



SYSTEM-TRAP-RAINWATER ENGINEERING AND LOCKBRICK TECHNOLOGY IN HOUSEHOLD SCOPE TO IMPROVE QUALITY OF LIFE

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ABSTRACT

East Indonesia is classified as underdeveloped regions, especially in rural areas. Still found many unhealthy homes with limited available water anyway. Both of these problems resulted in a low quality of life. Encouraged by this challenge, and then developed a system-trap-rainwater engineering to provide water availability and lock-brick technology for a healthy home. The principle of system-trap-rainwater engineering are set the rainfall water on household yard remained in the yard by install the system to trap rainwater, keep and manage to meet the water need for life. This system consists of wells-trap-rainwater and drain-trap-rainfall-water, which interconnected as a network inflow to wells-trap-rainwater. The availability of adequate water can be used to develop agricultural-yard system to improve food security. The lock-brick technology is to build itself a healthy home at low cost. Dugouts when creating wells, utilized as a base material for making lock-brick. After a sufficient amount of lock-brick to build a house, and then compiled interlocking brick as new healthy house. It could be conclude that both system-trap-rainwater engineering and lock-brick technology could improve the quality of life.

Keywords: system-trap-rainwater, household yard, lock-brick technology, healthy homes.

INTRODUCTION

East Indonesia is classified as underdeveloped regions, especially in rural areas. Still found many unhealthy homes with limited available water anyway [1]. Both of these problems resulted in a low quality of life. Encouraged by this challenge, and then developed a system-trap-rainwater engineering to provide water availability and lock-brick technology for a healthy home. Many *embungs* (small reservoir) have been done for the water availability problem, but could not yet reach better development [2].

Since 2010, Susilawati has tried to promote the water-trap series along the gully as gully plug to get more water for agriculture and domestic-municipal-industry need. Based on the local wisdom, like systems done by people in Daieko village to get water by holding water flowing in the grooves of the natural drainage system called as water trap, that was developed a simple system to manage water as form as rain water trap series such as simple embankments as gully plug [3]. This system was developed to cope floods and droughts on small islands [4]. Furthermore, from the village of Daieko case studies, it has developed for the whole entire island of Sabu [5]. From the observation of the reservoir system failure cause largely due to the cliffs erosion of reservoir design, the system was developed further by adding a cliff reinforcement system with vetiver grass [6]. This system not yet implement anymore due to various constraints, especially concerning financial terms. Then this system developed furthermore in the household scale [7] which was implemented in four families in the Tli'uvillage. The most powerful constraint in water trap series system is the operation and maintenance of these structures [8]. This obstacle strengthened again by dwelling communities from each other. Fuelled by this experience, so was

developed of rain water management for agriculture and the need to live in a household scale system. That's could be happened because of between each household place are far each other (Figure-1). From the year of 2004-2010-2013, the Tli'u imagery as describe in Figure-1, it could be seen that the changing of the housing in the village is not significant. In the year of 2014 and 2013 was greener, as indicated during rainy season, but in the year of 2010 look like not green because of the dry season. Rainwater management in the household scale as system trap rainwater engineering would be the way to cope the scarcity for this condition.

SYSTEM-TRAP-RAINWATER ENGINEERING

The principle of system-trap-rainwater engineering is set the rainfall water on household yard remained in the yard by installing the system to trap rainwater, keep and manage to meet the water need for life. This system consists of wells-trap-rainwater and drain-trap-rainfall-water, which interconnected as a network inflow to wells-trap-rainwater (Figure-2). Combined with rainfall water on the roof, which are managed by rainwater catches canal structure that completed with mineralization and filtration structure so could use as clean water for life. These both systems build as rainwater management concept (Figure-3).



Figure-1. Tli'u village imagery from 2004-2010-2013.

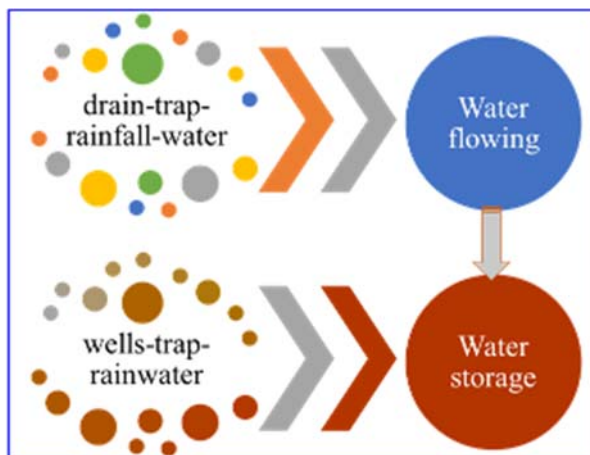


Figure-2. Principle of system-trap-rainwater engineering.

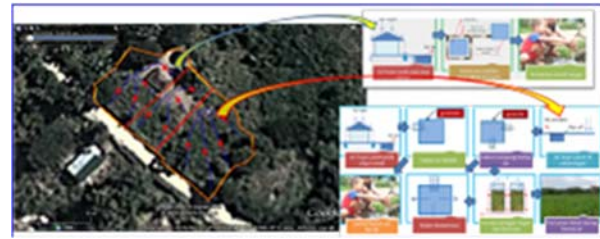


Figure-3. Rainwater management concepts.

Several steps have to be done for designing this model, i.e.:

- First step for surveying to the location, it must be observe how the runoff flowing, so that can be decided the location of the wells-trap-rainwater tank.
- Second step for analysing the water availability, it must be determined the catchment area of rainwater for each wells-trap-rainwater tank, so it can be known the volume of rainwater which can be captured and stored in the well-tanks.
- The next step is to be determined the dimensions of the catchment wells-trap-rainwater tank in accordance with the potential of rainwater that can be captured.
- The final step is designing drawings of the catchment wells-trap-rainwater tank.

Agricultural-yard system to improve food security

Agricultural development efforts to improve food security in the province of East Nusa Tenggara are always constrained by the scarcity and abundance of water. Water scarcity is often happened because of dry area, but the abundance of water also occurs because of the very high intensity of rainfall in a short duration of the rainy season. This situation known as water-logging conditions or water-saturated soil conditions, which reduce crop production or even the plants will die. Another situation which also resulted in crop failure is a condition of dry spell, where there is long enough of rain lag time during the rainy season.

The availability of adequate water from rainwater management system can be used to develop agricultural-yard system. The availability water will guarantee the agriculture water need, so that will be improving the food security (Figure-4).

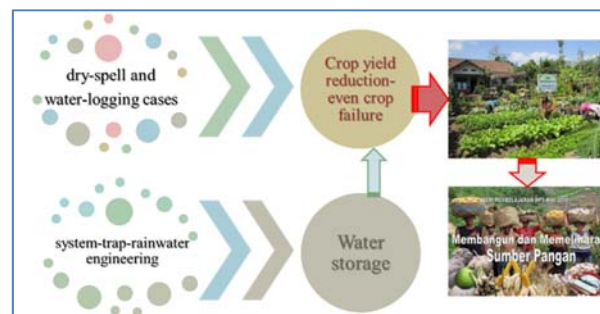


Figure-4. System-trap-water engineering for food security.



THE LOCK-BRICK TECHNOLOGY

The lock-brick technology is to build itself a healthy home at low cost. Dugouts when creating wells-trap-rainwater tank, utilized as a base material for making lock-brick. When sufficient amount of lock-brick to build a house are ready, then compiled interlocking brick as new healthy house (Figure-5).

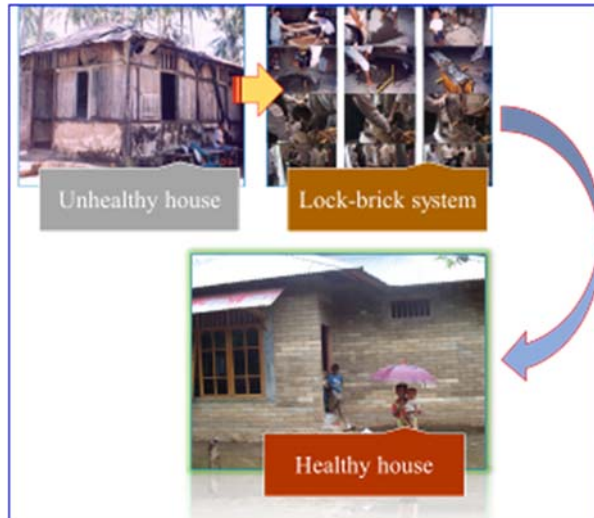


Figure-5. The lock-brick technology for healthy house.

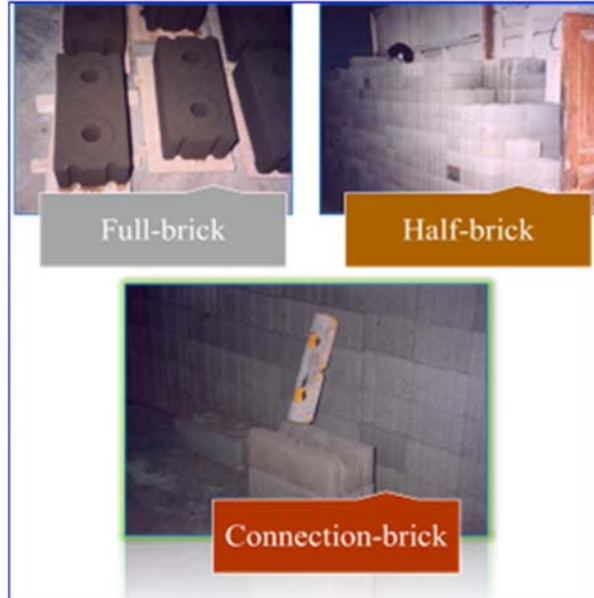


Figure-6. Three kinds of bricks.

Bricks were used are not required mortar in the construction work. The positive and negative connections are provided at the bottom and top of the bricks so that it can interlock with one another. Grout holes in the brick lies on a straight line vertical shots. The grout holes required for the completion of cement and sand that certain places such as at the corners, joints and other open side.

Basic materials used to make interlocked bricks (lock-brick) are local soils, where we will build the house mixed with a little cement. Additions or cement intended to improve the strength and durability of the ground; also serves to reduce changes in volume caused by the presence of clay particles and increases the compression strength and water resistance properties on the brick. Furthermore, it is pressed by machine presses until achieve volume ratio of 1:1.65 to improve stability properties of the soil.

The pressing process, can produce three kinds of bricks: full brick, half brick and brick connection. Full bricks and half bricks are used for levelling the relationship on construction work, while the connection is used for laying brick horizontal beam (Figure-6).

Several photos below, describe the implementation of this system at the house of Mr. Lukas Hiller Liunesi.



Figure-7. The house of Mr. Lukas: outside and inside.



Figure-8. Mr. Lukas has made almost 3000 lock-bricks.



Figure-10. It must be levelled.



Figure-11. Construction of the window.



Figure-9. Starting arrange the lock-bricks.



Figure-13. Household scopes - improve quality of life.



Figure-12. The construction of well-trap.

CONCLUSION AND RECOMMENDATION

The system-track-rainwater engineering could be provided the availability of water to meet household water and agriculture-yard requirement. It means that the household economy will increase as whereas the quality of life. By the fulfilment of the needs of the household water will improve public health. By the construction of a healthy home, the family will be more prosperous life. It could be conclude that both system-trap-rainwater engineering and lock-brick technology could improve the quality of life (Figure-13).

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