International Conference on Electrical Engineering and Informatics 2016 (ICON EEI 2016)

WEDNESDAY, 5 OCTOBER 2016

08.00 – 08.30	Registration
08.30 – 10.00	Opening Ceremony
10.00 – 10.30	Coffee Break
10.30 – 11.15	Invited Speaker 1 Prof. Zainal A.Hasibuan, Ir., MLS., PhD. (APTIKOM, Indonesia) “Revitalizing Small and Medium Enterprise in Digital Era: Challenges and Opportunities”
11.15 - 12.00	Invited Speaker 2 : Prof. Ir. Rinaldy Dalimi, M.Sc., Ph.D (Dewan Energi Nasional) “National Energy Policy and Renewable Energy”
12.00 – 13.00	Lunch Break

THURSDAY, 6 OCTOBER 2016

08.00 – 08.30	Registration		
08.30 – 09.30	Invited Speaker 3 : Prof. Dr. Kohei Arai (Saga University) “Multi-Layer Observation of Agricultural Fields (from Space, Ground based Cameras and Drone)”		
09.30 – 10.30	Invited Speaker 4 : Prof. Dr. Tharek Abdul Rahman (WCC, UTM, Malaysia) “5G Mobile Communication System: Evolution or Revolution”		
10.30 – 11.00	Coffee Break		
11.00 - 12.00	Invited Speaker 5 : Prof. Dr. Eng. Khoirul Anwar (Telkom University, Indonesia) “Challenges on 5G and 6G Wireless Networks: Finding New Resources”		
12.00 – 13.00	Lunch Break		
13.00 – 15.00	Parallel Session 1		
	Room 1 Computer Science and Informatics	Room 2 Electrical & Power Engineering	Room 3 Telecommunication & Wireless
15.00 – 15.30	Coffee Break		
15.30 – 17.30	Room 1 Electrical & Power Engineering	Room 2 Electrical & Power Engineering	Room 3 Telecommunication & Wireless
17.30 – 19.00	Break		
19.00 - Selesai	Gala Dinner		

FRIDAY, 7 OCTOBER 2016

08.00 – Selesai	Cultural Program (Tour)* (*with additional arrangement)

PARALLEL SESSION

TIME	NO	ROOM 1		
		CODE	TITLE	PRESENTERS

PARALLEL SESSION 1 (13.00 -15.00)	1	CS-01	Decision Support Systems for Loans at Bank BPR Pekanbaru	Aulia Ferani[1], Indah Lestari[2] and Dewi Hajar[3]
	2	CS-02	The Eclat Algorithm Implementation In Determining Selected Contraception Method	Lia Anggraini, Enny Norsyanah, Suwanto Sanjaya, Fadhillah Syafria, Alwis Nazir
	3	CS-03	Determination System of Football Players Position Using Algorithm K-Nearest Neighbor	Bronardhe Candra Rizqy
	4	CS-04	Traceability Software for Food Supply Chain and Management System	Evizal Abdul Kadir
	5	CS-05	Adjustable Knapsack in Travelling Salesman Problem Using Genetic Process	Andysah Putera Utama Siahaan
	6	CS-06	Early Warning Smoke Disaster Using Wireless Sensor Network	Reza Firsandaya Malik, Siti Nurmaini, Deris Stiawan and Nurul Hikmah

TIME	NO	ROOM 2		
		CODE	TITLE	PRESENTERS
PARALLEL SESSION 1 (13.00 -15.00)	1	EL-01	Robustness Speed Control 3 Phase Induction Motor Using Programmable Logic Controller	Noorly Evalina[1], Abdul Azis H[2]
	2	EL-02	Analysis Improvisation Reactive Power Energy Saving Lamps Based On Inverter	Zuraidah Tharo[1], Noorly Evalina[2], Adi Sastra Pengarapan Tarigan[3]
	3	EL-03	Performance Analysis of Grid Connected Photovoltaic System in Difference Weather Condition	Syafii, Refdinal Nazir and Welly Yandri
	4	EL-04	Integration Regenerative Braking System With ABS In Electric and Hybrid Vehicles	Z. Zaini
	5	EL-05	Fault Location Estimation With Simple Reactance and Takagi Method On Distribution Line of Bangko PT. Chevron Pacific Indonesia	Yellyna Sari Agus
	6	EL-06	Determination of Capacity of A 150 KV Electrical Power System Safe-Guard at PT. PLN In North Sumatra Region	M. Rizki Syahputra

TIME	NO	ROOM 3		
		CODE	TITLE	PRESENTERS
PARALLEL SESSION 1 (13.00 -15.00)	1	TL-01	Clustered Directed Diffusion Based Routing Protocol Wireless Sensor Networks for A Forest Preventive Fire System at Tesso Nilo National Park	I.Yasri, Y.Rahayu, Febrizal, Indah Kurniati and Santi R. Sipayung
	2	TL-02	Clustered Data Aggregation Based Routing Protocol Wireless Sensor Networks for A Forest Preventive Fire System at Tesso Nilo National Park	I.Yasri, Y.Rahayu, Febrizal, Indah Kurniati and Santi R. Sipayung

	3	TL-03	CATV Network Increased Reliability Analysis from Coaxial Cable to Fiber Optic Systems at PT. Chevron Pacific Indonesia	Ery Safrianti[1], Lina Oktaviana Sari[2], Indra P. Wijaya[3]
	4	TL-04	7 GHz Microwave Backbone Link Design Pekanbaru and Bangkinang	Yusnita Rahayu, A. Risyal Nasution

PARALLEL SESSION 2 (15.30 -17.30)

TIME	NO	ROOM 1		
		CODE	TITLE	PRESENTERS
PARALLEL SESSION 2 (15.30 -17.30)	1	EL-07	Investigation of Converter Parallelization Through High Frequency Transformer	Muhammad Imran Hamid[1], Andi Pawawoi[1], Zaini[1], Fitriadi[2], Desmiwarman[2]
	2	EL-08	Prototype of Switch Control Battery Charger on Generation of Hybrid Energy	Noveri Lysbetti Marpaung
	3	EL-09	Properties of Nitrogen Gas Breakdown Voltage under Direct Current Positive Polarity	Eddy Hamdani, Tumpal Pardede, Fri Murdiya
	4	EL-10	The Properties of A Mixture Of Epoxy Resin and Palm Kernel Shell as New Solid Insulation	Fri Murdiya, Yan Habibilah Pesa, Febrizal, Dian Yayan Sukma
	5	EL-11	Treatment of Voltage Direct Current to Ions Flow on Midrib and Leaf of Palm Tree	Saktioto[1], Defrianto[1], Suhardi[1], Awitdrus[1], Dewi Indriyani Roslim[2]

TIME	NO	ROOM 2		
		CODE	TITLE	PRESENTERS
PARALLEL SESSION 2 (15.30 -17.30)	1	EL-12	Total Harmonic Distortion Analysis of Solar Electric Power Generator 320WP for Low Voltage on Household Aplication	Nurhalim, Firdaus
	2	EL-13	Fault Type Identification and Location Estimation Using Adaptive Neuro Fuzzy Inference System (ANFIS)	Ika Mayla Sari, Dian Yayan Sukma
	3	EL-14	Design of Renewable Energy Data Measurement Instrument for Archipelago Area	Ibnu Kahfi Bachtiar
	4	EL-15	Design and Prototype To Improve Power Efficiency Renewable Power Output Using Technology Converter	Suwitno

TIME	NO	ROOM 3		
		CODE	TITLE	PRESENTERS
PARALLEL SESSION 2 (15.30 -17.30)	1	TL-05	Design Broadband Elliptical-Shaped slot Antenna for 5G Wireless Communications	Yusnita Rahayu, M Ibnu Hidayat
	2	TL-06	Design of Pet Feeder using Web Server as Internet of Things Application	Andi Adriansyah, Muchd. Arief Wibowo, Eko Ihsanto
	3	TL-07	Early Warning Systems for Peat Fires	Rahyul Amri[1], Ari Sandhyavitri[2]
	4	TL-08	Design Virtual Private Network in Engineering Faculty UR Using Network Development Life Cycle Method	Linna Oktaviana Sari[1], Aldi Kurniawan Batubara[2], Ivan Rafli Mustofa [3]

Traceability Software for Food Supply Chain and Management System

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***Abstract* — Food industries have been growing in the market since a few years ago, significant impact have seen in food industry worldwide makes business player concern to the consumer safety. Traceability software system developed cover partial process and uncover to the consumer information system. Smart selection on safe food product by consumer is a motivation in this research to design traceability software for food product in supply chain. A new design and development in traceability software cover for supplier and consumer is novelty in this research to gives complete information about food product before proceeds to buy. All the information about food product collected and recorded by supplier and manufacturer in every process of food product preparation to gives detail information in the system. Radio Frequency Identification (RFID) tag used in every food product as identification media, as well as to do faster process in collecting data by consumer. All the information collected then stored in RFID tag for every process started from farming information to manufacturing as well as importer for information in some case of country. Results show consumer be able to scan a tag labeled at food product to check detail information and history recorded by using smart phone that installed with traceability application.**

Keywords - Traceability, Software, Supply Chain, Food Industry.

I. INTRODUCTION

Global economy in food product struggles in new attach which is bioterrorism, people are very concern in this issue and emerging implications of foodborne illness outbreaks. Establishing security in the food supply chain is one of solution to control food product beside regulations. In the United States of America (USA), Bioterrorism Act includes a similar requirement regarding the establishment of records to identify the immediate previous sources and immediate subsequent recipients of food, including its packaging, which came into effect for larger processors [1]. The regulations have been implemented in most of countries worldwide for food security then every company has to follow the rule for food processing, enforcement is done depending on the size of company. In response of these concern distribution and processing of food product through the traceability either ingredients or finished good product are taking action. Large business player in food product are demanding of traceability from their supplier as a standard operation in running business, lately most of processor and supplier to recognize that traceability system proof usable for food safety and implement as minimum standard in operation.

Traceability is a technology has the ability to track, trace and locate an object (product), the use of traceability system for food product throughout a broad supply chain from the farmer to the customer. Traceability process is assist the system to track and trace critical food product is contamination occur that might cause unsafe to human health during delivery process started from the source, manufacturing, packaging, shipping and distribution to store or consumer. Traceability system is more on the size of business running, complex of food product and supply chain may use different tools and software to track and trace also device including level of information and security to apply. Some companies are required detail tracking and tracing for hundreds or thousands of each item from various of suppliers through a multi-step production process, while others are required simply system to track and trace of food product in just key point. In the some country, traceability is not only accessories for food product supply chain but it is a law that every company has to follow the regulation. Traceability systems have been obligatory for all businesses in the food chain in the European Union (EU) since January 2005 [2]. The EU gives direction that all food product businesses require to identify all suppliers, product feed and from which they supply. All

the information has to be managing in proper way or in a central data center in order to do inspection by authorities or demanding of traceability data.

The implementation of traceability software to support process that ties together in all aspects of food product processing including batch, tracking and tracing is a solution in product supply chain. The use of software gives advantages in a complete system to identify all the process such as manufacturing, quality control, labeling, handling management and accounting. With these integrated system used software might be a cost of investment for the company but benefits likely to outweigh the costs. Automated system using software is a technique to prevent mistake and error in manual data entry, support technology to capture food product using Barcode or Radio Frequency Identification (RFID) by handheld scanners [3]. Automatically capture for the product batch gives much data and information associated in manufacturing, process time, transportation, expiration, storage time, etc. Furthermore, a single information system and integrated software should be benefit and efficient in processing together with resources and planning unit also warehouse management system. Real time traceability is required in order these entire steps of processing to be located instantaneously and allowing quick response to determine which batch of food product are impacted then reminding or recall action to be fast. A streamlined system of food product using integrated software enables a business player to establish and maintain quality and monitor of the business process controls that are critical to customer then ability to maintaining product traceability and safety. Emerging of Information and Communication Technology (ICT) together with the information software system enables to enhance food product quality and safety, beside that healthy product to consume is first priority need to take attention by food provider.

II. Related Work

Growing number of consumer interest in food product and rising incidence food fraud is making manufacturer has established methods in production to adopt traceability system. Meantime, every consumer is now concern of their food originates supplied, because some processing may cause unsafe to consume by human. Development of ICT through gadget, smartphone and tab is advantages to food traceability using mobile system by customize the software for consumer. Advanced traceability system gives adapted solutions to the consumer by develop application software that be able to embed into mobile devices. Furthermore, currently most of mobile devices occupied with the RFID technology either Near Field Communication (NFC) or Magnetic Field System. In [4] discuss on the use of repositories software for mining data and combining mined results with IR techniques to improve the accuracy (precision and recall). Proposed IR techniques as trust-race and trust-based traceability recovery approach for four medium-size open-source systems to compare the accuracy of its traceability links with those recovered using state-of-the-art IR techniques based on the Vector Space Model and Jensen-Shannon model. Thakur et al introduce a new methodology for modeling traceability information using the EPC Information Services (EPCIS) framework, mapping of food production processes to provide improved description and integration of traceability information [5]. Rajo-Iglesias, develop a complete traceability system in the wine production sector by joining RFID technology with the use of Wireless Sensor Networks (WSN) for monitoring at the vineyards [6]. The proposed system could provide an advantage to the manufacturing by improving visibility of the processes performed and the associated control over product quality. Parreño-Marchante, proposed traceability system architecture based on web services, which are used to integrate traceability data captured through RFID systems with environmental data collected with WSN infrastructure [7].

III. Traceability Software for Consumer

Implementation of food traceability system enable consumer to check and trace product and processor history, the use of application software installed in mobile device to detect food product. There is concern need to take attention by system in order to provide information to consumer such as:

- *Simple*, application software as media to shows product detail and record should simple and user friendly. Straight to the information provide to consumer more effective and efficient also beneficial because they only required basic information of product.
- *Speed*, accessing information and product detail should in short of time while customer selection in shopping complex or retailer. The use of mobile devices such as smartphone or tablet to access the information makes network infrastructure is one of the aspects need to pay attention.
- *Accuracy*, because of many products and complex system that accessing by multiple peoples in the same time also provided by different supplier or manufacturer makes possibility to miss communication. Accurate information supply to customer is very important as reference for the customer whether food product is good or safe to consume.
- *Support*, integrated and multi-level system between supply chain and consumer application software makes flow of data indirect provide to consumer, some information is get from different stage of process in supply chain thus support for this level is important in order to gives correct data to consumer.

Traceability system for the consumer application does not work alone, it is required multi-level stage from supply chain processor to feed information and complete solutions to consumer. Beside, multi-level processing traceability also needs to pair with a real-time system for data collection then feed to consumer system. Furthermore, traceability software for consumer can be integrated to other system such as location service, online sales service, retailer portal and so on to makes complete solution for consumer rather than only single application used. Figure 1 shows a sample of architecture of the traceability system based on EPC Global standard network used RFID and WSN technology for customer.

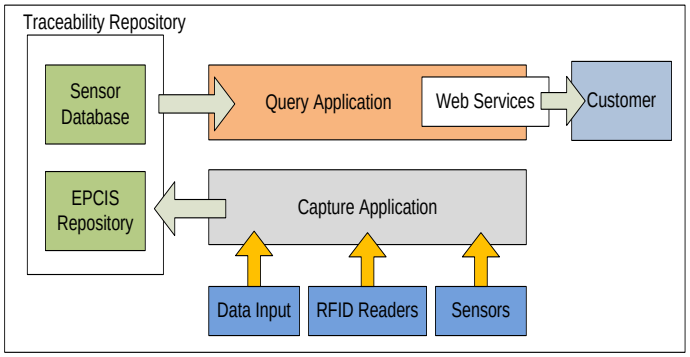

Fig. 1. Traceability system architecture based on the EPC Global standard network

A. Product Identification

Identification is defined as the act of determining or to prove that the object or material is correct, many kind of things that need to be identification before use and application could be in documentation, equipment, components, materiel, etc. Application in manufacturing and maintenance of products is required high attention to ensure that item in correct thing due to many similar objects. Increasing and spread up of fraudulent and counterfeit food product has become an issue across all industries and the globalization in supply chain management system then risk for consumer. Fraud of food product takes seriously impacting on the performance and reliability and reputation also financial losses for the supplier. In the supply chain system, traceability is a solution to verify product detail or location by applies identification of item that documented (recorded) in previous system. Implementation of product identification and traceability system especially in food product ability to eliminate of fraud and counterfeit items, then provide safety, affordability, and improve health of product that consume by human. There are several techniques to identification of food product and the common system used is Bar Code System and RFID. Evolution of mobile device such smart phones or tablet has enable to build in RFID system which is NFC reader. Identification of food product is come to

simple way and ability to do by develop application software for mobile devices then by scanning to the product and all the information is appear on display that previously recorded. Figure 2 shows an example of identification process food product in shopping complex, while consumer just tapping or scanning to one of product to know the product detail or processor history:

Fig. 2. Traceability system architecture based on the EPC Global standard network

Item identification normally refer to one of unique code or part number that different to each other's, serial number or batch is additional technique to make identification process is easy. There are several methods or technique in indication on object that normally currently used for item identification such as:

- RFID or NFC tag
- Labels or tagging
- Nameplates
- Barcode
- Permanent marker pens note
- Dot peening
- Etching
- Laser jet or ink jet printing

B. Product history record

Rapid growing of food product industries worldwide in numerous brand or trademark and supplier makes consumer concern to accept only safe and healthy product. Good food product manufacturing ability provides traceability system for product and minimizes the production and distribution of unsafe or poor quality food products, thereby minimizing the potential for bad publicity, liability, and recalls. The other hand also ability to gives product detail not only in term of ingredient but more than that is product history for example supply chain history, traceability and access to the consumer finger. The information of product especially food item that can directly consume by consumer such as fruit, vegetable, bread, etc. is very important because some of product come from far away in different countries or continentals, for example fruit such as apple and pear may import from African or China for ASEAN Countries market also Australia. Thus, information such as export date and time, product storage history is needed by consumer. There is some of most common information is very important to publish to consumer and with advanced technology using ICT system such as:

- Date and Time product cutting off from farmer
- Processing information in manufacturing
- Date and Time packing
- Exporting and Importing company
- Storage information
- Delivery to retailer

- Food product expiration date
- Halal certification (for Moslem countries)

Several previous research and study that discuss on food product traceability for consumer such as [8], discuss on traceability system for product and applied as tool to assist in the assurance of food safety and quality as well as to achieve consumer confidence Min [8]. Comprehensive information about food product by using traceability with regards for safety and quality in the food supply chain. Aiello et al discuss on evaluating the expected value that be able retrieve to consumer by implementation of traceability systems for perishable products like fruits and vegetables [9]. Study on presents mathematical stochastic model and approach for optimizing this supply chain system and establishing the optimal granularity level when a RFID solution is adopted. The supply chain system profit in the presence of RFID traceability has been calculated and compared with the current expected profit in absence of such a system and obtain the results that importance to the specific characteristics of the supply chain in determining the optimal configuration of the traceability system. Figure 3 show an example of screenshot information system and product detail history one of food product through smart device.

Fig. 3. Example of screenshot display on consumer smart devices for product details.

Smart consumer is normally very selective in food product either kind of product of source of the food comes from. Nowadays, most of customer is holding smart devices for communication, take note, photos, etc. thus with smart and mobile devices has ability to retrieve information all the history and journey of an item then consumer will get idea and decision whether kind of product safe to consume or not. Many cases happen in develop countries that the customer with low knowledge about food product then consume unsafe or unhealthy product even in expired date then caused dangerous for the body. As we seen on the news case of unsafe food product keep happen, this is also caused because of some party of people takes chances from this food trading, by selling or export rejected product that supposedly to destroy, then rejected product go to customer does not know about good food.

C. Traceability Software for Supplier

Food supplier or industries have built traceability systems not only to meet government regulation and legal requirements of customer standards but more than that to raise productivity through enhanced data and information management system. Traceability

software systems for supplier assist food industries to manage data and information for food product safety, quality and security throughout the food processing, manufacturing and distribution supply chain to consumer. If traceability in supply chain is develop in robust enough then it can offer to improved service, increase safety and quality control also high possibility to market food product with good reputable compare to others industries thus high market will achieve. With invest some of traceability system creating a safer food chain, then with such design will results lower cost in manufacturing and distribution systems, umber of product recall will reduce and expand sales in worldwide in a high-value food products, thus all of these impact into greater profitability for the company or industries. Storøy, proposed design of tracing food product framework and recommendation of good traceability practice used common principles of unique identification for food product which is common generic standard electronic exchange of traceability information (Trace Core XML) [10]. The used of trace food framework is applied in many countries that funded by EU funding project especially for the TRACE project. In [11] proposed a new solution customized and automated cooler for carrying samples, a smart sensor installed in the cooler storage and collect data during the process then a memory stick used to transfer collected data to a computer for further analysis. Several technologies are used in this solution such as microcontroller, sensors, RFID and Global Positioning System (GPS).

IV. SUPPLY CHAIN MANAGEMENT SYSTEM

Nowadays, many of well-known food and beverage brands are trust and going to online used software for supply chain management and visibility system, because to supports the requirements of the food and beverage industries with the advanced inventory and management system also capabilities with the real-time visibility of product especially for the critical product information from the manufacturer and supplier to the storage, and all the locations as chain in between the processes. Supply chain management system is a system has ability to control and monitor every step of product processes with support in some others technology as a part of in overall big system. In most of big company already implemented supply chain management system started from the source of material until end of processes which is consumer, this is to ensure that the entire product provide is safe to use or consume. Figure 6 shows an example of product supply chain management system for the manufacturer started from importer to the end which is retailer and consumer

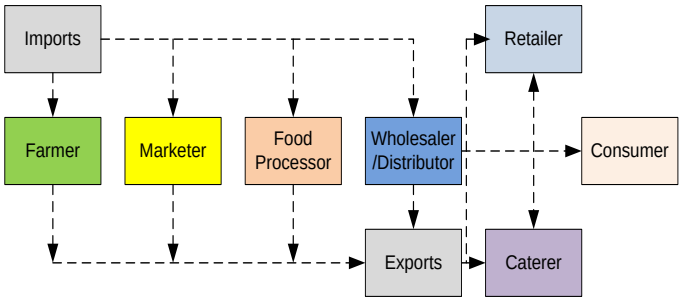

Figure 4. Example of product supply chain management system.

There are key benefits to introduce supply chain management system in the manufacturer or industries that drive traceability of product to motivate by wide in public interest concerns include the desire to improve management, government regulations, and industrial standards. Responding of the impact of social and economic major food safety incidents the many of manufacturer and industries are implement product supply chain management system in order all the product to be traceability. The system also assist of minimize in case of product call and sustain customer confidence to consume the product, with system implanted become more trusted source and information in retailer and recall

only the product is contaminated to avoid waste for good product. Supply chain management system with ability product to trace then this system also allow authorities to limit recall product related to the food safety incident only, this how to mitigate the negative response of economic consequences to gain industries and will be benefits for public interest.

Supply chain management system must be link together in the entire process of product supply, this the better way to make sure that source of food product is safe for consumer and disease outbreaks of food can be detect quickly. The link is depending on the size of process some may have larger because including many source of material and processes, some other relatively simple because the process only need a few step. Some others potential solutions to improve supply chain management system in product to be traceability include:

- Making supply chain management system is universal and comprehensive;
- Developing supply chain management system is compatible for the product;
- Mandating minimum requirements for suitable supply chain management system;
- Making premises is mandatory to identify for poultry and livestock producers;
- Requiring detailed information of product in case to handle emergencies in quickly;
- Cost effective supply chain management system for industries;
- Promoting the benefits of implementation supply chain management system; and
- Continuous evaluation to improve supply chain management system performance.

In some other developed countries, food supply chain management system for industries generates benefits for both public interest and private, but also substantial the costs involve for stakeholders. Efficient and effective supply chain management system gives optimum benefits as minimum costs involved. The ultimate prescription for making the good possible supply chain management system in the manufacturer or industries is to balance public and private costs for supply chain with public and private benefits.

V. CONCLUSION

The global market of food industry have to introduce a technology to control it, traceability system is a technology driven and is seeing new technologies and applications that applicable to implement on it. There are several technology implemented in the market to control the product traceability and supply chain management system such as RFID, Barcode, GPS, Infrared, etc. Software is one the important part in order to support traceability for product, all these step in all level with hardware and tool must have software to complete the system. There two big classification for the software part, as support processors in data processing and database software which is data storage. Proposed traceability software proof that benefit to the consumer to know information about food product before they are proceed to buy. The used of smart phone is coomo for everybody as communication tool, beside that smart phone has many functions for other purpose, one of it is can be install traceability software application. Sustainable food product system is another challenging for the future trend of product traceability including software part that sustain for the manufacturer or industries and consumer. Food product business in the future will be more complex to make for such as industrial agriculture, urban agriculture, bio-domes, small-scale farms, vertical growing spaces, backyard gardening, hydroponics, community gardening and so on.

ACKNOWLEDGMENT

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CERTIFICATE

No: 394/UN19.5.1.1.7/TE/DL/2016

This is to Certify

Dr. Evizal Abdul Kadir

SESSION CHAIR

at international conference

on Electrical Engineering and Informatics (ICon-EEI 2016)

5 - 6 October 2016, Pekanbaru

Dean

Faculty of Engineering Universitas Riau

Prof. Dr. Adrianto Ahmad, MT

Pekanbaru, 5 October 2016

General Chair

Dr. Yusnita Rahayu, SMIEEE

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e of Advanced Engineering and Science