DESIGNING PACKED PALM COOKING OIL DISTRIBUTION AT TRADITIONAL MARKET IN JAKARTA USING FUZZY CLUSTERING

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ABSTRACT

Referring to the Indonesian National Standard number 7709 year 2012 that palm cooking oil should be fortified with vitamin A, so that the distribution process required packaging to protect Vitamin A. Besides packaging palm cooking oil can make the content hygiene. Packaged cooking oil was distributed from the factory to the traditional market directly. In accordance with Regulation of the Minister of Industry of the Republic of Indonesia Number 87 year 2013 on the application of ISO palm olein is mandatory and Trade Minister Regulation number 80 year 2013 on compulsory packaging cooking oil, so need a mechanism to bulk cooking oil distribution.Simple packaging in the traditional market of producers to effective and efficient consumer. The purpose of this paper is to design a system of distribution of cooking oil from producers to consumers in traditional markets by creating a central cluster calls distribution center. Design models created using fuzzy clustering method. The results of this study create 15 clusters of traditional markets in Jakarta.

Keywords : Fuzzy clustering, packaged cooking palm oil, traditional market, distribution center

ABSTRAK

Teja Primawati Utami, Syamsul Ma'arif, Yandra Arkeman, and Liesbetini Hartoto. 2015. Klasterisasi Pasar Tradisional Untuk Distribusi Minyak Goreng Kemasan Sederhana dengan Metode *Fuzzy Clustering*.

Merujuk pada Standar Nasional Indonesia nomor 7709 tahun 2012 bahwa minyak goreng sawit perlu ditambahkan vitamin A, sehingga dalam proses distribusinya diperlukan pengemasan untuk melindungi Vitamin A tersebut. Tujuan pengemasan minyak goreng curah ke kemasan sederhana juga dilakukan untuk menjaga higienitas dan melindungi konsumen dari praktek pengoplosan. Sesuai dengan Peraturan Menteri Perindustrian Republik Indonesia nomor 87 tahun 2013 tentang pemberlakuan SNI minyak goreng sawit secara wajib dan Peraturan Menteri Perdagangan nomor 80 tahun 2013 tentang minyak goreng wajib kemasan, maka diperlukan suatu mekanis pendisribusian minyak goreng curah ke kemasan sederhana di pasar tradisional dari produsen ke konsumen yang efektif dan efisien. Tujuan dari makalah ini adalah mendesain sistem distribusi minyak goreng dari produsen ke konsumen di pasar tradisional dengan cara membuat klaster yang otomatis ditentukan sentral distribusinya. Desain model dibuat dengan menggunakan metode *Fuzzy clustering*. Hasil dari penelitian ini adalah terdapat 15 klaster pasar tradisional di Jakarta dengan masing-masing satu sentra distribusi.

Kata kunci : *fuzzy clustering*, minyak goreng kemasan sederhana, pasar tradisional, pusat distribusi

INTRODUCTION

In the world today, only in Indonesia and in Bangladesh people still consume bulky palm cooking oil, so in Southeast Asia only in Indonesia are still consuming bulky palm cooking oil. Palm cooking oil are consumed by the Indonesian reach 4,444 million tons per year, or 73.65% of total bulky palm cooking oil. Indonesian citizen consume bulk palm cooking oil, which not hygene and unprotectable from dust, contaminat and troubled mixing with used oil. Therefore, the government as a policy holder who assigned to protect consumers in accordance with Law No. 8 of 2009 on Consumer Protection, has made the Indonesian National Standard (SNI) 2012 number 7709 about palm cooking oil. The policy followed by the Ministry of Industry through Permenperin number 87 of 2013 on the application of ISO palm olein is mandatory and Trade Minister Regulation number 80 of 2013 on compulsory packaging cooking oil.

Strategy to conversion the bulk palm cooking oil to simple packaging needs to be followed up with the management of the distribution from producers to consumers in the traditional market. Therefore a logistics

system is needed to reduce shipping costs and keep stock for price stability. The movement of goods from producers to consumers is referred to as the distribution market[1]. In the distribution market, represents the ultimate consumer final destination track. The ability to deliver the goods in accordance with customer orders a service, and is called if integrated logistics services between production and distribution. Component logistics services include[2]:

1. The number of factories,
2. zero, one or many levels of distribution with central distribution,
3. the consumer,
4. suppliers of raw materials or component support,
5. product rotation in the central distribution and flow in and out of vehicles, and the last
6. transportation channels that link all of the above components.

Indonesia is an archipelago that has contained many traditional markets as a purchase transaction. Traditional markets are very scattered throughout Indonesia an effective mechanism and efficient distribution to be able to lower costs and stabilize prices. Good distribution mechanism is through the establishment of a central distribution, making it easy to control stock and price. Optimization determination of the distribution centers of each region can be done by clustering. Hamzah4 show that the process of clustering with fuzzy clustering provides better clustering results. In this paper the traditional market that will be made clustering are traditional markets in Jakarta.

Jakarta is the capital of Indonesia with 5 (five) provinces consisting of North Jakarta, South Jakarta, West Jakarta, East Jakarta and Central Jakarta (Figure 1). Each province has an traditional markets managed by PD Pasar Jaya. The traditional markets totaled 153 traditional markets (Figure 2), the price of bulk cooking oil in the traditional markets have disparity or difference price, otherwize the availability of bulk cooking oil in each market is not guaranteed. Thus the mechanism to be able to maintain the availability of cooking oil in traditional markets with stable price canprivided. This study seeks to address the problem.

Figure 1.Map of Jakarta
Gambar 1. Peta Jakarta

Traditional markets clustering is done by determining the center of the cluster which processed by using fuzzy clustering. Mapping the market cluster are made by considering the shortest distance, so hopefully it will be get a homogeneous cluster. Clustering process with Fuzzy clustering method generates better cluster compared to hard clustering[3]. The fundamental difference between the hard clustering or conventional method with fuzzy clustering method in fuzzy clustering is possible to produce many clusters that have different degrees or different members. Thus cluster method with fuzzy clustering can approach the real condition[3].

Clustering has long been used to determine a unique position in the distribution area. This became the basis of the fundamental characteristics of algorithmic data analysis at regional grouping. Almost since the invention of fuzzy sets, rules and potential information clustering already known and appreciated by many parties[4].

Fuzzy clustering is used to identify the center of each cluster directly of traditional market in Jakarta.

METHODOLOGY

Subsystem distribution is one case to distirbute simple packed cooking oil at traditional market in Jakarta.

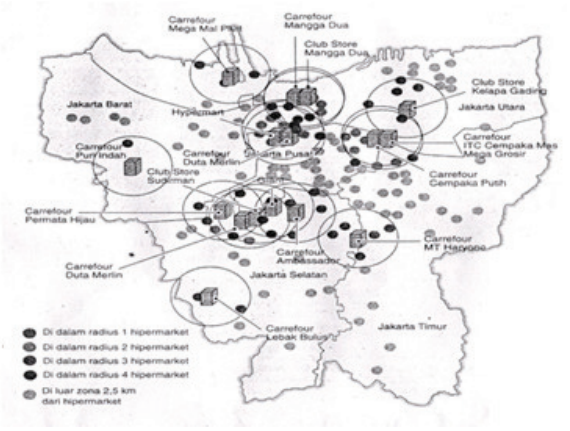

Figure 2.Mapping of Traditional Markets in Jakarta Provinces
Gambar 2. Pemetaan Pasar Tradisional di Jakarta

Distribution need start point to distribute to other points. Ones methode to have start point or called distribution center is Fuzzy Clustering.

Fuzzy clustering is one method that can capture the uncertainty of real data and it is known that fuzzy clustering can obtain strong results compared to the conventional method of hard clustering[5]. Referring to the general suppression of data analysis problems, this is a solution that is capable of analyzing a number of complex data, so that the role of fuzzy clustering is shown.

In this methodology, there is a difference, depending on whether they use fuzzy membership functions or density functions. This option is related to differences in the definition of uncertainty, the difference between the structure of fuzzy and probabilistic structure. In other cases the purpose of analysis is to estimate the non-linear parameters that determine the properties of uncertainty.

The data in this study was obtained from the Ministry of Trade and PD Pasar Jaya. Fuzzy clustering analysis in this study using Matlab application software. The frame work of this research method can be seen in Figure 3.

Fuzzy c-means algorithm (FCM) is one of the most widely used method in fuzzy clustering. Data clustering is the process of dividing the data elements into classes or groups so that the characteristics in the same class made as closely as possible, and characteristic in different classes are created as different as possible. Depending on the nature and purpose of data clustering is used, consideration of the similarity of data can be used to put

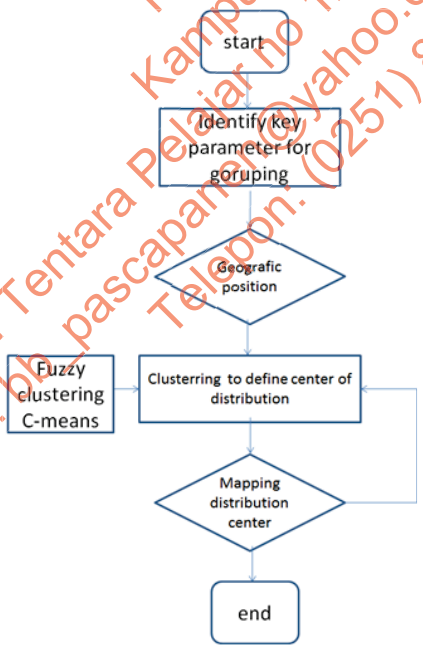

Figure. 3 Research Method
Gambar 3. Metode Penelitian

the data or the area into a same class, where the size of the degree of similarity determines how the cluster is formed. Some examples of parameters that can be used in clustering the distance, connectivity, and intensity[5].

Fuzzy clustering method of this paper is the method of Fuzzy C-Means (FCM) were adopted from Yang[6] and other authors [7,8]. Typically, the membership function is defined by a function of distance, so that the degree of membership proximities revealed entity cluster centers. By choosing a suitable distance function By choosing a suitable distance function (see [9,10] deferent cluster shapes can be identified. However, this approach usually fails to explicitly explain how clustering fuzzy structure associated with the data from which the data are derived.

The FCM algorithm attempts to partition a finite collection of n elements $X = \{x_1, \ldots, x_n\}$ into a collection of c fuzzy clusters with respect to some given criterion. Given a finite set of data, the algorithm returns a list of c cluster centres $C = \{c_1, \ldots, c_c\}$ and a partition matrix

$U = u_{i,j} \in [0,1],\ i = 1, \ldots, n,\ j = 1, \ldots, c,$ where each element u_{ij} tells the degree to which element x_i belongs to cluster c_j. Like the k-means algorithm, the FCM aims to minimize an objective function. The standard function is:

$$u_k(x) = \frac{1}{\sum_j \left(\frac{d(\text{center}_k, x)}{d(\text{center}_j, x)}\right)^{2/(m-1)}}.$$

Other algorithm of fuzzy c-means (FCM) by Kusumadewi[11] are below :

1. Input data to be in the cluster is a matrix of n x m (n = number of data sample, m – attribute for each data). Xij = sample data to i (i = 1,2,…,n), attribute to-j (j=1,2,…,m).

Umber of cluster (c)	= 15
Square (w)	= 2
Maximum iteration (maxIter)	= 100
Error (ε)	= 10^{-5}
First objective function (P0)	= 0
First iteration (t)	= 1

2. Random number (μ_{ik}) generated,
   i = 1,2,…,n; k = 1,2,…,c; with sequence below.

$$Q_j \sum_{k-1}^{c} \mu_{ik}$$

   j = 1,2,…,m
   which are,

$$\mu_{ik} = \frac{\mu_{ik}}{Q_j}$$

3. Center of cluster to-k ; V_kj with k = 1,2,…,c; and j = 1,2,…,m

$$V_{kj} = \frac{\sum_{i=1}^{n}((\mu_{ik})^{w} * X_{ij})}{\sum_{i=1}^{n}(\mu_{ik})^{w}}$$

4. Objective function at iteration to-t, Pt :

$$P_t = \sum_{i-1}^{n}\sum_{k=1}^{c}\left(\left[\sum_{j-1}^{m}(X_{ij} - V_{kj})^2\right](\mu_{ik})^{w}\right)$$

5. Partition matrix change

$$\mu_{ik} = \frac{\left[\sum_{j=1}^{m}(X_{ij} - V_{kj})^2\right]^{\frac{-1}{w-1}}}{\sum_{k=1}^{c}\left[\sum_{j=1}^{m}(X_{ij} - V_{kj})^2\right]^{\frac{-1}{w-1}}}$$

i = 1,2,…,n ; and k = 1,2,…,c

6. Finish iteration

If :($|Pt-P_{(t-1)}| < \varepsilon$) or ($t > MaxIter$) so iteration is stoping.;

If not t = t+1, looping go to 3.

RESULT AND DISCUSSION

Fuzzy C-Means analysis by Fuzzy Clustering which formulated by Kusumadewi[11] had calculate 153 traditional markets with 15 clusters. Every cluster had distribution center to be start point for distribution process.the Fuzzy Clustering was processed by Mathlab 10 version. Fuzzy Clustering is soft clustering which can make clusters and it should be more optimum than hard clustering.

On hard clustering, the data were divided into different groups, where each data element belonging to one particular cluster. While on Fuzzy clustering (also called soft clustering), data elements can belong to more than one cluster, and associated with each element is a set of membership level. It shows the strength of the relationship between data elements and specific clusters. Fuzzy clustering is a process to put this membership level, and then use the degree of membership to define data elements into one or more clusters.

Which differs from the k-means objective function by the addition of the membership values u_{ij} and the fuzzier m. The fuzzier m determines the level of cluster fuzziness. A large m results in smaller memberships u_{ij} and hence, fuzzier clusters. In the limit m = 1, the memberships u_{ij} converge to 0 or 1, which implies a crisp partitioning. In the absence of experimentation or domain knowledge, m is commonly set to 2. The basic FCM Algorithm, given n data points (x1, . . .,xn) to be clustered, a number of c clusters with (c1, . . ., cc) the center of the clusters, and m the level of cluster fuzziness.

In fuzzy clustering, each point has a degree of belonging to clusters, as in fuzzy logic, rather than belonging completely to just one cluster. Thus, points on the edge of a cluster, may be *in the cluster* to a lesser degree than points in the center of cluster. An overview and comparison of different fuzzy clustering algorithms is available.

Any point x has a set of coefficients giving the degree of being in the kth cluster wk(x). With fuzzy c-means, the centroid of a cluster is the mean of all points, weighted by their degree of belonging to the cluster[12]:

$$c_k = \frac{\sum_x w_k(x)x}{\sum_x w_k(x)}.$$

The degree of belonging, $w_k(x)$, is related inversely to the distance from x to the cluster center as calculated on the previous pass. It also depends on a parameter m that controls how much weight is given to the closest center. The fuzzy *c*-means algorithm is very similar to the *k*-means algorithm.

Choose a number of clusters. Assign randomly to each point coefficients for being in the clusters. Repeat until the algorithm has converged (that is, the coefficients' change between two iterations is no more than, the given sensitivity threshold).

Compute the centroid for each cluster, using the formula above. For each point, compute its coefficients of being in the clusters, using the formula above.The algorithm minimizes intra-cluster variance as well, but has the same problems as k-means; the minimum is a local minimum, and the results depend on the initial choice of weights.

The expectation-maximization algorithm is a more statistically formalized method which includes some of these ideas: partial membership in classes.Fuzzy c-means has been a very important tool for image processing in clustering objects in an image. In the 70's, mathematicians introduced the spatial term into the FCM algorithm to improve the accuracy of clustering under noise.

Parameter identification of determinants of cluster

Clustering of traditional markets in Jakarta was built with four parameters are combined. The parameter is the position of latitude, longitude, the amount of cooking oil traders in traditional markets and the accessibility of the 153 traditional markets. The first stage to form a cluster analysis is to determine the point object traditional markets in a group called a cluster, then the point of

traditional markets in the cluster have the same relative membership degree compared to other traditional markets point to another cluster.

Clustering is a main task of explorative data mining, and a common technique for statistical data analysis used in many fields, including machine learning, pattern recognition, image analysis, information retrieval, and bio informatics.

Cluster analysis itself is not a particular algorithm, but the equations that are used are resolved. It can be calculated by various algorithms which differ significantly in terms of determining the parameters depending on the cluster and efficient way to determine the cluster. Popular notion cluster is a group with close distance between cluster members, dense regions of the data space, interval or certain statistical distribution. Thus clustering can be formulated as a multi-objective optimization problem. Clustering algorithms and parameters appropriate settings (including values as a function of distance to use, the threshold density or number of clusters expected) depends on the individual data sets and objective results. Clustering analysis is not an automatic process, but an iterative process of knowledge discovery or interactive multi-objective optimization that involves trial and error. It will often be necessary to modify preprocessing and parameters to achieve the results desired properties.

Clustering to determine the distribution centers

Cluster centers are represented by vectors, which may not necessarily be a member of a cluster of data. When the number of clusters is fixed to k, k-means algorithm provides a formal definition as clustering optimization problem: finding the center of the cluster and assign the object to the nearest cluster center, so that the squared distance of the cluster can be minimized

Optimization problem itself is known as a hard non-probabilistic, and thus a common approach is simply to find an approximate solution. A non-probabilistic methods are very famous is Lloyd's algorithm, in fact often referred to as "k-means algorithm". But it was only find a local optimum, and usually run several different random initialization times. Variations such as k-means generally choose the best optimization of several iterations of data, but also limits the concentration of members of the data set (k-means), choose the median (k-median clustering), randomly selecting initial center (K-means ++) or allows testing of fuzzy cluster (Fuzzy c-means) [12].

Most k-means-type algorithms require the number of clusters - k - to be specified in advance, which is considered to be one of the biggest drawbacks of these algorithms. Furthermore, the algorithms prefer clusters of approximately similar size, as they will always assign an object to the nearest centroid. This often leads to incorrectly cut borders in between of clusters (which is not surprising, as the algorithm optimized cluster centers, not cluster borders).

K-means has a number of interesting theoretical properties. On the one hand, the method to partition the data space into a structure known as Voronoi diagram.12. On the other hand, is conceptually similar to the classification of nearest neighbor points between clusters. In addition, it can be seen as a variation of a model-based classification, and Lloyd algorithm as a variation of the expectation maximization algorithm.

There is a great interest in clustering techniques due to the vast amount of data generated in every field including business, health sciences, engineering and aerospace. It is essential to extract useful information from the data. Clustering techniques are widely used in pattern recognition and related applications. This research monograph presents the clusters for traditional market in Jakarta, which these have each distribution center.

Center of distribution of traditional market in Jakarta is defined by fuzzy clustering. we use MATHLAB to create the clustering. Fuzzy clustering with c-means is used for data analysis.Clustering of numerical data forms the basis of many classification and system modeling algorithms. The purpose of clustering is to identify natural groupings of data from a large data set to produce a concise representation of a system's behavior.

Fuzzy Logic Toolbox tools allow to find clusters in input-output training data[13]. It can use the cluster information to generate a Sugeno-type fuzzy inference system that best models the data behavior using a minimum number of rules[14]. The rules partition themselves according to the fuzzy qualities associated with each of the data clusters. the command-line function is using, genfis2 to automatically accomplish this type of FIS generation.

Quasi-random two-dimensional data is used to illustrate how FCM clustering works. To load the data set and plot it, type the following commands:

```
load sheet1.dat
plot(sheet1 (:,1), sheet1 (:,2),'o')
```

Next, invoke the command-line function fcm to find two clusters in this data set until the objective function is no longer decreasing much at all.

```
[center,U,objFcn] = fcm(sheet1sheet1,15);
```

Here, the variable center contains the coordinates of the fifteen cluster centers, U contains the membership grades for each of the data points, and objFcn contains a history of the objective function across the iterations. The fcm function is an iteration loop built on top of the following routines:

* initfcm — initializes the problem
* distfcm — performs Euclidean distance calculation
* stepfcm — performs one iteration of clustering

This command returns the result in Table 1.

To view the progress of the clustering, plot the objective function by typing the following commands:

```
figure
plot(objFcn)
title('Objective Function Values')
xlabel('Iteration Count')
ylabel('Objective Function Value')
```

Figure of convergency is presented on Figure 4.

Figure 4 was show the convergence iteration as output from data running process by Mathlab for fuzzy clustering process[15]. The cnvergence means the status of a set of routers having the same knowledge of the surrounding network topology. Optimum result was provided.

Mapping distribution center by fuzzy clustering

Finally, we plot the fifteen cluster centers found by the fcm function using the following code:

```
maxU = max(U);
index1 = find(U(1, :) == maxU);
index2 = find(U(2, :) == maxU);
figure
line(fcmdata(index1, 1), fcmdata(index1, 2), 'linestyle',...
'none','marker', 'o','color','g');
line(fcmdata(index2,1),fcmdata(index2,2),'linestyle',...
'none','marker', 'x','color','r');
hold on
plot(center(1,1),center(1,2),'ko','markersize',15,'LineWid
th',2)
plot(center(2,1),center(2,2),'kx','markersize',15,'LineWid
th',2)
```

center coordinate geographic of each cluster is presented on Tabel 2.

These are 15 cluster traditional market in Jakarta was difined. All of them will present on figure 5, 6, 7, 8, 9 and 10.Every cluster have one center called distribution center.

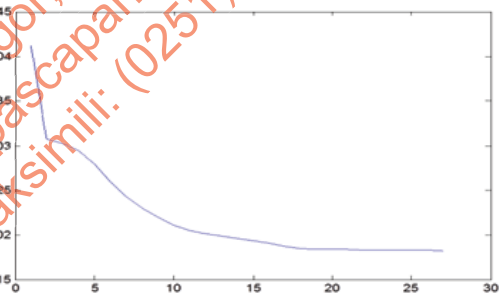

Figure 4. Convergence iteration
Gambar 4. Iterasi yang sudah konvergen

Table 1. Iteration Process
Tabel 1. Proses Iterasi

ITERATION	FCN	ITERATION	FCN
Iteration count = 1	obj. fcn = 0.041209	Iteration count = 15	obj. fcn = 0.019307
Iteration count = 2	obj. fcn = 0.030768	Iteration count = 16	obj. fcn = 0.019042
Iteration count = 3	obj. fcn = 0.030263	Iteration count = 17	obj. fcn = 0.018754
Iteration count = 4	obj. fcn = 0.029399	Iteration count = 18	obj. fcn = 0.018506
Iteration count = 5	obj. fcn = 0.027972	Iteration count = 19	obj. fcn = 0.018407
Iteration count = 6	obj. fcn = 0.026048	Iteration count = 20	obj. fcn = 0.018366
Iteration count = 7	obj. fcn = 0.024263	Iteration count = 21	obj. fcn = 0.018337
Iteration count = 8	obj. fcn = 0.022998	Iteration count = 22	obj. fcn = 0.018313
Iteration count = 9	obj. fcn = 0.021964	Iteration count = 23	obj. fcn = 0.018292
Iteration count = 10	obj. fcn = 0.021105	Iteration count = 24	obj. fcn = 0.018275
Iteration count = 11	obj. fcn = 0.020507	Iteration count = 25	obj. fcn = 0.018262
Iteration count = 12	obj. fcn = 0.020139	Iteration count = 26	obj. fcn = 0.018251
Iteration count = 13	obj. fcn = 0.019853	Iteration count = 27	obj. fcn = 0.018242
Iteration count = 14	obj. fcn = 0.019580		

Tabel 2. Distribution Center Coordinate
Tabel 2. Koordinat Sentral Distribusi

LATITUDE	LONGITUDE
6,166857107	106,5257554
6,117264127	106,5397226
6,097970909	106,5185177
6,113407044	106,4485211
6,132045031	106,5232911
6,084219788	106,4826314
6,198297649	106,5389418
6,177211515	106,5031623
6,11282601	106,5040352
6,147559819	106,477369
6,09005159	106,4984854
6,111806182	106,483161
6,075793481	106,5700858
6,151378553	106,5046289
6,085014952	106,4341617

Figure 5 present the cluster 1, 2 and 3. Member of traditional market of cluster 1 are : Cawang, Batu Ampar, Cililitan, Dukuh, Gedong, Kebon Pala, Kramat Jati, Makassar, Pinangranti, and Rambutan. The distribution center of cluster 1 is Kramat Jati traditional market. Then member of traditional market of cluster 2 are : Cipinang, Jati, Jatinegara Kaum, Kayu Putih, Klender, Malaka Jaya, Pondok kopi, Pulogadung, Pulogebang, Rawamangun and Utan Kayu Utara. The distribution center of cluster 2 is Jatinegara Kaum traditional market. Furthermore member of traditional market of cluster 3 are : Tanjung Priok, Tanah Tinggi, Sunter Jaya, Sumur Batu, Senen, Rawasari, Kemayoran, Kartini, Kampung Raya, Johar Baru, Gunung Sahari Selatan, Galur, Cempaka Baru, Cempaka Putih Barat and Serdang. The distribution center of cluster 3 is Senen traditional market.

Figure 6 present the cluster 4, 5 and 6. Member of traditional market of cluster 4 are: Rawabuaya, Merayu selatan, Kembangan selatan, Kedoya utara, Kebon jeruk, Duri kelapa, Joglo, Kelapadua. The distribution center of cluster 4 is Kebon jeruk traditional market. Then member of traditional market of cluster 5 are :Bali mester, Bukit duri, Cipinang besar utara, Cipinang muara, Kampung melayu, Kayumanis, Kebon manggis, Manggarai selatan, Pal meriam, Pondok bamboo, Rawabuaya and Tebet. The distribution center of cluster 5 is Manggarai selatan traditional market. Furthermore member of traditional market of cluster 6 are :Tambora, Pluit, Pinangsia, Penjaringan, Pejagalan, Jembatan lima, Jelambar, Grogol, Glodok, Duri Utara. The distribution center of cluster 6 is Glodok traditional market.

Figure 7 present the cluster 7, 8 and 9. Member of traditional market of cluster 4 are :Cibubur, Cijantung, Cilangkap, Cipayung, Ciracas, Munjul, Pekayon, and Setu. The distribution center of cluster 7 is Ciracas traditional market. Then member of traditional market of cluster 8 are :Jati Padang, Kampung Tengah, Lenteng Agung, Pasar Minggu, Pejaten Timur, Ragunan and Tanjung Barat. The distribution center of cluster 8 is Pasar minggu traditional market. Furthermore member of traditional market of cluster 9 are :Wijayakusuma, Pegangsaan dua, Manggis, Kwitang, Kenari, Kebon sirih, Karet, Gondangdia. Cikini and Paseban. The distribution center of cluster 8 is Kenari traditional market. The distribution center of cluster 8 is Manggarai Selatan traditional market.

Figure 8 present the cluster 10, 11 and 12. Member of traditional market of cluster 10 are : Cipete Utara, Cipulir, Gandaria Utara, Grogol Selatan, Kebayoran Lama Selatan, Kramatpela, Lebak Bulus, Melawai, Petukangan Selatan, Pondok Labu and Senayan. The distribution center of cluster 10 is Kramatpela traditional market. Then member of traditional market of cluster

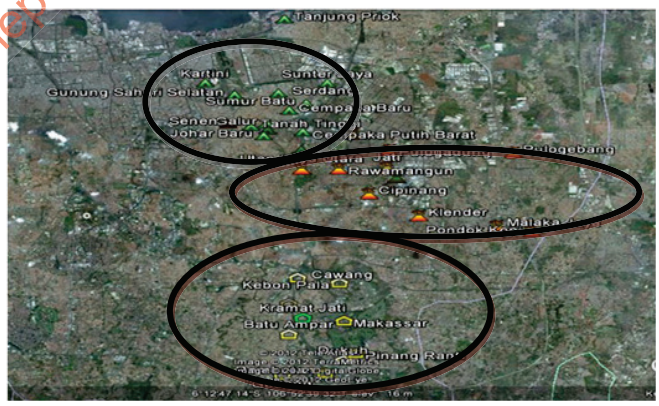

Figure 5.Cluster 1, 2 and 3
Gambar 5. Klaster 1, 2, 3

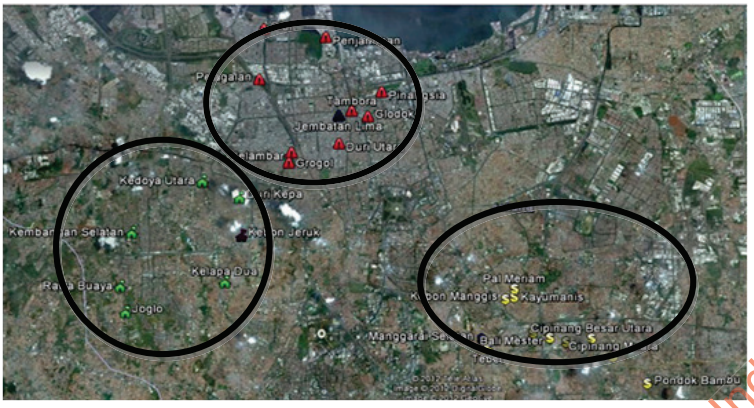

Figure 6.Cluster 4, 5 and 6
Gambar 6. Klaster 4,5 dan 6

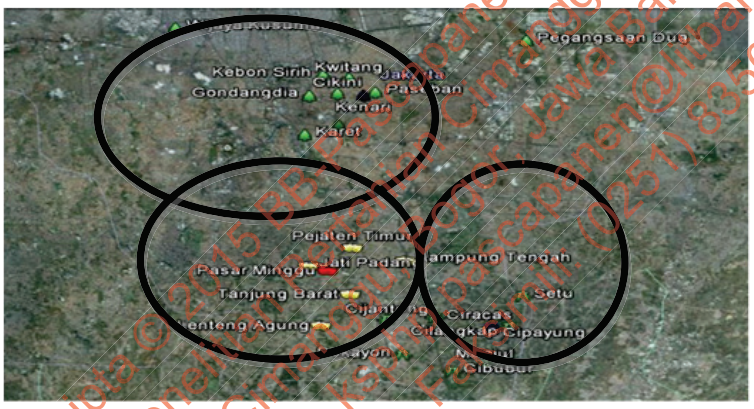

Figure 7.Cluster 7, 8 and 9
Gambar 7. Klaster 7, 8 dan 9

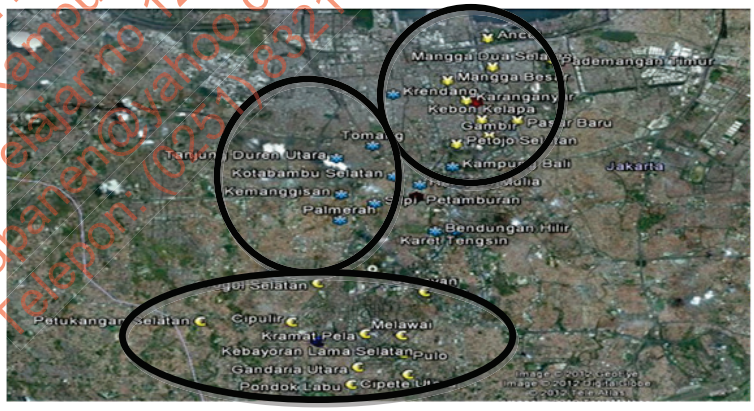

Figure 8.Cluster 10, 11 and 12
Gambar 8. Klaster 10, 11 dan 12

11 are :Ancol, Gambir, Karanganyar, Kebon Kelapa, Mangga Besar, Mangga Dua Selatan, Pedemangan Timur, Pasar Baru, Petojo Selatan and Taman Sari. The distribution center of cluster 11 is Karanganyar traditional market. Furthermore member of traditional market of cluster 12 are : Bendungan Hilir, Harapan Mulia, Kampung Bali, Karendang, Karettengsin, Kebon Kacang, Kebon Melati, Kemanggisan, Kota Bamboo Selatan, Palmerah, Petamburan, Slipi, Tanjung Duren Utara and Tomang. The distribution center of cluster 12 is Petamburan traditional market. The distribution center of cluster 8 is Manggarai Selatan traditional market.

Figure 9 present the cluster 13, 14 and 15. Member of traditional market of cluster 13 are :Cakung Timur,

Figure 9.Cluster 13, 14 and 15
Gambar 9. Klaster 13,14 dan 15

Cilincing, Kelapa Gading Timur, Marunda, Rorotan, Semper Timur and Tugu Utara. The distribution center of cluster 13 is Cilincing traditional market. Then member of traditional market of cluster 14 are :Cikoko, Duren Tiga, Kalibata, Mampang Prapat, Pancoran, Pela Mampang, Rawa Badak and Tegal Parang. The distribution center of cluster 14 is Duren Tiga traditional market. Furthermore member of traditional market of cluster 15 are : Cengkareng Timur, Duri Kosambi, Kalideres, Kamal, Kamar Muara, Kapuk, Pondok Pinang, Selong and Tegal Alur. The distribution center of cluster 15 is Kalideres traditional market. The distribution center of cluster 8 is Manggarai Selatan traditional market.

CONCLUSSION

The series of studies in this paper subsystem localized on cooking oil distribution mechanism is simple packaging especially in Jakarta. Good distribution mechanism can ensure the availability of supply in any traditional market, so it can be established simple packaging cooking oil prices. The mechanisms discussed in this paper with the determination of cluster solutions and distribution centers so simple packaged cooking oil distribution can be arranged well in 153 traditional markets in Jakarta. Traditional markets are divided into 15 clusters with each distribution center. Distribution centers are intended as a first link between the manufacturer of points with other traditional markets in channeling simple packaging cooking oil.

This traditional market cluster mapping using fuzzy-clustering method assisted with Matlab application as a data processing tool. Convergence of iterations on the processing of this data is the 27th iteration. At iteration is obtained respectively optimum distribution centers closest distance, the greater the capacity of trade and good protective accessibility between distribution centers and points of other traditional markets in each cluster.

Further advice of this research is the need for scheduling mechanism and determination of the distribution channels to distribute the simple packaged cooking oil from distribution centers to points of traditional markets that are members of a cluster. This is taking into account the type of fleet, fleet capacity and demand in the market points and also the production capacity of producers to meet the public demand, which is expected in the market price can be guaranteed stable and community health and economic stability.

REFERENCES

1. Tilokavichai V, P Sophatsathit, A Candrachai. Analysis of Linkages Between Logistic Information System and Logistic Performance Management Under Uncertainty. European Journal of Business and Management. 2012; 4(9):55-65.
2. Goetschalckx M, Vidal CJ, Dogan K. Modeling and design of global logistics systems: A reviewof integrated strategic and tactical models anddesign algorithms. European Journal of Operational Research. 2002; 14(3):1–18.
3. Sato M. Iinnovations in fuzzy clustering, theory and application. Springer. Netherland.2006.
4. Hamzah A. Pengenalan Pola dengan Fuzzy Clustering. Jurnal Academia ISTA, Lembaga Penelitian, Institut Sains dan Teknologi AKPRIND. Yogyakarta.2001; 4(1): 1-19.
5. Kannan SS. Ramathilagan, and R. Pandiyaragam. Modified Bias Field Fuzzy C-Means for Effective Segmentation of Brain MRI. International Journal of Transportation on Computing Science VIII LNCS. Springer-Verlag Berlin Heindelberg. 2010; 127-145.

6. Yang J, J Watada. Fuzzy Clustering Analysis of Data Mining: Application to an Accident Mining System. International Journal of Innovative Computing, Information and Control. ICIC International. 2012; 8(8):5715-5724.
7. Klawonn F, A Keller. Fuzzy clustering based on modified distance measures. Third International Symposium, (IDA'99), Lecture Notes in Computer Science, 1642. Springer-Verlag.1999; 291–301.
8. Agboizebeta IA, OJ Chukwuyeni. Cognitive Analysis of Multiple Sclerosis Utilizing Fuzzy Cluster Means. International Journal of Artificial Intelligence &Application (IJAIA). 2012; 3(1): 33-45.
9. Bataineh KM, M Naji, M Sager. A Comparison Study Between Various Fuzzy Clustering Algorithms. Jordan Journal of Mechanical and Industrial Engineering (JJMIE). 2011; 5(4):335-343.
10. Bobrowski L, J. Bezdek. C-means with l1 and l norms. IEEE Transactions on Systems, Man and Cybernetics.1991; 21(3):545–554.
11. Kusumadewi. Aplikasi logika Fuzzy untuk Pendukung Keputusan. Indonesia: GrahaIlmu; 2004.
12. Ahmed M, N Yamany. A Modified Fuzzy C-Means Algorithm for Bias Field Estimation and Segmentation of MRI Data. IEEE Transactions on Medical Imaging. 2002;21(3):193–199.
13. Nock R, Nielsen F. On Weighting Clustering. IEEE Trans. on Pattern Analysis and Machine Intelligence. 2006;28 (8):1–13.
14. Bottani E, Rizzi A. Strategic Management of Logistic Service A Fuzzy Function Deployment Approach. International Journal of Production Economics .2006; 1(1):27-46.
15. Aryanezhad MB et al. A Fuzzy Method Based on Left and Right Scores. International Journal of Industrial Engineering &Production Research. 2011;22(1):51-62.