

Administrative Decision Making by Computational Intelligence strategies for Dairy Development Sector

Mrs.M.Nirmala devi¹,

Assistant Professor,

Department of Computer Science & Engineering,

Thiagarajar College of Engineering, Madurai, India.

nirmaladevi2004@gmail.com

S.Meena²,

Student, M.E Computer Science and Information Security,

Department of Information Technology,

Thiagarajar College of Engineering, Madurai, India.

meenabecsea@gmail.com

ABSTRACT

Decision making is associate procedure and it is not possible as a rule. With decision support systems, the organizations associate information about their operations and execution. Decision makers foresee the profit by conditions before they happen. This ability makes predictive business, that is taken into account on a subsequent stage within the development of a real-time enterprise. The ultimate objective of this work is to assist the company in decision making by (i) diminishing the transportation cost (ii) increasing the profit of the organization (iii) delimiting the stock administrative by issuing a notification to the supplier, when the stock level falls below the threshold level (iv) displaying a graphical portrayal of income and expenditure for every department. In the proposed strategy, to expand advantage of the organization the tanker allocation is done by Hungarian algorithm used to optimize the transportation cost. Stock reordering reminders and loan sanction, tender allocation tracking system reports, is performed by PDF generation and servlet programming.

Keywords: Decision Support Systems, Hungarian Algorithm, Critical Path Method Algorithm, Cost Optimization, Computational Intelligence Techniques.

1. Introduction

The Tamil Nadu state dairy development division was set up in 1958. The managerial and furthermore

statutory controls over all the milk cooperatives in the state was exchanged to the dairy advancement on 01.08.1965. The official for milk production and dairy development was made as the useful enlistment center under the Tamil Nadu cooperative societies act. The business exercise of the division are such as milk procurement, processing, chilling, packing and sale of milk to the consumers, etc. In the way of liberalization policy, private dairies have entered in the field for dairying and a number of mini and large private sectors. Priority has been accorded for improving the performance of co-operatives by adopting a systematic approach and best possible methodology execution in milk co-operatives.

The milk producers' co-operative societies are formed and functioning at village level. In these societies only the milk producers are enrolled as members. The animals owned by producer members are supplied with an animal health cover at the doorsteps of the members by the veterinary assistant surgeons of the veterinary units, procurement groups and input groups. Breed improvement through artificial insemination is also carried out a nominal rate. The milk produced at the village societies is collected by the district unions after allowing some quantity to be retained at society level itself to meet the local demands. Tamil Nadu is one of the leading states in milk production.[5]

2. Related Work

Ketan et. al described about the parallel versions of the Hungarian algorithm for solving linear assignment problem. This paper focuses on the

efficient parallelism of the augmenting path search phase of Hungarian algorithm. The sequential Hungarian algorithm was used for finding the optimal solution to an linear assignment algorithm.[1]

Haibin et. al deal with the Many to Many assignment problem by using the Kuhn-Munkres(K-M) algorithm , which was a traditional process for dealing with the assignment process. The Many to Many assignment problem was improved by using the K-M algorithm with backtracking. Normally K-M algorithm, which was also called as Hungarian method and used for 1-1 assignment. It was done by finding the maximum weight matching in a weighted bipartite graph.[2]

Irfan et. al discussed a specific class of task assignment problem where each task was assigned to group of collaborating agents who work as a team. The agents who were working for the organization has certain capabilities and each has certain requirements. The objective was to gain maximum of the assigned agents to teams. Hungarian algorithm was used to find the near optimal solution for task assigning problems. [3]

Kuan-Hsun et. al explained how to efficiently assign the task onto the different cores with heterogeneous properties and then determines the execution mode of task to achieve high reliability and satisfy the tolerance of timeliness. Task mapping problem is solved by using the Hungarian algorithm for assigning the task efficiently. An iterative mode adaptation technique and guarantee the tolerable timing constraint is achieved by using the task execution modes. [4]

Angel et. al described about how to reduce the product stock outs, an Economic Order Quantity (EOQ) and Reorder point was recommended. The shortage of raw material reduces the productivity. The inventory management technique was used for the optimal level of inventory and to solve the problem of safety stock and lead time. [5]

Fabio et. al defined the PDF format of ECGs signals report for every 10 second. The advantage of using PDF-ECG was to satisfy both the needs for simple graphic report which was accessible without the installation of any proprietary software. The information generated was preserved for very long time. All the documents can be viewed by all the PDF readers. [6]

Peter et. al focused on the agreements and related policies for the participating governments to procure goods and services via public tender. This tendering aims to procuring the goods and services at lowest possible prices. This paper examines how public transport particularly bus services was procured under service cost and quality. [7]

Tingting et. al described about the success of the Public-Private Partnerships (PPPs) depends on the

performance of the tendering process. This paper identifies the 14 critical factors for the implementation of the PPP tendering were categorized into 7 dimensions. By using the recommended dimensions, both public and private entities in the PPP project will be at better position to structure and manage the tendering process. The critical success factors for PPPs are grouped into five categories. To achieve the objective of identifying the critical factors which affects the effectiveness and efficiency of PPP tendering is done by conducting interview used to enable the themes and patterns to emerge the capturing of the interview participants. Availability of the sufficient project pipeline and involvement of public officials and leadership are the most important ingredients for successful PPP tendering process. [8]

Denis et. al define about the loan given for micro-entrepreneurs in emerging market and underdeveloped nations. There is an increase in the repayment rates and also for controlling, screening and monitoring was done by social relation group and community. This study tell about the positive connection between repayment rates and financial capital creation. [9]

Ana et. al deal with the evaluation of training the tenders where the performance was measured against the "best performance" criteria. The goal was to access and compare many training schedules and resource allocation plans to the existing training objectives. The research was to evaluate the tender proposals for Australian Defense Training Schools. To evaluate the resource plans and schedules, Discrete Event Simulation (DES) to encapsulate the performance and permit an unbiased comparison. To satisfy the system and policy constraints, DES allows the study for tender feedback to improve the quality of all bids. [10]

Valerie et. al focus on developing and accessing the online training program to deliver the diagnosis to patient. It was a self training package available through web. This package was enabled to acquire the new skills. The training was provided by means of classical training which was based on the books like one way communication and the other is by interactive training. [11]

Santi et. al explain about the online training course for the teachers to upgrade the qualification. e-Learning UTQ was introduced. It was aimed to study the curriculum development, curriculum implementation, and the e-learning achievements. Data were collected in the form of documentary method. The training preparation, training management, and training operation has improved by UTQ online curriculum. [12]

Yu-Chieh justified about the text detection on video in complex backgrounds. The major task in news content extraction was to recognize the content area and remove the unrelated elements from the HTML code. The goal was to provide only the clean main content by scanning the entire HTML file to identify the text content and create the output text. [13]

Alberto et. al deal with the shortest path to the destination by taking the traffic conditions into account. This allows the drivers to take the shortest path for avoiding traffic jams. The paper proposed an algorithm for calculating all pairs of the shortest path. A parallel version of the algorithm was used to solve the pair of shortest path problems in metropolitan areas with large road networks. To make the proposed system as a cost effective, the shortest path calculation was needed. The algorithms like All Pair Shortest Path (APSP) and Single Source Shortest path (SSSP) provides the best performance time. It also solved the problem of identifying the alternative path. [14]

Xiaohua et.al discussed the problem of shortest paths. In this paper, how to refresh a cache when one edge of the underlying road network changes. Algorithm was proposed to detect the shortest path which were affected by the change of the edges. The performance of the proposed strategy shows the replacement of the affected path with the new path. A bitmap cache structure was used for storing the shortest path and answering the queries. [15]

Alberto et. al deal with the location based system which was useful for mobile users to suggest the shortest path. It not only suggest the current shortest path but also displays the alternate path for avoiding the traffic jams. The proposed system shows the set of algorithms which shows All Pairs of Shortest Path in free flow and congested traffic flows. Also enabling the location based system which deals with the emergencies and critical traffic conditions. A Parallel Version of the algorithm was also proposed to solve the All Pair of Shortest Path Problem for Metropolitan areas with a large road network. [16]

Alix et. al describes about the business design which has the advantages like joint process harmonization, business technique, information technology alignment, technological cost diminshment, risk and redundancies reduction, customer service improvement and improved responsiveness. It was used for solving different issues in daily basis. To improve decision making in collaborative environments was proposed by using the inter-enterprise architecture. Decision making involves a certain situation like production planning, inventory control, purchase planning and distribution planning. This inter-enterprise architecture was used for taking the unexpected decision in hierarchical production

planning used in a collaborative network to support better performance and more efficient decisions. [17] Bin Cao et. al details that the assignment problem can be solved by using Hungarian algorithm which retrieves the context and finds the similarity between the pair of places and Hungarian algorithm performs better than all other algorithms in retrieval and response time[18].

3. Structure of Aavin

State level federation frame policies, producers and also fixes the prices for all of its products within Tamil Nadu. In District level union, the received milk from societies is chilled, processed and supplied to the public through tankers and booth. Village level society constitutes members who own animals supplying milk to society.

3.1 Dairy Development Department - Aavin

The cattle population, that was 105.72 lakhs in 1974, has reduced to 16.58 lakhs during the same period. However, milk production in Tamil Nadu has increased enormously over the last two decades. From only 35.24 lakhs MT in 1993 – 94, it has risen to 47.53 lakhs MT in 2003 – 04. This has resulted in increase in per capita availability of milk to 209gm per day, that is near to the breeding policy adopted in Tamil Nadu, that has been in tune with the national policy. Cross breed cattle account for 24% of the entire white cattle population. Murrah and graded buffaloes account for 82% of buffalo population. Milk trade has become a manufacture providing employment opportunity in rural areas, particularly to the women folk thereby supplementing the family financial gain. To eliminate the middlemen and to protect the interest of the producers within the villages, milk producers' cooperative societies are fashioned. This has the assured remunerative value and market support to the producers besides catering to the needs of the consumers. Dairy development programs are being enforced through a network of co-operatives designed on the 'Anand model' of Gujarat state. Tamil Nadu was one in all the states that adopted the Anand pattern of co-operatives for milk production and marketing.

3.2 Dairy farm Department

The main functions of the dairy farm department include organization of societies, registration of the societies, management of primary milk cooperatives, milk producer's unions and Tamil Nadu cooperative milk producers federation. All the dairy farms including private dairies handling more than 10000 liters per day (LPD) of milk or milk products containing milk solids over 500 metric tons every year have to obtain a registration certificate under the provision of milk and milk products order 92.

Madurai Aavin union's milk procurement activities are taken through 8 milk procurement teams located in Melur, Chellampatty, Bodi, Thirumangalam, Usilampatti, Andipatti, Theni, and Madurai through several tankers which are already in contract with Aavin. The establishment of procurement teams enables the milk producers to produce milk economically & the market surplus milk to Madurai dairy through their village dairy co-operative. There are 804 functional societies over 34 milk collection routes and a chilling center at Theni district, Aavin procure milk at Rs 15.54 per liter and to members the payment ranges from Rs 14.50 to 15.50.

The zonal office plays a vital role in marketing activities of Aavin. The zonal office collects order from the customer and transfers it to the main office. Then the main office prepares the supply schedule and further arrangement to distribute the commodities in tight time. The total number of vehicles owned by Aavin are 19 vehicles, 5 tankers is in contract and 2 in union. In general allocation of tankers to the distribution centers was random and due to the random allocation of tankers to the distribution centers the transportation cost increases gradually.

3.3. Transport Department

It allocates the vehicles, driver, time to supply the goods. It maintains the log books for vehicles (i.e) expenses, route. It also involves in obtaining Permit, license, fit condition certificate for vehicle and drivers.

3.4. Milk Procurement Wing

Milk procurement wing comprises Milk Producer's Cooperative Societies (MPCS) and Self Help Groups (SHG). There are totally 804 MPCSs and 432 SHGs (as on date) functioning currently in Madurai Aavin covering Madurai and Theni district. Milk collected from societies and SHGs through Aavin milk collection routes (MCR). The procured milk from societies and SHGs, while in transportation, are kept in chilled condition through Bulk Milk Cooler (BMC). There are 16 BMCs totally with 10 from Madurai and 6 from Theni. Further 7 more BMCs are under construction. There are 29 Milk Collection Routes, 32,000 Milk Producers and 8 Milk Procurement Teams in Aavin. Currently there are 8 Milk Procurement Teams Functioning. They are Vadipatti, Melur, Usilampatti, Perayoor, Chellampatti, Andipatti, Theni and Bodi.

3.5. Marketing

This department functionalities includes (i) Coming out with plans to increase sales & to implement plan

to sell milk (ii) Arranging sales by-products in local areas and other states (iii) Arranging vehicles to cover local area (iv) Responsibility regarding sales of milk and its by-products (v) Solving the grievance of customers (vi) Conducting sudden investigation and assessment on depot owners (vii) Implementing plans to form new milk booths and new milk parlors and (viii) Arranging vehicle to cover the local area.

The process of granting loan to the subsidies and farmers was manual in Aavin. Verifying the documents and applications of loan in manual is error prone and increasing time. Tender allocation in Aavin is also a manual process which also causes more time and increases manual work. Knowledge about the cow farm training program is not done in Aavin so that people will know the effectiveness of healthy farming. Stock reordering was also a major complicated task overcome by Aavin there was lot of manual work involved in it. The year wise profit, loss, depreciation costs etc, were not graphically displayed and it was very difficult to categorize the performance of the organization.

4. Problem Description

The major problems in the existing system are

- i. Transportation cost of the tankers which carry the milk to the distribution center is more
- ii. Ordering and delivery of the product was not properly done. Since the time required for producing each of the product is not known the procurement level of each product gets decreased. Knowing the processing time of each product will increase the procurement of products.
- iii. Most important problem of the organization is the loan sanction process which was done manually each time by looking after and verifying lot of applications submitted to the organization.
- iv. Tender allocation in Aavin was a manual process.
- v. Cost required for training the people.

5. Proposed System

The proposed system consists of many benefits to the Aavin dairy industry such as allocating the tankers which carry milk to the distribution centers based on the distance between the Aavin depot and the distribution center. The allocation is done using the Hungarian Algorithm which is the best assignment algorithm in Operation Research. Using this algorithm the tankers are exactly allocated to the distribution center so that transportation cost is

minimized. Hence now, the transportation cost of the tankers which carry milk to the distribution center is minimized and hence there is also a marginal increase in the profit of the organization.

The next issue of the organization is the loan sanction process which was done manually each time by looking after and verifying a lot of applications submitted to the organization. This issue is solved using the Interactive and Dynamic form Designed with Servlet code as a part of the Website which includes all the details regarding age, salary, nationality, etc. This form filters the applications received for a loan using the criteria of minimum salary Rs.10000, women employee, government employee, handicapped people, etc. Based on the filtered forms the loan is sanctioned. The filtered forms are sent to the respective departments and mailed to respective people through the mail using servlet code.

Tender allocation in Aavin is done manually. It is helped even to automatically generate PDF document to the respective department. Tender is allocated based on the best quotation posted by the companies and it is filtered using Jdbc query. Using this process lot of paperwork could be eliminated and Tenders can be easily allocated.

Online training is done by embedding videos on the website. This method will automatically decrease the cost required for training and gradually increase the reliability, scalability and performance of the organization.

A method of determining time for each task and the order in which each task to be carried out is done by using Critical Path Method (CPM) an Operational Research method. Thus, by using this method the procurement of the products gets increased and thus by the profit of the organization gets increased.

Finally the Profit which has been optimized by reducing the Transportation and Procurement cost, year wise profit comparison chart is graphically displayed. For the efficient comparison and the process of predicting future sales the comparison chart for each procurement area and yearly comparison charts for best sold products are also displayed on the web page. A newly added page of Feedback which provides useful responses of the tender quoting companies, employees, Aavin staffs to improve the services of Aavin.

Fig 5.1 describes about the existing problems in the Aavin and the proposed techniques identified. For the allocation of the tankers and the distribution centre is solved by using the Hungarian algorithm. Time management for ordering and delivering the product is achieved by using the critical path method and operational research method.

The loan sanction process is done manually and to minimize the time Interactive and Dynamic form designed with servlet code is used. Tender allocation is also done manually, to minimize the manpower and time an automatically generated PDF document by JDBC query is introduced. Finally, for providing the training to all the employee in the organization, online training is handled by embedding the videos on the website.

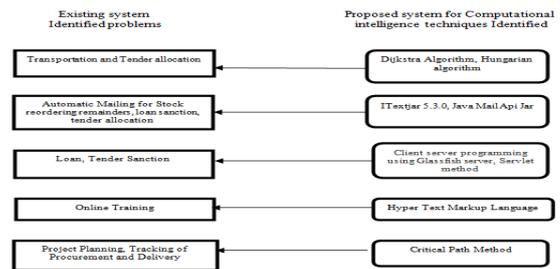


Figure 5.1 Problems identified and the proposed Computational intelligence techniques identified

The above Fig 5.1 describe about the existing identified problems in the Aavin and computational intelligence techniques identified for the proposed system. For the Transportation and Tender allocation of the tankers, Dijkstra Algorithm, Hungarian algorithm is used. Automatic Mailing for Stock reordering remainders, loan sanction, tender allocation is done by using JTextjar 5.3.0, Java Mail Api Jar. Client server programming using Glassfish server, Servlet method is used for Loan and Tender Sanction process. By using the Hyper Tex Markup Language, Online Training for the employee is given. The Project Planning, Tracking of Procurement and Delivery is completed by Critical Path Method.

For
5.1 Methodology

The proposed system consists the following modules.

5.2 Transportation and Tanker Allocation by Dijkstra algorithm and Hungarian Algorithm:

This module performs the allocation of Tankers carrying milk from depots to the Distribution centers based on the distance between them. Hungarian Algorithm is used to assign the tankers exactly to the nearest distribution center. By performing this module the Transportation cost and there by Profit of the organization is increased.

This method was originally invented for the simplest assignment for a collection of persons to a set of jobs. The algorithm finds an optimal assignment for a given “n x n” cost matrix. “Assignment issues deal with the question the way to assign n things (e.g. task) to n machines (or agents) within the simplest manner”. Assume that we have N workers and N jobs that should be done. For each pair of job, Our goal is to finish all the jobs, by minimizing total inputs, whereas assigning each worker to exactly one job and vice versa. Converting this problem with a formal mathematical definition we can form the following equations:

$$\{c_{ij}\}_{N \times N} \text{ - cost matrix, where } c_{ij} \text{ - cost of worker } i \text{ to perform job } j.$$

$$\{x_{ij}\}_{N \times N} \text{ - resulting binary matrix, where } x_{ij} = 1 \text{ if and only if } i^{\text{th}} \text{ worker is assigned to } j^{\text{th}} \text{ job.}$$

$$\sum_{j=1}^N x_{ij} = 1 \forall i \in \{1, 2, \dots, N\} \text{ One job to one worker assignment.}$$

$$\sum_{i,j=1}^N C_{ij} X_{ij} \rightarrow \text{min} \text{ - Total cost function.}$$

- One worker to one job assignment.

$$\sum_{i=1}^N x_{ij} = 1 \forall j \in \{1, 2, \dots, N\}$$

```
Function Dijkstra (Graph, source)
  For each vertex v in Graph:
    Dist[v]=infinity
    Previous[v]=undefined
    Dist [source]=0
    Q =the set of all nodes in Graph
  While Q is not empty:
    U :=node in Q with smallest dist. []
    Remove u from Q
  For each neighbor v of u:
    Alt =dist [u] +dist_between (u,v)
    If alt<dist[v]
      Dist[v]=alt
      Previous[v]=u
  Return previous []
```

5.3 Automatic Mailings for Stock reordering reminders and loan sanction, tender allocation by ltextjar5.3.0 and Java Mail Api jar

This module deals with the reminder of stock reordering when the threshold level (minimum number of items) of a product is reached. This reminder is done by generating a PDF and mailing it to the respective departments automatically. This module also deals with the reminder of EXPIRY DATE of each product at the respective time. Stock reorders, loan sanction, tender allocation, etc..Are done using Java Servlet code. In order to reorder the stocks a PDF is generated by using the list of items in the stock currently in the database. JDBC connection is used to retrieve data from the database.

ltextjar5.3.0 is a free Java-PDF library that allows you to get PDF files on the fly (dynamically). iText is an ideal library for developers looking to enhance web- and other applications with dynamic PDF document generation and/or manipulation. iText is not an end-user tool. Using this method automatic mailing of a PDF which is generated by the Servlet

code for stock reordering is done. This method has decreased the manual working of the employees and increased the reliability, scalability and performance of the organization.

5.4 Loan, Tender Sanction by Client server programming using the Glassfish server servlet method

This module includes online training for uneducated people regarding cattle farming, applying for loans and other information’s regarding cattle rearing. This online training is done by using HTML tags. Only to the registered users in the Front End website will be able to view the videos and other private details regarding loan and tender sanction. The entire module is done using a Java Servlet program. Though servlets can respond to any reasonable requests, they implement applications hosted on Web servers

Glassfish server which is an open-source application which is used for server project, which was established by Sun Microsystems for the Java Enterprise Edition platform and is sponsored by Oracle Corporation.

5.5 Online training by Hyper Text Markup Language (HTML)

It will embed scripts written in languages like JavaScript that affect the behavior of HTML web pages.

5.6 Project Planning and tracking of procurement and delivery by Critical Path Method

Critical Path Method is used to find the order in which each task should be accomplished; Cash cost of each job can be calculated. And also the time required for each task is calculated. The Critical Path Method (CPM) is one of several related techniques for doing project planning.

6 Results and Discussion

Data Collection

In the proposed system, Decision Making for Aavin needs several data to be collected regarding the Transportation, Procurement and Profit

optimization. Each data set consists of several valuable data of Aavin organization. The following are the attributes of different datasets collected:

- Year till 2016
- Profit
- Loss
- Distribution centers
- Depots
- Distances
- Type of sellers
- Products of Aavin
- Type of milk sold
- Fat content
- Rate of milk
- Total quantity sold

Table 6.1:Data

Madurai - Usilampatti		
Place	Product	Values
Madurai	Ghee	36
Madurai	Butter	22
Madurai	Milk	98
Madurai	Milk Powder	30
Usilampatti	Ghee	10
Usilampatti	Butter	12
Usilampatti	Milk	70
Usilampatti	Milk Powder	18

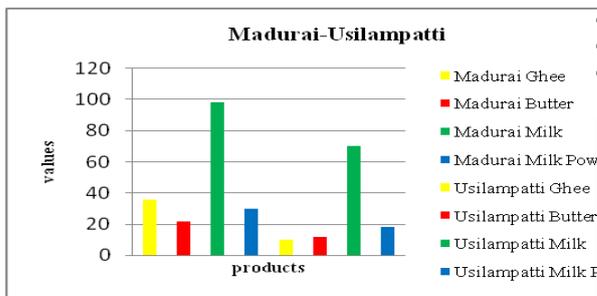


Figure 6.1 Product - Values comparison for Madurai-Usilampatti

Table 6.2

Madurai- Andipatti		
Place	Products	Values
Madurai	Ghee	36
Madurai	Butter	8
Madurai	Milk	98

Madurai	Milk Powder	4
Andipatti	Ghee	12
Andipatti	Butter	10
Andipatti	Milk	64
Andipatti	Milk Powder	18

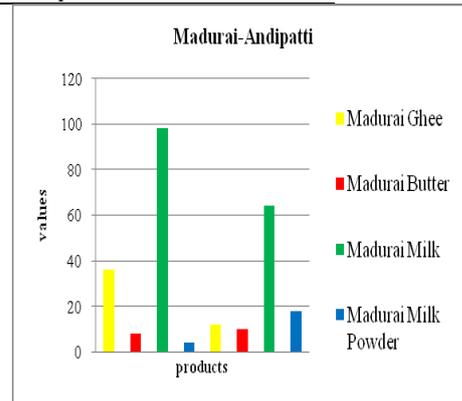


Figure 6.2 Product - Values comparison for Madurai - Andipatti

Table 6.3

Madurai - Theni		
Place	Product	Values
Madurai	Ghee	38
Madurai	Butter	20
Madurai	Milk	98
Madurai	Milk Powder	30
Theni	Ghee	22
Theni	Butter	10
Theni	Milk	68
Theni	Milk Powder	18

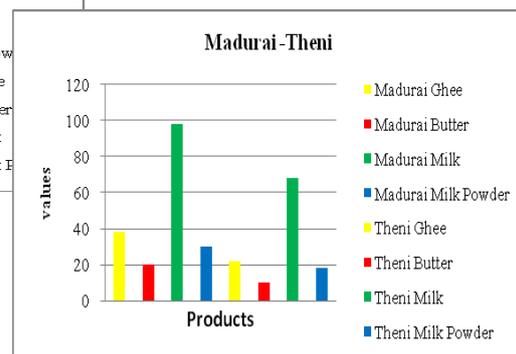


Figure 6.3 Product - Values comparison for Madurai- Theni

The above figures 6.1, 6.2, 6.3 shows the different products of Aavin like Milk, Ghee, Butter and Milk Powder done between Madurai-Theni, Madurai-

Andipatti, Madurai-Usilampatti. Among the different products milk production has high value with all the comparisons like Madurai to Theni, Andipatti, and Usilampatti. It helps to show the future prediction of each product.

Table 6.4 Marketing Performance

Types of Sellers	2010	2011	2012	2013
Parlour	63	69	73	75
Depots	474	479	479	483
Dropping points	106	109	110	110
Institution	78	80	83	83
Retailers	399	401	401	421
Self Help Group	4	9	11	18

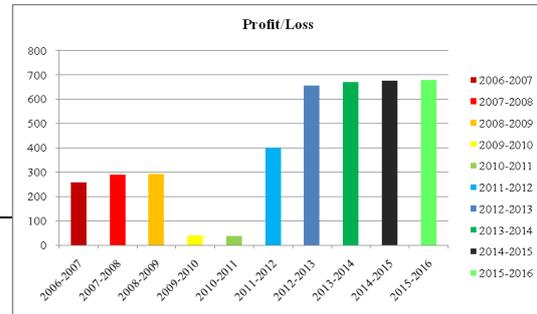


Figure 6.5 Profit / Loss Performance from 2006-2016

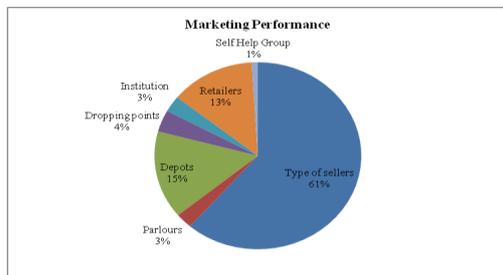


Figure 6.4 Marketing Performance

Table 6.5 Profit / Loss Performance

year	profit/loss
2006-2007	257.08
2007-2008	290.14
2008-2009	291.68
2009-2010	40.57
2010-2011	36.58
2011-2012	401.34
2012-2013	655.47
2013-2014	670.68
2014-2015	675.55
2015-2016	679.25

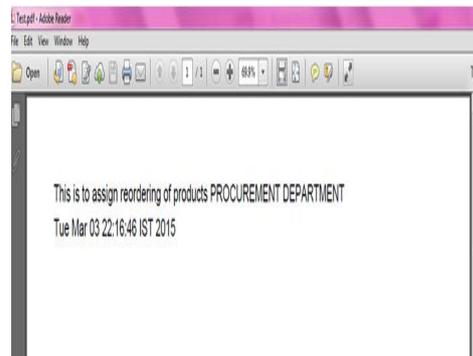


Figure 6.6 Inventory Control shows the output of automatic generation of pdf

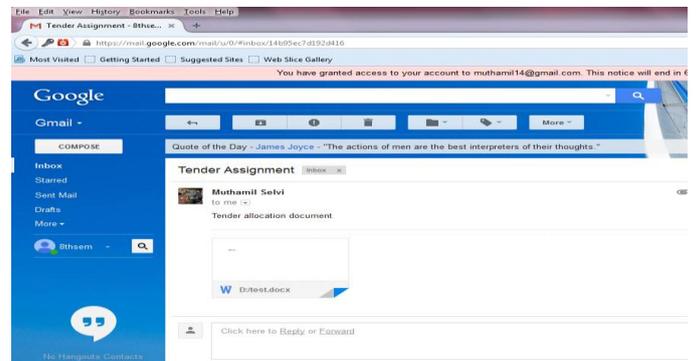


Figure 6.7 Mailing PDF shows the pdf which has got emailed to particular department of aavin.

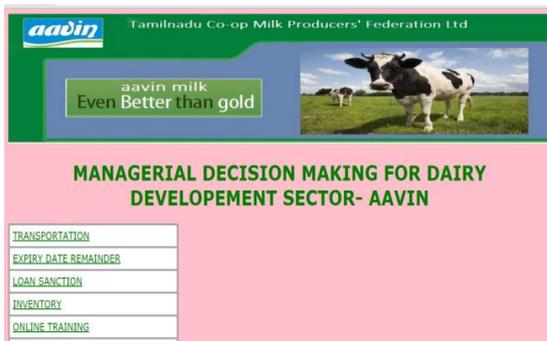


Figure 6.8 Website Design shows the design of website for the graphical display of results.

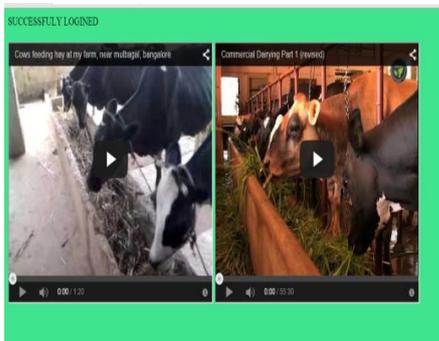


Figure 6.9 Online Training Video shows the module of Aavin online training of cow rearing.

7 CONCLUSION

Decision making is a crucial process and by using the decision support system companies correlates the data with their operations and performance. To extend the profit of the company the allocation is done by using the Hungarian algorithms which are also used for the analysis of research optimization. For automatically generating the PDF, tendering process is used. The time management for each task is done using the critical path method. The profit/loss performance for the organization gets increased to (+) 675.55 from (+) 679.25 and also the marketing performance gets increased.

8. REFERENCES

[1] Bin Cao, Jiaying Wang, Jing Fan, "Querying Similar Process Models Based on the Hungarian Algorithm", Journal on Services Computing. Nidhyananth, D., & Sugapriya, S. (n.d.).
 [2] An Overview of Consumer Behavior towards AavinMilk in Erode District. *IOSR Journal of Business and Management*, 64–66.
 [3] Jayakumar, P. (2017). problems of milk producer in budalur block of, *4(12)*, 41–46. [8]Tingting Liu, Yan Wang, Suzanne Wilkinson, "Identifying critical

factors affecting the effectiveness and efficiency of tendering processes in Public–Private Partnerships (PPPs): A comparative analysis of Australia and China" *International Journal of Project Management*, Elsevier, 2017

[4] Bi-yan, W.E.N.(2016). An Empirical study on Customer Satisfaction of Tourism Services [J]. *Tourism Science*, 4(7), 420–435. Retrieved from http://en.cnki.com.cn/Article_en/CJFDTOTAL-LUYX200603007.htm.

[5] Denis Griffin, Bryan W. Husted, "Social sanctions or social relations? Microfinance in Mexico", *Journal of Business Research*, 2017, Elsevier

[6] Ana Novak, Luke Tracey, Vivian Nguyen, Michael Johnstone, Vu Le, Doug Creighton, "Evaluation Of Tender Solutions For Aviation Training Using Discrete Event Simulation And Best Performance Criteria", *Proceedings of the 2017 Winter Simulation Conference*, 978-1-4673-9743-8/15/\$31.00 ©2015 IEEE

[7] Valerie Saint-Dizier de Almeida, Marie-France Agnoletti, "Impact of online training on delivering a difficult medical diagnosis: Acquiring communication skills", *Journal of Applied Ergonomics*, 50 (2017) 242-250

[8] Xiaohua Li, Tao Qiu, Ning Wang, Xiaochun Yang, Bin Wang, Ge Yu, "Refreshment of the shortest path cache with change of single edge", *Journal of Expert Systems with Applications*, 67(2017) 1-11, Elsevier.

[9] Vairamuthu, M., & Krishnan, G. (2017). A Study Brand Positioning in Dairy product at villupuram, Tamilnadu, *6(2)*, 5-10.

[10] Santi Wijakkanalan, Wiphada Wijakkanalan, Paisan Suwannoi, and Somkeit Boonrawd, "Teacher and Educational Personnel Development through e-Training: UTQ Online Office of the Basic Education Commission, Ministry of Education, Thailand", *International Journal of e-Education, e-Business, e-Management and e-Learning*, Vol. 3, No. 1, February 2017

[11] Yu-Chieh Wu, "Language independent web news extraction system based on text detection framework", *Journal of Information Sciences*, 2016

[12] Dr. Angel Raphella. S, Mr. Gomathi Nathan. S, Ms. Chitra. *International Journal of Emerging Research in Management & Technology*.

[13] Alberto Faro , Daniela Giordano, "Algorithms to find shortest and alternative paths in free flow and congested traffic regimes", *Journal of Transportation Research Part C*, Elsevier 2017.

[14] Xiaohua Li, Tao Qiu, Ning Wang, Xiaochun Yang, Bin Wang, Ge Yu, "Refreshment of the shortest path cache with change of single edge",

Journal of Expert Systems With Applications, 67 (2017) 1–11, Elsevier

[15] Alberto Faro, Daniela Giordano, "Algorithms to find shortest and alternative paths in free flow and congested traffic regimes", Journal of Transportation Research Part C, 73 (2016) 1–29, Elsevier

[16] Alix Vargas, Andres Boza, Shushma Patel, Dilip Patel, Llanos Cuenca, Angel Ortiz, "Inter-enterprise architecture as a tool to empower decision making in hierarchical collaborative production planning", Journal of Data & Knowledge Engineering, 2017

[17] Bin Cao, Jiaying Wang, Jing Fan, "Querying Similar Process Models Based on the Hungarian Algorithm", Journal on Services Computing

[18] shopsDipak Laha, Jatinder N.D Gupta, "A Hungarian penalty-based construction algorithm to minimize makespan and total flow time in no wait flow" computer & industrial engineering, 98, (2016), 373-383, Elsevier.

[19] Tingpeng Li Yue Li, and Yanling Qian. "Improved Hungarian algorithm for assignment problems of serial-parallel systems", Journal of Systems Engineering and Electronics Vol. 27, No. 4, August 2017.

[20] Band, P., Grade, H., Grade, T. L., English, S., Grade, H., Grade, T. L., & Manager, D. (n.d.). No Title (2018).

