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This is to certify that *Pichai SARANROM (U00022)*, from *Rambhai Barni Rajabhat University, Thailand* has attended, and delivered an oral presentation in the 2011 International Conference on Environmental and Agriculture Engineering (ICEAE 2011) in Chengdu, China during July 29-31, 2011. His/her paper has been selected as one of the most excellent papers.





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## Participation and Presentation Certificate

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**Paper title:** Local Check Dams In Eastern Region of Thailand: Low cost and local material utilization

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## Local Check Dams in Eastern Region of Thailand: Low Cost and Local Material Utilization

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**Abstract.** Project of “Local Check Dams in Eastern Region of Thailand : Low cost and local material utilization” was set the objective as following 1) Screening for advantage and disadvantage of ten former check dam in Thailand. 2) Making the proper check dam for low cost with local material utilization. 3) Collected the concerned data on preserving water. By the three groups of researchers from Rambhai Barni Rajabhat University, Local administrator and local farmer to come together in the field and make a final conclusions among the groups in each step by step at Tambol Huay-Rang, Amphoe Maung, Trad province, for making pilot model of check dam for preserve the natural water from rainy season up to dry season with the low cost and local material utilization in 2009. The step of making low cost check dam with local material utilization can divided into 6 step as following 1) Take a consideration to former check dam in Thailand 2) Making inforcement structure by polar wood 3) Reinforcement structure by bunch of connecting bamboo 4) A bunch of connecting bamboo to place nearby the polar wood. 5) To seal the bunch of connecting bamboo with inner plastic bag of fertilizer, without any polluted any material for the coming rainy season. 6) The completed low-cost check dam with local material utilization. The researchers can get achievement with 5 low-cost check dams at Trad Province. The cost of investment near about 5,000 baht (approximately 170 US\$) the quantity of the water preservations range from 2,500 -5,000 m<sup>3</sup> benefited area as covered from 175 – 375 Acers.

**Keywords:** Local check dam , Low cost and local material utilization, Water Preservation

### 1. Introduction

Water is essential natural resources for human life. It start from inside and outside the human body up to domestic use for example industrial use, transportation use, sport use, recreation use and also influence to human habitats, environments and ecosystem including the way of living such as sustainable agriculture, sufficiently economic system. (Petts, 1984, Aini, 2007, Shieh et.al.2007).The people try to utilization it with carefully system, especially try to preserve it from rainy season until dry season by so many technology concerned for example pond, dam, check dam and so on. A Check dam is the construction or small barrier that lay across the stream of water flow, constructed of rock, gravel bags, sandbags, fiber rolls, or reusable products, placed across a cannel, small river, constructed swale or drainage ditch for the purpose of water harvesting. (Balooni,et.al. 2008, California stormwater, 2003.). The check dam serves mainly 5 purpose such as 1) to the provide direct irrigation 2) to prevent rain water from flowing always into the sea 3) Reduce or mitigate the speed of the water stream 4) reduce soil erosion and trap sediments 5) facilitate the recharging of surrounding wells through percolation of water. (Zhou,et,al. 2004, Lin,et.al.2008, Zeng,et.al.2008, Hassanli et.al.2009.).

#### The check dam in Thailand,

All of the natural water preservation project in Thailand classifieds as big, medium and small level depend on amount of investment by financial budge of government for every year with rather big amount but

the Thailand people still not enough for their demand. The farmer or the land holder in local area cannot wait for the governmental budget. They were looking for private natural water preservation making by themselves. Because of 10 of the former local check dam quite expensive and consumed heavy work for them. The two main ideas for making private check dam, first one is a low cost investment and the second for local material utilization without complicated procedures. The researcher want to make the pilot model of check dam for enhance the farmer or land holder which having dry or empty small canal to preserve the rainy season water up to dry season with the lowest cost on their own investment.

## 2. Objective and Methodology

### 2.1. Objective

The researcher tries to soft the problem by aiming to

1) Take a consideration for advantage and disadvantage of ten former check dam in Thailand.

2) Making the proper check dam for low cost with local material utilization.

2.1) Step of making check dam

2.1.1) Main structure for against the stream of water (Inforcement Structure)

2.1.2) Sub-structure for implement against the stream of water (Reinforcement Structure)

2.1.3) To seal for the water control both of water preservation and level of water

2.1.4) Making proper reservoir not to damage to any point of view

3) Collected the concerned data on preserving water.

### 2.2. Methodology

Groups of the researchers from university, local administrators and local farmers come to the field and brainstorming in each step with final conclusion before tried out in each step and collect the data by group consideration.

## 3. Result

### 3.1. Take a consideration to former check dam in Thailand.

The three groups of the researchers come together and make a consideration to all of the 10 former check dam and make a final conclusions that none of them can be suitable to these location (Trad Provinces) because of a lot of polluted material residual and quiet heavy work to make, repair and removal it out. For example heavy weight of rock and sand bags, especially in the next rainy season the rock and the sand bags become to obstacle against the stream of the water and making them to be flooding area. It should be check dam which easily to remove it out or portable type.

### 3.2. Making the proper check dam for low cost with local material utilization.

3.2.1) Step of making check dam consist of four main step as following

(1). Main structure for against the stream of water (Inforcement Structure) can be applied with so many type of local material utilization. The 3 groups of the researcher tried to searching and comparing among them

Table 1. Comparisons of four type of local material for making main structure for against the stream of water (Inforcement Structure)

Local Material	Advantage	Disadvantage
1.Factory Wooden Polar	1.High Quantity of water preservation 2.Marketable supply 3.Strong Structure 4.Easily to work	1.Expensive
2. Bamboo Polar	1.High Quantity of water preservation 2.Moderately strong structure 3.So abundant and Easily to work 4.Some area free of charge	1.Inferior than factory wooden polar or steel pipe

Local Material	Advantage	Disadvantage
3. Wooden Tree Polar	1.High Quantity of water preservation 2.So abundant and Easily to work 3.Moderately strong structure 4.Some area free of charge	1.More heavier than bamboo polar 2.Sensitive to deforestation
4. Black pepper climbing pole	1.Strong structure 2.Marketable supply	1.Limited length for 4 m. only 2.Heavy weights and clumsy
5. Steel pipe	1.Highest strong 2.Compactness structure 3.Not limited on length 4.can get reused material for cheaper	1.Expensive

### (2). Sub-structure for implement against the stream of water (Reinforement Structure)

Table 2. Comparisons of four type of local material for making splint for sub-structure for against the stream of water (Reinforement Structure)

Local Material	Advantage	Disadvantage
1. Stem of red grass, Giant reed, Great reed ( <i>Arundo donax</i> L. )	1) Local availability 2) So abundance 3) Cheap or some area free of charge 4) Compactness structure	1) Lowest reinforcement 2) Easily to broke 3) Shorts period durability
1. Stem of bambam, ( <i>Donax grandis</i> (Marantaceae)),	1) Local availability 2) So abundance 3) Cheap or some area free of charge 4) Compactness structure	1) Low reinforcement 2) Moderated to broke 3) Should be made for basket or other utilization 4) Sensitive to deforestation
3. Grinding Bamboo	1) Local availability 2) So abundance 3) Cheap or some area free of charge 4) Compactness structure 5) No limitation for length	Consume the time for grinding
4. Factory wooden twig	1) Compactness structure 2) Easily to work 3) Strongest structure	Expensive

### (3). To seal for the water control both of sealing and level of water

Table 3. Comparisons of four type of local material for the water control both of sealing and level of water

Local Material	Advantage	Disadvantage
1.Tinplate	1. High Quantity of water preservation 2. Marketable supply 3. Stronger structure 4. Corrugation Structure increase reinforcement	1. Clumsy for setting 2. Consumed the time 3. Difficult for removal 4. Risky on work 5. Difficult for bending 6. Fixed level of water for one level only cannot be adjust
2. linoleum	1. High Quantity of water preservation 2. Marketable supply	1. Clumsy for setting 2. Difficult to bending compare to plastic sheets 3. Consumed the time 4. Should be complete linoleum without hole

Local Material	Advantage	Disadvantage
3. Plastic sheet or vinyl sheet	<ol style="list-style-type: none"> <li>1. Cheap</li> <li>2. Can get reused material</li> <li>3. Public participation</li> <li>4. No residual effect</li> <li>5. Can adjust the level of water preservation</li> <li>6. Easily for making and repair</li> <li>7. Low worker</li> </ol>	<ol style="list-style-type: none"> <li>1. Low technology</li> <li>2. Moderately effective</li> <li>3. Sensitive maintenance</li> </ol>
4. Inner side of fertilizer plastic bag	<ol style="list-style-type: none"> <li>1. Cheapest or free of charge</li> <li>2. Using waste material</li> <li>3. Easily to control level of water</li> <li>4. Compactness structure</li> <li>5. Lowest worker</li> <li>6. Easily to repair or removal</li> </ol>	Frequently maintenance



Fig. 1 Step of making low cost check dam with local material utilization following

- 1). Select the location
- 2). Making inforcement structure by polar wood
- 3). Reinforcement structure by bunch of connecting bamboo
- 4). A bunch of connecting bamboo to place nearby the polar wood.
- 5). To seal bunch of connecting bamboo with inner plastic bag of fertilizer, without any polluted any material for the coming rainy season.
- 6). The completed low-cost check dam with local material utilization

### 3.3. Collected the concerned data on preserving water.

Table 4. The data on place, type of location, size of check dam, quantity of water preservation, cost of investment and benefited area of making check dam in Eastern region of Thailand (Huay Rang Distric, Amphoe Muang, Trad Province).

No.	Place.	Type of	Size of	Quantity of	Cost of Investment	Benefited area
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		location	check dam (m <sup>2</sup> )	Water Preservation. (m <sup>3</sup> )	Bahts	US\$*	Rais.	Acres.*
1.	Ban Klong- Peed, Moo 10	Across under the bridge	3 x 1.2	3,500	4,300	143.57	120	300
2.	Ban Klong- Peed, Moo 10	Across under the bridge	3 x 1.2	2,500	4,500	150.25	70	175
3.	Ban Klong- Peed, Moo 10	Across the cannel	5 x 1.2	3,000	5,000	166.95	100	250
4.	Ban Koh- Kwang, Moo 1	Across the cannel	4 x 1.2	2,500	4,700	156.93	140	350
5.	Ban Chang- klua, Moo 6	Across the cannel	5 x 1.2	5,000	5,250	175.30	150	375

\* 1 US\$. Approximately 30 baht \*\* 1 Acre equal to 2.5 Rais.

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