Human Resources and Technology Development for Cocoa Processing Industries in Southeast Sulawesi

1Maulidiyah, 2Ansharullah and 3Muhammad Nurdin

1Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halmahera, Kendari 93232, Indonesia.
2Department of Food Technology, Faculty of Agricultural Industrial Technology, Universitas Halmahera, Kendari 93232, Indonesia.

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Address For Correspondence:
Maulidiyah, Department of Chemistry, Faculty of Mathematics and Natural Sciences, Universitas Halmahera, Kendari 93232, Indonesia.
Tel: +6281388327118; E-mail: maulid06@yahoo.com

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ABSTRACT

The objective of this research was to identify the need for skilled human resources and technology required for the development of cocoa in Southeast Sulawesi, to develop the potency of cocoa seed by increasing its added value through diversification of its processed products, and to assess the feasibility of establishing institutions of vocational education, either in the level of high school, community colleges, or relevant courses at universities in the sub-region of Southeast Sulawesi corridor, in order to support the implementation of Master plan of acceleration and expansion Indonesian Economic Development or MP3EI (Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia) activities in this region. In the long term, this study may be used as a model for the preparation of professional and skilled human resources, and for use of the appropriate technology in other areas in Indonesia. The research was conducted with a survey method, by using questionnaires and FGD (Focus Group Discussion) of the various parties involved. The research was mapping the readiness of the human resources in the technology in developing the cocoa processing industries in Southeast Sulawesi.

KEY WORDS
Cocoa, Human Resources, Southeast Sulawesi, MP3EI

INTRODUCTION

Development of processed cocoa products, as one of the Center of Excellence in Southeast Sulawesi sub economic corridor, would require the availability of skilled human resources and appropriate technologies. Skilled and productive human resources would improve the economic growth, and therefore the availability of qualified and relevant training institutions would be a necessity[1,2]. In the era of innovation driven economy, the role of higher education institution is very important, in order to produce qualified and productive workforce[3]. In the long term, this workforce would be able to apply an appropriate science and technology for improving the added values of the sustainable economic activities. Therefore, a systematic and well-planned study is required to obtain the information of the human resources and technology readiness in the region[4,5].

The improvement of capacity building of human resources and capability in science and technology is one of the three main strategies in implementing MP3EI. This is because in the era of knowledge economy, the engine of economic growth would be highly depending on the capitalization of the research findings to become product innovations. In this context, the role of the educated human resource is the key factor in supporting sustainable economic growth. Therefore, the main objective in the education and training system should be able to create a human resource, that is quickly adaptable to the development of science and technology[5,6].
Southeast Sulawesi Province is one of the sub MP3EI economic corridor, in which the focus of this sub-corridor is to increase the added value of cocoa. So far, the commodity has been proven to be a good contributor in the foreign exchange of the country. Nationally, cocoa has been the third largest foreign earner, after oil palm and rubber[7]. Its exchange value in 2013 has reached USD 972 million, which was derived from the beans and its processed products, including cocoa butter and cocoa powder[8,9]. These processed cocoa products were needed by the food and beverage industries in many countries. As an example, the industries in the United States and Europe required about 2.5 million per year.

However, in Southeast Sulawesi cocoa has faced several obstacles, in terms of production, technology, policy, and infrastructure. [10]. Efforts to increase the added value of primary products such as diversification of cocoa beans into the processed products is one of the solutions to these problems[11,12]. This effort will require skilled human resource and technological readiness. Therefore, mapping the readiness of the technology and the availability of skilled human resources needs to be done so that the acceleration and expansion of economic development in Southeast Sulawesi sub corridor may be implemented sustainably [13].

The specific aims of this study were: (1) Identifying the needs of skilled human resources and technology needed for the development of cocoa in Southeast Sulawesi sub corridor; (2) developing an appropriate technology to increase the added value of the products through diversification; and (3) assessing the feasibility of the establishment of vocational education institutes, in high school, community college, as well as relevant courses at universities in the surrounding region. This paper has been presented on the 8th international conference on innovation and collaboration towards ASEAN community 2015.

Methods:

The overall research was conducted in three stages, which began in June 2012, and would end in December 2014. The current study was the first stage of the overall research, which was mapping the readiness of human resources and technology in developing cocoa processing industries in Southeast Sulawesi. The second stage would be conducted to study the feasibility of the establishment of community college and study program relevant to the cocoa processing industries. The last stage would be facilitating a pilot project in developing the established community college and study program. The data was collected in the cocoa production center in the Southeast Sulawesi Province. A survey method was employed, using questionnaires and FGD (Focus Group Discussion) on the various parties involved, including the cocoa farmer groups, cocoa industry, the Department of Industry and Trade, Department of Education and Culture in the district/city/provincial level, Higher Education institutions in the region of Southeast Sulawesi sub economic corridor.

RESULTS AND DISCUSSION

1. Current Condition of the Human Resource Availability in Southeast Sulawesi:

The population of Southeast Sulawesi based on the Statistic Center Bureau/Badan Pusat Statistik is as much as 2,360,586 people spread in 14 regencies/cities. Percentage of the population in each district/city can be seen in Figure 1. Most populated districts is South Konawe, and the smallest is the Konawe Island.

![Fig. 1: Number and distribution of inhabitants of Southeast Sulawesi in 2013.](image)

Seen from main employment of Southeast Sulawesi residents aged over 15 years, the majority of work is in the fields of agriculture, fisheries, and plantations (Figure 2). Thus, these commodities are very influential on the economy in this province [8].

Cocoa is a commodity that has generated significantly a foreign exchange in this area. However, based on observations in the field, most cocoa farmers still lack adequate knowledge and skills to implement ways of...
good practices [14]. This concerns ranges from farm management, cultivation, crop maintenance, harvesting, and post-harvest handling. The application of good agricultural practices (GAP) at the farm level is still very low. The cause of the problem is not solely due to technical factors, but also relates to socio-economic factors and business administration systems. Therefore, lack of knowledge, skills and awareness of cocoa farmers in cocoa cultivation standards apply to the post-harvest handling.

Fig. 2: The main job of the population is in agriculture and plantations in Southeast Sulawesi Province.

To improve the knowledge and skills of this, there should be a need for a systematic attempt, for example by forming a vocational school, community college, or college courses in the area of science and technology of cocoa processing [15]. This will require qualified human resources. Currently, the state of the quality of human resources as a whole population of Southeast Sulawesi in 2013 can be seen in Figure 3. These data shows that the number of learners level secondary schools, and colleges of the total population of each age 10-14 years, 15-19 years, and 20 - 24 years are 54%, 43%, and 26%, respectively. This shows that there are still many people who do not enroll in the existing formal education in both public and private institutions.

Fig. 3: Comparison between the number of residents based on age"U10-14", "U 15-19", and"U 20-24", (blue legend) and the number of resident attending school and university (red legend) in 2013.

2. Cocoa Production and Its Potency in Southeast Sulawesi:
Cocoa is a commodity in Southeast Sulawesi, due to good marketing prospects along with local conditions that favor its development, production of cocoa beans in this area continues to increase from year to year [7], as shown in Figure 4.

From a total of 14 districts/cities in Southeast Sulawesi, North Kolaka and East Kolaka was the major center of cocoa producers in this area, as shown in Figure 5. The other districts actually have huge potential for increased production, given the availability of land, and its environmental appropriateness.

Areas with the most potential to be developed is Muna, Konawe, Kolaka, and Konawe Island. This cocoa has contributed significantly to economic growth in this region.
Fig. 4: Production of cocoa in Southeast Sulawesi from 2009 to 2013 as well as its comparison with the results of other wood plantations [8].

Fig. 5: Cocoa production (in ton) in the district/town in Southeast Sulawesi in 2013 [8].

3. Southeast Sulawesi Cocoa as Commodity Exports:
   As an export commodity, cocoa in Southeast Sulawesi is the third largest after mining and fisheries, as shown in Figure 6.

Fig. 6: Export value in thousands of tonnes of exports of Southeast Sulawesi in 2013 [8]

4. Quality of Cocoa in Southeast Sulawesi:
The observations in the study have indicated that there are some Indonesian cocoa quality problems, especially in the Southeast Sulawesi. Among the problems is the high content of cocoa beans which were not
fermented, insect contamination, defective seed content, and quality instability[13,16,17]. These problems require the implementation of quality control measures, primarily because it is a mainstay export product[8,18]. The overall quality of cocoa at the farm level is low due to the processing of sub-standard way, in accordance with standard procedures of appropriate processing[13]. Several factors that affected the quality of cocoa is the water content, and fermentation[16,17,19]. High moisture content (more than 9%) will decrease because of the quality of cocoa beans will be vulnerable to attack by fungi and insects during storage[20]. Storage conditions will also be influential, if the place has particularly high humidity. Further impact from damage due to insects and fungi are the destruction and disintegration of component flavor of the fat from the cocoa bean[21]. With dehydrolyzed cocoa butter, it will taste rancid poses, so this will affect the use of cocoa on further processed products[9,16].

Another factor that affects the quality of cocoa in Southeast Sulawesi is the high content of unfermented cocoa seed. Most farmers do not ferment cocoa beans during processing [17]. According to the Standards of Quality Cocoa SNI 01-2323-2002, non-fermented beans was classified as grade 3 quality or low quality (Fermented cocoa beans that do not have the typical flavor of chocolate). Causative factor of the problem is the absence of differences in prices received by farmers.[9]

5. Preparation of Human Resources for Cocoa-Based Industry Development in Southeast Sulawesi:

As commodity plantations has produced many foreign exchange, cocoa in Southeast Sulawesi still have opportunities and greater prospects for development. Until recently, almost all production of cocoa plantations in this area is still sold and traded in the form of cocoa beans. Adding value and selling price of the product only within the confines of a simple post-harvest handling, as in the process of harvesting, curing, separation of cocoa beans, fermented beans, until the drying. As a result, the added value derived from these commodities is still very limited[22].

Basically, the potential and industry opportunities and cocoa-based business in this area is still very open to be developed starting from the upstream to downstream [13]. In the upper level, for example, cocoa cultivation and production of high quality is still very much needed, given the current plant has a lot of elderly and no longer efficient [23]. Various other management issues such as pests and diseases as well as smallholder management is still needed treatment. Whereas at the downstream level, e.g. cocoa processing industry into intermediate products, such as cocoa liquor, cocoa butter, cocoa paste and not developing at all[9,13]. In fact, the industry in producing the product will add value and employment opportunities for people in Southeast Sulawesi.

Realization of potential and industrial development opportunities and cocoa-based businesses in this area can only be done if there are various contributing factors, such as the raw material supply of quality cocoa beans, human resources (HR) skill, marketing, capital, infrastructure, (favorable) government policy, and management efforts [24]. For the medium and long term as mandated in MP3EI program, preparation of skilled human resources needs to be done early to support the sustainability of these efforts. Therefore, the establishment of vocational schools, community colleges, as well as courses in the universities in this area needs to be done to prepare skilled human resources in the medium and long term [8,15,25].

MP3EI program has three main strategies, namely (1) the potential of the region through the development of six economic corridors, (2) strengthening national connectivity, and (3) development of Centers of Excellence in every corridor. Relating to the third strategy in MP3EI program, preparation of skilled human resources in the field of development of cocoas needed [8].

Table 1: Stages of development of cocoa, the level of technology, educational institutions and the training required.

<table>
<thead>
<tr>
<th>No.</th>
<th>Stages</th>
<th>Level of technology needed</th>
<th>Types of educational and training level needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Germination and seedling cocoa</td>
<td>Simpleto mid level of technology</td>
<td>Secondary Vocational School &amp; Community College</td>
</tr>
<tr>
<td>2</td>
<td>Cocoa planting</td>
<td>Simpleto mid level of technology</td>
<td>Secondary Vocational School &amp; Community College</td>
</tr>
<tr>
<td>3</td>
<td>Cocoa harvesting</td>
<td>Simpleto mid level of technology</td>
<td>Secondary Vocational School &amp; Community College</td>
</tr>
<tr>
<td>4</td>
<td>Fermentation and drying of cocoa beans</td>
<td>Mid to high level of technology</td>
<td>Community Colleges &amp; Three Years Diploma Program</td>
</tr>
<tr>
<td>5</td>
<td>Processing of cocoa beans into cocoa liquor, cocoa butter, and cocoa powder</td>
<td>Mid to high level of technology</td>
<td>Community Colleges, Three year Diploma Program, and S1 Program of Cocoa Processing</td>
</tr>
</tbody>
</table>

Stages of development of cocoa, the level of technology, educational institutions, and the training required in Table 1. For regional production centers in Southeast Sulawesi cocoa beans, such East Kolaka and North Kolaka, the establishment of Community Academy in the field of development of cocoa is worth doing. This is because the establishment of such institutions will support the independence and sustainability of the industry and cocoa-based businesses in the area. In addition, Community Academy has been recognized by the government as stipulated in Law No. 12 of 2012 on Higher Education, the establishment of educational
institutions of this kind will make it easier for local cocoa farmers to be trained as skilled workers. From the survey results and interviews with local farmers in the cocoa producing areas in North Kolaka and East Kolaka, it was found that local farmers have very high interest to include daughters and sons if they can be established Community Academy in their region. Academy Establishment Cocoa Community Development in this area is also supported by the readiness of local government in setting up the required infrastructure. Similarly, the availability of the field extension skilled and experienced in the area that are ready to be involved, especially as a tutor in the educational institutions.

Conclusions:
The results obtained in this study are: (1) HR readiness to support the development of cocoa in Southeast Sulawesi sub corridor still need to be pursued in an optimal, given the number of residents age group junior high, high school, and higher education institutions in this area compared to the number of students that exist today; (2) the availability and suitability of land in various districts in Southeast Sulawesi is very suitable for the development of cocoa production. Therefore, it is necessary expansion of production areas to areas that have not been optimized production; (3) knowledge, skills, and support systems are good trading system should be given to the farmers in this area so that the quality of the resulting cocoa may increase the added value and economic value of these commodities; and (4) academy establishment cocoa community development in the area of cocoa production centers in Southeast Sulawesi feasible and necessary to support the development of the Center of Excellence in Southeast Sulawesi sub corridor as mandated in MP3EI Program.

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