

Sarunya Kasembunyakorn 2009: The Development of a Dyeing Machine for Improving the Quality of Local Silk Dyeing. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Assistant Professor Kajjarus Piromthamsiri, Ph.D. 135 pages.

The primary aim of this study was to investigate various local silk dyeing processes in Thailand in relation to the variations in the quality of dyed silk yarns. It also attempted to develop a prototype dyeing machine for improving the local silk dyeing process. The ultimate goal of this study was that the new improved dyeing machine could be proved technically feasible while economically viable as well as environmentally sound and socially accepted so that it could be recommended.

The study selected three local silk dyeing groups from Napho, Buri Rum Province; Sanuan Nai, Buri Rum Province; and Nonmuang, Nong Bua Lam Phu Province for technical investigation. Hence, interview and data collection was conducted to examine the dyed silk yarn quality measured in terms of various indicators. Using local dyeing method (LDM) with labor-intensive, open container, traditional equipment and wood energy, the quality of dyeing methods was then evaluated for color value (L^* , C^* and h^*), colorfastness (dE^* values of color change and color staining) and reproducibility (dE^* values of the three replication pairs). All LDMs proved their effectiveness in producing quality dyed silk yarn in spite of a low level of reproducibility. At the same time, this study proposed new improved dyeing machines as considered to be the first and second prototype dyeing machines (PDM I and PDM II) as alternative dyeing methods, with technical innovation from heat control, automatic wheel rotary system, liquid petroleum gas energy. In particular, the PDM II which is the improved model of the PDM I in terms of better semi-closed container system and more effective heat measurement produced far better results in the above evaluation indicators, including that obtained color values close to the standard color, relatively higher colorfastness level and more consistent degree of reproducibility. In general, the quality of dyed silk yarn from PDM II was found highest among the dyeing alternatives.

The PDM II was then recommended as the prototype dyeing machine with comparative advantages to be further promoted. Moreover, economic, environmental and social considerations between LDM and PDM II also confirmed the relative feasibility in favor of PDM II despite some further technical improvements of PDM II which could still be possible, as already suggested in the study.

Student's signature

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