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The use of Indigenous Knowledge in Agriculture and its Role in Sustainable Development

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Abstract: ***Indigenous knowledge (IK) has become an interesting topic and a growing field of investigation, both nationally and internationally, with increasing attention being paid to IK by academia and institutions. However, until now, an accurate definition of IK remains a great challenge, because there is some degree of argument between the terms IK and scientific knowledge. For this reason this article will focus on two main points; firstly will try to define IK based on aspects which make IK different from scientific knowledge. Secondly, it will try to show the importance of indigenous knowledge in sustainable development by providing a number of examples about the advantages and drawbacks of IK in sustainable development.***

Keywords: Indigenous Knowledge (IK), sustainable development (SD)

Indigenous knowledge (IK) has become an interesting topic and a growing field of investigation, both nationally and internationally, with increasing attention being paid to IK by academia and institutions. However, until now, an accurate definition of IK remains a great challenge, because there is some degree of argument between the terms IK and scientific knowledge. As a result, there is a difference between researchers about the definition of IK. During research of the literature related to IK, many definitions may be found that overlap in many aspects. For this reason, this essay will try to define IK based on aspects which make IK different from scientific knowledge. According to Warren (1991), IK is "…the local knowledge – knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. It is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management and a host of other activities in rural communities".

Warren reveals that IK is a set of perceptions, information and behaviour which is used by local community in order to guide them in terms of land use and the use of natural resources. In other words, IK is created by a local community to meet its daily needs in terms of food, health……etc. In addition, Berkers (2008) defined IK as "…a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generation by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment". So IK is not just one set of knowledge which scientists believed in the past. Rather, it is cumulative knowledge which can progress and develop over time. Moreover, based on these two definitions we can determine the main concept of IK as Ellen and Harris (1996) cited in World Bank (1997).

These concepts are that first IK is local knowledge that is locally focused, because indigenous people will speak about places which they are responsible for and which they are familiar with, so IK is locally based knowledge instead of knowledge which is used across a wider range.

Second, it is experiential in terms of being based on what people have preserved in their surroundings, and what is passed down through generations. Thus IK is experiential rather than experimental.

Third, it is social. It is very socially constructed, with the IK network being part of peoples‟ kingship relationships, cultural systems and social systems generally.

Fourth it is learned via being apprenticed to local experts, such people have the responsibility to pass knowledge made up of particular pieces of information. Fifth, it is pragmatic rather than theoretical. It is not knowledge about making grand statements and being applied universally. Rather, it is local knowledge intensively based on what can actually be done with regard to real situations in the real world. Sixth, it is generally orally preserved rather than being written down in general articles or journals. Examples include songs, stories and other traditional performances which are passed down from generation to generation. Seventh, it is spiritual. This is thought to be the most important aspect of IK in that it is often times expressed in very spiritual ways. In contrast, as mentioned before, there is a sort of variance between IK and scientific knowledge. Thus, these differences can very easily be explored by comparing the main concepts of both terms. The main concept of scientific knowledge is that first it is replicable. Scientific knowledge is based on experiment. Second, it is strictly controlled. Third scientific knowledge can be abstracted universally (theoretically) and scientists attempt to use across a wide range, and in a very broad way. Fourth, it is rigorously empirical and experimental. Fifth, it is impersonal knowledge which does not have a link with particular individuals. Sixth, scientific knowledge is sustained via institutional networks instead of through social networks. Seventh, scientific knowledge is based on technological use. As a result, IK is an important aspect of culture. It is the way in which a culture can be preserved and

handed down. It can respond to new situations and can adapt itself to changing circumstances (Ross et al., 2010).

Since World War II, development theorists have viewed IK as being in binary opposition to "scientific," "western," "Eurocentric," or "modern" knowledge, because Eurocentric believe that only Europeans can progress and adapt to various conditions in different fields. On the other hand, it is believed that indigenous peoples or knowledge cannot progress and adapt to different conditions (Battiste, 2005). Nevertheless, there has been a clear change in academic judgment about IK, because in the three last decades, most of the academic work on IK has been represented by development sociology, anthropology and geography. However, nowadays, the interest in IK has encouraged theorists to use IK for various fields such as medicine, human health, soil science, agriculture, management, forestry, sustainability and so on (Agrawal, 1995).As a result, it has been noted that the views of development theorists have changed toward IK, and many national and international organizations and institutions such as UNESCO, CIDA, and the World Bank, and many journals and newsletters, have emphasized the importance of IK. In the academic area, a lot of conferences have taken place trying to join the issues relating IK to development and sustainability. For this reason, this essay will seek to show and evaluate to what extent IK can be utilized alongside sustainable development in different approaches or fields.

Sustainable development has become a subject matter and was first used by the World Commission on Environment and Development in its report "Our Common Future". This report defined sustainable development (SD) as the meeting of needs or the use of natural resources by the present generation, without compromising the ability or destroying the situation for the next generation. However, this definition has been critiqued by development theorists and scientists who pointed out its many limitations. This is because it just focuses on how developments sustain human needs without focusing on other factors (Kothari, 2007). In other words, the process of sustainable development requires additional factors such as how people adapt to the idea of sustainability, and how people can obtain sustainability in different sectors, or what knowledge has led people to achieve sustainable development.

Starting in the 21st Century, humanity has faced unprecedented dangers and problems such as air and water pollution, drought, disasters….etc. As a result, most scientific work has gone into devising coping strategies to find solutions for these problems. Thus, with the failure of development theories in the last three decades, the focus in most of the social sciences has changed. Development theorists have begun using IK as an influential tool to enhance the process of sustainability. Nevertheless, development theorists and scientists can be divided into two groups. One group believes that indigenous people with IK cannot change anything because they are trusting nature to make and determine provisions for all aspects of their survival and their future lives. As a result, they believe that IK cannot have any effective impact on sustainable development and natural resource management (Windschuttle and Gilling, 2002). Despite these views, a second group believes that IK contains legitimate knowledge and has the capacity to help the process of sustainable development and natural resource management (Ross et al., 2011). However, current views about IK accept that IK is an important tool which holds promise for agriculture, food security and sustainable development and is able to provide alternative development approaches (Agrawal, 1995; World Bank, 1997).As Agrawal (1995) says, the reason for changes in the views of theorists with regard to IK is based on two main points. Firstly, IK is capable of working with different trends in the social sciences terms of the thinking and development of administrative practices and sustainability. Secondly, IK is reckoned to be an important natural resource that is able to facilitate the development process in terms of cost-effective and sustainable ways. This is because IK covers the whole range of human experience such as being able to integrate with physical sciences such as agriculture, medicine, climatology, engineering and irrigation or with social sciences such as politics, economics, military studies and sociology, or areas of humanities such as communications, arts and crafts,……etc(Williams and Muchena,1991). For this reason I will try to explorer the role of IK in each of these fields.

The following examples offer a brief and short explanation of the role of IK in different sectors. In Vietnam, for instance, there are around 54 different ethnic groups. These groups have lived for many years by practicing their own traditional knowledge with regard to agriculture and protecting biodiversity such as in the forests. Moreover, this knowledge has led to the creation of a strong relationship between the local culture and natural resources, or biodiversity in particular, and has helped to manage and protect biodiversity in this area (Trung et al., 2007). For instance, Ban Buahis a small village in Vietnam. Villagers in this area have a ritual management of natural resources which helps them to maintain an ecological balance in terms of resource management. They believe that the forests are sacred and that people should respect them and not try to destroy them. As a result, villagers use IK because they know everything about the forests in terms of when, how and what should they should use and collect in the forest. They only collect wood in the form of dried branches and fallen trees. This system of management in Bah Buah has become a real model which the government has used to create successful community forest management based on local community‟s knowledge. This example shows that IK can be integrated with modern knowledge to become a powerful tool in terms of sustainable management in a country like Vietnam.

Figure 1: shows Communal forest in Ban Banh village in Vietnam

Our second example is related to a particular farming method for the production of food on the part of the Hmong people who live in the northern region of Vietnam, especially in a district called Dong Van. This is a high rocky mountain region. Farmers in this region use "Rocky Pocket Agriculture" for farming maize. They built pockets in the lower levels of the mountain as well as the high reaches. They chose maize to farm these pockets because this crop needs no fertilizers and these pockets have enough soil to grow maize. Hence, by evaluating the uses of IK in terms of farming maize, it can be seen that IK has some advantages over modern knowledge. For example, growing maize based on IK is less expensive than farming using new technologies. The maize variety grown as a result of using IK is more delicious than introduced varieties. The results of this example precisely match with scientific statement with regard to IK; scientists believe that IK has a particular principle that allows continuous cropping through whole the year without the need to use chemicals or fertilizers which degrade the environment and particularly the soil. Furthermore, this work often appears as a reason for replenishing the soil (Glaxton, 2010). Furthermore, using IK in agriculture is one of the most important ways to reduce costs and prevent the loss of plant genetic materials that are highly resistant to diseases. Although, modern technology, to a certain extent, has solved the problem of food and fibre needs, it is, however, too expensive in terms of costs of technology transfer…..etc (Davis and Ebbe, 1993).

Figure 2: Left is an example of rock pocket agriculture and right picture is a view of Rocky Mountain in Vietnam.

The third example is related to forest development and re-greening limestone mountain areas in Vietnam also. The government had plans to plant exotic trees such as acacia which has an international value, in Phuc Sen. It is a small village in Vietnam with limestone mountains covered around 79% of the total area of the region. The main economic activity of the people in this village is agriculture production. On the other hand, the ethnic minority people in this village are aware of the importance of the forest for the local ecology. As a result, these people have commenced to re-green the limestone mountain in this area by using local IK in order to choose suitable trees which are able to grow in this environment. They chose a tree called the Mac Rac. Within a couple of years of introducing this project, local people had solved the firewood and water shortage problem. At present only 1,010 hectares appear as part of the Limestone Mountain. The rest of area is covered by divers trees. With this example it can be seen that the government failed in terms of planting exotic trees because the local people knew better which indigenous trees are able to grow under which environmental condition. As a result, it can be seen that IK plays an important role in terms of adapting to different environmental conditions and sustaining local peoples" activities. Thus, the best way to utilize IK is to use it in conjunction with scientific knowledge.

Figure 3: The Mac Ractrees in Vietnam

Africa, on the other hand, has countries in which most international institutions are working to help local government fix problems such as poverty, drought, health care……etc. In the two last decades, governments and institutions like the World Bank have attempted to use local IK to find suitable solutions for different problems on this continent. According to a report published by the World Bank in about Mozambique (World Bank, 1998), local communities in this country commenced to return people who were displaced from the land during the civil war over a period of more than 50 years. The result of this project was that around 5 million refugees were helped to settle in only two years. The main significance of this example is how could these local communities have undertaken this project without receiving any help from donors and the government? Local communities relied on customary laws or IK to prevent any potential conflicts that might have arisen during this project. As a result, IK appeared as a political problem solving source, which helped the people involved to settle and for them to resume farming which, in

turn, helped to increase the growth of agricultural production in this area.

In the field of medicine, IK has had an interesting effect on public health. According to a World Bank report in 2002, in Vietnam there were around 3,830 different sorts of medicinal plants. Most of these plants were grown in the uplands which were populated with different ethnic groups. The local people in these uplands were using some of these plants to heal common diseases such as headache, fever……etc. In fact, medicinal plants in Vietnam have an important role to play in terms of protecting public health. However, these plants also contribute to preventing hunger and poverty because local people are collecting and selling these plants. Hence, IK "…provides the basis for problem solving strategies for local communities in Vietnam, especially the poor and is an underutilized resource in the development process" (World Bank, 1998).

In Iran, farmers manage their farmlands and agro ecosystems based on IK and a reliance on locally available resources, which has led to sustainable development (Koochkeki, 2005). In Iran, water shortages or scarcity in arid land is one of the big problem facing farmers with regard to crop production. However, by using local IK, farmers are able to produce one particularly interesting crop in the form of black cumin. They have used IK to overcome the water problem by extracting underground water which is locally called Qanat. Thus, IK has helped farmers to adjust to harsh and hostile environmental conditions. On the other hand, as mentioned before, local people with IK know which crop scan is grown with regard to each environmental condition. As a result, Iranian farmers chose black cumin because this crop does not need a great deal of water during the growing process, and it is short lived annually. Nowadays, black cumin has become of the one of the socio-cultural entities of Iran.

Figure 4: shows the black cumin plant

In terms of food habits, IK has an effective role to play. According to Charles Takyoh Eyoung, in Central Africa, people are now living for shorter periods than before, certainly compared with the last two generation who lived to between 70 and 90 years. Part of this problem relates to peoples" eating habits. In the past, people never cooked food without using vegetables. This made their diet more balanced. Using this example, two main points might be explored. First, local people, by using IK, learned how to prepare a balanced diet without going to school to learn how prepare such a diet. Furthermore, the development of technology, especially in the health care sector has been unable to help people eat a balanced diet in this country. Second, in some situations, scientific knowledge can have a negative impact on IK, which cause a reduction in the power of IK.

In addition, in Africa, local people controlled a serious disease called Schistosomiasis by using IK. This disease spread by fresh water and has caused the death of around 200,000 people in Asia, Africa and Latin America in the past. Local people in Africa used a plant called Endod. This is a trailing shrub or climber on the trees in tropical areas in Africa. Nowadays, Endod has been selected by scientists as an effective way to prevent this disease.

Figure 5: an example of Endod plant

In contrast, with all of these benefits of IK, Briggs (2005) quoted a farmer in Tanzania as saying "If IK is so good, why is my farm so poor?"This sentence changes the direction of this essay"s discussion to the opposite side which is what the limitations are or the problems associated with IK in terms of sustainable development? For instance, some of the people who make use of IK are using shifting cultivation and mixed cropping during the farming process. This has led to a reduction in the productiveness of farming land and has destroyed biodiversity. Another method which indigenous people are using during the farming process is fallowing and the slash and burn of land after each farming cycle. All of these activities by local people have a negative impact on the survival of wildlife, and even where they exist. For this reason, agriculture extension workers have encouraged local farmers not to use such practices as part of the agricultural process. In the Manokwari forest in north Papua in Brazil, local people were using IK to burn the trees in order to clear land which they then used for agriculture. This led to the loss of large numbers of trees in the last few decades until the present day when the Brazilian government has started to prevent the burning of forest land by indigenous people.

Figure 6: shows burned forest by local people in Papua Brazil.

An attempt has been made in this work to review and explore the role of IK in sustainable development in different fields such as agriculture, health care, food security, food habits, protecting biodiversity and so on. The results show that IK is dynamic and has developed over time. Local communities with IK have the capacity to adapt to any environmental change. This might count as the core of sustainable development and natural resource management (Adger, 2000). Furthermore, the integration of IK and modern knowledge or scientific knowledge can give a boost to the sustainable development process in many countries. Frequently, development theorists have sought to use IK during decision making about many environmental issues. For instance, the Ugandan government, by leveraging IK and scientific knowledge, has reduced the risk of maternal mortality rates (World Bank, 1998). However, IK appears to achieve a better fit when it addresses local small scale problems. In some situations, the integration of IK and scientific knowledge has faced some barriers. The reason for these barriers existing can be explained in several ways.

First, as mentioned at the beginning of this essay, IK involves local knowledge and is usually transmitting informal ways such as orally. So IK does not have appropriate institutions or communities to attempt to ensure it is across a wide range.

The second barriers as Ross et al. (2009) determined in their book „Indigenous People and the Collaborative Stewardship of Nature" involve institutional barriers. These relate to the ways in which IK is often referred to. IK is usually expressed by social or spiritual rather than scientific frameworks. As a result, scientific and natural resource managers find it difficult to understand. For this reason, indigenous people have to translate their knowledge into some kind of framework to help scientists understand. Even so, IK has faced these problems and met all of these challenges. Nevertheless, according to most of the studies which have done about IK, it has been suggested and agreed that the potential of using IK in sustainable development and management is an important key to helping humanity escape from these problems which have been caused by human activities. As Puffer (1995) has determined, there are a number of key components which have caused the acceptance of IK by scientists and development theorists. These are, firstly, IK often appears as a key to reducing risk, especially with regard to protecting biodiversity. Secondly, IK helps local communities to generate income by meeting domestic needs.

Thirdly, IK is a sort of knowledge which is readily available.

Fourthly, because IK is attested by evidence from a number of sources, including those most trusted in the community, it meets the needs of addressing local problems.

Fifthly, using IK produces readily visible results within a reasonable amount of time, thereby meeting multiple needs. However, the main challenge associated with IK remains an unsolved issue, which is the way in which scientists and development theorists seek to ensure that IK comes out as local knowledge to be used internationally. For this reason, as mentioned in the first paragraph, many national and international organizations and institutions such as the World Bank, and UNESCO, and also in the academic field, have begun to concentrate on local communities in order to encourage local people to share local ideas with each other, and attempt to build strong relationships between IK and scientific knowledge. This work might be allowing development theorists to use appropriate forms of IK in different fields, by combining and integrating both concepts.

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