A Theoretical Framework of Agricultural Marketing Intelligence Support System

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***Abstract*— The market intelligence information that focuses on producers, farmers, or agricultural groups is still in its nascent stages. A framework to provide offering guidance on is significant related to markets, pricing information, and other related subjects needs to be established in order for farmers to make informed decisions. The Agriculture Marketing-Intelligence Support System (AM-ISS) aims to provide commodity market outlooks for individual commodities, offer research studies on particular commodities, and give marketing intelligence before to and throughout the harvest of certain farm commodities. Making the right judgments is influenced by a multitude of aspects inside the complex system of agriculture. It facilitates the development of decision assistance tools that increase farmers' accessibility to agricultural markets. This study and development of an agricultural marketing intelligence system for agriculture framework was done to address the rising demands. This essay concentrated on the elements that go into creating a decision-support system for the agricultural market.**

***Index Terms*—Agriculture, ICT, Database, GIS, AM-ISS.**

I. INTRODUCTION

There are significant price swings in the agriculture sector around the world, primarily for agricultural goods. Because of these changes, farmers are unable to make the decisions that will increase the value and profitability of their farming operations in terms of what to cultivate and when to sell. However, a wide range of decision support frameworks are typically targeted at specific domains, so there is no one method that is obviously applicable when faced with a market intelligence problem that does not clearly belong to any of these domains. A method is also urgently needed to offer market knowledge, which is essential for farmers to be able to make decisions about trade-related matters.

Market intelligence is the use of effective data analytical techniques to lower the level of risk in decision-making, which might undoubtedly aid farmers in making the right decisions at the right time. Complex challenges for farm management are posed by problems including the falling profitability of agriculture, climate change, and growing environmental concern. The foundation of AM-ISS is the pursuit of technology that can make agricultural systems science more approachable and helpful for assisting farmers in comprehending marketing tactics. Technology has the power to evaluate and reshape historical tendencies for societal good. Because of the increased interconnectedness of the world, there is an abundance of data that can be explored to inform decisions that could change the farm-to-consumer value chain. It aids in decision-making and helps agricultural stakeholders acquire new perspectives on agricultural marketing.

The AM-ISS is becoming dependent on data analytics to supply appropriate and unique technologies for researchers to provide the farmers with accurate information so they can give the farmers timely and competent guidance. It may be the best way to research the market environment as well as to advance AM-ISS's research and support for future data analysis resources. Additionally, the government should consider it when developing policies.

II. NEEDS OF AM-ISS

In rural India, agriculture is the primary source of income. Despite this, the small farmer's profits do not match their labor and input costs, which has an impact on the nation's food security and agricultural output. Applying the newest concepts and cutting-edge technology continuously in the agricultural sector is crucial to improving farmer income. It is insufficient and ineffective information distribution to the farming sector that is the plague of Indian agriculture, not the absence of modern technologies or R&D initiatives.

Therefore, AM-ISS in agriculture can act as a catalyst for growth.

Similar to agriculture, the topic of agricultural marketing is becoming more important and is included in the concurrent list of the Indian Constitution. It simplifies marketing methods, controls the competitive process, and makes marketing decisions easier. Farmers must be given accurate, timely information that they can understand if the marketing systems are to mean anything to them.

III. AM-ISS AWARENESS AND USE

With the use of AM-ISS, you can gain knowledge of potential future events. We must move from market data to information and finally to market intelligence in order to complete this process. Since intelligence requires analysis, it is different from information. The goal of this research is to make sense of the vast amounts of data and information. [1] Farmers and traders must be able to make informed choices about what to cultivate, when to harvest it, whether to keep it, and when to sell it.

Price information is the primary AM-ISS the needs of the farmer. Extension personnel must be able to advise farmers on both how to raise crops and how to sell them as farmers become more focused on the market. The major goal of AM-ISS is to communicate reliable and timely marketing information to aid in the marketing decisions and initiatives of farmers, the government, development organizations, academics, and researchers. AM-ISS aids in making certain that produce reaches places where there is a market for it. It reduces transit costs, shortens marketing channels, and ensures that each marketing transaction is fair and that all parties share in the risks and rewards.

The ideal AM-ISS should be in charge of: gathering all market data and information gathered by multiple agencies; processing and analyzing that data and information to produce knowledge that can be applied; and the dissemination of information.

IV. OVERVIEW OF AM-ISS

A theoretical framework offering a generic structure capable of holding all the components offered by the more specific frameworks. A strong start for AM-ISS should come from the establishment of the modelling frameworks, reference framework, and mapping procedure. Assumptions, methodology, ethics, and the study's place within the AM-ISS framework have all been outlined in tentative terms. The goal of the current framework structure is to create the initial study design.

There are two major tasks that need to be accomplished:

- Utilizing formalization and generalized frameworks, contribute new knowledge to the problem of an agricultural marketing decision;
- Give an answer to the practical question of how to create a modelling methodology that complies with methodology and uses particular (modelling framework-provided) building blocks for a particular AM-ISS.

This framework provides an ideal scenario to develop strong DSS framework in agricultural marketing to provide market intelligence which is "both a mechanism for practical problem solving and generating and testing theory.

Decision Support system

Furthermore, there is no DSS taxonomy that is generally recognized. Different classifications are suggested by various authors. Utilizing the user's relationship as the standard, [2].

DSS is founded on the pursuit of technology that can improve access to and utility of agricultural systems science for directing management of production [i.e. farming] systems [3].

Interactive computer programmers that generate models using analytic techniques aid in the formulation of alternatives, the analysis of their effects, and the interpretation and selection of the best solutions for implementation [4].

A cooperative DSS enables the decision maker (or its adviser) to amend, complete, or refine the system's suggested decisions before returning them to it for verification. The system once more completes, polishes, and improves the decision maker's suggestions before returning them to her for approval. The entire procedure then repeats itself until a comprehensive solution is produced.

Important Types of DSS

Specialized problem-solving expertise is offered by a knowledge-driven DSS and is kept as facts, rules, processes, or in structures similar to these. [5]. Access to and manipulation of a statistical, financial, optimization, or simulation model are key components of a model-driven DSS. Model-driven DSS are not always data dense, but they do employ data and

parameters supplied by users to help decision makers analyses a scenario. A model-driven DSS generator with open source is called Decodes. [6] More than one person can work on a shared activity with the support of a communication-driven DSS; examples include integrated tools like Microsoft's team [7] Access to and manipulation of a time series of internal company data and, occasionally, external data are prioritized by data-driven DSS or data-oriented DSS. Unstructured data is managed, retrieved, and manipulated by a document-driven DSS in a number of different formats.

V. AM-ISS FRAMEWORK

The proposed framework divided into six main stages. The system can be more improved in the process of decision making. This system is validated by requirement analysis and specification. if it is not then it should be reconstructed until the appropriate model is generated.

A. Data Collection

Commodities are divided into domestic and international categories in this research study on agricultural commodities that uses the AM-ISS to give intelligence. primary representative market for each commodity, and these markets' prices are tightly correlated with those of all other markets. Based on the AM-ISS framework, which primarily provides price intelligence, studies will need all past information on production, yield, rainfall, imports, exports, local and international prices, government policies, and—most importantly—price data for agricultural commodities in a time-series format. Secondary Data - consists of analyst reports, journals, web portals and published sources of information. The bulk of the information it comes through secondary research for AM-ISS.

Primary data is more direct and hands-on; it involves contacting published information sources, meeting in-person with influential decision-makers, and clearing up crucial unknowns that secondary data fails to capture. Following data model development, primary data from surveys and interviews will be used to validate the model.

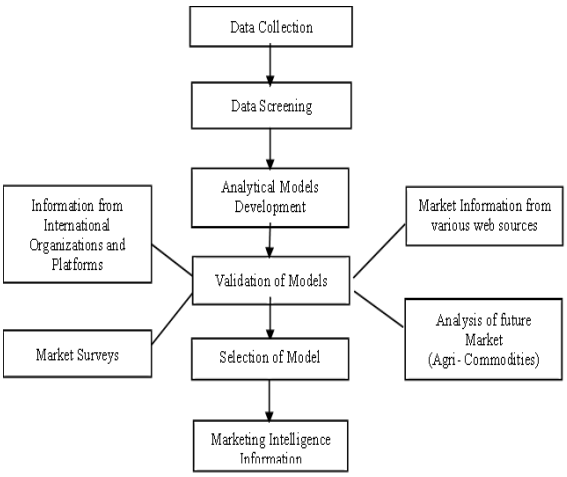

Figure 1-The Proposed Framework of AM-ISS

B. Data Screening

Numerous factors, technical as well as non-technical, have impacted the agriculture. Given the limitations of human processing, it will be a difficult effort to filter and assimilate this volume of data. We cannot multitask like a machine, and we have a history of logical fallacies.

to archive historical data in addition to geographical and highlight-related information about the methods that the AM-ISS is interested in. The registration of measurements into databases and their subsequent processing, retrieval, and storage are covered in this portion of the proposed paradigm.

The historical data that is now accessible about production, yield, rainfall, imports, exports, local and global prices is stored in the form of data which is going to be stored in the form of a database after filtering. The information must follow the problem's perimeter.

C. Analytical Model Development.

Both primary and secondary sources of data have been used to create the suggested framework. This data will be gathered and analyses to create the AM-ISS framework. The AM-ISS system is being developed using cutting-edge methodologies for data analysis, and intelligence on markets, such as commodity price prediction, will be prepared using all time-series and econometric methods that have historically been used to analyses data on production, yield, rainfall, imports, exports, local and global prices, government policies, etc. In this case, aim to create the models that:

- Fundamental Models using Econometric Models [establishing relationships between prices and production, availability, exports, imports, etc.]
- Technical Models using Classical Time Series Decomposition Models [identifying seasonality, cycles, trends and irregular components]
- Technical Models using Traditional Time Series Models [Moving Averages and Exponential Smoothing]
- Advanced Technical Models like ARIMA, X-12 ARIMA, Neural Network, etc.

Every function needs to be analyzed separately throughout the analysis process. For each analysis item, a relative model associated to that analytical item will be created. The key to the entire system is the model's design. Professional knowledge relevant to the simulations will also be provided for decision support.

The selection of a methodology is arbitrary and based on the predisposition of the decision maker, and every approach has the ability to produce rankings that differ from one another. [8]

The models employed to derive the system's state and construct sound decision-making options. Analysis models and tools ought to be created to foresee behavior and predict responses. Using historical data, data from the Data Collection System, and other data, models can be calibrated to produce better results.

D. Dissemination

In order for the AM-ISS to be useful to farmers and agricultural entrepreneurs, the information provided must be accurate, timely, and understandable. This will allow a farmer to decide how much to produce, when to sell it, and where to sell it. It will also allow a trader to expand their trade. The AM-ISS represents the actual decision made by the decision maker based on the results of the multi-criteria analysis, which generated supported by analysis models and domain knowledge, to give an undisputable answer.

VI. CONCLUSION

Making intelligent choices is always essential. Nowadays, surveys are being conducted all over the world to collect factual data on livestock, crops, and other agricultural resources.

Making wise decisions is constantly the result of careful planning. Agriculture AM-ISS planning and development processes represent a multi-complex problem that is particularly challenging to tackle if not fully addressed. Forecasting is extremely challenging due to the interdependence of diverse activities on one side of the hand, and services on the other.

The decision-making procedures require a qualitative evaluation from the producer in addition to any other issues they are currently dealing with. Our suggested model combines social and economic factors, and expert systems assist decision-makers in creating AM-ISS. Our process model may help to improve the suitability of agricultural AM-ISS as result in the predicted agriculture solution model.

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