, when they are idle, instead of using it for non-agricultural uses, we can go for either the urban agriculture method or the actual cultivation of the land with various crops.

As the lands nearby will have similar properties, we can use them to estimate the productivity of the land. Data science can play an important role in getting the data of the cultivated neighboring lands[2]. Firstly, we can rely on the latest and advanced farming tools based on IoT sensors, Spectroscope, Radio Frequency identification, and others to acquire the neighboring lands' data. These sophisticated tools have most of the activities of farming registered and filtered to provide useful information. This data comprises land properties such as nutrients, minerals, and other soil fertility details. Once the data is collected from the nearby farms, the estimation process of the unutilized available land can be started. With this achieved estimation we can predict what type of crop or food can be produced from the land.

Now, to make the productivity of these lands last, we can use futuristic innovations like precision farming where we can select the best possible yield with less risk. People have this taboo that farming is an arduous task but it is no longer valid given the current advancements in agriculture where, with the help of smart farming, all the tasks can be automated or controlled through mobile devices with less human intervention [3].

Figure 2: Implementation of Precision Farming

With this, not only the food production will be increased but also the quality of food will be better [4]. And this increase in the number of households farming will create a friendly and driving influence towards such initiations among working or business professionals. As these tasks are automated they will surely garner some attention and lead to a substantial change in investments.

1.1.3.Barren Lands :

Transforming barren lands into productive lands is not that common even though there are many instances of such transformations. It might be because people who own barren lands are either not aware of the process or not sure about the outcome of the process. To overcome this, we can gather data of such transformed barren lands and use it to come up with patterns to get the best possible practices. In addition, one can make use of devices like RIPPA Robot to get the status of the land. RIPPA (or Robot for Intelligent Perception and Precision Application) works based on its ability to 'farm' by eradicating weeds and foreign bodies from the crops. The usage of robots in farming might raise a question of expenses but RIPPA is powered entirely by sunlight. It has a 'hood' enveloped altogether in solar panels, under which its internal workings and equipment are found.This type of new technology will assist growers in taking their farms into thefuture.

1.2.Challenges :

1. The data collected regarding farming and land utilization may be employable but more data has to be gathered in order to get high precision levels and make it more effective.

2. Privacy constraints may arise when sharing the gathered data among individuals as the data may not be compliant with confidentiality.

3. The individuals from different areas may not be able to grasp the statistics or guidance shared because of various elements being considered.

2. Conclusion :

The Use cases of Data science go way beyond the above-mentioned scenarios but the implementation of it in the context of land exploitation will yield substantial results and it will address the common issue of food insecurity and land devastation. We attempt to show insights on making optimal and informed choices on the manageable, impartial, and economic use of the land and follow it through to beneficial execution. It will be accomplished through connections and negotiations between organizersand decision-makers at national, regional, and local levels. It will be on the basis of effective, efficientdata gathering and processing in an appropriate flow resulting in a justifiable, luciddesign for the future necessities of the land.

Apart from the discussed practices, we can always examine other purposes of land like food processing units, nurseries, grazing, forestry, and others. The below diagram depicts the data flow from data producers to the data consumers.

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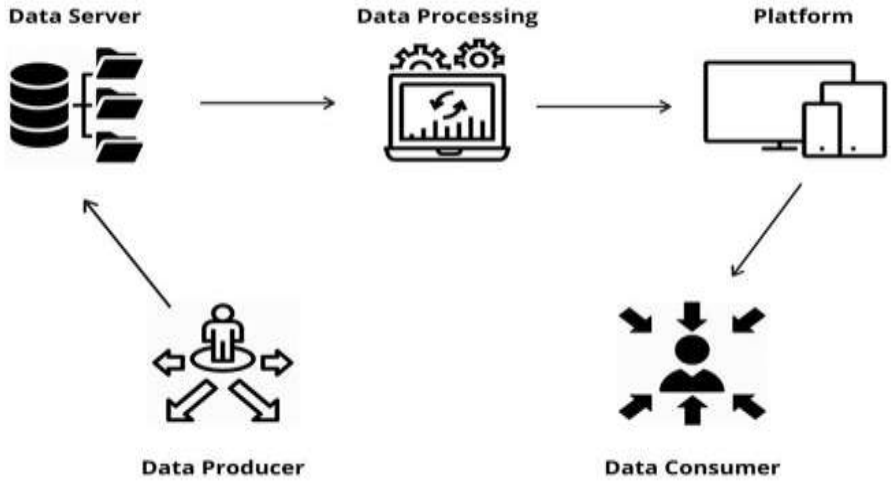

Figure 2: Data flow Diagram.

The above diagram demonstrates the data flow from Data Producer to Data Consumer. In our scenario, both the roles will be the citizens. Based on the circumstances, the role changes. Individuals as data producers will provide the information (such as land properties) to public or private organizations. They then maintain the data and process it using data science methodologies to get patterns regarding land exploitation. Finally, the processed data is presented to data consumers through a platform to access and decide on which steps to take for better land utilization.

In this way, it is worthwhile seeking to achieve improvement of livelihood, food, and water security, and best possible realization of various developmental targets of land using Data Science to extract knowledge and actionable insights from structured and unstructured data so as to ensure sustainable development of land resources. It will enable farmers to capitalize by minimizing application input costs and improving information quality for better high-level decision-making. In addition, more studies are needed to assess the added value of the use of data science in the agriculture sector.

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