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Utilization of Local Grass *Cynodon dactylon* for Football Field Rehabilitation and Minimizing the Incidence of Injuries

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Abstract

The problems faced are uneven football field surface, uneven grass growth, many pebbles and boulders, stagnant and muddy during the rainy season and fractures in the soil during the dry season which make the field not of a good standard for use and have an impact on the incidence of injuries to field users. This study aims to improve the quality of grass for football field using quality local grass *Cynodon dactylon* in order to overcome the problem of bad fields and avoid field's users injury. The method is through field rehabilitation technology by improving the surface design and soil media profile as well as the use of quality local grass. The rehabilitation technology includes improving the surface of the field to improve drainage by designing a "*geger sapi*" shape. The assessment of the rehabilitation results used a qualitative approach with a questionnaire survey to the local community of field users. The results of field grass rehabilitation make the quality of grass in the field after rehabilitation better growth by 45%, perception grass quality was very good by 43%, the surface of the field is flatter, no gravel and surface rocks are found so the flooded were not found by 83%. Field conditions with better grass quality also reduce the frequency of injuries incidents of player during competition about 61%. Hence, field grass rejuvenation benefits the environment and public health. This great benefit will increase the comfort and closeness between the local community.

Keywords: drainage system; football grass-field; foot injury; "*geger sapi*" shape; turfgrass

INTRODUCTION

Social facilities are facilities held by the government or private parties, can be utilized by the general public in a residential environment. Sports fields are one of the important social facilities and need to be available in a residential environment to be used by the community individually and in groups. General facilitation and comfortable surrounding environmental conditions will create a good quality of life for the community (Permanasuri and Yulianasari, 2021). One of the public facilities is the field, which is used to support community activities in open spaces. Activities that are often carried out on the field are sports activities, including football, volleyball and badminton (Wahdah and Dewi, 2013). Sports activities as a sense of spirit that occur due to awareness, enthusiasm and strength in the self (Hsu et al., 2020). Therefore, sports activities are expected to be carried out comfortably in order to

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produce physical and spiritual health (Vorokhaev, 2020).

The Anggrek Semi Football Association (PSAS) located in Klaruan Hamlet is a research partner engaged in community empowerment by facilitating the local young generation in carrying out football training exercises. PSAS already has its own field on village treasury land. However, the condition of the field surface is uneven, grass growth is uneven, there is a lot of gravel and surface rocks, flooded and muddy during the rainy season and there is fracturing during the dry season which makes the field not of good standards for use. Mr. Sugito, S.Pd., as the Head of Palur Village, Mojolaban Sub-district, Sukoharjo Regency stated in certificate number: 145/08/I/2022, that football field rehabilitation facilities are needed by PSAS in order to have a good standard field so as to improve the quality of players' play, and minimize the incidence of player injuries. The criteria that must be met by sports fields in order to provide comfort for use include clean, well-maintained, beautiful and comfortable (Wahdah and Dewi, 2013), and special criteria for the comfort of football sports according to Peng et al. (2020) are the suitability of using the type of grass, surface and planting media, as well as the growth of the grass.

Conditions of Palur Village field with natural grass whose uneven growth on the surface are at risk of causing serious injury events (Ngatuvai et al., 2022). The characteristics of the field grass surface including traction, hardness and evenness affect the player's footing or grip and have an impact on the incidence of injury (Mathew et al., 2021). According to Serpell et al. (2012) grasses with conditions that are too long and thick produce a greater friction force when used. Gravel and surface rocks, fracturing of the soil and uneven growth of grass can cause injuries such as beret wounds or scratch wounds from being exposed to gravel or hard ground surface when falling. Flooded field conditions during the rainy season can cause users to slip. Foot injuries from falls while playing ball can cause trauma to the head, knees and shoulders (Meyers, 2010). Based on the description that has been submitted, it shows that field conditions that are not of good standard are at risk of injury and cause health problems. Therefore, it is necessary to carry out field rehabilitation to reduce the risk of user injury. Field rehabilitation activities are expected to be carried out because they provide many benefits not only to PSAS partners, but also to the people of Palur Village.

Local grass in the partner area is included in the type of *Cynodon dactylon* which belongs to the Poaceae family (Zheng et al., 2017). *C. dactylon,* known as Bermuda grass, is a plant that can repair ecological damage, including soil. *C. dactylon* can adapt and grow in sodic soils and irregular conditions by dispersal of seeds to rhizomes (Singh et al., 2013). In saline soil conditions, the water quality is low (irrigation using wastewater) even though this grass can grow well without much addition of nitrogen fertilizers (Licata et al., 2022). The availability of *C. dactylon* in the field and the method of breeding make this grass relatively easy and more often used for afforestation practices (Ng et al., 2020). *C. dactylon* is widely distributed in the tropics and subtropics with the advantages of strong viability (Leung at al., 2015), fast reproduction and resistance to trampling making this grass suitable for field rehabilitation (Wang et al., 2020). In addition, the roots and leaves of grass plants can reduce the velocity of run off and reduce the amount of soil erosion. Utilization of quality local grass as a manifestation of developing regional resource potential and overcoming existing problems in the region. For this reason, this study aims to improve the quality of grass for football fields using quality local grass *C. dactylon* in order to overcome the problem of bad fields and avoid field's users injury.

MATERIALS AND METHOD

Overview

The football field in Klaruan Hamlet, Palur Village, Mojolaban Sub-district, Sukoharjo Regency, Indonesia is empowered by the partners of the football association PSAS by facilitating the local young generation in carrying out football practice exercises. PSAS already has its own field on village treasury land. Uneven field surface conditions, uneven grass growth, a lot of gravel and surface rocks, flooded and muddy during the rainy season and there is fracturing during the dry season which makes the field not of good standards for use. The Head of Palur Village, Sugito stated in certificate number: 145/08/I/2022 that the football field needs to be rehabilitated so that the field is of good standard and quality, so that it can have a positive impact on many

aspects in the development of potential partners, communities and villages.

Problem identification

The results of the analysis are the implementation team on partner issues show that the football field managed by the PSAS partner has a high level of injury risk to the field user community. The field soil surface is uneven, grass growth is uneven, there are many gravel and surface rocks, flooded and muddy during the rainy season, while in the dry season there is a lot of fracturing, which shows that the current field conditions make the field not of good standards. The football association, PSAS, planned the idea of improving the field, but has not yet mastered the knowledge and technology of how to rehabilitate the field to meet good requirements and minimize the risk of injury. In-person outreach and demonstration facilities are needed to enhance knowledge and skills in field rehabilitation and sustainability of its maintenance. Therefore, the service implementation team offers solutions to overcome the problems faced by partners (Figure 1), namely rehabilitating and socializing to educate partners about field rehabilitation knowledge and technology by improving surface design and soil media profiles as well as the use of quality local grass. Utilization of quality local grass as a manifestation of the development of regional resource potential owned by partners.

Implementation methods

This community service was carried out from April to November of 2022. The stages of service activities consist of: (1) preliminary survey to determine the condition of partners, football field and environment, (2) dissemination of football field rehabilitation technology to partners, (3) carry out football field rehabilitation by the process of: surface leveling, improvement of soil media profile and growth and maintenance of grass, (4) assessment of community satisfaction through questionnaires. This service uses a qualitative descriptive approach by taking into account the success of grass utilization and community satisfaction with the quality of the field before and after field rehabilitation is carried out. The results of the study will discuss the condition of the field grass and the incidence of injuries from the perception of football field users (Figure 1). Fifty respondents were interviewed directly on the field in order to acquire information regarding football field user satisfaction. Related respondents are community members who utilize the pitch.

Field rehabilitation starts from the preparation of the planting medium and the selection of the type of grass to be used. Preparation of the planting medium is carried out by leveling the surface of the field in advance. Field surface

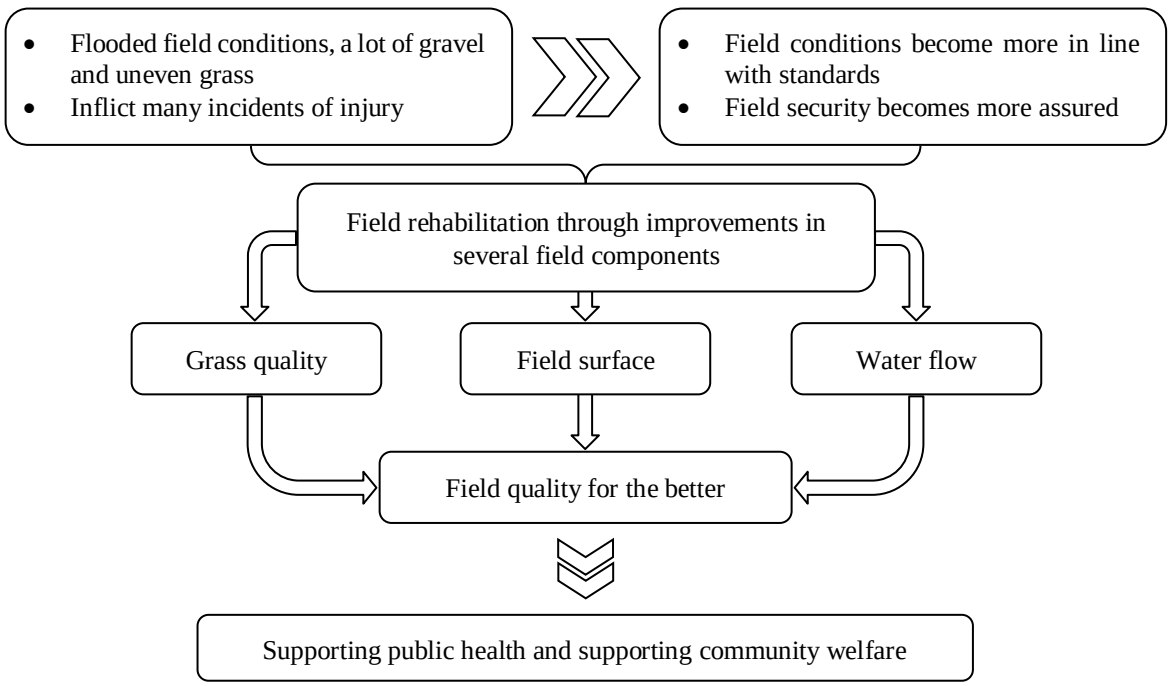


Figure 1. Football field rehabilitation process

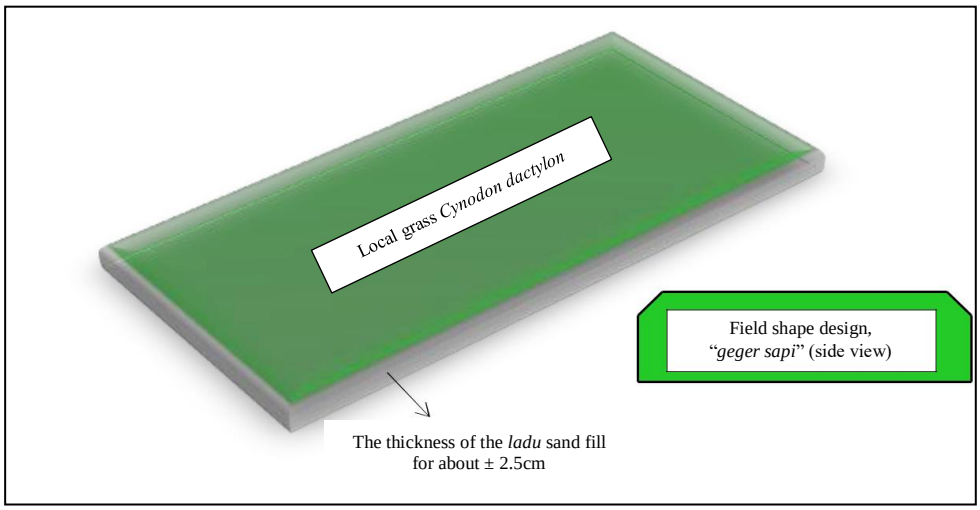


Figure 2. Football field design "*geger sapi*" with local grass *C. dactylon*

leveling using heavy equipment. Soil leveling serves in clearing the field and removing grass debris and weeds around the field soil, as well as ensuring gravel and surface rocks covering part of the soil surface are also removed. Rehabilitation technology includes improving the surface of the field for drainage improvements by designing a "*geger sapi*" shape where the middle is made higher and on the right and left sides is made lower for water drainage arrangements. Improving the soil media profile by cleaning gravels and then adding *ladu* sand material on the surface with 2.5 cm high. In this community service was chosen *C. dactylon* as a grass for planting in the field. Provision of grass seedlings (*C. dactylon*) vegetatively and maintained for 45 days (Tan et al., 2017). Ready grass is immediately planted into the growing medium by transferring it to a substrate with a mixture of sand with soil using a ratio of 1:1. Next is carried out treatment for 45 days. *C. dactylon* is proven to be adaptable to even dense soil conditions so that the biomass produced remains high.

Lawn maintenance is carried out at the time after planting the grass, in order to take care of the growth and quality of the grass. Maintenance is carried out by applying liquid organic fertilizer and pruning weeds around the *C. dactylon* grass planting (Figure 2). Maintenance is carried out by PSAS partners with direction from the implementation team during socialization. Assessment of the incidence of injuries before and after the rehabilitation of the football field.

Evaluation and monitoring

Periodically, evaluation and monitoring are carried out by field observations and interviews with 50 PSAS partners. The evaluation and monitoring results are presented in a qualitatively descriptive manner meant to convey a variable succinctly and clearly. The descriptive research data can be utilized for further analysis and conclusion drawing (Riptanti et al., 2018).

RESULTS AND DISCUSSION

Field grass conditions

Cited from *Quality Concept For Football Turf* states that the turf surface of the field is required to be constant (Paripurno, 2014). The condition of good quality grass is one of the most important parts of football, balanced by a good field ground level as well (Pablo et al., 2012). Likewise in this football field rehabilitation program, where field conditions are improved from various aspects, ranging from grass, soil surface, to field conditions during rain and drought. Throughout the rehabilitation process, grass growth after planting is said to be excellent. It grows quite quickly within 4 to 6 weeks after planting (WAP).

Data shows fertilization affects grass growth after rehabilitation. Based on the results of the public perception survey (presented in Figure 3), as many as 45% of grass growth is affected by fertilization, while those who state that it is very influential are 23%, quite influential 26% and only 6% state that it has no effect. Fertilization is closely related to the availability

of nutrients for plants and refers to plant growth. The type of grass plants applied fertilizer shows very noticeable vertical growth (Kastalani et al., 2017). Similar results also occurred in the research of Qohar et al. (2021) where fertilization treatment had a very noticeable effect on grass growth results, especially on the diameter of the stem, the number of leaves and the height of the plant. The higher the dose of organic fertilization results in better grass growth (Holanda et al., 2021). Applying fertilizer to this rehabilitation program is the right step to obtain good grass growth (Zhang et al., 2021).

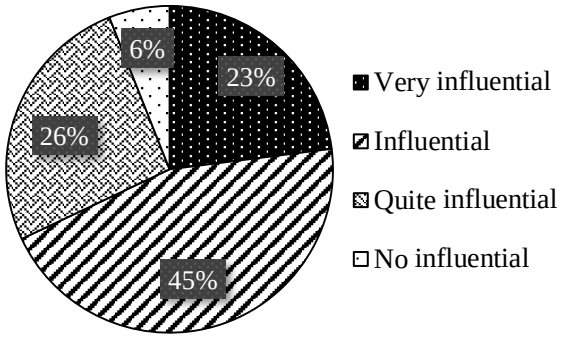
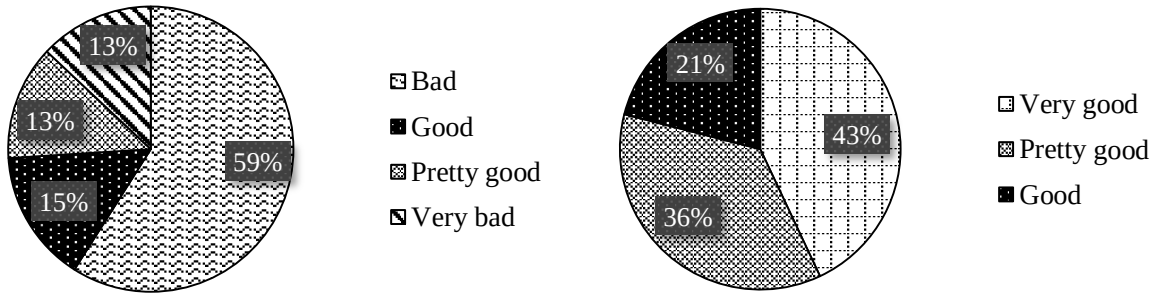


Figure 3. Fertilization effects on grass growth

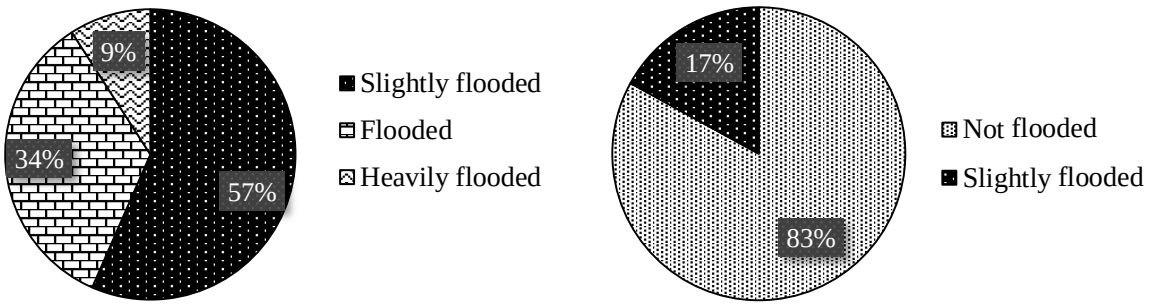
Another aspect of the condition of the grass observed post-rehabilitation is its growth along the field plot (Hancock et al., 2019). The public's perception of the condition of the grass before rehabilitation was 13% very bad, 59% bad, 13% pretty good and 15% good (Figure 4). The condition of the field grass after rehabilitation is very good. The grass of *C. dactylon* used is of high quality, with morphological characteristics of the grass *C. dactylon* has a high drought tolerance ability. The results showed 43% stated the quality of the grass was very good, 21% stated it was pretty good and 36% stated it was good enough (presented in Figure 4), so that in real terms the rehabilitation of the field using *C. dactylon* grass provides satisfaction for the local community and creates good field conditions.

Field conditions during the rainy season before rehabilitation are very flooded due to poor soil drainage conditions (Kaur et al., 2020). The percentage of fields that were inundated before rehabilitation was 9% heavily flooded, 34% flooded and 57% slightly flooded (Figure 5). The flooded conditions resulted in the grass being submerged in water and the pitch being uncomfortable to use. Too dense soil surface makes it difficult for the soil to absorb water. As a result, during the rainy season where the rain intensity is high, the field cannot be used comfortably and as it should be. Poor drainage conditions are the cause of flooding (Pratiwi et al., 2020). Drainage channels function as groundwater infiltration in an environment (Daraz et al., 2021), usually made by making small pore holes with a diameter of 10 cm and a depth of 1 to 1.5 m. Figure 5 shows that post-rehabilitation field conditions have better drainage conditions than before rehabilitation. Based on the survey results, field conditions after rain only occur slightly flooded 17% to not flooded 83% (Figure 5), where conditions are better than before rehabilitation if after rain there is a flood with a slight to very inundated intensity depending on the intensity of rain at that time. The field rehabilitation program is able to improve drainage conditions, and improve the comfort of field users by lowering the level of inundation in the field after rain.



a. b.

Figure 4. Public perception of (a) grass condition before rehabilitation, and (b) grass condition after rehabilitation



a. b.

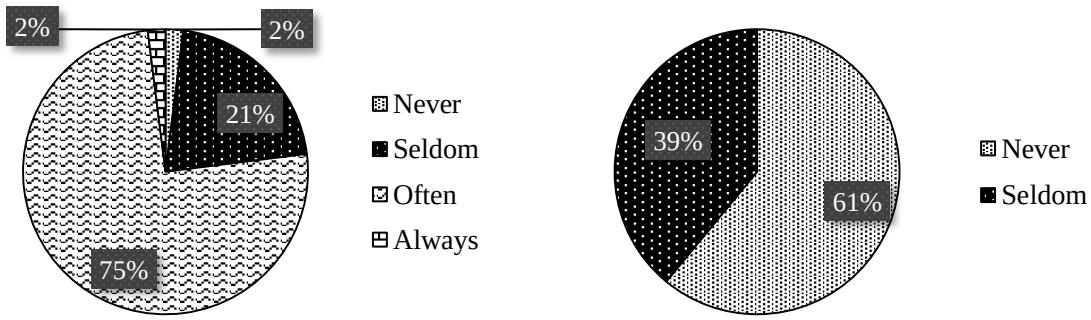
Figure 5. Public perception of (a) field condition after rain before rehabilitation, and (b) field condition after rain after rehabilitation

Injury incidents

Injury is an accident that results in injuries and causes pain in the joints, muscles and bones in the body, hands, feet and head (Jones, 2019). Football sports injuries can occur at the time of the game and training. The skill of football players in performing basic movements determines the mastery of positions and situations when playing on the field. Players who are not proficient in performing basic techniques are at risk of injury. In addition, injuries can be caused by the condition of the field used is not of good quality. The results showed that the injury intensity of PSAS football players was relatively frequent at 75%, while the relatively rare intensity was only 21% (Figure 6). The high intensity of frequent injury events indicates that there were many injuries to PSAS football players on the field before rehabilitation, where the intensity also represented poor field conditions.

Based on pre-rehabilitation field observations, field conditions are known to have a lot of gravel and surface rocks, and uneven grass on the field surface (as shown in Figure 7). Pebbles and surface rocks can result in scratches and abrasions to infection of injured parts of the body. Several incidents of injuries due to poor field conditions often occur. The injury incident of a PERSIK Kediri national football player due to poor field conditions occurred at Brawijaya Stadium, Kediri, during Bhayangkara FC's match against PERSIK Kediri (Top Skor, 2020). Paul Munster, coach of Bhayangkara FC stated that the uneven condition of the field surface, as well as the thickness of the grass with holes in some parts of the field caused players to run out of energy, fatigue and slip to injury. The poor field conditions also caused the running of the game to be disrupted, and even the players became uncomfortable when doing short ball games between players. Similar conditions also occurred during the international match between Argentina and Mexico at AT&T Stadium, Dallas, United States in 2015. Argentine national team footballer Lionel Messi suffered a foot injury from a slip on the sunken grass (Wicaksono, 2016).

Injuries due to poor field conditions lead to the importance of observing the quality of



a. b.

Figure 6. Public perception of the frequency of (a) injury before field rehabilitation, and (b) injury after field rehabilitation

the field, and if the field conditions are bad, it is necessary to carry out rehabilitation. Grass media is an important component supporting positive benefits in football sports facilities. Improvements in field quality, especially improvements to grass and field surfaces, will minimize the incidence of falls, slips, fatigue while playing and injuries to players. A field with good grass and surface quality creates comfort and safety for the players and the entire team that will compete. According to coach of Borneo FC (Susetyo, 2022), the good quality surface and field grass at Brawijaya Stadium, Kediri, post-rehabilitation is considered to increase the confidence of the players to play their best technique, and do not have to worry about injuries when playing, so as to produce a good game when competing.

Similarly, according to the community, the field rehabilitation program carried out in Klaruan Hamlet provides satisfactory results and actually maintains the health of PSAS partner athletes and the local community (Figure 8). The incidence of injuries of football players on the Klaruan Hamlet field has decreased drastically. Based on the results of the study, 61% of the public stated that there had never been an injury incident, and only 39% stated that

Figure 7. State of the football field at Klaruan Halmet before rehabilitation (Pre-survey on January 19th 2022)

Figure 8. State of the football field at Klaruan Halmet after rehabilitation (Tryout by the village football team on November 26th 2022)

there was still an incidence of injury with a rare intensity (Figure 6). Improvements in the quality of the pitch showed good results, where there was a decrease in the incidence of injuries from those whose intensity often became less likely to never and rarely occur in each game.

CONCLUSIONS

This study revealed that rehabilitation football fields with local grass *C. dactylon* and drainage improvements by designing a "*geger sapi*" was highly recommended. Improvement in the field improves grass quality with good growth, the surface of the field is flatter, not flooded and no gravel or surface rocks are found. Thus, the good grass quality in the field conditions reduces the frequency of injuries of the players during competition. By evolving and adopting these methods in the rehabilitation of the football field, it is possible to improve public health and community welfare.

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