ISSN No. 0976-5697

Volume 2, No. 5, Sept-Oct 2011

International Journal of Advanced Research in Computer Science

REVIEW ARTICAL

Available Online at www.ijarcs.info

Role of Data Mining in Minimizing Socio-Economic Risk Factors (SERF) Affecting Agriculture

Mamta Rajshree*
Assistant Professor
School of Computer Engineering and Information Technology, Shobhit University,
Meerut, (UP), India
mamta.rajshree@rediffmail.com

Shwetank Arya
Assistant Professor
Department of Computer Science, Faculty of Technology
Gurukul Kangri University,
Haridwar, (Utrakhandh), India
shwetank_arya@rediffmail.com

Abstract: The role of data mining in minimizing Socio-Economic Risk Factors (SERF) and prediction is a leading next generation agricultural intelligence. This enables land users to make better decisions by alerting them to hidden patterns in data that are discovered. Farmer decisions with regard to agriculture production and technology use are strongly influenced by SERF such as age, education, farming experience, land size, risk willingness, innovativeness, extension use efficiency, live stocks, family members, scientific attitude etc. SERF remained neglected because of an emphasis on increase in productivity. The aim of this paper is to give a review of SERF and presents a novel data mining model to overcome SERF prevailing in agricultural environment especially in Indian context.

Keywords: Socio-economic risk factors; Agriculture Intelligence: Data Mining; Classification

I. INTRODUCTION

Agriculture is the combined system of independent components such as soil, water, crops, livestock, labor and other environmental resources. The complete agriculture system can be divided into two main elements: technology and human. Technology includes the use of pest, seed, livestock potentials, soil, water etc. The application of these factors can be improved by the technology improvement through teaching and training. Human is an exogenous factor that is farmer. Farmer decides whether or not to adopt technology and other supported resources. The decision depends upon how the farmer perceives and understands the technology. Farmer perception and understanding are influenced from a variety of SERF such as age, experience, education, land size and risk willingness etc. In this study an attempt is made to find the relationship in socio-economic factors and agriculture production using the data mining.

II. DATA MINING

Data mining techniques are used to find patterns, classify records and extract useful information from large data sets, and predict outcome for decision analysis in variety of areas as social sciences, environment sciences agricultural sciences etc. Data mining involves different algorithms to accomplish different tasks such as classification, classification, association rules, summarization, regression, summarization, sequence discovery, prediction and time series analysis [5]. Data mining is the task of discovering meaningful patterns from large data set. Data mining techniques can be categorized into three main classes: statistical techniques, classification techniques and clustering techniques.

A. Statistical Techniques:

There are various statistical concepts that are various statistical concepts that are the basis of data mining such as point estimation, Bayes theorem, hypothesis testing, regression and correlation etc.

B. Classification Techniques:

Classification technique is supervised learning. These algorithms based on statistics, decision tree, neural network and rules.

C. Clustering Techniques:

Clustering Technique is unsupervised learning. Clustering is of two types hierarchical clustering and partition clustering.

III. ROLE OF SERF IN AGRICULTURE

Socio-economic factors are the social and economic experiences and realities that help to change one's attitude, personality, perception and life style of the human being. The paper deals with the role of data mining techniques in the field of agriculture and related areas. Some of the most used data mining techniques such as classification; clustering and statistical techniques along with their applications in various domains of agriculture have been discussed. Data mining techniques in the field of agricultural decision making for forecasting agricultural production, quality of production and management are new research areas. This review is conducted to explore the application of data mining in the domains of agriculture for the purpose of investigating some efficient technique to improve the socio-economy of the farmers.

A. Factors affecting the adoption of new technology:

A study was carried out to find the factors affecting the rice farmers' adoption of new technology such as Integrated Pest Management (IPM), row seeding, certified seeds and rice varieties etc., using the focus group discussion method, it was found that low education of farmer, weak perception of new technology, weak teaching capacity, lack of capital,

small land, not good infrastructures and limited capacity of extension staff led to low technology adoption [3]. Another study was conducted to assess the contribution of socio-economic factors towards the extension use efficiency of farmers in selected farming systems in eastern dry zone of Karnataka. Sample data was collected from 120 respondents by using pretested structured interview schedule.

The 4 farming system were identified: Crop,Crop+Dairy, crop+Dairy+Sericulture and Crop+ Sericulture. Socio-economic factors: age, education, land holding, family size, social participation, management orientation, scientific orientation, risk willingness and innovativeness, livestock possession, Cosmo politeness, cropping intensity were considered. Land holding, cropping intensity and scientific orientation were found to be significant at 5% level, Cosmo politeness at 1% level and age education, family size, social participation livestock possession, management orientation, risk willingness and innovativeness were found to be non-significant under crop farming system [6]. A study was done to identify the factors that affect the adoption of new technology among smallholder farmers in western Tanzania and resulted that the lack of technology knowledge and inability of farmers to wait for two years before getting direct benefits from the technology were the main factors in the planting improvement.

The study also identified that the farmers' training through workshop and seminars, enforcement of laws for animal grazing and facilitation to farmers in getting more credits, are the major approaches to enhance the adoption of the new technology [11]. Another study was done to ascertain the socio-economic and technology specific factors that influenced the farmers' decision to adopt the improved soybean seed as a production technology and resulted that farm size and expenditure on hired labor were significant at5% level [13].

B. SERF affecting the adoption potential of improved tree fallows:

A study was conducted to assess the feasibility, profitability and accessibility of improved tree fallows and labor constraints and institutional support were found feasible factors, high opportunity cost of labor was found favorable factor for profitability and for acceptability important factors were perception of soil fertility problem, past investment in soil fertility, current fallowing, economic importance of annual cropping, wealth level and access to off farm income [14].

C. SERF in soil Erosion and Conservation:

In a study the influence of socio-economic factors on erosional processes and conservation measures mainly in a Western European farming context were explored and found that agricultural subsidies, quotas and guaranteed prices are important for farmers in developed world [2]**.**

D. SERF affecting land degradation and consolidation:

A study discussed the SERF: land tenure, poverty, pressure on the land, labor availability, economic incentives, technical knowledge, appropriateness of used technology, economic and financial returns, off-site vs. on-site costs and social status affecting land users and land degradation in the context of developing countries, and found that farmers were strongly influenced by economic incentives [10]. Another study was conducted to investigate the personal, physical and socio-economic factors affecting farmers' adoption of land consolidation to reduce the conflicts related to irrigation, inter-farmer conflicts and shaping parcels into a form proper for mechanized agriculture. SERFs related to an individual's management skills include education, farmer experience, age and vocational training, are important to represent a farmer's ability to understand farm technologies. Age and education of farmer are found to be significant in land adoption technology [1].

E. Features of sustained farmer and abandoned farmers:

A study was done to examine socio-economic conditions of peasant farmers and the consequences on agricultural technology in South west Nigeria. In depth study and structured interview schedule were used to collect the sample, analyzed using statistics and found that sustained farmer and abandoned farmers had most features in common. Both cultivated similar crops, used family land or inherited land and they heavily depended on family labor or hired labor. The study also revealed significant positive correlation between age and soybean adoption level, age and cassava adoption level, organizational membership and extension contact, factor affecting sustained use of maize and cassava technology while a negative correlation was reported between factors affecting sustained use of maize technology and extension contact [7]**.**

F. Factors Affecting the Turnover and the Supply and Demand Relationship in Agricultural Trade:

A study was done to analyze the situation in agricultural land market in Poland, including the identification of factors, affecting the turnover and the supply and demand relationship in trade and characteristics of parties to contracts of sale of agricultural land. These changes are main factors affecting the modernization of the agricultural sector and strongly influence the socio-economic development of rural areas [9].

G. SERFs Affecting Production System:

In a study SERFs and livestock aspects of different production systems were investigated. Age, occupation, education, family size, farm holding, income from different sources, number and type of different animals, milk, production, marketing, breeding, feeding aspects etc. were studied with the help of pre-tested schedule, and revealed that type of livestock play an important role in various production systems. Mixed animal system proved best in the development of farming community and overall development of farming community based on local livestock aspects and socio-economic characteristics leads to sustainability [8].

H. Factors Affecting Smallholder Farming and Household Security:

A study was carried out to investigate the socio-economic issues related to the state of food security of small holder farmers in the Thulamela local municipality oh Vhembe district of South Africa and identified the factors that can be adopted by smallholder farmers in addressing the problems of household food insecurity[12].

IV. SERF AND AGRICULTURAL MODELING

Socio-economic environment is the combination of variety of factors. These factors have firm relation with the production and the technology used. Agricultural production, market demand and trading are collectively influenced by SERF. Data mining technique allow identifying meaningful hidden patterns in the socio-economic data set. Diagrammatic representation of SERF and agricultural modeling is depicted in the figure 1.

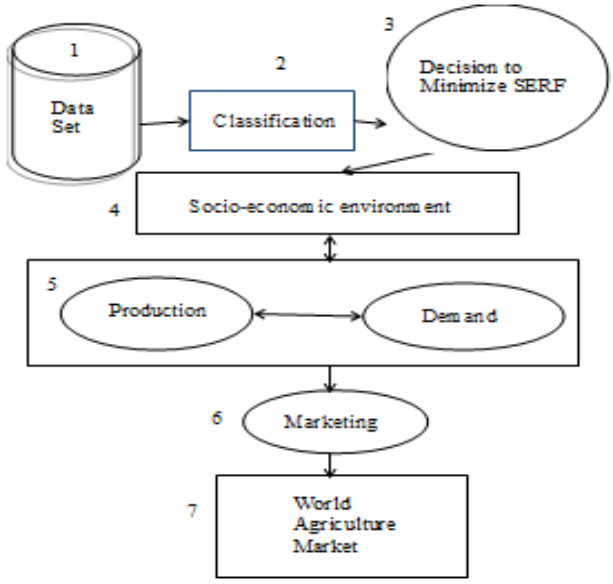

Figure 1. Diagrammatic representation of SERF & agricultural modeling.

Detailed explanation of the figure 1 is as follows:

A. SERF data set includes data related to age, education, experience, training, no of family members, risk willingness, social status, innovativeness, scientific aptitude, production efficiency, extension use efficiency etc.

B. Data mining technique such as classification can be used to construct the groups to identify the meaningful patterns in various groups.

C. Data mining classification allow to identify the relationship in between the production and specified factor, for example if we have a group of 45 farmers having the age of 20 to 30 years and their production efficiency is 70 % of the total production of rice in the year 2010 and another group of 40 farmers having the age group of 50 to 60 years with production efficiency of 48%, it conclude that the younger farmers have better productivity than the old age of farmers. Similarly, other SERFs groups may facilitate in determining the useful relationships. Classification also facilitate in determining the meaningful patterns in inter group relationships.

D. Socio-economic environment is the combination of various SERFs that influence the production, technology adopted and strategies used for trading.

E. Production is related to demand and both require planning and technology, production and demand again greatly influenced by SERFs. Agricultural product marketing depends on the production and demand and it influence the word agriculture market.

(6, 7) World trading is the output of the whole agricultural process. Data mining technique extract hidden meaningful information to improve the agricultural methodology consequently farmer can compete in the agriculture world market.

V. THE ROLE OF CLASSIFICATION IN MINIMIZING SERF

The process of grouping a set of objects into classes of similar objects on the basis of some predefined criteria is called classification. Classification technique is used to categorize data set into a target groups. SERFs are independent variables and production efficiency is dependent variable. SERF dataset is associated with threshold values. Classification partitions the dataset into various groups according to the threshold value. For example different educational level has different threshold values. Threshold value 1 is used for the farmers who are illiterate, those who have passed 10^{th} class 2 is used, 3 is used for the farmers who had completed class 12^{th} and threshold value 4 is used for higher educated farmers. Farmer groups of different education level with their respective production efficiency allow analyzing the relationship in education level and agriculture production efficiency. Similarly group of extension-use-efficiency allow analyzing the impact of extension-use-efficiency on the agriculture production level. In addition classification also reveals the hidden relationship in between various domains of SERF. For example groups of various education levels and their respective extension efficiency reveal the hidden pattern in between education and extension use efficiency. If positive relationship is found in between education and extension-use-efficiency, we can suggest for the improvement in education level for the purpose of improving the extension-use efficiency¸ and consequently production will be improved.

VI. FUTURE DIRECTIONS

The objective of the present study is to identify effective factors on farmers' attitude towards agriculture in Indian context. Opinion and attitude towards agricultural activities are greatly influenced by socio-economic environment such as age, education, experience, land size, risk willingness, land tenure, innovativeness, social participation, training, livestock etc. Using the data mining technique hidden patterns in between SERF can be revealed and analyzed. Improvement in these factors can increase the level and quality of agriculture production.

VII. REFERENCES

[1]. Aslam S.T.A., Gundogdu K.S., Yaslioglu E., Kirmikil M. and Agric. I.," Personal, Physical and socioeconomic factors affecting farmers' adoption of land consolidation", Spanish Journal Agricultural Research", 5(2), 204-313, 2007.

[2]. Boardman J.Poesen J. and Evans R., "Socio-economic factors in soil erosion and conservation", Elsevier, Environmental Science and Policy 6, 1-6, 2003.

[3]. Chi T.T.N. and Yamada R.,"Factors affecting farmers' adoption of new technologies in farming System: A Case study in Oman district Can the province making Delta", Omanrice 10:94-100, 2002.

[4]. Dunham M.H., Data Mining Introductory and Advanced Topics, Pearson Education", 2009.

[5]. Han J. and Kamber J., "Data Mining Concepts and Techniques", 2006.

[6]. Malathesh G.B., Shivmurthy M., Lakshmanreddy B.S. and Rao L.R., "Socio-economic factors and extension use efficiency of the farmers in selected farming systems", Karnataka J. Agric. Sci., 22(2):357-361, 2009.

[7]. Omobolanle O.L., "Socio-economic Conditions of Peasant Farmers: The Case of Agricultural Technologies' Sustainability in Southwest Niggeria", World Journal of Agricultural Sciences 3(5): 678-684, 2007.

[8]. Raju, D. T., Prakash, M.G., Rao, S.T.V. and Reddy M.S., "Socio-economic and livestock aspects of different production system – Indian case study", Livestock Research for rural development 18(12)2006.

[9]. SIKORSKA A., "The socio-economic factors affecting the development of agricultural land market in Poland", ACTA University, agric. Et silvic. Mendal. Brun., 2010, LVIII, No. 6. pp 445-'452.

[10]. Stocking,M.A., Murnaghan, N., Handbook for the Field Assessment of Land Degradation. Earthscan, London, 2001.

[11]. Matata P.Z., Ajay O.C., Oduol P.A. and Agumya A.,"Socio-economic factors influencing adoption of improved fallow practices among smallholder farmers in western Tanznia", African Journal of Agriculture Research Vol. 5 (8), PP 818-823, 18 April, 2010.

[12]. Oni S.A., Maliwichi and Obadire O.S., "Socio-economic factors affecting smallholder farming and household security: A case of Thulamela local municipality in Vhembe District of Limpopo Province, South Africa", African Journal of Agriculture Research Vol. 5 (17), PP 2289-2296, 2010.

[13]. Idrisa Y.L., Ogunbameru B.O. and Amaza P.S., "Influence of farmers' socio-economic and technology characteristics on soybean seeds technology adoption in Southern Borno State, Nigeria", African Journal of Agricultural Research, Vol.5 (2).PP 1394-1398, 2010.

[14]. Franzel S., "Socioeconomic factors affecting the adoption potential of improved tree fallows in Africa", Agroforestry Systems 47:305-321, 1999.