International Journal of Innovations & Research Analysis (IJIRA)
ISSN :2583-0295, Impact Factor: 5.449, Volume 02, No. 04(II), October- December, 2022, pp 213-215

ROLE OF MATHEMATICS IN AGRICULTURE

Dr. Kavita Jain*

ABSTRACT

Mathematics is considered as the 'Queen of Science' since every phenomenon that occurs in the cosmos involves mathematics directly or indirectly. Mathematics has a vital role in our daily life activities as it helps us to think analytically and reasonably. One cannot imagine life without mathematics. All our activities are governed by some or other law of mathematics. The knowledge of mathematics is very important role to play in the agriculture industry.

Keywords: *Mathematical, Agriculture Industry, Farmers.*

Introduction

Mathematics is used in each and every aspect of the universe. The uses of mathematics are sometimes noticed and sometimes unnoticed in every field of life. One of the important industries which works on the application of Mathematics is "Agriculture". To be a farmer it is more important to have problem solving, decision making and money management abilities. They use advanced mathematical technology to calibrate machines and irrigation pumps. This paper brings to light some of the important role of mathematics in the agricultural field.

Mathematics and Agriculture

The agriculture industry is one of the key areas where mathematics is applied. Be it problem solving, decision making or money management skills, all are more crucial for success as an agriculturist. The study of mathematics and agriculture go hand in hand. Using mathematics, it is possible to determine how much water may be utilized in proportion to the area available for cultivation, the amount of investment in a certain crop, use of fertilizer epidemiology, DNA sequencing, gene technology, measuring fertility of soil and other fields all use mathematics. In order to feed the growing population and supply raw materials for industries, agriculture has historically been the foundation of every country's economy. It is evident that applying mathematics for the growth of agriculture is important and desirable. The different mathematical models used in agriculture includes empirical, deterministic and stochastic approaches. These models are dynamic in nature and involve the different branches of mathematics like, algebra, dynamics, mensuration, differential equations, linear programming including assignment and transportation problems, probability, mechanics etc.

A few examples of application of mathematics in agriculture are as follows:

- **Conversion of Units for Measurement of Area**

We know that the availability of land for cultivation plays an important role in the life of a farmer. The entire land owned by a farmer may or may not be used by all farmers for cultivation. Some farmers reside in the same premises where they grow crops, while some rear their cattle inside their farm and therefore use a portion of their land to raise hay crops for their cattle. Apart from this some farmers who

* Associate Professor, Mathematics, B.B.D. Government College, Chimanpura, Shahpura, Jaipur, Rajasthan, India.

own large piece of land, they restore some area for green fencing. Thus, farmers have to plan the division of land for varied activities. The area of land used by farmers is calculated in different units like acres, hectares etc. It is difficult for the common man to understand the size of an acre or hectare as the traditional unit in our minds is feet or kilometers. We can thus use mathematical conversions to convert an acre into perspective for e.g., 43560 sq. feet is equivalent to one acre and one hectare is equal to 0.01 sq. kilometer. We can thus convert globally used units to more familiar ones using proportions and conversions. The conversion of measurement units facilitates the farmers to calculate the cultivation area, investment and average production cost etc.

- **Soil Analysis**

Soil analysis is a process used by farmers to estimate the concentrations of available plant nutrients in order to find out the type and quantity of fertilizer to be used by him for a good yield. The knowledge of mathematics is used by the farmers for the analysis of soil, as a farmer needs to measure the moisture and acidity of the soil in order to decide the type of crop he can grow in his field. Using the various numerical analysis techniques, the farmers can approximate the kind and quantity of fertilizer to be used. The farmers need to measure how fertile the soil is and by using mathematics he can estimate the amount of fertilizer and its cost, to obtain maximum production. The chemical composition of the fertilizer to be used by any farmer is prepared using ratio and proportion of the contents involved as per requirement of crop. Soil analysis also helps farmers to plan the rotation of crops to be followed in order to maintain the fertility of soil.

- **Estimating Crop Yield**

The linear programming is a mathematical technique widely used to estimate the average yield of the crop depending upon the size of the land. It is also used to maximize the profit of the farm by changing the crop structure. It is a powerful technique to find optimal allocation of resources. Using assignment problem method agriculturists can allocate different works to the different workers involved in farming according to their capabilities. This will not only reduce the working time but will also maximize the production.

- **Calculating Profit and Loss**

Mathematical techniques are used by the farmers to estimate the amount of the yields depending upon the investments made by the farmers and accordingly calculating the loss and profit percentage so that the farmers can attain economic stability. The farmer can decide the minimal price for his crop after calculating the total of all expenses made by him. This mathematical estimation not only provides economical stability to an individual but also gives pace to the nations economy as better yields reduces the net agricultural imports.

- **Grading of Seeds**

Farmers use numbers to describe and grade seeds. Seeds are sold and purchased according to grades and depending upon the grade farmers estimate the quantity of seeds required to attain the desired crop yield based on the area of cultivable land they own. Also the shape and size of grains can be controlled on the basis of the grade numbers of the seeds used for producing variety of grains. A farmer chooses the seed required by him on the basis of the number depending upon the demand, nature of soil available, effective cost and the climatic conditions of his area.

- **Shapes and Sizes of Plots**

The area and the shape of the plot is a key factor to consider when approximating the average crop yield. Much of farming is unpredictable, due to weather dependence and agriculture market. Farmers try to estimate the yield of certain crop by counting how many seeds are on the head of the plant. By looking at the square footage of a field and estimating the number of heads, farmers can calculate the approximate yield. The farmers can use mathematical modelling to calculate the optimal use of land depending upon its shape and size**.**

- **Developing Climate Models**

Mathematics is very helpful in the designing of better climate models which helps the farmers to plan the appropriate time for the various steps involved in the production of different types of crop. Earlier farmers had to suffer heavy losses due to unpredicted changes in the climate, but nowadays the expected climate of the near future can be predicted quite accurately. This gives the farmers sufficient time to sow, reap and store their crops.

- **Marketing**

Marketing in agriculture industry involves transportation, storage, processing and packaging. Mathematics has an important role in all the above processes. Based on the demand and supply of a product the transportation cost can be optimized using linear programming techniques. Geometry can be used to decide the shapes and sizes of storehouses to ensure safe storage of crops. Moreover, mathematical modelling can be used to allocate proper quantity in a particular pack.

Besides the above stated applications of mathematics, we observe the varied application of statistics in the field of agriculture industry. Statistics finds its importance for collection, analysis and interpretation of numerical data involved in agricultural experimentation. The data collection and quantitative analysis play a vital role in the development of the agriculture industry of a nation. Data analysis is useful in estimating, planning and development of agricultural and national income. Various interpolation methods can be used by agriculturists for weather forecasts, rainfall and its distribution, temperature variations, market economics etc. so that the time of sowing of seeds and harvesting of the crops can be scheduled accordingly. Agriculture engineering is yet another important field which involves the different branches of mathematics. Agriculture engineering is the field of study and application of engineering science and designs principles for agriculture purposes. It is a vast field of study involving the mathematical principles used to improve the efficiency of farms and agrobusiness enterprises as well as to ensure sustainability of natural and renewable resources.

Conclusion

Agriculture is the utmost necessity for human life. Though we have numerous fields of occupations in this world and the recent worldwide technological advancement has opened new avenues for employment and livelihood. But the fact remains that the first and foremost need for survival of humanity is agriculture. In the field of agriculture, mathematics is useful for estimation and regression analysis to prepare farm records and management. Manual decision making and assumption takes much more time and the chances of error may be high. Mathematical approach not only reduces time but also gives a clear view on important issues of farm industry. Thus, viewing agriculture in mathematical way enhances socio- economic development of the nation. In short, a country's development can be judged by the development in its agriculture industry.

References

1. Pennsylvania state university agronomy guide 2005- 2006.
2. Wood, John R; Wood, Alice Romberg, "Agriculture" Bookrags,2006
3. Nina Mitchell. Mathematical applications in agriculture: October 2016
4. Lavanya Kumari. P, Reddy GK, Krishna TG. Computational experiences of assignment problems in agriculture sector, International journal of advanced computer and mathematical sciences, 6: 18-29,2015.
5. D. Subhasri. Mathematics on agriculture: IJSR, 2018.