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Protected areas and ecosystem management: The case of the Palmarin Community Nature Reserve and the Bamboung and Gandoul Community Marine protected areas in Senegal

(Aires protégées et gestion des écosystèmes: cas des Réserve Naturelle Communautaire de Palmarin et des Aires Marines Communautaires Protégées de Bamboung et de Gandoul au Sénégal)

***Adama Cheikh DIOUF[1], Aicha Idy Seydou Wally BA[2], Dome TINE[3] and Matar TOURE[4]**

[1]Docteur en Géographie, Université Gaston BERGER de Saint-Louis

[2]Doctorante en Géographie, Université Gaston BERGER de Saint-Louis

[3] Département de Géographie, chercheur associé au Laboratoire de Télédétection Appliquée (LTA)- Institut des Sciences de la Terre (IST), Université Cheikh Anta DIOP de Dakar- Sénégal

[4]Etudiant en deuxième cycle en Géographie, Université Gaston BERGER de Saint-Louis

Email: aichaidy@gmail.com[2], dometine85@gmail.com[3], matartoure342@gmail.com[4]

*Corresponding Author Email: adamacheikhjunior@gmail.com[1]

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*Corresponding Author

Adama Cheikh DIOUF

Docteur en Géographie, Université Gaston BERGER de Saint-Louis

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*Corresponding Author Email: adamacheikhjunior@gmail.com[1]

Abstract

The integration of local populations into policies for the preservation of natural resources in their immediate environment is a recommendation of the United Nations following the RIO conference in 1992. In Senegal, the community reserve and the protected community marine area of Palmarin de even as the Protected Community Marine Areas of Bamboung and Gandoun have favored the integration of the riparian populations in the process of resource management of these environments. These populations on the periphery or inside these protected areas have developed strategies favorable to the rational exploitation of resources. These strategies, the fruit of innovation, vary from the establishment of a biological rest period to the development of beekeeping through the use of the banne stove and the exploitation of initiales resources such as the palm tree of of Fayaka and Moundé.

Keywords: natural resources, preservation, integration, innovation and beekeeping

Résumé

L'intégration des populations locales dans les politiques de préservation des ressources naturelles de leur environnement immédiat est une recommandation des Nations Unies au lendemain de la conférence de RIO en 1992. Au Sénégal, la Réserve communautaire et l'Aire Marine Communautaire Protégée de Palmarin de même que les Aires Marines Communautaires Protégées de Bamboung et de Gandoun ont favorisé l'intégration des populations riveraines dans le processus de gestion des ressources de ces milieux. L'objectif de ce papier est d'analyser les stratégies développées par les populations au tour des aires protégées. Pour ce faire, la méthodologie adoptée consiste à une revue littéraire, à une observation directe et à des enquêtes auprès des populations. Les résultats de ce travail montrent que les populations de la périphérie ou de l'intérieur de ces aires protégées, ont développé des stratégies favorables à exploitation rationnelle des ressources. Ces stratégies, fruits de l'innovation varient de la mise en place de période de repos biologique au développement de l'apiculture en passant par l'utilisation du fourneau banne et de l'exploitation des ressources initiales telles ques les rôneraies de Fayako et de Moundé.

Mots clés: ressources naturelles, préservation, intégration, innovation et apiculture

Introduction

After the first United Nations Conference on Environment and Development, held in Rio in 1992, the integration of populations through the participatory approach to natural resource management should replace the expulsive approach. This new situation accentuates the process of the great grooming of repressive forest texts. This forest policy reform is happening everywhere with, as a backdrop, the idea of taking into account all stakeholders BALLET J., (2009, p.40). This situation has resulted in Senegal in the recognition and encouragement of community initiatives for the management of community heritage in natural resource conservation policies. This contribution attempts to answer questions related to the impacts of community reserves and Community Marine Protected Areas in the process of conservation of natural resources in Senegal. More precisely, it is a question of analyzing the conservation and resilience activities developed by the populations living on the periphery or inside these protected areas.

Methodology

The method used in this study is based on a literature review, participant observations and the development and administration of a questionnaire in order to collect socioeconomic data. The observations made it possible to understand the conservation strategies developed in these protected areas. This made it possible to orient the surveys at the village level of the Somone Community Reserve (Thiès region), the Protected Community Marine Areas (AMCP) of Bamboung, Gandoun (Fatick region). For the administration of the questionnaire, the technique used is quota sampling. This method involves assigning a quota per village when the population to be surveyed is made up of several subgroups found in the survey villages. For this study, a quota was set for each village based on a sampling rate of 10% (Table 1).

Table 1: Numbers in the survey villages

Name of Protected Areas	Villages	Staff surveyed
Bamboung MPA	Toubacouta	15
	Soucouta	10
Palmarin MPA	Ngallou	10
	Diakhanor	15
Gandoun MPA	Djirnda	15
	Diamniadio	10

The choice of villages depends on their location in relation to the Protected Area. It is at this level that we observe the conservation strategies and resilience systems developed by the populations. The examination and analysis of all the information obtained leads to the results and discussions that follow.

Results

Protected Areas: RN sustainability tools

Community Heritage Area

A community heritage area is by definition a space for the sustainable conservation of local biological and plant diversity, having reference value for current and future generations of the community that created it. It must be based on an endogenous and consensual initiative for the conservation of a natural and / or cultural site (founding principle). The choice of location and the area to be safeguarded are determined by consensus between customary, religious and administrative authorities, populations and local socio-economic actors. To concretize Community Heritage Areas (APC), decrees are taken by the Minister to establish the creation of community heritage. These APCs are established on the basis of a process and community dynamics led by local elected officials, village leaders and volunteers (young people), deconcentrated and decentralized technical services of the State, partners who live around them. A community space. Community heritage areas require a number of measures to be taken, ranging from restoration and development of resources to technical supervision, including the establishment of a communication system adapted to local realities. Community Protected Areas aim to avoid any activity likely to disrupt the ecological balance of aquatic ecosystems.

Community Marine Protected Areas

Climate variations currently pose an unprecedented threat to natural ecosystems. Faced with this real threat, actions are being taken to seize opportunities that could significantly limit the current and future impacts of climate variations. It is in this perspective that the Protected Community Marine Areas (MCPA) are developed with the aim of sustaining certain resources deemed vulnerable to climate change. These MCPAs constitute sanctuaries where fish species can reproduce without any human disturbance.

This need to protect the resources of the marine environment remains a global affair which materialized by a congress on national parks held in Durban in September 2003. The promotion of Marine Protected Areas constitutes a definite advantage for the conservation of ecosystems and of the benefits including social and economic benefits for local communities. MCPAs, when well-managed, are effective tools for the conservation and sustainable management of marine and coastal resources. They make it possible to preserve key habitats such as sea grass beds, mangroves, mudflats, estuaries and deltas, island environments, etc. Such a mosaic of environments constitutes fundamental habitats for the renewal of stocks of certain resources, in particular nurseries, spawning grounds and migration routes for fish fauna. Therefore, MCPAs must be better taken into account in the definition of fisheries policy measures in West Africa. Another argument that militates in favor of the creation of MCPAs is that they constitute, in a way, an insurance policy against the failure of other forms of management of fishery resources.

To this end, the government of Senegal has set up a network of MCPAs making it possible, on the one hand, to preserve the biological and cultural diversity of the coastal zone, and on the other hand, to promote the improvement of means of existence of local populations (fight against poverty of resident communities).

Table 2: Use maps of the Gandoun MPA

Use maps of the Gandoun MPA	
Classes	Superficie ha
Water	6158,87
Locality	26,03
Mangrove	2774,93
Shurb Savannah	2585,89
Salty Lands	299,91
Mudflat	5104,59

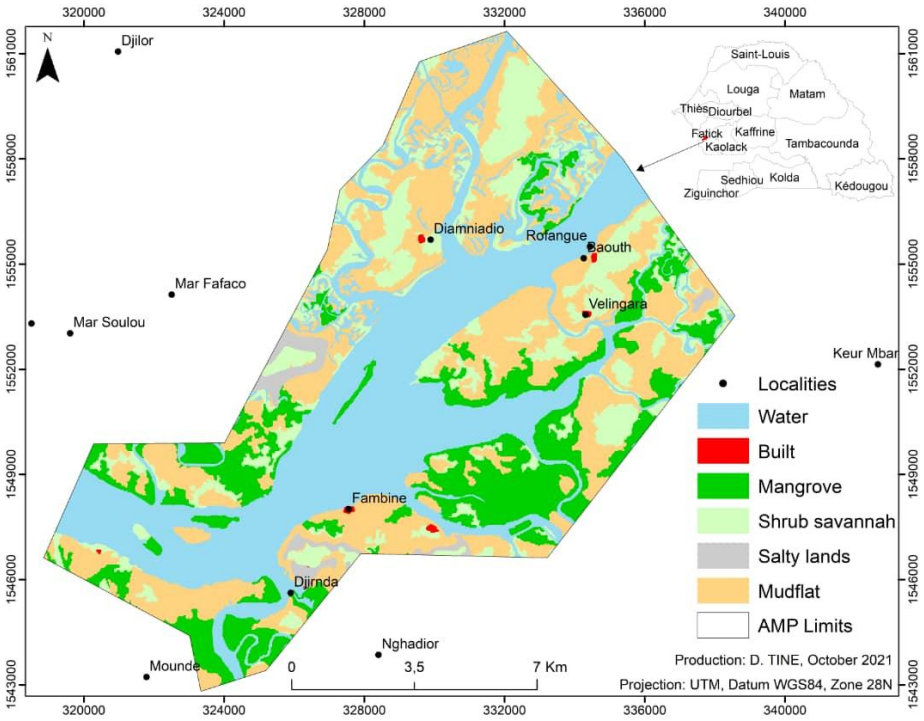

Figure 1: Location and land use maps of the Gandoun Marine Protected Area

Table 3: Use maps of the Palmarin PMA

Use maps of the Palmarin PMA	
Classes	Superficie ha
Water	1773,7
Locality	1,42
Mangrove	366,56
Wooded Savannah	2530,61
Salty Lands	1934,67
Mudflat	2663,75

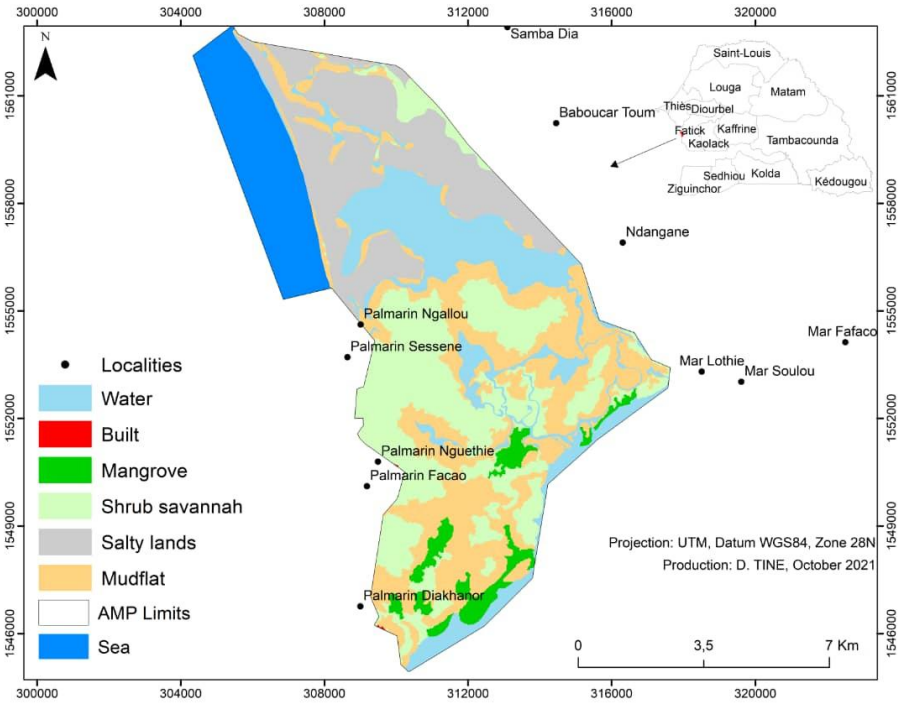

Figure 2: Location and land use maps of the Palmarin Protected Marine Area

Table 4: Use maps of the Bamboung PMA

Use maps of the Bamboung PMA	
Classes	Superficie ha
Water	807,15
Mangrove	3664,23
Wooded Savannah	152,64
Shurb savannah	934,87
Mudflat	968,51

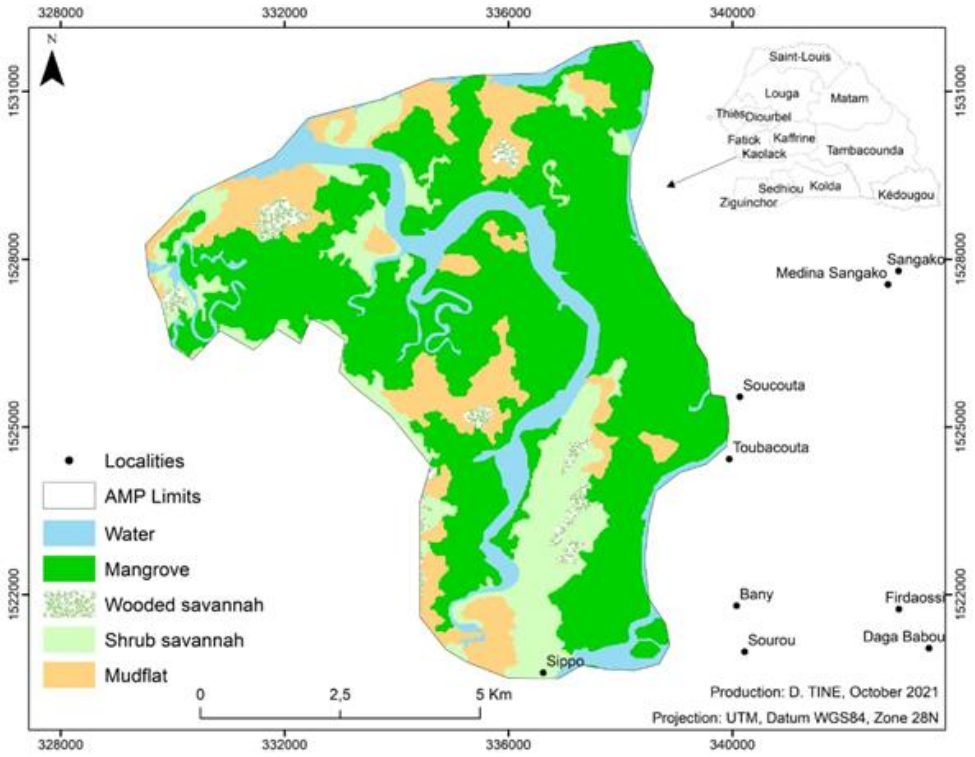

Figure 3: Location and land use maps of the Bamboung Protected Marine Area

Resilience of stakeholders in turn and in protected areas

Biological rest and rotation in the collection

Biological rest is a measure used to preserve fishery resources. It consists of suspending fishing, or harvesting in the case of oysters, during the species' reproduction period. This period generally corresponds in the Saloum islands to the rainy season (from June to October). According to a resident of Djirnda: "The measure has always been adopted, not for reasons of protection of the resource but rather for reasons of product quality, because sexually mature oysters are said to be milky and in bad taste".

According to administrative actors (Municipality of Djirnda, 2009):

> "Various forums organized with stakeholders in the collection of marine molluscs have made it possible to identify fishing areas and consider means of development for exploited resources. Rotation systems have been defined for the collection sites for marine molluscs (oyster, ark, murex, cymbium) with a biological rest period of 5 months (June to October), a selective harvest period (October to January) and an access period (January-June)".

Those involved in oyster harvesting have accepted the development of areas for harvesting this resource in order to improve the productivity of their activity. Beyond the oyster, the other species benefit from biological rest allowing them to increase their reproductive capacity. During these periods, harvesting activities take a break to allow aquatic resources to increase their production and quality.

Picking and oyster farming sector

In this sub-sector, which is the area of predilection for women, several strategies have been adopted to better enhance the value of catches. The women made garlands of five oyster shells strung on 1.5m nylon thread. According to the actresses, to make a good garland, the oyster shells must be equidistant from 15 to 20 cm on the wire. The garlands are tied vertically on a pole, which is placed against the mangroves, in a place where they are submerged at high tide and exposed at low tide. The mangrove branches protect them from the sun's rays. The garlands are installed in oyster blocks corresponding to breeding units. The sites chosen also met other criteria, some of which related to the height of the water column at high tide (1 to 1.5 m), as well as the turbidity and salinity of the water nearby. The practice of oyster farming in these MCPAs is showing results.

Photo 1: Garlands

Photo 2: Moundé basket

Photos: DIOUF A. Ch., April, 2015

The facilities for this practice have made it possible to create additional ecological niches for oysters in Madina Sanghako, Moundé and Soucouta. In Madina Sanghako, according to an interlocutor, six months after the installation of the garlands, the catch rate was 10 oysters per shell.

Beekeeping

At the level of beekeeping, the strategies developed by the actors to enhance the beekeeping potential are numerous and their implementation is facilitated by the ecological conditions of the environment. These ecological conditions of the area allow the development of beekeeping. The latter is now productive. This production of honey in the RBDS prompts some researchers to consider this product as "The Gold of Saloum". In Sanghako, the quantities of honey produced annually in the mangroves varied from 45 to 75 kg, with an average production of four to eight kg per hive. In order to increase their production for the next few years, beekeepers participated in mangrove reforestation activities to strengthen the existing vegetation cover. The development of beekeeping resources and potential is up to date in the localities of Moundé, Nghadior and even in the mainland of the socio-cultural area of Niombato. People, supported by the International Union for Conservation of Nature (IUCN) have started to use modern beehives. This technique, being planned, can further improve beekeeping yield. This beekeeping activity can also contribute to the protection of ecosystems since wood cutters will no longer venture into sites colonized by bees.

Photo 3: Modern beehive

CURAAN, March 2020

Use of the awning furnace

The increasingly growing demand for wood is pushing back forest formations. Aware of this situation, the Peace Corps volunteers encourage the women of the MCPAs studied to use the “banne furnace”. This tool helps reduce the amount of dead wood. Unlike the old tools used, the banne furnace built in the kitchen leaves only one passage for a small quantity of dead wood. According to the actresses, the “banne stove” is a device capable of concentrating heat for a long time. An interlocutor based in Ndorong Sérère, said that before the installation of the banne stove, "she used three times more wood per day for the needs of the three meals". Therefore, the banne stove is a good way to reduce the consumption of fuelwood and helps reduce the activities of collecting dead wood or cutting green wood. In these MCPAs, women also practice market gardening to take advantage of free time during the dry season. In some villages, women have at their disposal a plot in which they can develop their activities. This is the case of the women of Djirnda who, with the support of the Rural Agricultural Advisor (CAR) volunteer, developed small market gardening in their plots and several crops are cultivated there (tomato, eggplant, okra and others).

Photo 4: Moringa oleifera nursery

Photo 5: Market gardening practice

Photos: DIOUF A.C., 2015

This photo highlights women bustling about in their garden. They got together in small groups and divided the field into small plots. Each group must pay a unanimously fixed sum and the remainder goes to the members of the group. This is a source of motivation.

Promoting the palm tree of Fayako and Mounde: an ecological and economic alternative

In the process of adaptation, certain localities in the area where the gathering and processing of fishery products were the areas of predilection for women are now witnessing a reconversion of activities. This attitude of women results from the scarcity of fishery resources experienced by Fayako in the decade 1980-1990 according to one interviewee. Thanks to the support of the NGO WAAME, the women of the localities (Moundé and Fayako) began to devote themselves to the promotion of the palm tree. However, the reconversion process is much more accentuated in Fayako than in Moundé because the degradation of the mangroves is much more significant in Fayako. This island has experienced very advanced mangrove degradation. One of the consequences of this situation, women could no longer practice oyster farming (oyster culture) with the scarcity of aquatic resources. These women have always derived most of their income from mangrove forests. For years, these women have practically no more economic activities. They were far from imagining that the exploitation of the palm trees which abound all over this island could constitute an alternative for them because they did not know their usefulness. It is in this context that the Non-Governmental Organization West African Association Marine Environment (WAAME) which works in the field of biodiversity conservation in the RBDS has guided the women of Fayako in the valuation of the by-products of the palm tree by 2006. Anxious to help them develop the by-products of the palm tree, the managers of this NGO called on the expertise of the populations of the village of Fandène (department of Thiès) who excel in this field.

Photo 6: The palm tree of Fayako

Photo 7: By-products of the palm tree

Photos: WAAME, June, 2009

Thus, a trainer from this locality stayed in Fayako. After several training sessions, in addition to exchange visits to Fandène, the populations of Fayako, in particular women, began to invest fully in the valuation of the by-products of the palm tree: tables, chairs, benches, brooms, baskets, etc. mats, lampshades, basketry products, beds, living room, wardrobes ... This new opportunity (diversification of income) for the populations of Moundé and Fayako (municipality of Djirnda) through the manufacture and marketing by women of by-products of rôniers, makes it possible to satisfy certain social demands without calling on fishery resources.

Thus, innovation constitutes a means of reducing the pressure on mangrove ecosystems and respecting the biological rest of 7 to 8 months. These women who are active in the valorization of the by-products of the palm tree under the aegis of the NGO WAAME, after an exchange visit to Fandène in April 2010, for the valorization of the by-products of the palm tree through capacity building on the techniques of making artisanal items. These training courses in rônier carpentry (30% men) and basketry (65% women) have improved the living conditions of the villagers, and more particularly the women of Moundé and Fayako.

An inhabitant of Fayako, manufacturer, maintains that this new activity has greatly improved the living conditions of the populations of the village, he thus affirms that: *"We solve our day-to-day problems with the income from this business. For marketing, he explained that it's not uncommon to see a visitor delighted with the work placing orders. Also, artisanal articles are sold in the "Loumas" of certain localities such as Foundiougne, Fatick, Passy, Gandiaye… For example, a folding chair is sold at 10,000F CFA, baskets between 1000 and 4000 F CFA"*.

Another person said in these words: *"We never thought that we could make so much money by upgrading the by-products of the palm tree"*.

Today, the women of Fayako earn a consistent income that allows them to take care of family problems and keep funds at their mutual. "We even support our husbands financially," revealed the interlocutor, who also said that this new activity has greatly slowed down the phenomenon of rural exodus. Many married women were sent to Dakar to work during the dry season. Today, they stay in the village to make artisanal items made from the palm tree, she said. To this end, the NGO WAAME affirms in its 2009 activity report that: "Basketry and wood carpentry could be important alternatives for biological rest periods so that people can carry out other activities".

Photo 8: Authorities inaugurating the hangar

Photo 9: By-products of the palm tree

Photos: NDIAYE Ch. T., March, 2012

Photo 9 shows the diversity of by-products from the palm tree. They are stored in kiosks and sheds. These allow the storage of products for their disposal. It is for this purpose that the local and administrative authorities inaugurated the Ndahonga hangar in 2010. The monetary income derived from this marketing contributes to the sustainability of the reforestation and development actions of the rôniers and participates massively in the application of strategies adopted especially those relating to resource management.

In these villages of the rural commune of Djirnda, women, organized in EIG, are today very involved in mangrove reforestation activities (Genres Rhizophora and Avicennia) under the technical and financial supervision of NGOs and JICA projects. , IUCN, WAAME, OCEANIUM, or the Mangrove Project, etc. This reforestation, which aims to help local populations take charge of restoring natural mangrove resources, began around 1998-2002 in the villages visited. Mangrove reforestation actions are undertaken by these associations with the support of external partners and the municipal council. Through these structures, mobilization techniques for land management are better mastered by local actors.

Restoring ecosystems over time becomes a means of preserving biodiversity and ensuring the sustainability of exploited resources. Rehabilitation, which aims to restore essential ecological functions in environments modified by man or by nature, is particularly indicated. It is in this context that ad hoc mangrove reforestation actions have already taken place under the leadership of NGOs and local youth associations. Each year during the rainy season and more particularly during the months of August and September, reforestation activities are carried out.

Photo 10: Reforestation of mangroves

Photo 11: Regeneration of mangroves

Photos : DIOUF A.C., avril 2020

In addition to reforestation activities, there is a natural regeneration process of mangroves in some places. However, it should be seen in photo 11 that the natural regeneration system has resulted in a reorganization of the spatial arrangement of the species found in the mangrove ecosystem. In general, in a mangrove ecosystem, the Avicennia species is positioned behind the Rhizophora species.

For Avicennia, activities related to their reforestation require more effort than those for the rhizophora species, which only require the collection of propagules that fall from mother plants when they mature. This led to the establishment of a nursery for the reforestation of the Avicennia species. This nursery is a site where Avicennia seeds are sown while waiting for their germination before being transplanted to places suitable for their development.

Photo 12: Avicenia nursery

Photo 13: Avicenias felds

Photo : DIOUF A.C., avril 2020

The ecological peculiarity of the brackish wetland of the mangrove areas, added to the complexity of the reproduction and the establishment of young propagules in the mud, mean that studies must be carried out in parallel with field actions in order to determine the best conditions for practice mangrove reforestation.

Discussion

The aim of this research is to analyze the impact of the Palmarin Community Nature Reserve and the Bamboung and Gandoun Community Marine Protected Areas in the resilience strategies of their peripheral populations. In his study DIOUF A. C., (2019) retains that the promotion of Community Marine Protected Areas constitutes a definite advantage for the conservation of the structure, functioning and diversity of ecosystems; their reconstruction in the event of degradation; improved fishing performance and social and economic benefits for local communities. Speaking about the importance of the mangrove and the advantages of these ecosystems, NDOUR N., (2005) suggests "An approach integrating mangroves in the oyster farming system in a natural environment developed thanks to NGOs and projects ". This initiative can also contribute to the sequestration of carbon dioxide in the RBDS as evidenced by the work of (DEUGUE-NAMBOMA R., 2008) in the municipality of Djirnda. According to (DEUGUE-NAMBOMA R., 2008): "The total quantity of carbon sequestered in the Municipality of Djirnda is estimated at 1,936 tonnes in two years".

In their study DIOUF A.C., BA A.I.S.W. and CISSOKOH D., (2019) show that a Community Heritage Area aims to safeguard a natural and / or cultural heritage site deemed of major interest by local populations. The present research achieves similar results and goes further by clearly showing that the establishment of biological rest, the rotation of fishing activities, the development of beekeeping and the use of the "banne furnace" contribute to reducing the risks of impoverishment of the populations on the periphery of these protected areas.

The satisfactory results of biological rest in MCPAs testify to the technical feasibility of the activity and corroborate its applicability over the range of RBDS. These results also corroborate those of FAYE A. (2017), DIOUF AC, CISSOKHO D., and SOMADJAGO M., (2020) who emphasized that the populations of the RBDS like those of the Protégées are open to innovation as part of the development of their resilience strategies in the face of new modes of governance of protected areas.

Conclusion

At the end of this analysis, we note that the protected areas constitute community heritage which offer various useful resources to the neighboring and peripheral populations. The latter have not failed to develop strategies likely to perpetuate the resources of their immediate environment. All the strategies aim at the rational exploitation of natural resources. To this end, we can cite the banne stoves which considerably reduce wood consumption and the development of beekeeping which encourages stakeholders to actively participate in reforestation activities. This enthusiasm of beekeepers can also be a good way to preserve mangrove ecosystems because bees regularly attack wood cutters.

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