PROCEEDINGS

2nd International Conference on Adaptive and Intelligent Agroindustry (ICAIA)

September 16 - 17, 2013

IPB International Convention Center
Bogor - Indonesia

Organized by:

Department of Agroindustrial Technology

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5. Ono Suparno, Prof.
(Departement of Agroindustrial Technology, IPB)
6. Agus Buono, Dr.
(Head of Department of Computer Science, IPB)

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Departement of Agroindustrial Technology, Faculty of Agricultural Engineering and Technology Bogor Agricultural University

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WELCOMING ADDRESS

Prof. Dr. Ir. Nastiti Siswi Indrasti
Head of Agroindustrial Technology Department
Faculty of Agricultural Engineering and Technology
Bogor Agricultural University
On
Second International Conference on Adaptive and Intelligence Agroindustry (2nd ICAIA)
Bogor, September, 16 – 17, 2013

Assalamu'alaikum Warohmatullahi Wabarokatuh
In the name of Allah, the beneficent and the merciful,

Distinguish Guest, Ladies and Gentlemen
Let me first thank you all for accepting the invitation to participate in this 2nd International Conference on Adaptive and Intelligence Agroindustry (ICAIA). In particular I would like to thank Rector of IPB (Institut Pertanian Bogor/Bogor Agricultural University) Prof. Herry Suhardiyanto for supporting this event as part of the series academic event in celebrating the 50th Anniversary of Bogor Agricultural University.

In fact, the idea of organizing this conference was the continuation of the International Workshop on Computational Intelligence and Supercomputing Technology for Adaptive Agroindustry held by the Department of Agroindustrial Technology, Bogor Agricultural University last year.

Professor Kenneth A De Jong from George Mason University, US has successfully conducted joint international research with some staff from the Department of Agroindustrial Technology and Department of Computer Science, Bogor Agricultural University. The research aims to develop an integrated and intelligent system (namely SMART-TIN©) for the design of adaptive agroindustrial system in order to achieve a sustainable agroindustry that can mitigate global climate change and at the same time secure food, water, energy and natural medicine supply.

We are certainly proud to have been able to assemble this event in IPB, Bogor. The range of participants and audience at this conference is precisely something I would like to stress. The main goal of the conference is to provide an effective forum for distinguished speakers, academicians, professional and practitioners coming from universities, research institutions, government agencies and industries to share or exchange their ideas, experience and recent progress in Adaptive and Intelligent Agroindustry.

Distinguish Guest, Ladies and Gentlement,
Global climate change is the most challenging problems for us today and in the near future. This global change in our climate can lead to the shortage of the food, water, bioenergy and natural medicine that will affect the quality of human life. Many studies indicate that the threat of food, water, bioenergy and natural medicine crisis due to global climate change still worries our society. This problem can be solved by the development of agroindustry, i.e. an interrelated value chain entities from farming, to agro-processing industry and then to the end-customers. In fact, the design of agroindustry is complex and involves many factors and large data bases and more importantly, needs a good intelligence to process data and information to good decisions. Therefore, the way to design and manage agroindustry should be improved in order to meet the design objectives.

Agroindustries consume quite significant amount of energy on one side, on the other side they generate sizable amount of industrial wastes and its utilization as a captive energy resource is a kind of potential. Based on our study, a plywood industry with the production capacity of 200.000 m^3/year could generate 32 percentage of solid waste. If this amount of waste used as an energy alternative, it may result on the saving of 131.037.768.597 rupiah per month. Similar to plywood industry, sugarcane industry with the production capacity of 480 ton per hour could generate 154 ton per hour of waste (bagasse) and this amount of waste contribute to the saving of energy consuming by 19.250 Kwh. Recent study we conducted, indicated that cassava starch industry may contribute to a significant amount of waste. It has also potential usage as an energy resource. Based on our study the conversion of its waste into energy will contribute to the saving of energy usage of 4100 liter biogas per ton material.

The three industries mentioned is only examples of how potential the role of agroindustrial waste as an alternative resource in replacing the conventional energy resource as its presence will be significantly reduced. The new, incremental energy contributions that can be obtained from waste biomass will depend on future government policies, on the rates of fossils fuel depletion, and on extrinsic and intrinsic economic factors, as well as the availability of specific residues in areas where they can be collected and utilized. All of these factors should be in detail examined to evaluate the development of the industrial waste contribution. Hope this conference will also discuss this issue in more detail as it is an important matter for all of us. We should no more think just how to produce high value product but it is also necessarily important how to keep our live in good quality by understanding following old saying…" only when the last tree has been cut, only when the last fish has been angled, and only when the last river has been polluted, then we realized that we could not eat money".

I do not to take up any more of your time with these opening remarks. Let me simply thank you once again for sharing your thoughts with us. Here's wishing every success for the conference. May Allah bless all of us.

Thank you for your kind attention,
Wassalamu'alaikum Warohmatullahi Wabarokatuh

AGENDA of
2nd International Conference on Adaptive and Intelligent Agroindustry (ICAIA)

Time	Activities	Room
Day 1 (16 September 2013)		
08.00 – 09.00 (60’)	Registration	
09.00 – 10.00 (60’)	Opening Ceremony • Welcoming Address: Prof. NastitiSiswiIndrasti (Head of Dept TIN, Fateta, IPB) • Conference Opening: Prof. HerrySuhardiyanto(Rector of IPB) o ABET Certification announcement and short ceremony o Launching International Double Degree Master Program in Innovation and Technopreneurship in Cooperation with University of Adelaide, Australia o Soft-launching Master in *Logistik Agroindustri* (Agroindustrial Logistics)	Ballroom
10.00 – 10.45 (45’)	Opening Speeches: Prof. IrawadiJamaran (Agroindustry Guru, IPB: 25’) Prof. Eriyatno (Industrial and System Engineering, IPB: 20’)	Ballroom
Session 1		
10.45 – 11.15 (30’)	Keynote Speech Dr. YandraArkeman (IPB)	Ballroom
11.15 – 12.00 (45’)	Keynote Speech Prof. Kenneth De Jong (George Mason University, USA)	Ballroom
12.00 – 13.30 (90’)	Lunch Break	
Session 2		
13.30 – 15.15 (105’)	Moderator: Prof. EndangGumbiraSa’id (IPB) Invited Speakers (1-4) (4 x 20 minutes) Discussion (25 minutes) Tentative Schedule: Prof. Kim Bryceson (Australia), Prof. SyamsulMa’arif (IPB), Prof. KudangBoro Seminar (IPB), Prof. HaruhiroFujita (Japan)	Ballroom
15.15 – 15.45 (30’)	Break	
15.45 – 17.30 (105’)	Moderator: Prof. Marimin (IPB) Invited Speakers (5-8) (4 x 20 minutes) Discussion (25 minutes) Tentative Schedule: Dr. Gajendran (UK), Prof. Noel Lindsay (University of Adelaide), Dr. KuncoroHartoWidodo (UGM), Prof. UtomoSarjonoPutro (ITB)	Ballroom
Day 2 (17 September 2013)		
08.00 – 08.30 (30’)	Registration	
08.30 – 10.15 (105’)	Moderator: Prof. KudangBoro Seminar (IPB) Invited Speakers (9-12) (4 x 20 minutes) Discussion (25 minutes) Prof. Egum (IPB), Prof. Marimin (IPB), Dr. AgusBuono (IPB), Dr. HeruSukoco (IPB)	
10.15 – 10.30 (15’)	Coffee Break	
10.30 – 12.30 (120’)	Parallel Session 1 Moderator: Prof. Fujita (7 paper @ 15 minutes) Discussion (15 minutes) Parallel Session 2 Moderator: Prof. Ono Suparno (7 paper @ 15 minutes) Discussion (15 minutes) Parallel Session Moderator: Prof. Suprihatin (7 paper @ 15 minutes) Discussion (15 minutes)	

12.30 – 13.30 (60’)	Lunch Break	
13.30 – 15.00 (90’)	Open Discussion (Open Forum) with Prof. Kenneth De Jong Topic: Foundations and Applications of Genetic/Evolutionary Algorithms	Ballroom
15.00 – 15.30 (30’)	Conference Closing	Ballroom
15.30 – 17.00 (90’)	Indonesian Agroindustry Association (AGRIN) National Congress (PIC: Prof. Suprihatin)	Ballroom
17.00 – 17.45 (45’)	Refreshment and Closing of AGRIN National Congress	Ballroom

CONTENT LIST

Risk Management Model in Dairy Product Transportation With Fuzzy Logic Approach

Winnie septiani
Department ot Agroindustrial Technology
Bogor Agricultural University
winnie_septiani@yahoo.com

Yandra Arkeman
Department ot Agroindustrial Technology
Bogor Agricultural University
E-mail: yandra_ipb@yahoo.com

ABSTRACT

Transportation risk management is an integral part of risk management to minimize the impact on efficiency, profitability and success of the operation. The critical point in the dairy product transport risk is on that is easily damaged products contaminated with bacteria due to improper handling of dairy. This study aims to: (1) Identify risks in dairy product transport, (2) analyzing and assessing risk in dairy product using fuzzy logic approach (3) Determination of risk management is based on a risk assessment phase 1 and phase 2. Transport activities in the agroindustry supply chain covering dairy delivery from farmers to dairy collectors, dairy delivery from the collector to the cooperatives and the delivery of dairy to the cooperative Dairy Processing Industry (IPS). Hierarchical Breakdown Structure (HRBS) is used as the basis of risk classification stage. Assessment and risk analysis performed using fuzzy logic approach. Determination of the magnitude of risk in the form of linguistic formulated and expressed in the form of IF THEN rule. The relationship between risk and risk factors described in the relation ship chain risk (risk dependency chain). Risk management performed on the transport activity that has the greatest chance of risk, which is the risk of transport cooperatives to IPS.

Keyword : risk transportation, dairy product, fuzzy logic, HRBS

1. INTRODUCTION

Assessment and risk analysis of transportation is an integral part of risk management to minimize the impact on efficiency, profitability and success of the operation. According to Coyleetal (2011), the risk of transport is the transfer of risk from the activities of goods/products are measured by the value of the probability and impact (severity) that could potentially affect the performance of the supply chain. Risk due to the low transport many handling operations every day. Errors in scheduling deliveries, loading and unloading process errors by labor and external disturbances such as road and weather conditions cause temporary disruption of transport material or product.

Tumala (2011) defined risk as a combination of the probability or frequency of occurrence and magnitude of the impact of the incident. Development of formal risk management processes have been carried out at this time. Risk management processis divided into four main stages such as risk identification, risk assessment, risk management strategies and the evaluation and monitoring of risk.

The critical point in the dairy product transport risk is on that easily damaged products contaminated with bacteria due to improper handling of dairy. Damage caused by the formation dairy as a result of lacticacid fermentation of lactosebycoli forms. Fermentation by these bacteria will cause the dairy to be changed and the aroma is not favored by consumers. To minimize contamination by micro organisms and inhibit the growth of bacteria in dairy that can be stored for longer so handling after milking farmer should be a major concern.

The scopeof activities includes temporary storage transportation, loading and unloading of the matter, the transfer from one location to another. Transport activities in the agroindustry supply chain covering dairy delivery from farmers to collectors, dairy delivery from the collector to the cooperatives and the delivery of dairy to the cooperative Dairy Processing Industry (IPS). The emergence of risk on any transport activity will cause harm to the major actors of dairy product, which is farmers, co-operatives and Dairy Processing Industry (IPS). Each of fender has an interest and agroindustry linkages dairy to keep dairy is not broken, ranging from milking at dairy farms up in processing. If the risk and the cause can be identified since the beginning of the risk management efforts can be planned appropriately.

This study aimsto: (1) Identify risks in dairy product transport, (2) analyzing and assessing risk in dairy product using fuzzy logic approach(3) Determination of risk management is based on a risk assessment phase 1 and phase 2.

2. METHODS

Transportation risk identification performed based dairy product transport risk category developed by Coyle *et. al*. (2011), which divides risks into six categories that is transportation risk of losing the product (product loss), the risk of damage to the product (product damage), the risk of contaminated products (product contamination), the risk of late delivery (delivery delay), disruptionof supply chain (supply chain interruption), security breaches (security breach). Risk factors will be identified based on six categories of the transportation risk.

Stages of transportation risk management under taken include risk identification, risk analysis and risk management based on risk evaluation. Fuzzy set theory allows to model risk assessments kualititaif. By using fuzzy association, relationship between sources of risk and its consequences can be identified. Hierarchical Breakdown Structure (HRBS) is used as the basis of risk classification stage. The use of methods / tools at every stage and the results / outputs at each stage can be seen in Table 1.

Table1. The use of methods / tools and the results / outputs at each stage of the research

Sub Stages of Research	Tools	Output
1. Risk Identification	• Categorization of transport risks by Coyle *et.al.* (2011) • *Hierachy Risk Breakdown Structure (HRBS)*	• The critical point in each sub-system risk activities dairy supply chain transportation • Risk and risk factors • Risk Catalog
2. Measurement and risk assessment	Linguistic Model of Fuzzy *risk dependency chain*	• Fuzzy classification for assessment posibility, severity • The assessment sub-system dairy supply chain transportation activities
3. Evaluation of risk	Linguistic Fuzzy Model	• Magnitude of risk
4. Risk handling	Integration of the results of phase1 and 2	risk management

3. MODEL ASSESSMENT AND RISK ANALYSIS AT DAIRY PRODUCT TRANSPORTATION

3.1 Risk Identification

Fresh Dairy coming out of goats containing bacteriostatic which can prevent the development of bacteria. Long bacteriostatic activity depends on the level of bacterial contamination or the initial population and environmental temperature. In case of a low level of bacterial contamination or bacteria that little initial population and a low temperature environment, the bacteriostatic will be effective for 24 hours. And at room temperature and a low level of contamination, bacteriostatic be active for 12 hours. However, the initial state of high bacterial populations, as well as the temperature of its environment, bacteriostatic activity will be short lived (± 2 hours). Therefore, the shorter the time needed to transport dairy the better.

One of the factors that constraint the people at the farmer level that is less hygienic sanitation systemat both the milking farmers, as well as at the level of collecting and Cooperatives of the KUD. Intake of dairy performed gradually twice a day according to the time of dairy, and are the morning. At the collector level test alcohol (alcohol precipitation test / APT) or boiled test (cloton boiling) and a specific gravity test. Reservoir level (KUD) 3 testing performed above also added the test fat, dry matter content (TS), dry matter without fat (SNF), methylene blue and total bacteria.

Dairycoolingis usuallyperformedatthe level ofa containerdairybefore it issent toIPS. Cooling dairy is one of the preservation efforts to maintain the quality of the dairy afte rmilking. If delivery of the dairy container to IPS performed on the same day (that day), dairy cooling is done at a temperature of 8-10C. But if the dairy delivery performed on different days (the next day) cooling needs to performed at a temperature of 4 Cand the temperature is kept constant. Transport activities ranging from farmers to the Dairy Processing Industry can be seen in Table 2.

Table 2. Transport activities ranging from farmers to IPS

transport Activity	**Farmers - Collectors**	**Collectors - Cooperative**	**Coopertives - IPS**
Dairy delivery	Short of activities milking, dairy is sent will be stored in the afternoon cooling unit	Dairy has delivered a variety of quality	Delivered Dairy using dairy tank
Distance	Cooperative collectors in the farm	Distance of about 30-40 km	
Means of transportation used	Delivered Dairy using dairy tank	Delivered Dairy using dairy tank	Delivered Dairy using dairy tank
Dairy inspection	Examination of specific gravity and alcohol	Inspection rate of fat and protein	Examinationof bacteria, antibiotics,etc.

3.2 Categorization of risk based on the risk category of transportation Coyle et al (2011)

Transportation risks in the supply chain will be identified dairy product based transport six risk categories, each category of risk is decomposed into several more specific risks and is defined as shown in Table 3.

Table 3. Defining Risk categorization and Dairy product Transport

Category	**Specific Risk**	**Definition**
Product Loss	*Product pilferage*	Risk oflossdue totheftof dairy
	Shipment Jettison	The risk of dairy lossfordisposalProducttripfor safety reasons
	Piracy and Hijacking	The risk ofpiracyorillegal chargeson the way tothe delivery location

Category	Specific Risk	Definition
Product damage	*Equipment accidents*	The risk of dairy damage caused damage Tools and modes of transportation
	Foor freight Handling	The risk of damage due to the bad handling of dairy on the activities of loading and unloading and temporary storage
	Improper Equipment	The risk of damage caused by the use of dairy Tools are not according to their capacities and also use tools that do not address the transport mileage
Product contamination	*Climate control failure*	Risks due to contamination of the dairy temperature and humidity settings are not right
	Product tampering	The risk of contamination dairy afte rmilking is done by only by a group of individuals to commit fraud to for gery dairy, through the addition of water, coconut water, coconut milk, rice water, dairy mask, goat dairy, sweetened condensed milk, and skim dairy
	Exposure to contaminant	The risk of dairy contamination because dairy is contaminated a substansi others, such as dust, left over food, fur, pathogenic bacteria, insecticides, antibiotics, etc.
delivery delay	Congestion	Risk dairy delivery delays caused due to traffic congestion
	Poor weather	Risk of delivery delays due to weather factors natural dairy that can not be controlled, such as the disaster floods.
	Equipment Malfunction	The risk of delay in delivery due to damage in transport mode trips
Supply Chain Interruption	*Carrier bankruptcy*	The risk ofsupplychain disruptionscaused bythe instability offinancialfirmsbecause ofthe economiccrisisandthe high price ofenergy(electricity, fueloil, etc.)
	Capacity shortage	The risk of supply chain disruptions caused by the transport capacity can not meet all requests
	Labor disruptions and strikes	Risks due to labor disturbances and strikes
Security Breach	*Shipment control breakdown*	Risk controld is order due to failure of delivery of security
	Unprotected transfer facilities	The risk of security breaches because no facility that allows the protection of the tand contamination of products
	Lax Security process	The risk of security breaches due to negligence of the security process

Risks that do not occur in the agroindustry supply chain dairy is dairy the risk, the risk of disruption due to no protection of security facilities and the risk of security breaches due to negligence of the security process.

3.3 Preparation of risk catalog

Risk catalog is a collection of dairy product transportation risks that have been identified using HRBS. All items in the catalog of risk is defined by risk, risk, risk factors, types of risks, the central risk (risk center). Divided into two types of risk, namely the risk that comes from internal and external risks, internal risk sources can be controlled while the relative external risk sources come from environments that are relatively difficult to control. Center identified risk based on identified risk factors, which include product, people, equipment and the environment.

R	A	B	C	D

Figure1 :Preparation ofAgendaTransportationRisk

Description :
A: Risk(by category of risk)
B: Risk factors
C: Centerof risk (products/dairy (1), human (2), equipment (3), the environment (4)
D: Type of risk (internal risk sources (1), external (2)

Small part of the risk catalog agroindustry supply chain transportation dairy is shown in Table 4.

able 4. Small sections of the catalog Transport Supply Chain Risk Dairy product

HRBS code	Risk category	Risk	Risk Factor	Risik center	Risk type	Activity (X/Y/Z)
R.1.2.1.2	*1. Product pilvirage*	*1.2 Shipment Jettison*	disposal of dairy products due to defective and rejected IPS	Product	external	C
R.1.3.2.2		*1.3 Piracy and Hijacking*	Piracy or illegal charges	Human	External	C
R.2.1.3.1	*2. Product damage*	*2.1 Equipment accidents*	Damage modes of transportation	Tools	internal	B,C
R.2.2.2.1		*2.2Foor freight Handling*	Loading and unloading activities are poor	Human	internal	A,B,C
R.2.3.3.1		*2.3 Improper Equipment*	Use equipment that is not in accordance with their capacity	Environment	internal	B
R.3.1.3.1	*3. Product contamination*	*3.1 Climate control failure*	Temperatures in compatible	Environment	internal	B,C
R.3.2.2.1		*3.2 Product tampering*	Adulterationof dairy	Human	internal	A
R.3.3.3.1		*3.3 Exposure to contaminant*	a platform that is not clean container (dairy cans)	Environment	internal	A
R.3.3.3.1			Dairy tank transporter unhygienic	Environment	internal	B,C
R.4.1.4.2	*4. Delivery delay*	*4.1 Congestion*	traffic jam	Environment	External	C
R.4.2.4.2		*4.2Poor weather*	Weather	Environment	External	B,C
R.4.3.3.1		*4.3 Equipment Malfunction*	Damage equipment and modes of transportation	Environment	internal	B,C
R.5.1.4.2	*5. Supply Chain interruption*	*5.1 Carrier bankruptcy*	price volatility due to the economic crisis and its high energy prices	Environment	External	A,B,C
R.5.2.3.1		*5.2 Capacity shortage*	Transport capacity can not meet demand	Environment	internal	B,C
R.5.3.2.1		*5.3Labor disruptions and strikes*	Labor strikes	Human	internal	A
R.6.1.2.1	*6.Security Beach*	*6.1Shipment control breakdown*	failure to control delivery	Human	internal	C

Description:
X: Farmers-CooperativeContainer
Y: ContainerCooperatives-Cooperatives
Z: Cooperative-IPS

3.4 Assessment and Analysis Risk

Assessment and risk analysis of transportation in the supply chainis divided into three dairy product transport activity is the delivery dairy from farmers to collectors cooperatives, dairy delivery from cooperative to cooperative collection, delivery of dairy cooperatives to IPS. Important characteristics to be considered in the risk assessment is the likelihood (probability) of occurrence of the risk and impact of the risk. Risk assessment can be performed using numerical valuesbut in this paper used the linguistic variables, very low (VL), low (L), medium (M), high (H) and very high (VH). Descriptive Interpretation of Fuzzy Membership Function representation for Severity, Likelihood can be seen in Table 5.

Table 5. Descriptive Interpretation of Fuzzy Membership Representation of Severity and Likelihood

Category	Likelihood	Severity
Very Low (VL) 0,0,1.0,2.0	The risk is difficult observed	This risk does not affect the performance of transport
Low (L) 1.0,2.0,3.0, 4.0	The possibility of lowrisk (rare)	Risk of causing little disruption to the transport activity but did not cause damage to the system
Medium (M) 3.0,4.0,6.0,7.0	Risk the possibility of being (sometimes happens)	Risk of causing disruption on transport activity, but its effect on the performance of the business unit is still small
High (H) 6.0,7.0,8.0,9.0	High opportunities for this risk	This leads toa decrease of transportation risk business unit performance and cause harm
Very High (VH) 8.0,9.0,10.0,0	High opportunities for this risk	The transport risk causing a serious impact on the business unit damage and result in huge losses

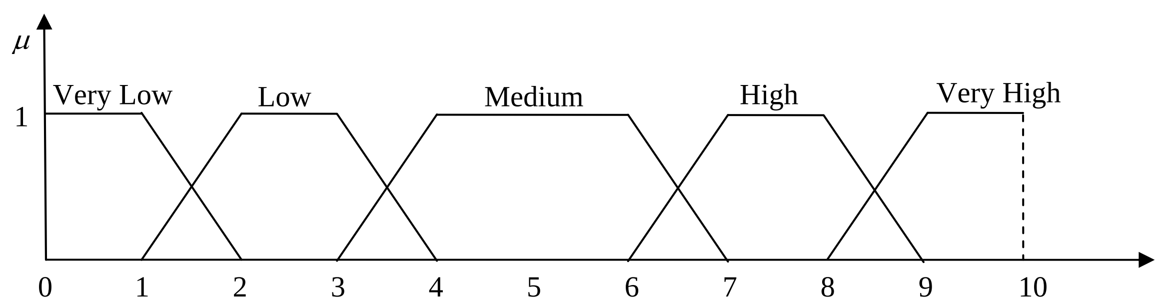


Figure2 : Graphical representation of Fuzzy Membership Function for Fuzzy Linguistic Variables

With membership function:

$$[x] = \begin{cases} 0; & x \leq a \; or \; x \geq d \\ (x-a)/(b-a); & a \leq x \leq b \\ 1; & b \leq x \leq c \\ (d-x)/(d-c); & x \geq d \end{cases}$$

The difference between risk and risk factors evident in the assessment and analysis phases. Risk factors at the lowest level in the hierarchy is used for determining the risk and severity of risk all the values that affect the system. Likehood values and severity defined by the rules of IF THEN rule in to the magnitude of risk or impact of risk, risk factor values are determined by using a combination of fuzzy. Interdependence of risk (R) and risk factors (RF) determined during the process of identification and assessment of risk by using chain relationships (risk dependency chain) as shown in Figure1.2 and 3.

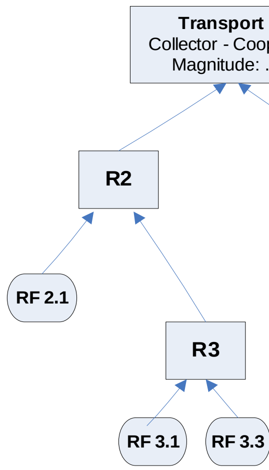


Figure3 : Chain Risk Relationsand Risk Factors for Container Transport Farmers

R2 is affected by RF2.1 and R3, R3 is affected by RF3.1 and RF3.3. R5 is affected by RF5.1 and RF5.2. The magnitude of the risk magnitude that occurred on the activities of farmers to transport container can be calculated based on the value of R2 and R5 risk. Severity and likelihood values measured and assessed in each risk factor. The same reasoning logic to chain relationship risk and risk factors to the cooperative transport of container (Figure 2) and risk of transportation cooperatives to IPS (Figure 3).

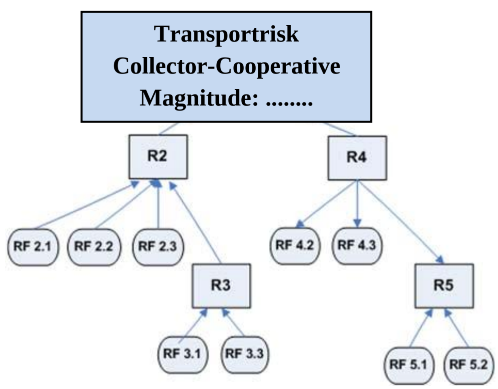
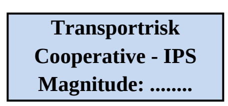


Figure4 : Risk Chain Relations and Risk Factors for Cooperative Transport Container

Risk is the case of the identification results is the risk of a cooperative transportation to IPS. Identified risks appear in all risk categories. R1 is influenced by risk factors RF1.2 and RF1.3. Value is also affected by the risk R1R6, which affected RF6.1. R2 is affected RF2.1 and RF2.2, is also influenced by the magnitude value of R3 risk. Magnitude of risk is influenced R4 R5 magnitude.



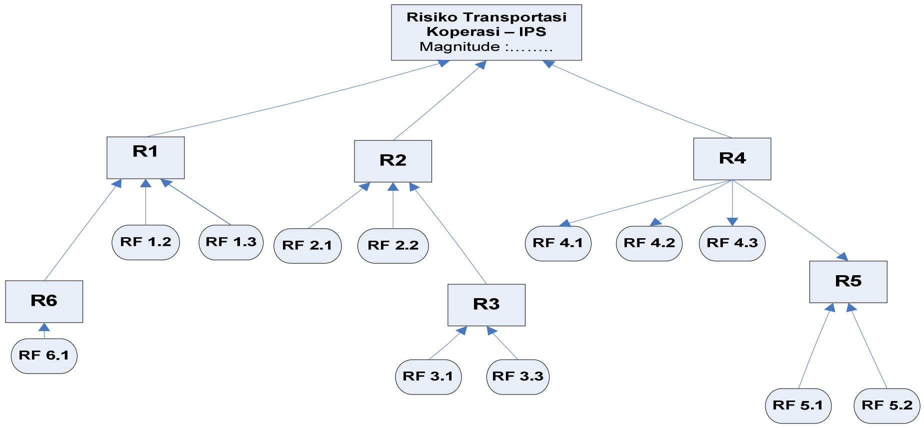


Figure5 : Chain Risks and Risk Factors Relations Cooperative Transport to IPS

Determination of the magnitude of risk in the form of linguistic formulated and expressed in the form of IF THEN rule. IF the following proposition called the antecedent, while the following proposition THEN called the consequent. Relationship between the likelihood of occurrence L, V severity, and magnitude of risk E represented as follows:

R1 : **IF** L is m_i AND S is n_i THEN M is o_i

i = 1,2,3,.....K

description:

L: Likelihood

S: Severity

m, n: constant linguistic antecedents (qualitatively defined function)

M: magnitude of risk

o: constant consequent linguistic

Example:

IF likelihood high **AND** severity is very high **THEN** magnitude risiko is very high

Table 6. Some IF THEN rule Prepared for Determination

Rule	Probability	Domain Fuzzy	Severity	Domain Fuzzy	Impact
1	very low	0,0,1.0,2.0	very low	0,0,1.0,2.0	very low
2	very low	0,0,1.0,2.0	low	1.0,2.0,3.0, 4.0	very low
3	very low	0,0,1.0,2.0	medium	3.0,4.0,6.0,7.0	low
4	very low	0,0,1.0,2.0	high	6.0,7.0,8.0,9.0	high
5	very low	0,0,1.0,2.0	very high	8.0,9.0,10.0,0	high
6	Low	1.0,2.0,3.0, 4.0	very low	0,0,1.0,2.0	very low
7	Low	1.0,2.0,3.0, 4.1	Low	1.0,2.0,3.0, 4.0	low
8	Low	1.0,2.0,3.0, 4.2	medium	3.0,4.0,6.0,7.0	low
9	Low	1.0,2.0,3.0, 4.3	high	6.0,7.0,8.0,9.0	high
10	Low	1.0,2.0,3.0, 4.4	very high	8.0,9.0,10.0,0	high
11	Medium	3.0,4.0,6.0,7.0	very low	0,0,1.0,2.0	low
12	Medium	3.0,4.0,6.0,7.0	Low	1.0,2.0,3.0, 4.0	low
13	Medium	3.0,4.0,6.0,7.0	medium	3.0,4.0,6.0,7.0	medium
14	Medium	3.0,4.0,6.0,7.0	high	6.0,7.0,8.0,9.0	high

Rule	Probability	Domain Fuzzy	Severity	Domain Fuzzy	Impact
15	medium	3.0,4.0,6.0,7.0	very high	8.0,9.0,10.0,0	very high
16	High	6.0,7.0,8.0,9.0	very low	0,0,1.0,2.0	medium
17	High	6.0,7.0,8.0,9.0	Low	1.0,2.0,3.0, 4.0	medium
18	High	6.0,7.0,8.0,9.0	medium	3.0,4.0,6.0,7.0	medium
19	High	6.0,7.0,8.0,9.0	high	6.0,7.0,8.0,9.0	very high
20	High	6.0,7.0,8.0,9.0	very high	8.0,9.0,10.0,0	very high
21	very High	8.0,9.0,10.0,0	very low	0,0,1.0,2.0	medium
22	very High	8.0,9.0,10.0,1	Low	1.0,2.0,3.0, 4.0	medium
23	very High	8.0,9.0,10.0,2	medium	3.0,4.0,6.0,7.0	high
24	very High	8.0,9.0,10.0,3	high	6.0,7.0,8.0,9.0	very high
25	very High	8.0,9.0,10.0,4	very high	8.0,9.0,10.0,0	very high

Examples of calculation Example Calculation of the Fuzzy Risk Exposure Measurement Transport Cooperative-Dairy Processing Industry can be seen in Figure4. Severity and likelihood assessed for each risk factor. The magnitude of the risk magnitude based on the value of the risk factors.

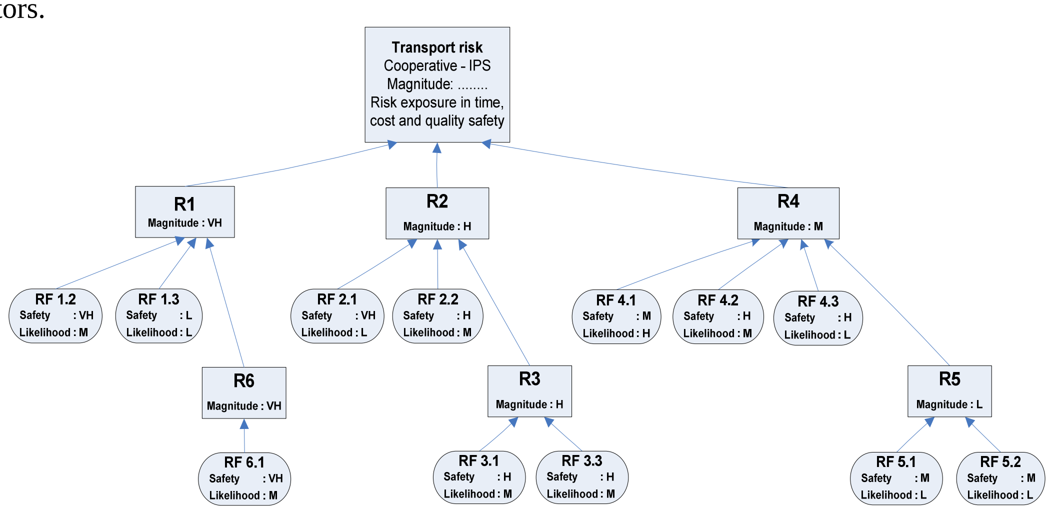


Figure 4. Fuzzy Calculation examples in Risk Exposure Measurement Transport Cooperative-Dairy Processing Industry

4.3 Risk Management

Risk management strategy is an attempt to deal with the risk based on the results of the identification and measurement of risk in the previous stage. Risk management strategy is determined based on a risk assessment (Table 7)

Table7. Search andRiskManagementofTransportationCooperativestoIPS

HRBS Code	category	Specific risks	Risk Factor	*risk Center*	type	likelihood	severity	Risk magnitude	Handling Risk
R.1.2.1.2	1. Product pilvirage	1.2 Shipment Jettison	disposal of dairy products due to defective and rejected IPS	product	external	Medium	high	high	improvement of dairy inspection standards
R.1.3.2.2		1.3 Piracy and Hijacking	piracy or illegal levies	people	external	low	low	low	external factors, it is difficult to control
R.2.1.3.1	2. Product damage	2.1 Equipment accidents	destruction modes of transportation	equipment	internal	low	very high	high	periodic maintenance modes
R.2.2.2.1		2.2Foor freight Handling	loading and unloading activities are bad	people	internal	medium	high	high	establish SOPs regarding loading and unloading activities
R.3.1.3.1	3. Product contamination	3.1 Climate control failure	improper temperatures	equipment	internal	medium	high	high	temperature setting control milk
R.3.3.3.1		3.3 exposure to contaminant	Tank transporter that are not hygienic milk	equipment	internal	medium	high	high	dairy tank inspection
R.4.1.4.2	4. Delivery delay	4.1 Congestion	Traffic jam	environmental	external	high	medium	medium	find another alternative pathways
R.4.2.4.2		4.2 Poor weather	Weather	environmental	external	medium	high	high	external factors, it is difficult to control
R.4.3.3.1		4.3 Equipment Malfunction	destruction equipment and modes of transportation	equiment	internal	low	high	high	periodic maintenance modes
R.5.1.4.2	5. Supply Chain interruption	5.1 Carrier bankruptcy	price volatility due to the economic crisis and high energy prices	environmental	external	low	medium	low	external factors, it is difficult to control
R.5.2.3.1		5.2 Capacity shortage	transport capacity can not fulfill demand	equipment	internal	low	medium	low	dairy tank inspection
R.6.1.2.1	6. Security Beach	6.1Shipment control breakdown	failure to control delivery	people	internal	medium	very high	very high	examination delivery schedule

5. CONCLUSION

1. Identify the risk of transport is divided into three activities, namely transport of farmers to collector, collector to transport cooperatives, cooperative transportation to IPS. Opportunity risk is greatest in transportation cooperative activities to IPS. Risk identification results prepared using the Hierarchy of Risk Breakdown Structure (HRBS), which sub sequently made into a catalog of risk so that searches can be more easily carried out risk
2. Assessment and risk analysis performed using fuzzy logic approach. Determination of the magnitude of risk in the form of linguistic formulated and expressed in the form of IF THEN rule. The relationship between risk and risk factors described in the relationship chain risk (risk dependency chain)
3. Handling risk carried on transport activities that have the greatest chance of risk, ie the risk of transportation cooperatives to IPS.

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