

# Analysis of Good Manufacturing Practices (GMPs) Implementation In Gudeg SMEs to Improve Food Safety Product

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## Abstract

*Gudeg is one of traditional food preferred by public in Yogyakarta. To meet the standard and quality requirements for Gudeg product the industry is required to be capable of making improvement to production procedure in each flow of its production activities. An analysis of the implementation of GMPs (Good Manufacturing Practices) to Gudeg SMEs in Yogyakarta is deemed important. It aims to identify the factors of the highest non-conformities and to provide solutions in creating a better food production procedure for Gudeg SMEs in Yogyakarta. The aspects that had the highest incompatibility values were formulated using the 5 Why's Analysis method and Ishikawa diagrams. The research aims: 1) to analyze the implementation of GMPs in one of the SMEs in Gudeg production in Yogyakarta; 2) to analyze the factors of the highest discrepancy with the implementation of GMPs; and 3) to give suggestions for the improvements such nonconformities. The results of the assessment of the implementation of GMPs in Gudeg SMEs showed that the level of GMPs implementation was good with a conformity (93.30%). The highest discrepancy was found in the employee aspect (37.5%) due to the absence of employee training regarding food sanitation and safety in the industry, also the lack of reference standards for the application of GMPs in industry.*

**Keywords:** Good Manufacturing Practices, food safety, Gudeg production, industrial sanitation

## 1. INTRODUCTION

Compared to other sectors, the culinary industry is one of the largest contributors to Gross Domestic Product (GDP). As revealed from data from the Ministry of Cooperatives and Small and Medium Enterprises in March 2021, the number of SMEs reached 64.2 million with a contribution to GDP of 61.07% or 8,573.89 trillion Indonesian Rupiahs. SMEs were able to absorb 97% of the total existing workforce, and collect up to 60.42% of total investment in Indonesia (Ministry of Finance of Republic of Indonesia, 2021). The large number of SMEs engaged in the culinary field has caused a number of SMEs to be capable of competing with other similar SMEs.

*Gudeg* SMEs, being one of Yogyakarta's indigenous culinary delights, were also under intense competition. The number of *Gudeg* SMEs in Yogyakarta is growing, as is competition in the business sector (Hendrix and Nasution, 2022). The large number of similar industries selling *Gudeg* both as food and as special gift from Yogyakarta has made the producers to improve their competitiveness performance in industrial. The enhancement of the competitiveness can be achieved by producing good quality product which is safe to be consumed.

Quality products are able to be made using high-quality raw materials and standard-compliant processing methods. Young jackfruit, chicken, eggs, tofu, tempeh, and spices are some of the basic ingredients utilised in the production of *Gudeg* and its supplement. The process of making *Gudeg* has various operations, such as sorting, washing, cutting, boiling, and cooking (Khairani and Amalia, 2022). Thus, to support the production process, production control is required at the level of production areas as well as production support facilities.

Implementing a Food Safety Management System is a critical aspect of the production of high-quality products that adhere to Good Manufacturing Practices (GMPs). GMPs developed regulations for certain food sectors, such as meat, poultry, seafood, dairy products, feed, and pet food (Lee et al., 2021). The raw materials of *Gudeg* were considered to be a part as these as well (Khairani and Amalia, 2022). Several criterias, such as applicable standards, personal hygiene, process control, pest control, and production sanitation facilities were the important concerns in implementing GMPs (Purwantiningrum, 2018). To meet the standards and quality requirements for *Gudeg* product, particularly in certain moments, such as long holidays at which is the industry will experience a peak production, the industry was required to be capable of making

improvements for production activities. Based on the preliminary study, several irregularities were found in its operational activities, such as the presence of cross-contamination of products due to the lack of sanitation implementation on the employee aspect. In addition, pests were still found in the production room due to a lack of pest control and inappropriateness in raw materials handling, such as placing the raw materials directly on the floor.

The aims of this research were: 1) to analyze the implementation of GMPs in *Gudeg* SMEs; 2) to analyze the causes of discrepancies in GMPs implementation; 3) to provide recommendations for improvement of the most severe discrepancy. It refers to the Regulation of the Minister of Industry of the Republic of Indonesia No. 75/M-IND/PER/7/2010 on GMPs with Thus, solutions can be provided to SMEs to improve production procedures and enable the SMEs to compete with other similar industries.

## 2. MATERIAL AND METHODS

The research was conducted in a food industry producing *Gudeg* in Yogyakarta city. Observations were carried out in the production area, labor support facilities, and supporting production facilities. The observations were conducted using the assessment form for 17 aspects of GMPs referring to the Regulation of the Minister of Industry of the Republic of Indonesia No. 75/M-IND/PER/7/2010 on GMPs. The application of GMPs covered 17 aspects of research, including the aspects of location, buildings, sanitation facilities, machinery/equipment, materials, process control, final products, workers, packaging, labelling and product descriptions, storage, maintenance and sanitation programs, transportation, documentation and recording, training, product recall, and implementation of guidelines. To support the observational analysis, in-depth interview was conducted with operational manager regarding the factors of discrepancies. In-depth interviews were carried out based on 17 aspects that were observed in detail. Operational managers have the authority and the responsibility to organize production activities, which made it appropriate to be respondent. The accumulated GMPs implementation assessment was calculated by the percentage of compatibility and incompatibility in each aspect. The calculation was done using equation 1. Thus, the analysis was carried out using descriptive statistics.

$$\text{Percentage of aspect of GMPs values} = \frac{\text{values of compatibility/incompatibility}}{\text{total number of sub aspect}} \times 100\% \quad (1)$$

Pareto diagrams were constructed to identify the highest factors of discrepancies by using the 5 why's technique to formulate a Cause-Effect Diagram with the Addition of Cards (CEDAC). The formulation of the CEDAC regarding the highest discrepancy in GMPs implementation at *Gudeg* SMEs was supported by the results of the interviews. On the other hand, a CEDAC diagram was generated to identify the highest discrepancy factor on GMP implementation. Kuswandi and David (2018) stated that the Ishikawa diagram was a representation of the cause and effect of a problem by analysing the main causal factors in the form of machines, people, methods, materials, measurements, and the environment.

## 3. RESULTS AND DISCUSSION

### 3.1. The Assessment of GMPs' Implementation

The results of the GMPs assessment on *Gudeg* SMEs in Yogyakarta have been carried out using a GMPs form covering 17 aspects as seen in Table 1 (Ministry of Industry of Republic of Indonesia, 2010). The accumulation of the assessment of the GMPs implementation in SMEs showed that the results of the GMPs implementation level in *Gudeg* SMEs were quite good with a total compatibility of 93.30% and deviation of 6.70%. However, improvements are still needed, particularly in the aspects where there have been incompatibilities in the GMPs implementation to improve the product quality of *Gudeg* SMEs. The incompatibility was found in several aspects, including location, building, sanitation facilities, employees, storage, maintenance and sanitation programs, and transportation.

#### 3.1.1. The aspect of location

The first incompatibility in the aspect of location was found in the selection of industrial locations on the side of major roads in which the location has not managed to reduce pollution from motor vehicle fumes. The second discrepancy was related to the industry's location in a

lower land area with potential for floods. In addition, the drainage system was deficient, evidenced by the presence of poor water flow and the presence of rubbish.

### 3.1.2. The aspect of building

Floor and wall intersections have formed dead corners where dirt can accumulate. The accumulation of dirt can lead to food safety issues such as the contamination of *Gudeg* products. On the other hand, the wall surface in the production room was dark and made of a material that was not easy to clean. All production activities were carried out traditionally, such as cooking using the firewood. Thus, the production room became darker eventhough it has been repainted. The design of industrial rooms that are in direct contact with food must meet standards (easy to clean) to avoid food contamination (Lelieveld et al., 2005). In addition, the production space was lack of light and had a poor air circulation. The importance of airflow in food production areas was to provide a high level of air quality. Air has become one of the sources of contamination in food products, hence air quality should be maintained to prevent the spread of bacteria from the air to food products (Moracanin et al., 2019).

### 3.1.3. The aspect of sanitation facilities

The discrepancy in the aspect of sanitation facilities is the unavailability of a warning that every employee must wash their hands with soap or use a hand sanitizer after using the toilet. In addition, sanitation facilities for workers have not been equipped with work shoe rinse aid, considering that the shoes are often used by employees to went to warehouses, toilets, and other places that can be the cause of cross-contamination in food products. Poor sanitation practices enhanced the environmental quality of bacteria and other infectious agents (Kibret and Abera, 2012).

Table 1. Accumulation of the Assessment of GMPs Implementation in *Gudeg* SMEs

No	Aspect	Number of sub-aspects	Compatibility		Incompatibility	
			Value	Percentage (%)	Value	Percentage (%)
1	Location	7	5	71.43	2	28.57
2	Building	36	32	88.89	4	11.11
3	Sanitation facilities	21	19	90.48	2	9.52
4	Machine/equipment	12	12	100	0	0
5	Materials	6	6	100	0	0
6	Process control	25	25	100	0	0
7	End-product	3	3	100	0	0
8	Employees	8	5	62.5	3	37.5
9	Packaging	6	6	100	0	0
10	Label & product description	6	6	100	0	0
11	Storage	8	7	87.5	1	12.5
12	Maintainance and sanitation program	37	36	97.3	1	2.7
13	Transportation	8	7	87.5	1	12.5
14	Documentation and recording	11	11	100	0	0
15	Training	6	6	100	0	0
16	Product withdrawal	6	6	100	0	0
17	Guideline implementation	3	3	100	0	0
Total		209	195	<b>93.30%</b>	14	<b>6.70%</b>

### 3.1.4. The aspect of employees

Employee discrepancy was caused by the lack of regulations regarding hand washing before and after work, as well as the ban of smoking, spitting, and other acts in the production area that could lead to product contamination. Employees and visitors who accessing the

workplace, particularly production rooms, were not required to use guest identity cards, Personal Protective Equipment (PPE), or adhere to hygiene standards. Furthermore, the industry has not appointed and delegated the person in responsibility of executing the food safety management system to skilled and competent employee.

### 3.1.5. The aspect of storage

Raw materials that have not been used for the production process were placed on the floor. CFR (2016) mentioned that floors can be a source of contaminants, especially if there are piles of water or liquid waste. Raw material storage should be arranged on pallets to avoid touching the floor, not against the wall, and away from the ceiling. This minimises contamination and the potential for insects on the floor, walls, and ceiling to transfer to the raw materials.

### 3.1.6. The aspect of maintenance and sanitation programs

The SMEs was still deficient appropriate pest control. In the absence of pest control, there may be a few discrepancies in the maintenance and sanitation programs. The food sector should have pest trapping devices on readiness to catch flies, flying insects, and cockroaches. A rodent box station would also be useful for trapping mice. Furthermore, pest control in the food industry can be utilized alongside integrated pest management (IPM). The method is particularly effective for pest management in food industries due to the uses relatively few potentially harmful pesticides (Kloosterman and Mager, 2014).

### 3.1.7. The aspect of transportation

The incompatibility in the transportation aspect was a distribution procedure. It was unable to protect the goods against contamination, particularly dust and dirt. This would be due to the fact that the truck merely delivered the products stored in stainless steel containers without covers. The product should be stored in a well-sealed packaging to prevent contamination. In aside from protecting the product from contamination, packaging was an essential aspect to consider when preserving *Gudeg* products (Nurhayati et al., 2017).

## 3.2. Incompatibility in the GMPs Implementation in *Gudeg* SMEs

There were 10 out of 17 aspects that have been compatible in the relation to the GMPs implementation, as shown in Table 1. However, the 7 aspects were not compatible with the GMPs implementation in *Gudeg* SMEs. The results of the calculation of the assessment of discrepancy of GMPs implementation in *Gudeg* SMEs were analyzed. The aspect with the highest discrepancies value, as shown in Figure 1, was deployed into a Pareto diagram. The aspect of employee became the main priority that needed to be improved for industry of *Gudeg* SMEs. The aspect of employee obtained the highest incompatibility value with a total deviation value of 37.5% of the overall GMPs assessment and 32.78% of incompatibility of GMPs in *Gudeg* SMEs.

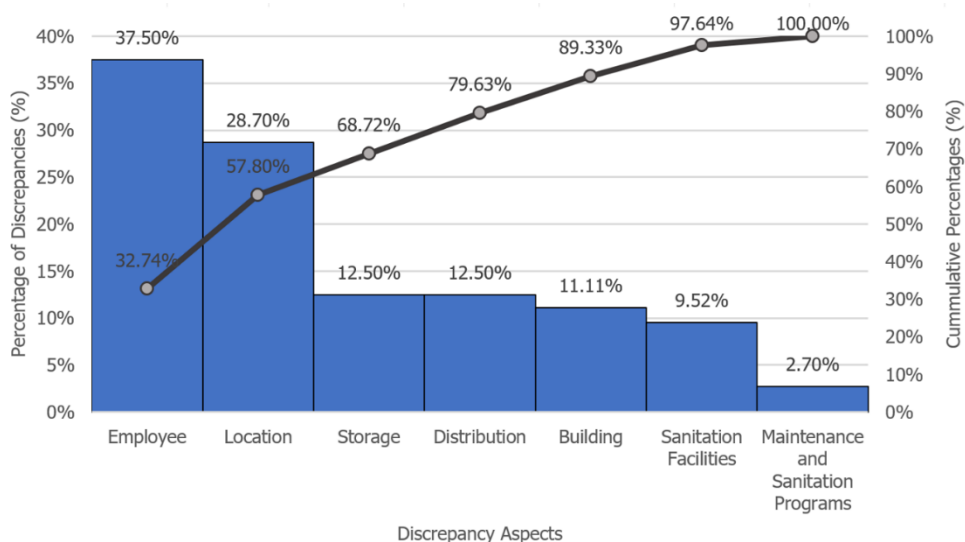


Figure 1. Pareto Diagram of GMPs Discrepancies

Table 2 presents the results of the analysis using CEDAC regarding the incompatibility of GMPs implementation in the aspect of employees of SMEs *Gudeg*. Based on the 5 Why's Analysis method and the Ishikawa diagram (Figure 2), several factors of the incompatibility of GMPs implementation in the aspect of employee were found in terms of three causative factors including environment, human, and method.

Environmental factor was related to the lack of trained personnel in charge of implementing the food safety management system. It was found that this is related to many branches which spreaded across various regions. Moreover, the quantity of human resources was found still limited. While on the method factor, employees were not equipped with the PPE required in the food production process to prevent any cross contamination. This is due to the lack of employee training on the importance of using PPE. For the human factor, employees carried out activities that can contaminate the products, such as not washing their hands and smoking around the production area. It may caused due to the lack of references of the sanitation standard.

Table 2. Incompatibility of GMPs Implementation in the Aspect of Employees

No	Factor	Cause I	Cause II	Cause III
1.	Environment	Lack of trained personnel who is in charge of implementing the food safety management system	Lack of resources in the implementation of food safety management system	Many branches spread across various areas
2.	Method	Unavailability of PPE that is in accordance with the industrial need	Lack of knowledge of employees about the importance of the use of PPE as the manifestation of GMPs	Unavailability of training for employees about the importance of the use of PPE as the manifestation of GMPs in industry
3.	Human	Employees carried out the activities that can contaminate the products	No SOP regulating the GMPs in industry	Lack of reference standard about the implementation of GMPs in industry

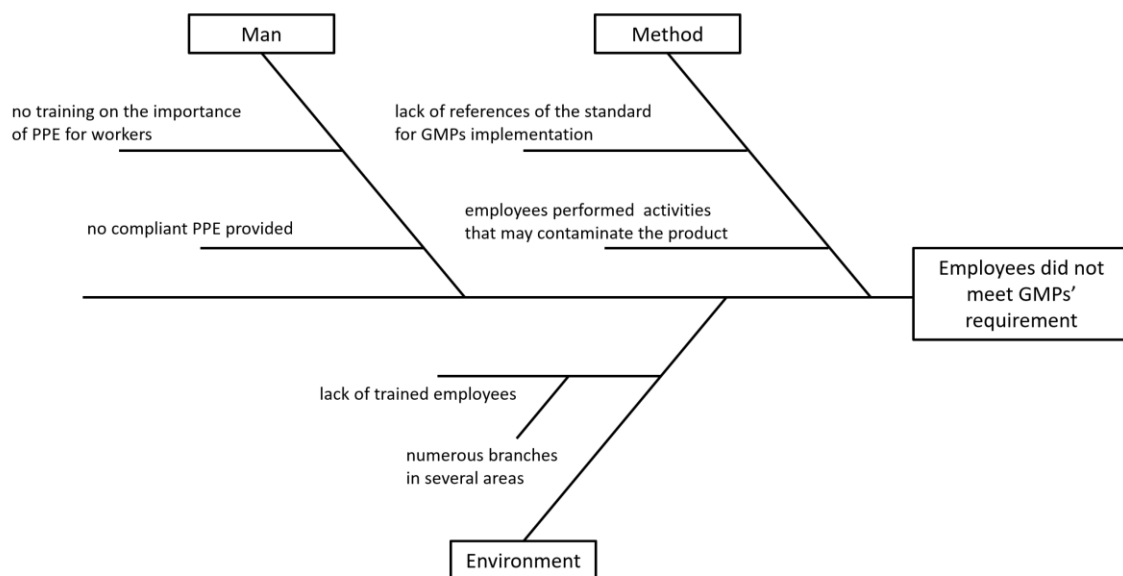


Figure 2. Ishikawa Diagram of the Factor of Incompatibility in the Aspect of Employees.

### **3.3. Recommendation for the Improvement of the GMPs Implementation in *Gudeg* SMEs**

*Gudeg* SMEs ought to carry out well-organized management, in accordance to the recommendations. Employees must be trained in order to put into operation a food safety management system. This aim is to increase the quality of personnel, particularly those who have direct contact with food products. In addition, GMPs training for employees can be provided to ensure the food safety and product quality. Furthermore, certain established industrial branches can strengthen their food safety systems. According to Medeiros et al. (2011), training and provision of sanitation hygiene visual media have proven to influence health behavior or practice; for this reason, it is deemed important to hold training related to hygiene and sanitation for employees to increase the awareness of food safety.

In addition, PPE was still required to the extent that it served as one of the employee support facilities. It was beneficial for both the personnel and the products that are produced. Aprons, headgear, and tools for taking food (gloves or food tongs) are all necessary PPE for food industry employees. (Khairina et al., 2018). SMEs is a labor-intensive industry, hence cross-contamination can be expected where the main contributor was contamination from food handlers (Lee et al., 2021). Thus, Cross-contamination could be prevented by using appropriate PPE in the food industry.

The industry management may establish a reference standard for GMPs implementation by referring to the Regulation of the Ministry of Industry of Republic of Indonesia No. 75/M-IND/PER/7/2010 about GMPs Guidelines. These regulations include a variety of measurements that have not been found in *Gudeg* SMEs' GMP implementation. The *Gudeg* SMEs was intended to further improve the efficiency of GMPs implementation in the industry.

Furthermore, the industry may introduce controls on personnel hygiene by developing Standard Operating Procedures (SOPs), encouraging workers to be more concerned and maintain personal hygiene when they enter or leave the production area. Employee habits consisted of eating and drinking at workstation, smoking, spitting, sneezing in front of food, and wearing jewellery should be prevented due to the potential contamination of the food in production area (Latif et al., 2017). This is in line with the requirement that workers wore PPE such as workwear, gloves, masks, and boots. They required to wash their hands with soap after work, particularly when after using the restroom.

## **4. CONCLUSIONS**

The level of GMPs implementation in one of the *Gudeg* SMEs in Yogyakarta was found already good with compatibility of 93.30% with a deviation of 6.70%. However, it still needs improvements, especially on the aspect of employees. The incompatibility of the GMPs implementation in *Gudeg* SMEs were the absence of employee training on food safety and personnel hygiene in industry and the lack of reference standard for the GMPs implementation in the industry. The improvements to the GMPs implementation in *Gudeg* SMEs on the aspect of employees were highly suggested. The SMEs management should be able to organize, add, and distribute the trained personnel who were in charge of implementing a food safety management system, able to provide PPE, and establish reference standards for the GMPs implementation in *Gudeg* SMEs in Yogyakarta by referring to the Regulation of the Minister of Industry of the Republic of Indonesia. In addition, making SOPs related to employee hygiene would be necessary to improve the personnel hygiene of the food handlers in *Gudeg* SMEs.

## **ACKNOWLEDGMENT**

This research was supported by Department of Agro-industrial Technology, Faculty of Agricultural Technology, Universitas Gadjah Mada. The author gratefully appreciate the *Gudeg* SMEs and respondents' participation.

## **REFERENCES**

CFR. 2016. Current Good Manufacturing Practice in manufacturing, packing, or holding human food: Part 110. The Code of Federal Regulations.

- Hendrix, T. and Nasution, S.Y. 2022. The Efficacy Strategy of the Launching New Variety Product: Case Study Bagong Canned *Gudeg* Traditional Foods from Yogyakarta. *Jurnal Manajemen Indonesia*, 22(1), pp. 88-102. doi: 10.25124/jmi.v21i3.2714.
- Khairani, T.S. and Amalia, R. 2022. Potential risk of work accident in the production process of *Gudeg* chicken using the Failure Mode and Effect Analysis (FMEA) method. *Agroindustrial Journal*, 9(1), pp. 32-43. doi: 10.22146/aij.v9i1.84164.
- Khairina, A.D., Palupi, I.R. and Prawiningdyah, Y., 2018. The Effect of Visual Media on Food Sanitation Hygiene Practices of Food Handlers in Campus Canteens (in Bahasa: Pengaruh Media Visual Higiene Sanitasi Makanan Terhadap Praktik Higiene Penjamah Makanan Di Kantin Kampus). *JHE (Journal of Health Education)*, 3 (2), pp. 65-74.
- Kuswandi, N dan David M. 2018. *People Development Handbook: Rahasia Para Profesional Trainer Mendelivery High Impact Learning Program*. Jakarta: Hasfa Publishing.
- Kibret, M. and Abera, B. 2012. The sanitary conditions of food service establishments and food safety knowledge and practices of food handlers in bahir dar town. *Ethiop J Health Sci.*, 22(1), pp. 27-35.
- Kloosterman, L., and Mager, K. 2014. *Hygiene in food processing, Second Edition: (Chapter: 14 - Pest control in food businesses: an introduction)*. Woodhead Publishing. Sawston, United Kingdom.
- Latif, R., Dirpan, A. and Indriani, S., 2017, December. The status of implementation of Good Manufacturing Practices (GMP) shredded fish production in UMKM Az-Zahrah, Makassar. In *IOP Conference Series: Earth and Environmental Science* (Vol. 101, No. 1, p. 012040). IOP Publishing. doi: 10.1088/1755-1315/101/1/012040.
- Lee J.C., Daraba A., Voidarou C., Rozos G., Enshasy H.A.E., and Varzakas T. 2021. Implementation of food safety management systems along with other management tools (HAZOP, FMEA, Ishikawa, Pareto). The Case Study of *Listeria monocytogenes* and Correlation with Microbiological Criteria. *Foods*, 10(9), pp.2169. doi: 10.3390/foods10092169.
- Lielveld, H.L.M., Mostert, M.A., and Holah, J., 2005. *Handbook of hygiene control in the food industry*. CRC Press LLC, North America.
- Medeiros, C.O., Cavalli, S.B., Salay, E. and Proença, R.P.C., 2011. Assessment of the methodological strategies adopted by food safety training programmes for food service workers: A systematic review. *Food Control*, 22(8), pp. 1136-1144. doi: 10.1016/j.foodcont.2011.02.008.
- Ministry of Finance of Republic of Indonesia. 2021. The Government Continues to Strengthen MSMEs Through Various Forms of Assistance (in Bahasa: Pemerintah Terus Perkuat UMKM Melalui Berbagai Bentuk Bantuan). <https://www.kemenkeu.go.id/publikasi/berita/pemerintah-terus-perkuat-umkm-melalui-berbagai-bentuk-bantuan/>.
- Ministry of Industry of Republic of Indonesia. 2010. Good Manufacturing Practices (in Bahasa: Pedoman Cara Produksi Pangan Olahan Yang Baik. <https://peraturan.go.id/id/permenperin-no-75-m-ind-per-7-2010-tahun-2010>.
- Moracanin, S.V., Memisi, N., Djukic, D., Milijasevic, M., Borovic, B., and Raseta, M. 2019. Air quality and impact on food safety. *IOP Conf. Ser.: Earth Environ. Sci.* 333 012111. doi: 10.1088/1755-1315/333/1/012111.
- Nurhayati, R., Rahayu, E.N.H., Susanto, A., and Khasanah, Y. 2017. Shelf Life Prediction for Canned *Gudeg* using Accelerated Shelf Life Testing (ASLT) Based on Arrhenius Method. *IOP Conf. Ser.: Mater. Sci. Eng.*, 193, pp.012025.
- Purwantiningrum, I., Widyahastuty, W., Christian, J., and Sari, N., 2018. Assessment of Good Manufacturing Practice for small scale food industry in Malang region, East Java, Indonesia. *IOP Conf. Ser.: Earth Environ. Sci.* 131 012028.