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The contribution of local knowledge in agriculture to sustainable development

Daniel Ugih Echoh, Tarmiji Masron, Salfarina Abdul Gapor

***Abstract*---Local knowledge (LK) has played an active role in the lives of rural communities in virtually every part of the world such as in agriculture. At the same time, the contribution of LK towards sustainable development is getting wider acceptance especially in today's agricultural practice. Therefore, continuous study to define the sustainability element is needed especially within community who still utilise LK. The purpose of this paper is to discuss the contribution of local knowledge practiced by the Iban farmers in lowland paddy cultivation located in the coastal areas of Sarawak in relation to the sustainable development context. The study was conducted in two Iban villages in Kuala Tatau namely Kuala Serupai and Sungai Semanok. There are 22 farmers of different age and gender involved in this research through in-depth interview, focus group discussion and participant observation that were carried out for a year. The findings show that this knowledge contribute to the three pillars of sustainability frame work such as socio-culture, socio-economic and environment.**

Keywords*---*local knowledge, sustainability, agriculture, rural development, Iban

I. Introduction

Agriculture is a main economic activity in rural Sarawak especially among the natives such as Iban farmers. Sarawak was listed as one of the highest poverty rates in Malaysia since independence especially in the rural area. Most of the farmers are poor, living in rural area and commonly associated with the agricultural sector [1] For the Iban farmers, paddy cultivation activity is just for their self-sufficiency and they sell the surplus to buy basic needs such as sugar, salt, petrol and some time for special case expenditure such as education, especially during the end of year before the school activity begins [2]. Refer to, the production of hill paddy by shifting cultivation is only approximately 750 kilogram per hectare compared with wet paddy output of 2,000 kilogram per hectare [3][4]. In the interior, the soils have low nutrients and of low quality, low population density and low technology making the swidden system a suitable agricultural method.

Daniel Ugih Echoh, Tarmiji Masron
School Of Humanities, Universiti Sains Malaysia, Penang, Malaysia
danielusm@hotmail.my; egisusm@gmail.com

Salfarina Abdul Gapor
School Of Build Environment, University College Of Technology Sarawak, Sibu
Malaysia
salfarina@ucts.edu.my

Iban farmers also practiced *berduruk* system whereby all or some of the farmers at the village help each other's at every stage of the paddy cultivation, which are conducted based on rotating shifts [2][5] and practiced their belief system and traditional culture in paddy cultivation [6][7]. Both of this belief systems have relationships with their surroundings environment such as with trees, birds, insects and the experiences that they were faced from this system finally contribute to the existence of LK [2]. Figure 1 shows the map of Kuala Tatau in Sarawak [8].

Figure 1: Map of Kuala Tatau in the State of Sarawak

II. LK and Sustainable Development

In Sarawak, LK has been shaped and modified by young farmers over many generations. LK skills have been developed outside the formal educational system and are embedded in culture and structured in tradition. It also becomes the basis for decision-making among the rural communities especially the farmers with respect to food security, human and animal health, education and natural resource management surroundings [9]. LK, therefore, facilitates dynamic information systems critical in decision-making [10]. It is a knowledge which is developed and used over time by local people and is influenced by environmental and socio-economic realities. It is based on experiences which have been empirically tested and proven often over many generations and is adapted to local culture [2][11]. LK is a dynamic system as it allow people to carry out their daily tasks and also adapt and cope with new problems in the face of

environmental and economic uncertainties and hardships [12]. Some academicians refer LK as the matured long-standing traditions and practices of certain regional, indigenous, or local communities. LK has also been referred to as the unique, traditional, local knowledge existing within and developed around the specific conditions of women and men indigenous to a particular geographical area [13].

How can LK contribute to sustainable development? Literally, sustainable development refers to maintaining a balanced development over time. Sustainable development have three main pillars to be addressed, socio-economic sustainability, socio-cultural sustainability and environmental sustainability. Sustainable development goals will be achieved when the development brings the benefits to the three pillars [14]. Figure 2 show the three pillars of sustainable development.

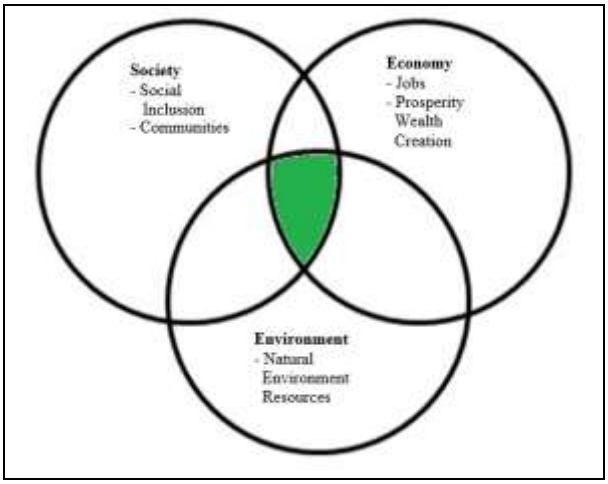

Figure 2: Three Pillars Of Sustainabe Development

Source : [14]

Figure 1 illustrates the concept of sustainable development that combines three components, namely the development of biophysical social and economic systems as indicated under environment, socio-economic and socio-culture. The green colour in the middle of the figure shows the overlapping of the three components which represents the goal to achieve sustainable development. Environmental sustainability indicates the resilience and maintenance of environmental resources that benefit human being directly or indirectly.

Direct benefits include resources to generate income and sustain livelihood, whereas indirect benefits are climatic and environmental, such as preventing soil erosion, providing watershed, etc. These resources need to be maintained and conserved, through sustainable utilization, whereby consumption is less than the existing supply of resources. In most cases renewal of appropriate resources should be done to ensure sustainable development, such as replanting. Socio-economic sustainability refers to sustainable livelihood that meets basic needs, especially shelter, food clothing, education and health. It also refers to the fair distribution of resources between the rich and the poor, i.e. reducing inequality gaps between the rich and the poor. Socio-cultural sustainability refers to development that enhances social cohesion of the community through the recognition of their world view and local knowledge. Socio-cultural sustainability celebrates multi-cultural values, identities and values. The case study in this paper demonstrates the three pillars and how LK can promote sustainable development.

III. Research Methods

The research utilises qualitative method by interviewing 22 farmers through in-depth interview and focus group discussion. The respondents are of different age groups, gender and different experiences and period of involvement in paddy cultivation. Participant observation is also used to examine the real agricultural systems practiced by the farmers. This method is important to verify data from the interview session. Data analysis done by content analysis whereby transcripts are thematised and categorized according to topic and issues.

IV. Findings

A. *Socio-culture*

The farmers practiced "*berdandang*" systems in planting cultivation. It helps reducing the maintenance cost because every farmers is doing the same task for their paddy. This system is the practise of planting paddy next to other farmers to reap the benefit of reciprocal maintenance and harvesting ad reduce pest attack through an integrated and synchronised pest managemet. The *berdandang* system increase the competition between pest because by planting in a group at the same time, the acreage of paddy planted is higher compared to just planting alone in an area. Figure 3 and 4 show the *berdandang* system and the situation that make that system inapplicable.

Land A	Land B	Land C
Paddy Cultivation	Paddy Cultivation	Paddy Cultivation

Figure 3: The Concept of *Berdandang* System at Kuala Tatau

Figure 3 shows the possibility of *berdandang* system to be practiced due to the existence of many paddy farmers planting in adjacent in the same area. Figure 4, on the other hand shows the inapplicability of practicing the *berdandang* system because only one farmers are planting paddy, whereas the adjacent farms are not being cultivated, causing inefficiency in pest management.

Land A	Land B	Land C
No Agricultural Activities	Paddy Cultivation	No Agricultural Activities

Figure 4: The Situation That prevent *Berdandang* System to be Applied

Refer to Figure 3 and 4, the *berdandang* system cannot be practiced by only one farmer. The system needs a strong community, good relationship and unity spirit among the farmers to make sure this system can be applied. This system also requires the cooperation between farmers because in any process or stages of paddy planting, the farmers must work simultaneously. The rational of this concept is to make sure that paddy can grow and harvest at the same period and maintenance task can be done simultaneously. The task distribution among gender also exist in this case (Refer to Figure 5).

Figure 5: The Farmers Attending The Ritual Ceremony at Sungai Semanok, Sarawak
Resource: [2]

Figure 5 show the famers (men and women) working together by completing individual task during the ritual ceremony at Sungai Semanok, Kuala Tatau. In this ceremony, men and women contribute their expertise based on gender such as men is leading the ceremony and the women preparing the ceremony tools. In food preparation, women task is cooking while the men is preparing meals.

B. Socio-economic

The main goals of paddy cultivation using Iban LK is to maximise rice output while the use of *berdandang* system is to reduce the maintenance and man power cost. At the same time, it can help farmers to reduce the risk of pests and diseases. The cooperation among the farmers in pest control management in this system can reduce maintenance costs. This is because, farmers do not have to spend so much on pesticides compare to cultivation without *berdandang* system. Based on their experiences, this systems is very effective and it can support the socio-economic of the family. The socio-economic elements in this case are not only contributed from a cheap cost of pest control but also the sustainable source of paddy seeds because all farmers exchange the seeds among them. There are about 20 types of local paddy seeds identified and the reservation of the seeds promotes food security [15]. In addition, farmers also planted vegetables based on intercropping at the paddy field such as corn, bean, cucumber and some of green vegetables for family use and surplus sold for extra income. Sometimes they exchange the crops and paddy seeds among the farmers via a batter system.

C. Environment

The Iban farmers believe that the practise of the *berdandang* system in paddy cultivation also reduce the risk of water and air pollution at the paddy field by not using artificial chemical pesticides. Pesticide drift occurs when pesticides suspended in the air as particles are carried by wind to other areas, potentially contaminating them. It also can volatilize and may be blown by winds into nearby areas, potentially posing a threat to wildlife. The environmental impact of the pesticide includes negative effects of pesticides on non-targeted species.

The farmers also set up the *orang-orang* (*r*eplica is a scarecrow) and netting to catch birds at the paddy field. According to the farmers, the clearing task need to be conducted every week to make sure the paddy field is free from coconut and other tree leafs because the abundant of leaves will attract insects and birds to the paddy field. They believe a group of pests or insects like certain moist condition such as a pile of leaves. This LK is also practiced during the land selection whereby the farmers only choose *tanah ladu* because of its moist conditions and the soil structure is more compact compare to the other soil which insects detest because they are not comfortable living in this type of soil. Tanah ladu characteristics are has a brown colour, moist and commonly suitable for paddy cultivation.

At the same time, farmers choose *tanah pengerang* area to plant paddy because it is the most fertile soil. This soil is ifrequenty use for agricultural use. So the farmers experiences proof this soil is more fertile for paddy cultivation. Here, land selection, maintenance process and source of paddy indicate that this system is designed to preserve biodiversity, not to destroy it [9]. At the same time, the farmers believe their experiences on the practiced of the traditional culture and belief systems can contribute to the quality and quantity of the paddy yields. For them, the most important thing here is the unity and sincerity to practice this system. Figure 6 shows the flow of the existence of LK in paddy conservation at Kuala Tatau, Sarawak.

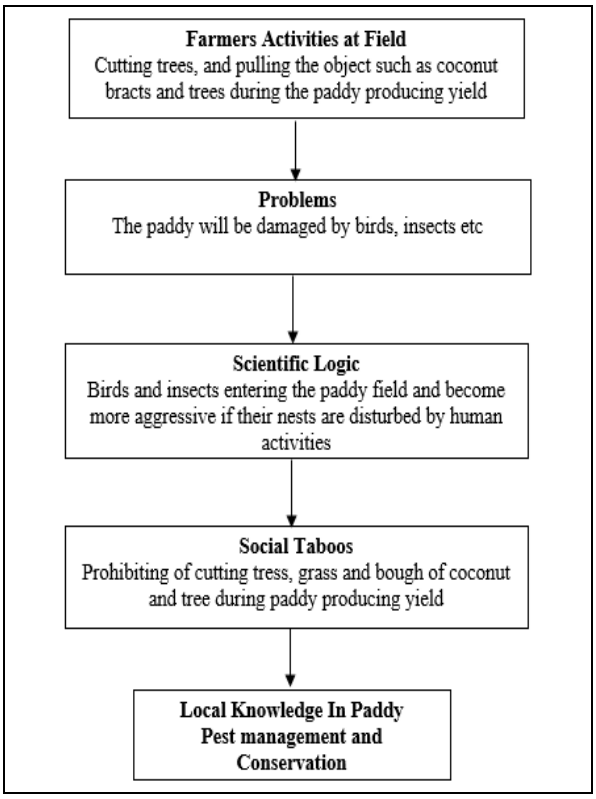

Figure 6: The Existence of Local Knowledge in Paddy Conservation at Kuala Tatau, Sarawak

Refer to Figure 6, LK is also practiced during the harvesting stage which is embedded in their socio-cultural belief of prohibiting the disturbance of birds' and insects' nesting area. Hence tree and grass cutting and pulling of object from the ground, such as coconut are prohibited. This is to preserve bird nesting and prevent the birds and insects from attacking the paddy field, especially when yield are almost harvested. The rationale is done once their nesting area is destroyed they will go to the paddy farm to collect materials to rebuild their nest and at the same time will also destroy the paddy. This is an example of LK showing how the community work in tandem with nature by deep understanding of their ecosystem and applied it in pest management.

v. Conclusion

LK contributes towards sustainable development in agriculture through pest management system using the reciprocal means of *berdandang* and techniques to choose soils and exchange crops and paddy seeds. Socio-economic sustainability is achieved by reducing the needs to buy chemical pesticides from outside and output is maximize through reciprocal maintenance of the field which reduce labour and variable costs, which eventually contributes towards sustainable livelihood and food security. Socio-cultural sustainability is achieved through strong cohesion between the villagers in undertaking the *berdandang* system. At the same time, identity and traditional values are preserved and practiced paralled to their world belief system. Environmental sustainability is achieved by the preservations of indigenous seedlings and organic agricultural system.

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References

[1] K. Kalantari, S.F. Hossien, A. Ali, Q. Iraj and C. Shala, "Major challenge of iranian rural communities for achieving sustainable development". Am. J. Agric. Biol. Sci., DOI: 10.3844/ajabssp.2008.724.728, 2008.

[2] U. E, Daniel, "Sustainable Development, Local Knowledge and Cultural Systems In Agriculture: Case Study Of Iban Farmers at Kuala Tatau, Bintulu, Sarawak." Thesis For Masters Of Social Sciences, University Science of Malaysia, Penang, 2014.

[3] John. R, Walton, "The Economic Structure of Sarawak', in King, V.T. and Parnwell, M.J.G (eds.,) Margins and Minorities: The Peripheral Areas and Peoples of Malaysia." Hull: Hull University Press, 1990, pp.130-146

[4] B. Madeline, "Towards the National Vision Policy: Review of the Economic Policy and New Development Policy among the Bumiputera Communities in Sarawak." *Journal of Malaysian Studies*, 21(1), 2004, 211-256Freeman 1955

[5] F. Derek, Report of the Iban. Pp. 140−142, The Athlone Press, University of London, London, 1970.

[6] Mohd. Taib, "Iban Cultural Heritage in the Context of Present Day Malaysia." In *The Sarawak Museum Journal*. Vol.2, 1989.

[7] J. James C, "*SARAWAK*." Dewan Bahasa dan Pustaka, Kuala Lumpur, 1976.

[8] http://www.lib.utexas.edu/maps/middle_east_and_asia/malaysia_rel98.pdfK (Cited on 23 September 2014)

[9] C. Beckford and D. Barker, "The Role and Value of Local Knowledge inJamaican Agriculture: Adaptation and Change in Small-Scale Farming." *Geographical Journal* 173, 2007, 118-128

[10] I. Scoones, and J. Thompson, "Beyond Farmer First: Rural peoples' knowledge, agricultural research and extension practice. London: Intermediate Technology Publications." 1994.

[11] Netherlands Organization for International Cooperation in higher education/Indigenous Knowledge (NUFFIC), Best practices on indigenous knowledge." 1999.

[12] P. Richards, "Indigenous agricultural revolution: ecology and food production in West Africa." Hutchinson, London and Westview Press, Boulder, CO, 1985.

[13] G. Louise, "Working With Indigenous Knowledge, A Guide for Researchers, IRDC, 1998

[14] E. Barbie, "The concept of sustainable development', whose growth? whose environment?."*World Devlopment*, Bank Dunia Agricultural Credit : Sector Policy Paper, The World Bank, Washington, D.C. Vol.20 No.4, 1987, 1975, 481-496.

[15] M. Claxton, "Indigenous Knowledge and Sustainable Developemtn." Third Distingushed Lecture, The Cropper Foundation, UWI, St Augustine, Trininad and Tobago, September, 2010.

About Author (s):

Daniel Ugih Echoh graduated from School Of Social Science, Universiti Sains Malaysia (USM), Penang. He received his Master (Development Planning & Management) in 2014. Currently he is Phd Student (Agriultural Geography) at School Of Humanities at USM. His research interest include sustainable development, local knowledge, gender and rural development.

Associate Professor Dr Tarmiji Masron graduated from Universiti Sains Malaysia (USM), Penang. He received his Phd degree in Geographic Information System (GIS) in 2003. He became a deputy director of Institutional Development Division at USM in 2014. His research interest include GIS, Spatial Social Science and Spatial Decision Support System (SDSS) and Historical GIS

Associate Professor Dr. Salfarina Abdul Gapor graduated from University of Sheffield with BA (Hons) in Urban Studies and pursued her Master in Environment, Development and Planning at the University of Sussex. She continued her PhD in Geography at the University of Hull. She had taught at Universiti Sains Malaysia since 2002 and moved to Albukhary International University in 2012. She is currently at the University College of Technology Sarawak, under the Architectural Programme at the School of Built Environment. Her research interest is in sustainable development, local, knowledge, poverty, gender and rural development.