INDIGENOUS KNOWLEDGE AS A CULTURAL ADAPTABILITY TO SANDY ECOLOGICAL AREA: STUDY OF KẾ MÔN VILLAGE, ĐIỀN MÔN COMMUNE, PHONG ĐIỀN DISTRICT, THỪA THIÊN HUẾ PROVINCE, VIETNAM

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1. An Overview of Kế Môn Village

Kế Môn, in Điền Môn District, Thừa Thiên Huế Province is representative of villages having a coastal sandy eco-system. It is about 65km north of Huế City and. With a length of 2.4 km the village has its back against white sand dunes (*đôộn*). Its southern part is bound by Ô Lâu River, its northeastern part is bound by the sea, its southeastern part is close to Điền Lộc Commune and its western part is close to Vĩnh Xương Village.

Although Kế Môn village lies in a coastal eco-system, the villagers follow the tradition of the northern Việt people (Từ Chi - Phạm Đức Dương, 1996: 24 - 26) to turn their back to the sea and invest in farming on a narrow coastal strip, which bad for cultivation.([1])

Kế Môn village has a natural land area of 1,100 ha including about 777.1 ha of currently-in-use land managed by the Co-operative and more than 300 ha of

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[1] We attribute this characteristic of the village to its founding process. Founders of Kế Môn Village came from the north (most of them came from Thanh Hóa Province and some from Đức Thọ (Hà Tĩnh Province), and Phú Thọ and Cao Bằng Provinces. They took with them the technique of farming wet rice. However, at that time (15th century) Thuận Hóa had a narrow land area and a large population. As a result, local people such as those in Mỹ Xuyên Village had to cultivate "*ký tại*" field (the field that lies in the village's territory but belongs to others) in Manê area (in the current Phong Chương commune, opposite Kế Môn Village on the western bank of Tam Giang lagoon) about 10 km from Mý Xuyên (Nguyễn Thế, 1999: 74-78).

unused land managed by the Điền Môn Commune People's Committee. This includes 221.27 ha of cultivable land (185.38 ha of rice; 29.39 ha of subsidiary crops and 6.5 ha of short-term cash crops); 140 ha of forest land; more than 400 ha of specialized land (for capital construction, roads, irrigation works, and cemeteries); and nearly 10.4 ha of residential land. The village is about 3 km wide (from its land boundary to the sea on the north-south direction). Its land is divided into 4 categories: residential, subsidiary crop, cemetery ([2]) and desert land. Residential land is again divided into 6 categories of different qualities (from one end of the village to the area close to the *đôộn* (sand dunes). The desert soil is also called "chicken fat" as it is yellow and looks like chicken fat. This land is cool but infertile, as wild plants do not grow there. Moreover, during the rainy season, the water flows from the boundary of Quảng Trị to Ô Lâu River, washing out all nutriment from the soil. Kế Môn villagers differentiate it with the dusty soil around sand dunes where wild plants develop well. The dusty soil is white, dry and hot but fertile, because leaves fall and decay in it.

The village lies in the north - south direction, wider on the west and narrower on the east (See Annex 1). It was formed by 3 lines of parallel sand dunes along the coast, which are called by villagers as the inner sand dunes (*đôộn Trong),* the outer sand dunes *(đôộn Ngoài)* and the remotest sand dunes close to the sea (*đôộn Cụp).* The *đôộn Trong* and *đôộn Ngoài* are separated by a village gill (about 4.5 km long) which flows from Điền Hương commune (bordering Quảng Trị) to Đồng Dạ ravine before discharging into Ô Lâu River. The Đồng Dạ Ravine is the eastern natural boundary between Kế Môn Village and Điền Lộc Commune.

According to historical records, Kế Môn village was established very early. In the 16th century, Kế Môn was one of the 60 villages in Thuận Hóa region and belonged to *tổng* Vĩnh Xương (canton), *huyện* Kim Trà (district), *phủ* Triệu Phong (prefecture) (Vô Danh Thị, 2001: 57). In the 16th year under King Minh Mạng (1835), Kim Trà district was divided into Phong Điền and Hương Trà ([3]), and Kế Môn village was in Phong Điền district (Nguyễn Dynasty's National History bookstore), 1961: 27)

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[2] According to village law, the tombs of ancestors must be 20 - 30 m from each other's end and 15 - 20 m from each other's side. And the feet of this tomb must not be opposite the head of the other. People's tombs should be 4m away from each other. The head of the dead should be put on a higher position than the legs. With the concept of Yin and Yang should be harmonious, the deads were buried in the warm and cool land. Most of cemeteries lie on the sides of sand dunes or flat areas with the exceptions of some tombs which were on the top of the sand dune.

[3] In the Lê Dynasty it was Kim Trà district, Triệu Phong prefecture. Early in the Nguyễn Dynasty its name was changed into Hương Trà until today (Quốc Sử Quán (Nguyễn Dynasty's National History bookstore) of the Nguyễn Dynasty, 1997: 94).

Most of family lines in Kế Môn originated from the north. The pioneer came from the Võ family, who was accompanied by other 12 families, the Hoàng, Bùi, Phan (upper branch), Đặng, Nguyễn (highland), Nguyễn (plain), Lê, Trần Đình, Phan (lower branch), Trần, Trần Duy and Hồ ([4]). In the period between 1960 and 1965, the goldsmiths left the village to make a living in different regions. They came to Huế, Đà Nẵng, Nha Trang, Saigon, Gia Lai, Kon Tum, Đà Lạt and Buôn Ma Thuột. Some went to the US. after arriving in urban areas, they earned their living by doing different jobs, mainly small trading or worked for hire. After they accumulated an amount of money, and with their existing skills they began to work as goldsmiths.([5])

In the past Kế Môn village was also called xã. It was headed by a *lý trưởng* (village chief) who decided all village affairs. The *lý trưởng* was assisted by a *phó lý* (deputy chief). The *hương kiểm* (village security man) took care of the village security and order. The *ngũ hương* (five village staffs) were in charge of 5 important aspects in village affairs, including the *hương bốn* who was responsible for the village young men's register book and farmland register book. The village consisted of 4 *giáp* (an administrative unit under the village): Nhứt Đông, Nhì Đông, Nhứt Tây and Nhì Tây. Each *giáp* consisted of a number of *xóm*. The *giáp* was headed by a *trùm* who was responsible for *giáp*'s security. The man worked as secretary of the *giáp* was called *xạ*. In addition to these men, the village also had 8 errand men who look after rice fields and dykes (called *tuần đinh*) and 2 *thủ khoán* (shrubby forest protectors).

After 1975, Kế Môn was called *thôn* and headed by a *thôn* chief. *Giáp* was changed into *đội*. Currently the village consists of 4 *đội*, and 35 *xóm* with 521 households and 2,225 people. Village administration is divided into two areas,

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[4] Later the village was joined by another 4 families, the Trần (upper branch); Nguyễn (later), Hoàng Công and Hoàng.

[5] According to villagers, goldsmith occupation was founded in the 18th century. A skilled goldsmith called Cao Đình Độ (1735) from Cẩm Tú village, Cẩm Thuỷ district, Thanh Hóa province emigrated to the south. While he was on the Ô Lâu river to Phú Xuân, his boat was capsized by Dừa hamlet, Kế Môn village. Two local farmers, Hoàng Công Bàn and Trần Duy Lợi who were harvesting rice, jumped into the river and saved his life. After that Độ became an adopted son of the Trần Duy family. Later the skilled goldsmith Cao Đình Độ was called to work in the royal court by Tây Sơn Kings and then King Gia Long. When he was old, he handed down the trade to his son, Cao Đình Hương. Feeling grateful for Kế Môn villagers who had protected and helped them in their difficult time, Hương returned to the village and taught goldsmithing to villagers. From then on, Kế Môn village became welknown for their trade. In the Nguyễn dysnasty, jewellery used by the Kings and mandarins were all made by Kế Môn goldsmiths. Their children had opportunities to attend school and many passed royal examinations and won doctorate degree: Nguyễn Thanh Oai (also called Nguyễn Uy (the 1843 royal examination), and Trần Dĩnh Sỹ (the 1895 royal examination).

administrative and production (this administration system has been applied since 2003). Administrative affairs are managed by the *thôn.* Meanwhile agricultural production, and field, dyke and forest protection are managed by the *đội* but under the management of the Cooperative and the village's Control committee.

Rice planting ([6]) has been the village's major occupation since its foundation. Villagers also planted sweet potatoes and melons on the sandy area close to the sea, and other subsidiary crops such as peanut and cassava. A study of the *đất trạng* (or *bạch sa* - sea sandy soil) in Lộc Vĩnh (Phú Lộc district, Thừa Thiên - Huê) showed that sweet potatoes can grow well on *đất trạng* and help increase the soil fertility and reduce acidity (Lê Bình, 1988: 68). We think that this finding indirectly confirmed the plant selection and development process by Kế Môn inhabitants. However, farming has been done on sandy, acidic and saline soil, which is not favorable to crops, particularly not accessible to water resources. So different from farmers in other areas who cultivate argillaceous and alluvial soil, Kế Môn farmers have to make high beds and deep ditches for subsidiary crops to keep water and wash acid and salinity and prevent water-logging.

Despite obstacles caused by sand dunes, Kế Môn farmers know how to fetch water from the village stream and many *bàu* (low-land areas filled with water in the rainy season) such as Bội, Bể, Lấp, Đán, and Môn to irrigate their subsidiary crops on the sandy land, using buckets and shoulder pole. Here, the Đồng Dạ ravine is the major water resource to irrigate rice fields through deep canals, which can be used for both irrigation and drainage. They also dig wells close to their rice fields for irrigation.

In this difficult situation, wild plants on while sand dunes have become a gift of nature. They are the fence preventing wind and sand and provide food for villagers. And villagers, with their indigenous knowledge of the eco-system, have found measures to overcome natural disadvantages to protect their community lives and the wild plants.

2. The Dyke System and Indigenous Knowledge in Dyke Protection

The sandy coastal eco-system in Kế Môn causes many obstacles to the village. In addition to this, the village is bordered by water on 3 sides, Ô Lâu River in the south, the sea on the north and Đồng Dạ ravine in the east. During their existence, local inhabitants of many generations have always coped with natural disasters

[6] Village fields are divided into 3 categories: good quality field for sowing seeds (is called *ruộng trưa*); good and never sumerged field for rice transplanting (is calle *ruộng nhất*); and deep, poor soil and often submerged field lying along the Ô Lâu river (is called *ruộng ngoài*). Normal field is called *đẳng hạn.* Each category is again divided into 6-7 sub-categories. Position of these fields are named after Chinese characters and set to poem by Confucians.

such as whirlwinds, storms, floods, particularly sand erosion which filled up fertile soil, residential land and ancestors' tombs.

Confronting these obstacles, the locals have had no choice but to take measures to overcome them. With their experience, they have formed their indigenous knowledge (IK) of the regional eco-system. And vice versa, this IK has helped them accumulate more experience in productive activities to improve their lives, as well as grasp the causes and effects of natural negative phenomena. By oral communication, generations have handed down the IK about their habitation to improve their individual as well as community lives. Oral tradition has helped them maintain and protect their ancestors' experiences and fruits of their labor. The dyke system along Ô Lâu River, sand dykes (called by the locals as *đê Cụp*) and ravine dykes are example of this. In fact the dyke is only a tool to defend their land, but construction method, position, reason and significance of dyke construction show the outcome of their labor and accumulated experiences on the environment. All are aimed at maintaining the community life, not only economic but also moral and spiritual.

Dyke maintenance was done by the *giáp,* and each *giáp* was responsible for a dyke portion allocated by the village. The task was assigned by the village chief to the *trùm* (chief of *giáp*). The *trùm* would be responsible for assigning specific work to each person to ensure labor effectiveness and avoid overlapping of work.

The village adopted strict regulations on *ngày đình công*. It meant that anyone who was absent on that working day would be put in compensating work, and who could not fulfill his work would be considered insufficient. Those who were away from home had to come back to work on that day. In order to realize these regulations, the village has taken monitoring measures and the regulations have been changed from time to time. Before 1954, those who did not participate in *ngày đình công,* would be let in "debt", and the village secretary entered their names on a list. When the village required labor for any other work, they had to work in compensation. From 1954 to 1979, those who missed *ngày đình công* could work in compensation within 1 or 2 days after. From 1979 to 1999 when cooperatives were operating, *ngày đình công* was realized by giving marks to the workday. Since 1999, a piecework system has been applied. The village's cooperative contracted the repair of the dyke portion to villagers by a certain quantity of rice. The rice was collected by rice field area defined by the village and will be paid equally to people who participated in *ngày đình công*. After receiving the task, the *giáp (đội*) would assign specific jobs to each member.

Dyke maintenance:

*** River Dykes:**

Some of the village's fields lying along Ô Lâu River are often submerged and not favorable for rice growing. The dry season prolongs from May to August also submerged rice fields in saline water, destroying rice and causing financial difficulties to the locals. In order to dam up water for rice planting and prevent saline water from the river to the rice fields, villagers built a dyke system along the Ô Lâu River. The earthen dyke system is about 3,500m long and 0.5 – 0.7m high and is about 18m from the fields.

The Ô Lâu river dykes are very important which directly impact the lives and economic activities of the whole community. So local people had to make regular repairs. In 1997 - 1998, the State, through a World Food Program project, helped upgrade the Ô Lâu River dykes to 1 - 1.5m. Together with Cửa Lác dam, the upgraded Ô Lâu river dykes have helped prevent saline water entering the from Tam Giang lagoon in the dry season. As a result currently Kế Môn villagers don't have to make regular dyke repairs.

*** Sand Dykes:**

As Kế Môn lies in a terrain of high sand dunes, it is not easy to make a clear distinction between different land categories. The village cemeteries concentrate on flat land areas or along both sides of sand dunes. Meanwhile, fertile soil is concentrated on both sides of the stream and *bàu* (low-land areas filled with water in the rainy season), and is always threatened to be filled up by sand during the rainy season.

About this situation the locals said that it was because the village's western and eastern ends were higher, while its middle was sandy and low. When it rained hard, water flowed rapidly from Điền Hương *C*ommune (close to Quảng Trị province) while the water in Ô Lâu River rose up and could not discharge to the river immediately. As a result, water was logged in the sandy areas at an average height of 1 - 1.5m, even to 2m in lower areas. The water even spread out to the gill, swept away sand and filled up subsidiary crops and tombs. It not only caused economic losses but also negative impacts on their moral and spiritual lives. That is why a sand dyke system has been built and repaired for many centuries in order to keep the water from the sandy areas to the village in the flood season. The dyke was built of sand taken from areas far from the flow, along the sand dunes between *đôộn Ngoài* and *đôộn Cụp*. The dyke was about 3km long, and 1 - 1.5m high with a surface of 3 - 4m. During embankment, the locals spread shells or macadamianuts on the surface to prevent sand erosion. These materials were contributed by the people. It was defined that a people of working age have to contribute two baskets of these materials.

For Kế Môn villagers, sand dykes are very important in securing their lives, particularly spiritual lives, so they are very concerned with dyke maintenance. Every year in the 7th Lunar month, villagers use sand to reinforce the small, low or eroded dyke portions. Villagers of all generations have maintained that the best way to protect dykes is to plant *Dứa dại* (Pandanus hueensis), *Cỏ Ống* (Panicum miliaceum), *Cỏ Chi* (Cynodon dactylon) or dry bamboo on the dykes to retain the sand.

In our opinion, it was not accidental that *Dứa Dại*, *Cỏ Ống*, and *Cỏ Chi* were planted on the dykes to retain sand. It might be that Kế Môn villagers already knew how to build dykes to limit the damage of sand dunes as early as the time they came to reclaim the new land. Dyke protection methods might be very a important and urgent issue. The concentration of these wild plants on sand dunes enabled them to experience their biological characteristics and development process. Proceeding from that experience, the locals have planted them widely on their sand dykes to make the most of their useful effect in dyke protection. In the dry season *Cỏ Ống* are withered by the weather. However they have long water-contained stems so in fact they are still living. In the rainy season, the stems develop into plants. *Cỏ Chi* have long, deep roots spreading out as creepers. Their roots will help them develop again in the rainy season.

Similarly, *Dứa Dại* is also heat-resistant and easy to grow and particularly their roots can retain much sand (some bushes have roots of 10 - 15m long). Their large and deep roots can feed the plants well in poor sandy soil. However, the planting season should be suitable to help them develop easier. According to the locals, *Dứa Dại* is often planted in August (early rainy season). In the dry seaon (April - July) their roots will be long enough to strike into the soil and help the plants develop. Thanks to their roots, *Dứa Dại* can develop well in the dry sandy soil. Particularly, *Dứa Dại* is planted in big bushes (1 - 1.5m high) to be able to hinder the wind and prevent sand erosion. They can protect dykes in the rainy season, retain sand moving from other places and protect the dykes from erosion in the dry season. Here Kế Môn villagers' indigenous knowledge is also shown in the planting method. They grow these plants in two lines, along the dyke side and on its surface to make the most of their sand-retaining capacity.

In addition to planting trees to retain sand dykes, local people also understand about natural development of wild plants on the area. The wild plants including *Móc Tràm* (Caryota urens), *Tràm* (Melaleuca leucadendra) and *Trâm Bù* (Combretum Sp.) have been "planted" by birds. These plants develop and become an effective fence to retain sand, and the locals know how to make the most of them to protect their dykes.

3. Indigenous Knowledge (IK) in Sand Dune Protection

In addition to indigenous knowledge in protecting the eco-system and overcoming disadvantages caused by sand dunes, the villagers also take measures to protect sand dunes.

A long sand screen (2.5 km) consisting of high sand dunes along the coast protects Kế Môn village from sea winds and storms. Wild plants developed on *độộn cát* (sand dunes) act as a shield to protect the dunes ([7]). A Long time ago, the village already had regulations to protect wild life. Mr. Trần Mót, (81) told me of the village's strict law. In feudal times the law offenders were beaten by rod and fined, and even expelled from the village. Most of offenders who felled trees on *độộn cát* were beaten, and the rod was hung in the village's Communal house ([8]). However, the penalties have changed from time to time. In order to enforce the village law, the village established a *Lâm lộc điền hoà* Committee (*Lâm lộc*: forest; *điền hoà*: dyke) under the management of the *Hương kiểm*. The Committee had the responsibility to monitor affairs relating to dykes, fields and shrubby forests. It was divided into 2 groups to take care of the fields and shrubby forests. The 4 field protectors (*tuần đinh*) ([9]) were responsible for catching buffalos, cows, chicken and ducks, which damaged the rice fields. The 2 forest protectors (*thủ khoán*) were in charge of arresting and giving penalty to those who felled trees on *độộn cát*. Two *thủ khoán* had to patrol the forests and arrested anyone who felled living trees, even the leaves and branches. The offenders were beaten by a rod made of *Trù mèo* tree. Depending on their offence, the *thủ khoán* would release them or handed them to the *Hương kiểm.* Another local, Mr. Giây told me that his father had been a member of the *Lâm lộc điền hoà* Committee and had witnessed a girl who was given 5 rods until her wound was bleeding. It was simply because while sweeping dry leaves, she took some fresh branches to refresh her *bội* (a bamboo tool to shovel dry leaves).

Despite many obstacles brought about by sand dunes, the sand dunes still helped Kế Môn inhabitants develop their IK about the regional eco-system and the IK again helped them take counter measures to stabilize their lives. Particularly, the people also have specific knowledge of natural resources, their distribution,

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[7] Villagers consider wild plants on the sand dunes very important by saying "rú tàn, làng mạt" which means that if shrubby forests are destroyed, the village will no longer exists. This knowledge was formed very early in history, and has been maintained and handed out from generation to generation.

[8] This practice was similar to that of Phong Lai village lying in front of Kế Môn on the opposite bank of Tam Gian lagoon. The village law (copied in 1901) clearly stated about the penalties given to those who felled trees or dug holes on *độộn cát* and in vulnerable areas close to the river. The offenders would receive between 10 and 20 rods (*Khoán lệ*: 2003).

[9] If the *tuần đinh* caught any chicken or ducks which were causing damage to the rice field, he would beat them to death or handed them to the village to check and fine their owners.

harvest time and processing methods. This IK helped them make the most of indigenous natural resources to enrich their daily meals.

4. Natural Resources Exploitation Methods of Kế Môn Inhabitants

Basing on people's knowledge I have listed about 80 species of indigenous wild plants of different categories such as bush, climber, timber and grass (See Annex VI). The wild plants have been used as a shield to protect the village from winds and typhoons and as firewood, food, softdrink and medicines (See Annex VII). According to Kế Môn inhabitants, the wild plants develop widely but village elders said certain plants concentrate in certain areas. For example, the *Trâm Bù* (Combretum Sp.) often grows in higher sand dunes at the beginning of the village (Truông Chùa sand dunes); the *Dẻ* (Lithocarpus Sp.) concentrates at the end of the village (Truông Tàu sand dunes); the *Bứa* (Garcinia Sp.) develops well in cooler area along village's back road called *đường Cấy*; the *Bộp* (Actinodaphne fruinosa), *Sắng* (Drypetes glauca) and *Dành dành* (Gerdenia augusta) develop in areas close to the water; the *Móc* (Caryota urens) often grows on higher land because it has single and deep roots, if it grows in low land areas, its roots will easily be destroyed by water. Bushes such as *Me/Mua* (Melastoma candidum) develop in low and humid land).

Most of Kế Môn inhabitants have specific knowledge about wild plants, harvest time of each plant (See Annex VIII), the use of each part of the plant (See Annex IX) and purpose of use. According to them, summer is the harvest time of most of wild fruits between the 4th and 7th Lunar month, some fruits ripe in the 11th, 1st and 2nd Lunar month. According to adults and particularly children's taste, most of the wild fruits are edible. However they said the most delicious fruits are *Móc, Dẻ*, *Bứa* and *Trâm Bù.* Some fruits are edible but not to eat too much to avoid getting dizzy such as the *Rõi* (Garcinia ferrea). Some plants such as *Bứa* and *Sắng* not only provide ripe fruits, but also young sprout and leaves for daily food. Village women often pick young *Bứa* sprout to cook sour soup. Young *Sắng* leaves are used for salad. Yellow *Dành dành* fruits are used by housewives as a food color in cooking fish. *Chiều* (Tetracera Sarmantosa) is a climbing plant. Its leaves can make soft drink and its stem can be used as string to make gourd trellis, to tie cattle stable, doors, fences, and particularly to tie up dry firewood gathered from *đôộn cát* (sand dunes).

Some plants are also used in ritual ceremonies. For example, flowers of the *Bông trang* (Ixora coccinea) are used as offerings on the altar. After being roasted, its roots are edible and have a similar taste as roasted peanuts.

Wild plants' leaves can be used to make soft drink particularly during hot summer days. They are considered "cool" which can improve taste and digestion.

For example, the soup made from leaves of *Chiều, Nổ* (Shuteria vestita), *Mã rạng* (Macaranga mauritiana), *Móc, S*im (Rhodomyrtus tomentosa), *Chổi* (Baeckia frutescens), and particularly *Vằng* (Jasmimum) is believe to help women in childbirth. On the 5th day of the 5th Lunar month, village women accompanied by their children and grandchildren, particularly daughters and granddaughters went to the shrubby forest to pick up these leaves. It was not only an obligation of their children but also an effective way to learn indigenous knowledge. The leaves were then dried up in the sun to make soft drink for the whole year. However, this practice now no longer exists.

It is very important for villagers to have IK of specific plants, because plants of the same family but different species will have different use. For example, the *Xương rồng* (Euphorbia antiquorum) consists of different species. The *Xương rồng* that has strait 5 - forked branch is edible, while other species have toxic latex and can be used as a haemostatic or to cure some certain diseases.

Villagers also knew how to eat roots which had toxic content, for example *Củ Nần* (Dioscorea sativa). After taking the roots home, they soaked *Củ Nần* into hog-wash for 3 days to let the toxic content out, then soaked it in cold fresh water for another 6 days. Before eating, they tried to feed the fish and if the fish was still living, then they could eat the root.

Leaf and stem of grasses such as *Chua lè* (Emilia flammea) and *Tàu bay* (Gynura divaricata) can also be used as food. *Chua lè* develops in the rainy season in August - October under big bushes. The *Tàu bay* grows in any place but concentrates near the fire.

Particularly, many plants of *Cam thảo* family (Liquorice) develop in the area. *Cam thảo /Nút* (Scoparia dulcis) grows in bushes on flat area. Its white flowers look like small buttons. *Nút* has a medical value, so people (mostly women) from Kế Môn and particularly from Quảng Trị often came here to pick them.([10])

Kế Môn inhabitants used *Dứa dại* as a shield to prevent winds and retain sand. They used its roots as strings to tie doors, cattle stables and make trellis. Its sprout was used as food, particularly during the war. Women are very skilled in processing *Dứa dại*. They select young sprouts, strip off the green cover and take the white inside to cook it with fish.

Indigenous wild plant diversity is also a habitat for special insects. *Síu síu* is larva of a butterfly which appear in early spring. *Síu síu* is found on *Bời lời* (Litsea chinensis) and *Chập chọa* (Beilschmiedia roxburghiana) because they only eat the

[10] They used wooden rake to gather the grass (the rake was made of a wooden piece with nails on it, which connects to a long wooden bar).

leaves of these plants. According to villagers, this insect is edible but only in some certain periods of its development. Villagers temporarily divide its maturation process into 3 periods. They don't catch *Síu síu* when it is crawling on the stems to find leaves as it causes it chiness. It is only delicious when it lies in between two leaves to make cocoon. In the final period when *Síu síu* is already within the cocoon, it is still edible but not delicious because it already spitted out silk and its body is empty. Another insect called Rầy appears in the village at the end of spring and early summer. This dark brown insect is as big as the thumb and lives on the dew. Similar to *Síu síu,* this edible insect is much sought after by villagers particularly men. However they have to wait until dark to catch Rầy when the insects fly from the earth to sit on the *Phi lao* (Casuarina or *Dương* tree). That is why they are called Rầy Dương.

Indigenous wild plants not only provide food but also a habitat for birds of different species. And again birds supply villagers with eggs and meat. Village youngsters have learnt from their parents and grandparents knowledge and skills to make the most of these resources. Every year, particularly in the fruit ripening season (from early summer to later autumn), villagers, particularly young people often go hunting in the forests. Most of birds such as *Bìm bịp, Chim cu, Chàng làng,* and *Bồ chao* build their nests on high and bushy trees. Other birds such as *Le le* lives in the water gill, and *Tè hót* lives on grass in marshy areas. Villagers also know their reproductive season and their nesting place. Most of the birds here lay eggs in summer and in their nests on high and bushy trees. The *Hoàng Anh* bird digs holes in the sand to lay eggs, the *Đa đa* and *Sơn ca* birds lay eggs in grass bush, and particularly the *Đòm đòm* only lays eggs in *Dứa* bushes.

Although villagers know the habitat of each bird species, it is not easy to catch them. When night falls they light up bushes to dazzle the birds (*đóng đèn or ăn đèn*), then use an arbalest to hunt them down or a hand net to catch them. They can even catch the birds with their bare hands.

In addition to birds, there are animals living on the sand such as the *Dôông* and *Coòng* and villagers also have their indigenous knowledge to catch them. They said that the *Dôông* ([11]) only live on the land in 6 months of the dry season. They come out of their holes when spring ends and summer begins. In the remaining time they hide themselves in their deep holes underground. According to villagers, a *Dôông*'s hole is where the earth looks higher and some meters away from the trace. However, the *Dôông* live there at night and at dawn they come up to look for

[11] This animal is always in fear of rainstorm. During the 6 months living underground, they eat their reserved food. After the food runs out, it will eat its tail, and after a period of time the tail will grow again. To make a dish out of *Dôông*, the locals wash it before skinning, and avoid contacting it with water after that.

food. So villagers often go out hunting for *Dôông* very early in the morning. As their hole is very deep and zigzag and difficult to dig up, only men go hunting. However they must go in a team to save each other if one man is buried in the sand hole. In order to reduce risks, they use trap to catch *Dôông*. The trap is made of a small bamboo bar attached to a holed sheet-iron pipe at the size of a wrist and a length of 8 - 10 cm. The hunter connects the bamboo bar to the pipe with a string and makes the string into a ring, then thread it into the hole. After that, he sets the trap in front of the *Dôông'*s hole. When it goes out of the hole, it will be caught in the trap. In order to save time, the hunter sets many traps in different holes at the same time. However, after laying 2 - 3 traps, he will come back to check the first one, as the trapped *Dôông* may die in a short period of time. Similar to the *Dôông*, the *Coòng* ([12]) also lives in a hole, but its hole is smaller and lower. In addition to catching for food, young villagers consider catching *Dôông* and *Coòng* one of their entertainments. Kế Môn inhabitants also know that the *Dôông* and *Coòng* will make a best dish when eating together with *Móc* leaves. Sometimes they make a dish by grilling them.

Besides sand dune wild plants, villagers also feed themselves with fish, shellfish and turtles from the village gill and *bàu* (low-land areas filled with water in the rainy season). Early in the rainy season, shellfishes and fishes, particularly *Gáy* fish arrived with the flow from Ô Lâu River. From the 8th month of the Lunar year to the 1st month of the following year, villagers, particularly young women often went to catch fish. They put *rỗ chậm* (trapping basket smaller than a normal sized basket, but deeper and wide-meshed) on ditches along sides of vegetable crop beds. They stamped their feet on the ditch to herd fish into the *rỗ,* and then took it up to catch fish. When water began to rise they stretched a net on the watershed to catch fish. Beside shellfishes and fishes, the gill also provided them with turtles. They thrusted a bamboo stick or a tree branch into the water until they heard a sound (the bump between the stick and the turtle shell) and waded into the water to catch the turtle with their hands. However, the village gill and *bàu* now almost run out of natural resources as a result of fishing by electric shock, which has been widely practiced by villagers, particularly young people.

Sand dunes' natural resources are diverse food sources for villagers. However, as the national economy has been shifting in a commercial trend, their lives have been improved and foods no longer a too urgent need. So, natural resources have become food for young people's entertainment. For example, wild fruits make children happy and food made of fish, *Síu síu, Dôông* and *Coòng* have become titbits to be eaten over sips of alcohol by young villagers. This reality has changed

[12] The *Coòng* on sand dunes looks like the one on the seacoast but smaller with white belly and back (the *Coòng* on the sea has a light brown back and white belly).

the significance and objectives of exploiting natural resources on the sand dune terrain. From feeding villagers, natural resources have become commercial goods. Currently village children often catch *Coòng, Dôông* and *Síu síu* and sell them to village men at prices agreed upon by all villagers. For example, a *Síu síu* is sold at the price of VND 5,000, and a *Dôông* is VND 500. These wild products have also appeared in Điền Lộc market. For example, a *Dôông* is sold at VND 500, and a can of ripening *Móc* is between VND 500 - 1,000.

Some wild trees from *đôộn cát* have also appeared in the market in the forms of bonsai, ornamental trees or firewood. Wanton felling of trees for different purposes have destroyed many trees in these former luxurious forests. Big and beautiful *Mưng* trees (Barringtonia speciosa), *Phi lao*, and *Sanh* (Ficus benjamina) were uprooted by bad men who sold them to bonsai lovers in the city for alcohol. [13] They are almost not aware of harmful effects caused to the environment by wanton forest destruction.

The reduction of the floral coverage due to reasons mentioned above has badly affected the environment. That is why over the last few years, the Government has been more concerned about environmental protection through tree planting programs and projects in order to make the soil more fertile and humid and generate jobs for the locals.

5. Government Programs in Kế Môn Village

The *Finland-funded project on rural development* has been implemented in in Kế Môn village since 2001. The project is aimed at planting trees on waste land and bare hills to protect sand dunes and generate jobs for mountainous rural people to help them improve their lives. The project has been implemented in two phases: In Phase 1 (2001), trees were planted on 13 ha (8 ha of *Phi lao*, and 5 ha of *Keo lưỡi liềm* (Acacia crassicarpa). In Phase 2 (2002), trees were planted on 41.5 ha including 35 ha of *Keo* (Acacia) on sand areas. The remaining trees planted on sand dykes included 2h of *Dứa dại*, 2ha of *Phi lao*, and 2.5ha of *Keo lưỡi liềm*. In 2003, the *Finland-funded project* was not implemented because it depended on the acceptance of outcome in Phase 1 (after 3 years of planting and caring trees). However, in 2003 the Government Project 661 on *planting 5 million ha of new forests* in the period between 1998 – 2010 following Government Decision No. 661 was implemented in the locality with the aim of planting 10ha of *Keo*. Project 661 had 3 specific objectives with priority given to environment protection, natural disasters reduction, water resource increase, and bio-diversity conservation. The project was also aimed at generating more jobs for mountainous and rural

[13] Besides Kế Môn villagers, those from Điền Lộc have often come to fell and uproot beautiful trees for sales to satisfy their drinking needs.

inhabitants, reducing poverty and increase their income. In addition to these immediate objectives, the Project also has a longer, regional and national objective, namely to supply paper raw materials to meet the needs of domestic consumption.

Trees planted under these projects were either concentrated or scattered. Planting techniques were based on a design provided by an Agro-Forestry survey and planning team. The trees were drought resistent, including *Keo lưỡi liềm* (Acacia crassicarpa), *Phi lao, Dứa dại* and some indigenous trees such as *Mù U* (Calophyllum inophyllum). The trees were distributed to certain areas, with different techniques compatible with characteristics of each tree to make the most of them. For example, *Phi lao* likes "cool" soil, so it was planted close to the sea to prevent sand infiltration. Planting density was 5,000 trees/ha with a line distance of 2m, and a tree distance of 2m. The planting hole was 40 x 40 x 40cm and each hole was fertilized with 0.1kg of NPK. Distance from the nursery to the planting site was 2 – 3km. *Keo* was drought resistant and was planted on unstable sandy land to protect subsidiary crops. Planting density was 2,500 trees/ha. The planting hole was 30 x 30 x 30cm and each hole was fertilized with 0.1kg of NPK. Distance from the nursery to the planting site was 2 - 3km.

Trees were planted on sand dykes on band: The *Dứa* band was 10m wide, on the foot of the dyke with a line distance of 2m, a tree distance of 1m and a planting density of 5,000 trees/ha. A *Phi lao* band was 20m wide, planted on the seaside of the dyke with a line distance of 2m, a tree distance of 1m, and a planting density of 5,000 trees/ha. An intercropped band of *Keo* and *Dứa* was 10m wide, on the dyke surface with a density of 2,500 *Keo* trees/ha and 5,000 *Dứa* trees/ha. A *Keo* bank was 20m wide, planted on the village side of the dyke with a tree density of 2,500 trees/ha, a line distance of 2m and a tree distance of 2m. *Phi Lao* and *Keo* is fertilized with 0.1kg of NPK/hole. *Dứa* needs no fertilizer. Distance from the nursery to the planting site was 2 - 3km.

The project supplied participating households with seedlings, fertilizers and planting techniques. The standardized seedlings were as follow: A Phi lao seedling should be 80 - 100 cm tall and had its roots bound up in soil at the size of 15 x 22cm. Its root was 0.8 - 1.0cm in diameter, and must not have its sprout missing or any defect. A *Keo* seedling should be 30cm tall, had roots bound up in soil at the size of 9 x 14cm and the root was 0.2 - 0.3cm in diameter. A *Dứa* seedling should be 50 cm tall and its root is 4 - 5cm in diameter. The planting hole should be fertilized 15 days before. Care was given to the trees in 3 years, twice each year. Planters earthed up the roots and invested fertilize. Planting season was the 11^{th} – 12^{th} Lunar month. According to specialists from Thua Thien Hue provincial Forestry Development Sub-Department, in this time of the year when it became

warmer with high humidity, the surviving rate would be higher (Agro-forestry Survey Team, 2001).

Trees planted on sand dykes were managed by the collectives, and trees planted on sand areas were contracted to the households. After receiving the planting plan, the provincial project management unit (PPMU) made it clear to project districts and communes, and the commune People's Committee would assign the task to each village. The village cooperative would list the name of participating households and sent it to the commune People's Committee. The PPMU met villagers to tell them about their rights and obligations. Planters received a planting payment by number of trees. After 30 - 45 days the project specialist would check the surviving rate. If it was 90%, the planter would receive VND 400/ tree. If the seedlings died because of natural disasters, the project would supply new seedlings for replacement. Besides, planters were also paid for taking care of trees in the first 2 years, according to tree species. For example, planting and caring for one ha of Phi lao were paid VND 2,000,000, Keo would be paid VND 900,000 and Dứa would be paid VND 1,200,000. If villagers could find Dứa seddlings on the spot, the Government would pay VND 540,000/ ha for the seedlings. If the trees were survived after a year, the planter would be paid for his care of the trees, for example VND 270,000 for a ha of Keo, and VND 540,000 for a ha of Phi Lao.

According to the Prime Minister Decision No. 178/2001/QD-TTg, planters are entiled to use the trees on their registered area after having a permit by the provincial Department of Agriculture and Rural Developmand and People's Committee. However, each year they are allowed to exploit only 10% of the planted area. After paying taxes, they will receive 60 - 70% of the product value.

In the first phase of project implementation, only 18 households participated. However in the second phase, the number of registered households increased to 32 (Data provided by the Technical division of Thua Thien Hue Forest Protection Sub-department).

Conclusion

Living in a harsh sandy area, Kế Môn villagers have to overcome many natural obstacles such as sand storms, sand filling up fertile soil, tombs and residential land. However, indigenous knowledge has helped them control natural calamities and make the most of natural resources (food, fuel and medicinal herbs) for their lives. They have strictly comply with village law, represented by a "village law rod" hung in the communal house.

However, curerntly a gap still exists between village law and State laws, specifically seen in the protection and exploitation of natural resources on Kế Môn

village's sand dunes. The rod no longer exists. Tree planting projects have been implemented in the village. It shows that village law has not been effective in protecting wild plants along sand dunes.

Harsh terrain has caused numerous difficulties to the implementation of tree planting projects. Here, indigenous knowledge has been confirmed by people empowerment. I think this two-way process will help the locals better adapt to the environment with their indigenous knowledge and life experiences have helped them accumulate their indegenous knowledge.