Natural clay dye to develop eco-friendly products based on regional potential in Batik Crafts Center of Jarum Village, Bayat Subdistrict, Klaten Regency

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Abstract. This study aims to transfer technology of natural dyeing technique of tradition batik using clay extraction from Bayat, Klaten, Central Java. This is a solution to research partners’ problems related to the limitations of product variation techniques to meet market preference for products with innovation or novelty elements. In detail the partners’ problems include 1) Limited marketing, 2) Limited capital, 3) Prices of cloth as raw materials are getting more expensive, 4) The variety of designs or motifs and batik dyeing are limited due to artisans’ dependence on the orders from customers or batik companies, and the lack of human resources capabilities in terms of design and dyeing, particularly natural dyeing, and 5) Most production equipment of batik SMEs is old. This study used experimental and trial method. The implementation of natural dyeing techniques using Bayat clay has succeeded to solve the following problems: 1) Increasing the ability of batik artisans in Bayat to easily make varied alternative natural dyes from its local natural resources to expand market share and operating profit, 2) Cost savings or efficiency for producing eco-friendly batik dyeing, and 3) Reduced production waste due to utilizing natural dyes by using simple Liquid Waste Final Disposal Installation.

1. Introduction

There are some steps taken by batik producers to respond to market phenomena, after batik was designated by UNESCO as a world heritage cultural object, such as providing consumers with alternative products with some innovations, including novelty in terms of motif design [1]. Natural dyeing is the right method to be applied with various techniques acceptable for batik products [2]. Moreover, it aims to create smart consumers, since they use environmentally friendly (eco-friendly) products [3]. Business competitors in batik industry will be able to survive if they add some innovation to their products which that prioritize on the benefits and put more concern on environmental sustainability [4]. The orientation of consumer awareness to start using various eco-friendly products by applying an advanced recycling process for their waste as well as using products sourced from natural and organic materials, is increasing rapidly [5]. This is indicated by the increasing demand for clothing and food products which are categorized as green products basis starting in early 2020 during the pandemic era [6].

The potential of Micro, Small and Medium Enterprises (local term: UMKM) at the local level developed as an effort to accelerate community economic empowerment includes the leading commodities in creative industry, of which will become the leading commodity industry in most
regencies or cities in Central Java Province in the future [7]. The commodity of creative industry which now still becomes the leading commodity is batik industry, more particularly hand-drawn batik industry, stamped and printed batik motifs [8]. Klaten is one of the regencies (administrative area under provincial government) in Central Java Province of Indonesia which has been actively developing batik craft industry, both hand-drawn and stamped batik [9]. This industry is one of the leading industries in Klaten Regency. Batik creative industry is developed into a cluster by the local government of Klaten regency. Thus, it is expected to play a significant role in supporting the contribution to the industrial sector regarding Klaten Regency's Local Own-Source Revenue (Local term: PAD) [10]. The potential of batik industry in Klaten Regency can be indicated by the availability of a large enough workers, relatively stable number of demand for batik products, proportionately steady amount of batik SMEs’ production, although in recent years it has declined due to the growing amount of imported batik products from China [11]. In addition, there are some opportunities for materials and production processes efficiency as well as for increasing the economic value of the products that can be used as the innovations or elements of product novelty [12]. This is conducted by developing elements of natural dyeing techniques by utilizing the potential of excellent natural resources; accordingly, the products resulted can be categorized as eco-friendly products [13]. These development efforts can be carried out through the application of natural dyes for batik using clay from Bayat area.

2. Methods
The location of this research was determined by purposive method, i.e. based on certain criteria or considerations in accordance with the purposes of the activities implementation [14]. The locations of the study are Kebon Agung and Gedhang Kluthuk Hamlets (administrative area under village government). These hamlets were chosen as the research location because the two hamlets are the centers of the hand-drawn and stamped batik industry in Klaten Regency. In addition, there are 2 (two) Small and Medium Enterprises or SMEs (local term: Usaha Kecil Menengah-UKM) partners, i.e. UKM Batik Sekar Mawar and UKM Batik Nardo. These two SMEs were selected based on the consideration that both SMEs develop 2 (two) types of batik, i.e. UKM Sekar Mawar Batik develops their first-rate product, hand-drawn batik, while UKM Batik Nardo develops their superior product, stamped batik. In addition, these two Batik SMEs still have not shown significant results in selling their products. Only a few large-scale batik houses have successfully increased their sales. Moreover, they still use conventional methods in the process of making batik products which makes production costs sharply increase. Furthermore, the ability of the artisans to develop motif designs and natural dyeing alternatives with local potential basis is still minimal [15].

This study was conducted by implementing numerous types of activities which were carried out continuously [16]. There are a few methods conducted in carrying out the research, i.e. documenting data of the improvement of the artisans’ skill through training, introducing technology into batik industry, facilitating access to marketing, and monitoring [17]. The training carried out was focusing on developing batik designs, extracting clay to be natural dyes, and dyeing batik cloth with natural dyes made of clay. The introduction of technology was done by making liquid WWTP and how the system works. Marketing access facilitation for targeted SME products was implemented by conducting comparative studies about marketing development by establishing a tourist village of batik craft centers. The data collection activity was carried out by visiting UKM Batik Adi Busana, Bekonang village, Sukoharjo regency, Central Java province under a strict health protocol [18]. The last is assistance program as an effort to monitor all activities as well as to collect research data during the implementation and at the end of the activity [19]. Comprehensive monitoring was carried out 6 times. At the beginning of the activity, monitoring was done before the implementation of the study, i.e. monitoring the planned activities to be carried out, including scheduling, preparation of tools and materials, training locations and the introduction of batik waste treatment technology, as well as coordination with the artisans involved in the research [20].
3. Results and discussion
Bayat clay natural dye can be defined as a concept of efficiency which includes aspects of process and energy or a production process that minimizes production time, raw materials and energy. Natural dyes for traditional textiles (batik, hand-woven (local term: tenun), Indonesian traditional woven fabric (local term: songket)) are categorized as efficient by considering the ratio between the added value obtained from the economic side and the added value obtained from the ecological side [21]. Making Bayat clay natural dye is a strategy which combines the concept of economic efficiency based on strategic principles to produce products with better performance through the use of less energy and natural resources [22]. In principle, eco-friendly clay natural dyes is an effort done by Bayat Batik Craft Center to achieve 3 benefits, i.e. increasing the ability of batik entrepreneurs and human resources to make alternative batik motifs easily and varied in order to increase the market share and operating profit, cost savings due to the fact that the application of natural dyes can help realize real benefits for the company, and the process of making the same motif can be done with half the overall process time. Thus, the more efficient the use of time for the production process is, the smaller the expenditure for production costs will be, which eventually results in operational cost efficiency [23].

Klaten Regency is one of batik industry centers in Central Java Province. There are actually some subdistricts in Klaten Regency which still have batik industries, including Bayat subdistrict, especially in Jarum Village located approximately 25 km from Surakarta City [24]. Batik industry in the craft center has not yet applied natural dyes from clay to their batik products. Furthermore, there are still many problems in the batik industry related to product innovation and efforts to increase operating profits. In addition, most of batik SMEs in Bayat subdistrict own limited designs on their own batik motifs and there are some batik SMEs which are still very dependent on the orders of batik motifs from batik companies in Solo, Pekalongan, and others in the production. There are 40 batik SMEs scattered in several villages in Bayat subdistrict, including a moderately large number of batik SMEs in Bekonang Village, approximately 25 batik SMEs. One of the SMEs with a large scale of business is UKM SEKAR MAWAR Batik (SME-1), which has been working on batik with contemporary and Bayat Batik patterns. Meanwhile, UKM Batik NARDO, hereinafter referred to as SME-2, is also one of batik SMEs in Bayat Subdistrict, which is accurately located in Gedhang Kluthuk Hamlet. The batik patterns in this SME-2 are more complimentary, including contemporary and Bayat batik, patterns requested upon customer orders, and the process is done using a combination of stamp, printing and hand-drawn batik techniques [25].

The data of business SME-1 includes the conditions of production place, production materials and equipment, and also waste management of batik production. The condition of the business place in terms of production place is considered to be adequate as there is already a division of space for each production process. The condition of equipment and materials used is also sufficient; however, it is still necessary to add and repair as well as improve the equipment for production, especially the production equipment which is already starting to break down. This possible is due to the fact that some of the equipment is made of wood, such as tools for dyeing and pelorodan (a process of releasing wax from the cloth).

Meanwhile, the equipment for the batik process and dyeing process with natural dye is not yet available, particularly for production in large quantities, such as stoves, pans, pots, and wok [26]. The materials for dyeing are thus considered still inadequate, specifically natural dye material, such as bark, gambier, and so on. In the management of industrial waste, the conditions found in SME-1 seem to be still inadequate, for example the efficient use of raw materials and supporting materials, the existing management of liquid and solid waste, mainly solid waste from the remaining cuts or pieces of cloth, batik wax, and dyes, mainly waste from the process of material preparation, making batik (drawing, printing or stamping), dyeing, pelorodan and washing [27].

Solid waste is not only in the form of remaining cuts or pieces of cloth, but also batik wax and waste from dyeing activities in SME-1 as much as 2 quintals per month in dry form. Regardless the price of batik wax for hand-drawn batik is IDR 28,000 per kg; thus, if it can be processed again it will save the cost of raw material by IDR 5,600,000. Until now, the waste from cuts or remaining pieces of cloth has
not been processed into craft products, such as wallets, bags, etc. Meanwhile, batik wax waste has not been processed again into batik wax, of which subsequently can be reused in batik production. In addition, in terms of environmental health, employees, principally those working in dyeing and pelorodan division, until recently do not wear masks and gloves yet to protect against the effects of chemical dyes, while liquid waste from dyeing activity has so far only been flowed through the sewers inside the house to the surrounding gutters. Consequently, this waste management makes the water flowing in the gutters become colored, but not harmful to health [28]. Batik production in SME-1 is hand-drawn batik, because SME-1 still maintains the characteristics of batik products by producing BAYAT Batik patterns or contemporary batik patterns. The production capacity per month is around 300 pieces of batik cloth, while the sales turnover per month is IDR 90,000,000 with the price of hand-drawn batik being approximately IDR 300,000 per piece of cloth. There are about 20 motifs of batik motif designs have been produced by SME-1, and most of which are typical BAYAT’s unique batik designs, i.e. checkered pattern designs with various colors. The dyeing process is usually done using blue chemicals and natural dye from wood and gambier (purple). However, these natural dyes are still in the experimental stage. Even though SME-1 produces hand-drawn batik, they also receive dyeing services from other batik SMEs. Overall earning has decreased by 80% based on the average calculation for the second quarter of the pandemic in 2021 [29,30], as conveyed by the coordinator of Bayat Batik artisans.

4. Conclusion
This research activity resulted in several points which in fact exceeded the initial expectations on the application of natural clay dyes on Bayat Batik. Various things have indeed become turning points for business progress at Bayat Batik craft Center. This study has opened the artisans’ insight regarding the sustainability of batik business which can be achieved by adapting to the times. A comparative study for batik business insight into the center of batik industry in Bekonang, Sukoharjo became the closing for the series of the research activities. In addition, monitoring and evaluation are still regularly conducted for the sustainability of partnerships, collaborations and services for the development of batik business in Jarum Village, Klaten Regency. However, there are such potential issues to be solved in further research as developing the concept of batik tourism village that offers short training and workshops to maximize the potential and resources within Bayat Batik craft center. The followings are other documented problems related to the proposal for further service activities, i.e.: (1) it is difficult for the artisans to develop their businesses and to increase sales because of the increasing number of competitors, especially imitation products which use printing techniques, (2) the artisans are still not able to apply and build wastewater treatment plant (local term: IPAL) for liquid waste from batik production independently, which is actually very beneficial for the continuity of batik production, mainly to reuse water from wastewater treatment, (3) the artisans have difficulty in marketing natural dyed batik due to its long process, and (4) the artisans find a few obstacles in providing raw materials of cloth that makes the price expensive. Accordingly, it is immensely expected that the increase in revenue and sales will be able to be the main support for significantly solving the problems described above. Natural dyeing of batik using Bayat clay extract and variations in motif designs is effective for diversifying Bayat Batik products and increasing the artisans’ understanding on eco-friendly or environmentally friendly batik processes. The understanding of batik artisans concerning the orientation of sustainable production by considering nature and environmental conservation aspects becomes an urgent point which must be continuously socialized.

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