



Tropentag, October 11-13, 2006, Bonn
“Prosperity and Poverty in a Globalised World—
Challenges for Agricultural Research”

Development of Pico-hydropower Plant for Farming Village in Upstream Watershed, Thailand

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Abstract

Research on the development of Pico-hydropower plant for a farming village in Thailand was carried out. It is one aspect given by the national plan for the renewable technology development with wisely energy utilization from natural resources included wind, water, solar energies, bio-gas, and farm waste according to the Ministry of National Energy reported, respectively. Since, some upstream watersheds in Thailand are potential for the development of the large scale hydropower plants by mean of the dam constructions. However, most of proposed dam sites in the upstream watershed are located within the restricted area as for the forestry and environmental conservation zone according to the national environmental law of conservation. Pico-hydropower plant is more suitable to develop for the economic and farming zones of such watershed. A waterfall site in Ban-Yaeng Village, Nakornthai District in Phitsanulok Province which locates at the upstream of Wangthong Watershed (Sub-basin of Nan River) was selected as the pilot project for the construction of the hydropower plant. The appropriated technology using the centrifugal pumping machine as for the water-turbine connected to a 3-phase motor producing electricity of 380 volts at revolution of 1500 rpm was applied. The system was based on low cost of construction, local materials, and easy construction and maintenance systems. Its performance of the overall systems by mean of the efficiency was found to 52% resulted by the effective head of 8.4 meters, flow rate of 15 liters per second, and electrical power production of 644 watts which can be used for the light, some house-ware appliances, and some farming equipments. It can be applied to other small farming villages in any upstream watershed with enough head and flow rate in the stream over the year round in order to save investment cost for farming systems with the clean technology. However, it can be transferred to larger farming villages if higher head and larger flow rate in the natural stream or river were found which depended on the country and topography.

Background and Aim of the Study

Phitsanulok Province locates in the lower-northern region of Thailand with 365 km north of Bangkok. According to the report by Chuenchooklin (2005), the average annual electric consuming in Phitsanulok is 500 million kilowatt-hours (kWH). Most of energy sources are come from outside the province such as fuel. These fuels can be produced

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ICASI 2019 Rahmat Hidayat, Mesran, Tengku Mohd Diansyah, Supriyanto, Dodi Siregar, 2019-11-26 As an annual event THE 2ND INTERNATIONAL CONFERENCE ON ADVANCE SCIENTIFIC INNOVATION 2019 continued the agenda to bring together researcher academics experts and professionals in examining about Scientific Innovation in technology education management accounting and many aspect area In 2019 this event held in 18 July 2019 at Politeknik Kutaraja Banda Aceh Indonesia This ICASI Proceeding 2019 are published along with article from ICASI 2018 and each contributed paper was refereed before being accepted for publication The double blind peer reviewed was used in the paper selection

Microelectronics, Electromagnetics and Telecommunications Ganapati Panda, Suresh Chandra Satapathy, Birendra Biswal, Ramesh Bansal, 2018-11-02 The book discusses the latest developments and outlines future trends in the fields of microelectronics electromagnetics and telecommunication It contains original research works presented at the International Conference on Microelectronics Electromagnetics and Telecommunication ICMEET 2018 organised by GVP College of Engineering A Andhra Pradesh India The respective papers were written by scientists research scholars and practitioners from leading universities engineering colleges and R D institutes from all over the world and share the latest breakthroughs in and promising solutions to the most important issues facing today s society Micro Perspectives for Decentralized Energy Supply Martina Schäfer, 2011 **Engineering for Sustainable Development and Living** Jacqueline A.

Stagner, David S-K. Ting, 2021-05-01 What can we do to preserve a future for the next generation to cherish A potent answer is to exercise good stewardship in realizing more sustainable living and development This volume brings together experts from around the world to disseminate the latest knowledge and research toward this end i e engineering for more sustainable development and living Let us learn from a living cell that utilizes inherited biological intelligence to organize its resources for current needs and future existence We also have the responsibility to ensure universal access to electricity and increase the share of renewable energies Cost effective hybrid renewable energy systems should also be considered and furthered Advancing energy storage is a necessary striving for managing a future toilet paper crisis More accurate accounting of weather is crucial in furthering energy efficiency for human thermal comfort With cooling making up the highest energy cost in many medical structures combining low energy building strategies with source efficient and low cost manufacturing envelopes can contribute effectively to mitigating climate change To realize calculated improvements in practice we must assess the performance after implementation of the promising measures Construction is definitely the right place to start incorporating sustainable development and living Another means to promote sustainability is to improve engineering system performance Simple means such as a rightly positioned cylindrical rod can enhance systems that involve heat exchangers An important lesson came through dealing with COVID 19 teaching us to provide adaptation strategies through water energy food nexus planning building resilient communities for tomorrow **Biofuels and Sustainability** Kazuhiko

Takeuchi,Hideaki Shiroyama,Osamu Saito,Masahiro Matsuura,2018-07-13 This open access book presents a comprehensive analysis of biofuel use strategies from an interdisciplinary perspective using sustainability science This interdisciplinary perspective social science natural science means that the strategies and policy options proposed will have significant impacts on the economy and society alike Biofuels are expected to contribute to reducing greenhouse gas emissions revitalizing economies in agricultural communities and alleviating poverty However despite these anticipated benefits international organizations such as the FAO OECD and UN have published reports expressing concerns that biofuel promotion may lead to deforestation water pollution and water shortages The impacts of biofuel use are extensive cross sectoral and complex and as such comprehensive analyses are required in order to assess the extent to which biofuels can contribute to sustainable societies Applying interdisciplinary sustainability science concepts and methodologies the book helps to enhance the establishment of a sustainable society as well as the development of appropriate responses to a global need for urgent action on current issues related to biofuels *Developments* ,2006 The International Journal on Hydropower & Dams ,2007

The Engineering Institution of Zambia 2007 Symposium Proceedings Engineering Institution of Zambia. Symposium,2007 **Carbon Dioxide Utilization to Sustainable Energy and Fuels** Inamuddin,Rajender Boddula,Mohd Imran Ahamed,Anish Khan,2021-11-30 This edited book provides an in depth overview of carbon dioxide CO2 transformations to sustainable power technologies It also discusses the wide scope of issues in engineering avenues key designs device fabrication characterizations various types of conversions and related topics It includes studies focusing on the applications in catalysis energy conversion and conversion technologies etc This is a unique reference guide and one of the detailed works is on this technology The book is the result of commitments by leading researchers from various backgrounds and expertise The book is well structured and is an essential resource for scientists undergraduate postgraduate students faculty R D professionals energy chemists and industrial experts *International Journal on Hydropower & Dams* ,2008 Renewables 2005 Global Status Report Eric Martinot,2010 This report provides an overview of the status of renewable energy worldwide in 2005 It covers markets investments industries policies and rural off grid renewable energy in developing countries By design the report does not provide analysis recommendations or conclusions Contents 1 Global Market Overview 2 Investment Flows 3 Industry Trends 4 Policy Landscape 5 Rural Off grid Renewable Energy and Glossary Charts and tables *Science in Society* 60 Dr. Eva Sirinathsinghji,Prof. Roger Leakey,Dr. Emilio Del Giudice,Dr. Margherita Tosi,2013-11-18 In this issue From the Editors Scientific American Disinformation on GMOs New Paradigm Food Agriculture Paradigm Shift Urgently Needed In Agriculture UN Agencies Call for an End to Industrial Agriculture Food System Plants Warn One Another of Pest Attack through Mycorrhizal Fungal Network Post 2015 Development Africans Show the Way Nitrogen fixing for All Crops Not the Answer Physics of Organisms Galaxy Making Stars at the Edge of the Universe Other Surprises Continuous Creation from Electric Plasma versus Big Bang Universe Biology of

Organisms Non Random Directed Mutations Confirmed The Principle of Minimal Stimulus in the Dynamics of the Living Organism Towards 100% Renewables Renewable Ousting Fossil Energy Radical Grid Transformation under Way Surviving Global Warming Localized Food Energy Systems in Nature s Circular Economy Sunny Prospects for Solar Photovoltaic Japanese Farmers Producing Crops and Solar Energy Simultaneously Funding for Small Scale Anaerobic Digesters in England Sustainable water Purple Root Water Hyacinth A Natural Remedy for Pollution Freeing the world from GMOs Scientists Declare No Consensus on GMO Safety Beware the Changing Face of Genetic Modification **Who Owns the Water?** Klaus Lanz, Christian Rentsch, 2006-09-15 The shortage of fresh clean water states a report by the Human Rights Commission is the greatest danger to which mankind has ever been exposed It is only thanks to water and its mysterious qualities that life on earth is possible at all Without water there would be no food no clothing there would not even be the ink the Bill of Rights was written with Who owns the Water discusses the phenomenon of water marvels at its uniqueness and addresses the dangers and opportunities water offers to life The book looks at the most important questions about providing drinking water and producing food but also deals with water as a destructive force and investigates the chemical qualities of the molecule Who owns the Water points out the risks of unlimited privatization of water and records how dependence on water is exploited Committed picture sequences and detailed texts explain how water can belong to no one but has to be treated responsibly and held in appropriate esteem by the whole of mankind Government Reports Annual Index ,1978

Mini Hydropower for Rural Development Thomas Meier, 2001 Rural electrification enjoys high priority on Indonesia s development agenda In remote villages located beyond the reach of national electricity grids mini hydropower offers an environmentally friendly alternative to decentralized electricity generation Technical assistance programs have successfully introduced mini hydro technology in developing countries but have often failed to attain sustainable plant operation This book provides insight into the multifaceted conditions under which village communities are struggling to keep systems running A new approach linking productive electricity use and mini hydro operation is developed which incorporates experiences of market oriented approaches in small enterprise development Village communities are no longer left alone after the commissioning of the plants but are continuously provided need oriented services The study is exceptional in that the approach is experimentally applied in an actual project involving a village owned coffee roastery It is shown that the new approach not only contributes to a sustainable electricity supply but also to village development

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