PILOT STUDY REPORT
AND PROSPECTS FOR THE MAIN FIELDWORK 2009 – Joana Sousa

1. MAIN GOALS

1.1 Generating Baseline information

During this preliminary study the following baseline information gathered for the villages and croplands visited during the pilot study:

1. Agricultural calendar: where and when crops are cultivated;
2. Agricultural production: who and how crops are grown;
3. Spatial arrangement of crops within other landscape elements, monocultures and intercropping systems;
4. Major problems perceived by the farmers as affecting agricultural production;
5. Create a correspondence key to crop damage pattern and crop raiders' species or group of species, and identify major constraints to the identification of damage;
6. Patterns of farmers' daily life and finding the best procedures, situations and approaches to communicate with the farmers;
4. Define case studies to develop during the main field work along with the main people-wildlife conflict study and the most appropriate villages to cover.

1.2 Characterizing Scenarios

Although data collection followed an exploratory approach, some notes about the topics showed below were taken.

1. Characterize how farmers relate to landscape features: (i) farming production systems, namely the expectations from cash and food crops, (ii) dependence on natural springs, (iii) dependence on forest goods.
2. Document crop damage intensity: (i) monitor crop-damage and identify species responsible for damage.
3. Explore social meanings of damage: (i) assessing whether the damage the farmer describes as the one he perceives reflects a critical position towards conservation, (ii) difference in tolerance depending on the crop type and on the crop-raiding species, (iii) historical use of natural resources and understanding people-landscape relationships.

2. METHODS

2.1 Study Area

Cantanhez forests, located in the southwestern extreme of Guinea-Bissau, have recently been gazetted as a protected area. The landscape is a mosaic of subhumid forests, savannah and mangrove. Boé area, dominated by savannah and lateritic profiles, is a little studied area located 70 km east of Cantanhez National Park (Figure 1).

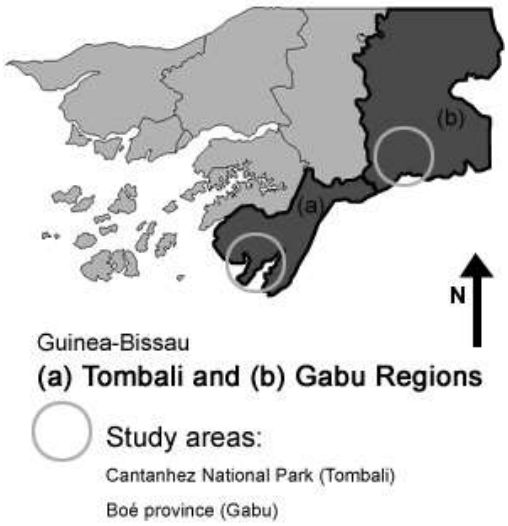


Figure 1 – Study areas: Cantanhez National Park, traditionally and more broadly known as Cubucaré, is located in Tombali region while Boé area in southern Gabu region.

Cantanhez National Park (1067.6 km^2) is located in Tombali region [INEC 2005] Komo and Kaiar islands were also informally visited. In Tombali (3736.5 km^2) region the population have been increasing since 1979 from 55099 (14.75 inhabitants/km^2) to 71065 in 1991 (19.02 inhabitants/km^2) and to 102482 in 2008 (27.43 inhabitants/km^2; http://www.statoids.com/ugw.html). This is still low compared to many sites.

The names of villages were replaced by codes (F1, F2, N1, N2, B, BF1, BF2); therefore they will not be shown in a map that could lead to their identification. One to three weeks was the time spent in the first five villages and the later two were visited for only a few days. The main criteria to choose the villages under study were defined by logistic constraints and the previous experience of the researchers in the area. However, several other factors were taken into account:

- **Forest influence**, villages close to dense forest patches, [Cassamá 2006] and villages in less forested areas [Silva 1997]. In general the north of the peninsula is considered to be less forested than the south. The visited villages located nearby well conserved forested areas were N1 and B; the

village N2 includes in its territory a forest that spans 3 km from N2, F1 forest is located approximately 5 km from the village and; in F2, there is not a well conserved forest patch.

- **Communicability with roads**, the distance to roads may influence bush meat and cash crops trade; N1 and B villages are located far from the road and N2, F1 and F2 are accessible from the main road.
- **Geographic variation**, Cantanhez National Park is a peninsula that gets wider from south to north, with several penetrating rivers and sea canals, which may constrain animal movement and foraging opportunities.

  Rui Sá (*pers com.*) reports higher pathogenic parasite loads in chimpanzee faeces in the forests of Cibe Cadique, Lautchande, Farim, Catomboi, Cassincha, e Canghode, all located on what can be considered the southern part of Cantanhez peninsula, wich may be a consequence of a stronger spatial constraintion. We may consider that N1, N2 and B are located in the southern part of Cantanhez, while F1 and F2 in the northern part.
- **Ethnic groups.**
  (1) Fulani people, who live both in northern Cantanhez and Boé province, together with Mandinga and the sosso, are reported as responsible for the Islamisation of several others ethnic groups in Guinea-Bissau, such as the nalu. The fulani are known to had been the allies of the Portuguese colonial regime in Guinea-Bissau [Temudo 1998]. Four fulani villages were visited during the pilot study to gather baseline data on perceptions of damage and crop foragers in two ecologically distinct environments: Boé (BN1 and BN2) and Cantanhez (F1 and F2).
  (2) Balanta people, living along the mangrove (the main ethnic group in Guinea-Bissau) have been described to live in villages away from the road, developing an effective and complex way of swamp rice cultivation in the mangrove [Teixeira da Mota 1954; Temudo 2009]. A balanta village (B) was also visited.
  (3) Nalu, today an ethnic minority living mainly in the south of Cantanhez peninsula, are the traditional land owners of Cubucaré peninsula (where Cantanhez National Park is located). They are recorded as having resisted the fulani invasion since the 15th century, and forhaving fought, together with the balanta, in the independence war against Portuguese colonialism [Temudo 1998]. Also, they were reported to establish a close relation with nature in terms of resources management, religion and medicine [Moreira 2001; Temudo 1998]. The nalu villages N1 and N2 were visited.
  (4) **Production systems.** There are villages where the swamp rice production is the more important (balanta villages), others where the upland crops are the most cultivated (fulani, tanda, sosso) and even others where a mixed system of rice production occurs (nalu).

Five villages were visited in Cantanhez National Park: two nalu villages, two fulani villages and one balanta village. In three of these villages at least some of the inhabitants already knew the researcher, which made data collection a lot easier. The fulani villages visited belong to 'Tchon di Guiledje' where the fulani were recognized as land owners, while the balanta and nalu villages visited belong to the 'Tchon Nalu', where the nalu people were the recognized land owners. One of the fulani villages visited has several balanta inhabitants. In the same way, one of the nalu villages had one balanta household nearby and in the other nalu village there are several balanta households that share the same territory, which is managed by the nalu.

Since Boé province is poorly known, reconnaissance walks were carried out in this region. This region has a rudimentary road network, notably at the east area of Fefiné river [Witt and Reintjes 1989]. Due to the lack of time and logistic means two villages were visited (BF1 and BF2). Very few studies have been carried out in Boé province, so there is little background information available about this site. Local people were not used to researchers and it will require a longer period to introduce myself to the villagers. Field assistants will always work with the researcher and will be recruited by asking the elders of the community or the local management committiees (for Cantanhez National Park) about who would be most appropriate for the task.

2.2 Collecting data

The aims of my stay in Guinea-Bissau were explained to the local community and it was highlighted that there were no compensatory measures coming along with this project and that I have no link with any conservation NGO working in Guinea-Bissau although I intend to give my report to NGOs, state official agencies my report, without referring interviewers' identity.

The villages to study during the pilot study were chosen following the criteria shown before and other opportunistic aspects, such as key-informants or new scenarios considered as important. The villages on military maps were added to a printed *google earth* map allowing the researcher to view the general characteristics at the landscape level.

Village lands were mapped using digital and field procedures to gather quantitative and qualitative data. Mapping the local landscape, village and agricultural fields' features was carried out during pre-arranged walks with key informants to facilitate collection of additional information about land use, land tenure systems and farming practices. This task will continue during the main fieldwork so that a database is developed. In the future digital images of Boé province and Cantanhez regions will be georeferenced, using ArcGis software, from which roads, villages, main rivers and forests can be identified. Drawings of

villages, backyards, croplands were and will be carried out and important notes registered whenever possible.

2.2.1 Exploratory sampling designs to estimate crop damage

During the pilot study damage was measured quantitatively using: (i) opportunist sampling, usually purely exploratory (this will be referred to along the text); (ii) point sampling (for fruit trees in orchards); and (iii) transect sampling with a categorical stratified distribution of transects; (iii) squared plots of 2.5x2.5 m for blackeyed pea. The transects varied from 1 to 1.5 meters wide and were 30 m long. The *strata* considered were the cropland edge and the cropland central area.

Cassava and orange damage were examined systematically in different croplands in the villages under study but the sampling was not replicated temporally. Cassava damage was measured in 30x1 m stratified transects in the central, periphery, and centre-to-periphery locations. The orange trees that existed in the visited villages were all sampled and georefferenced.

Upland rice and peanuts were not studied because the pilot study started when the harvest had already started. For upland rice an exploratory methodological test was made to choose and adapt the methods that will be applied in the main fieldwork.

2.2.2 Measuring damage

"A damage event (raid) was defined as any area of continuous crop loss attributable to one species" [Webber 2006]. To identify damage in croplands several animal signs were collected: tracks, dung, dental impressions in plants, diggings, and other physical remains or available signs [Naughton-Treves 1998].

The information collected during the pilot study aims to address the following:

(i) presence of crop damage in each cropland,
(ii) characterizing the reported sources of harvest loss,
(iii) distinguishing between human, wildlife or livestock induced damage, and whether it was accidental or due to actual feeding,
(iv) crop protection methods employed by farmers (e.g. human guarding, fencing, snares, scarecrows, magic elements, hunting).

There were two distinct types of crop losses; one taken accidentally and other in which the plant part is used for feeding. Buffalo and cow damage seems to be a consequence of trampling [Webber 2006]. Damage driven by humans, small mammals and insects will also be recorded, but for the latter no special efforts will be performed to identify the species.

More accurate and in depth quantitative sampling is going to be adopted during the main fieldwork. The easy-identifiable species and those difficult to identify through their signs were distinguished.

2.2.3 Crop foragers in Guinea-Bissau

The species known to crop raid in Guinea-Bissau have been described in a few studies about agricultural production systems [Bock 2001; Temudo 1998], but these works do not describe crop raiding, perceptions of risk or damage in detail.
The main plagues of swamp rice in norther Guinea-Bissau are birds, like partridge, and also the cane rat (*Thryonomys swinderianus*). The intensity of damage caused by each species varies from field to field and is closely linked to the presence of infesting weeds [Bock 2001]. The upland rice harvest is smaller then the swamp rice, being the first attacked by cane rat, other plagues (spodopteras and termites) and by piricullariosis disease [Bock 2001].

In 2000, the United Nations action plan for managing biodiversity in Guinea-Bissau reported primate species as crop-foragers, specifically: northern lesser galago (*Galago senegalensis*) and green monkey (*Chlorocebus sabaeus*) [PNUD 2000]. Although not identified crop raiders in the previously cited study document, the authors advised that patas monkey, Campbell's monkey, green monkey and western red colobus should be targeted for legal hunting and included in the amateur hunting license [PNUD 2000]. It is important to highlight that this document does not refer to the community hunting practices but to the "amateur hunting" licence [PNUD 2000].

Other species known damage crops are rodents: striped ground squirrel (*Xerus erythropus*), gambian sun squirrel (*Heliosciurus gambianus*), crested porcupine (*Hystrix cristata*) and cane rat known to provoke significant losses on rice fields in Guinea-Bissau [PNUD 2000]. This last species is large (4.5-8.8 kg), a good swimmer, non-burrowing and mostly nocturnal [Fiedler and FAO/UN 1994] and it broadly distributed in Africa [UICNRedList 2009]. Being semi-aquatic, it prefers areas of dense and tall grasses near streams, rivers or swamps. Thus crops grown near wet areas are very susceptible to cane rats. Although these are known to prefer raiding sugar cane and maize, other crops like cassava, groundnut, sweet potato and pumpkin are known to me damaged by this species [Fiedler and FAO/UN 1994]. There is another species (*Thryonomys gragorianus*), the savannah cane rat, but it is not described for Guinea-Bissau [UICNRedList 2009]. Although *Thryonomys gragorianus* is not described for Guinea-Bissau, and the *Thryonomys swinderianus* is not known to specially raid on rice, farmers growing the upland rice complain about its damage.

Measuring crop damage is far from being an easy task [Webber 2006]. Bush pig damage is easily identified considering the size and scale of the damage

and the conspicuous footprints. Primate signs could be seen in the soil or through distinctive bite marks.

Other studies report what is also applicable to Guinea-Bissau, for example: it is hard to distinguish between rat and squirrel damage [Priston 2005] and it is impossible to distinguish certain primate species from their crop damage evidences [Webber 2006]. This later description is very likely to also affect my research, at least for patas monkey (*Erythrocebus patas*), *c*ampbell's monkey (*Cercopithecus campbelli*), *g*reen monkey, king colobos (*Colobus polykomos*) and *w*estern red colobus (*Procolobus badius*).

Considering these limitations, to conduct reliable crop damage estimation is it essential to determine the factors constraining the identification of damage patterns. Therefore additional methods will be used to build up an identification key:

- describing every animal sign for match-testing in museums and literature;
- using information from different sources: different field guides and farmers;
- using opportunistic direct observations;
- giving cameras to farmers so that they can photograph crop raiding events;
- camera trap devices to detect nocturnal and less conspicuous crop raiders.

2.2.4 Indentifying social aspects influencing people-wildlife interactions

Men and women will be invited to participate in this study. Using semi-structured interviews, alongside participant observation I will explore social, religious, economic and political issues that might influence farmers' perceptions of, and tolerance towards, crop-raiding. More specifically I will collect information on:

(i) social meanings of crop foraging species, croplands and landscape features;
(ii) agricultural production systems and how they have been changing, including changes to subsistence and cash crop economies;
(iii) local land management and the new national park (for Cantanhez), and other conservation and development initiatives;
(iv) situations where animal species and people come into close contact (e.g. crop-raiding, orchard raiding, fresh-water access);
(v) perceived crop-foraging across species, between croplands, and assess the temporal and spatially related aspects;
(vi) identify Islamic and Animist features that might influence degree to which people do/do not tolerate crop raiding and to what extent religious issues constraint the control methods.

Semi-structured interviews

The interviews were employed in farmers' fields or homes or in a quiet situation where other people are unlikely to appear. The main limitation that I have to overcome is my inexperience in social research practice and therefore I tried to keep it simple and informal. During the pilot study I gained some experience and I intend to keep reading and studying.

Interview guides were useful to helpe me focus on the research questions. The guide for the semi-structured interviews is attached in annexe. Also, a more structured part of five questions was replicated when adequate (totalling 21 interviewees):

1 What crops do you produce?
2 What are the most important so that food is available year round in your household?
3 What do you sell?
4 What affects the quantity of yields that you harvest (naming one by one the products named above)?
5 How do you control them (naming one by one the factors cited above)?

In northern Guinea-Bissau, the main ways of controlling agricultural plagues are shooting, vigilance, and biological control by spreading fibers of oil palm extraction so that it attracts ants that can attack rodents [Bock 2001]. The termites are controlled by trunks that remain in the terrain and magic ceremonies or magic elements are also used [Bock 2001]. The farmers use fences to avoid crop-raiding by domestic animals. Mitigation efforts during storage are carried out so the granaries are well enclosed, cats are used to control rodents, rat snares, ash is used to control insects and rarely chemicals are used [Bock 2001]. Some information about control measures was collected but only when the researcher found appropriate, due to the potential illegal content of the answers.

As described before [Sousa 2007], the information given by the local community, and without referring to its accuracy, cannot be used in its absolute sense, expressions like "many" (*manga del* in Creole), "a lot" (*tchiu* in Creole), "never" or "nothing" are used as symbols of quantity but not as absolute measures of quantity. Therefore, since perceived measure will be assessed it is essential that, as far as possible, a common scale of absolute or relative quantification is found between the researcher and the participants.

The local participants will be encouraged to contribute their views, opinions and experience to the researcher. A considerable effort will be taken not disturb the farmers from their daily activities and this will be accomplished by living in the same villages, and arranging interviews around the participants' schedules. However, each interviewee is likely to be interviewed several times during the study, up to a total of 2-3 hours in duration.

Hope for compensation may arise considering the character of this study [Naughton-Treves 1997]. To avoid such expectations it will be clearly stated that this study will provide compensatory measures and my goals will be fully explained, individually to potential participant, collectively to informal gatherings or meetings and to everyone who asks about my stay or my work.

Focus groups

After independence (1974) Catanhez attracted researches and NGO due to its subhumid well conserved forests. Consequently people are tired of attending meetings and being interviewed by NGOs, conservation projects and researchers. Although the value of the results taken from focus groups is recognized and it is a method employed by several authors [Webber 2006], it involves considerable effort from farmers [Krueger and Casey 2000]. Therefore it is not appropriate for Cantanhez since it requires people to abandon their activities and move to an arranged place that is easily perceived as a major effort. Nevertheless, natural gatherings during evenings in the fireplaces were used as informal focus groups opportunities.

Participant Observation

Data collection will rely heavily on the ethnographic approach described by Jorgensen, which is based on everyday 'negotiation, reciprocity and exchange' with the local community [Jorgensen 1989:69]. During the fieldwork everyday life the research followed the local procedures as much as possible. An effort was made to transform every relevant observation into field notes.

3. PRELIMINARY RESULTS

The data presented respects to the results of a pilot study and since it is a short term approach several inconsistencies were found. These are described along with the results breakdown. Later in this report the contributions of this analysis to the main field work plan are presented. Some literature review is presented but it is not exhaustive, otherwise this report would miss its main purpose: refine the focus and the methods for the main fieldwork study.

Also, as a product of a pilot study, much information does not have a broader bibliographical context. Like this it is used the term 'notes on' when it is referred to bits of information that still have to be explored.

3.1 Production systems

From the crops grown in both areas, farmers manage the production dividing it. The main of crop production is used for home consumption but farmers retain a portion as seed for the following season. A further portion is sold to generate cash income. Generally, the seed part is only consumed in case of food shortage.

3.1.1 Farming calendar

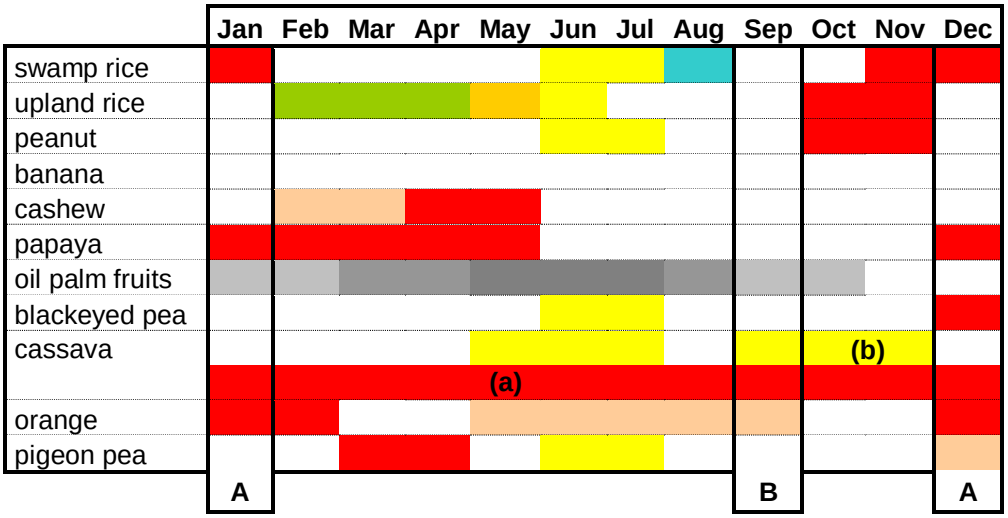
Cassava and banana are annual crops. Other fruits like cashew nut, papaya, mango, pineapple and orange ripen in a specific period, as do rice and peanuts. Therefore, except for a few crops, the agricultural calendar is quite scheduled, with crops being harvested from October to June. Consequently, data collection methods have to be adequate for each type of crop along the agricultural year. If, on one hand, for cashew and other fruits crop raiding activity matches fruit ripening, for rice and peanuts it may well be that sowing is as critical. The present research calendar does not cover the sowing period so it will not be possible to compare the mesured and perceived crop damage for this period but it will be cleared in the interviews which if any species are perceived to decrease potential harvest during sowing.

Growing upland rice involves choosing a good place for cultivation, which is preceded by slashing and burning the vegetation. The slash is initiated in March/April and the burning can be postponed until the first fortnight of July (Table 1). If vegetation material is damp it can decrease the burning efficiency which can reduce production significantly [Bock 2001].

A few rice varieties are harvested in January [Costa and Resende 1994], but generally it occurs in October/November being sometimes extended until December (Table 1). Swamp rice is harvested in December to January. Cashew fruit starts to ripen in March through to June (Table 1) [Boubacar-Sid et al. 2007]. In Cubucare peninsula (southern Cantanhez National Park, nalu land) the most important crop for goods exchange is peanut which is given to the balanta in

October, who will repay in rice after threshing in April and May [Temudo and Schiefer 2003].

Table 1 – Farming calendar for the main products.



	transplantation
	ploughing/sowing/planting
	burning
	slashing
	harvest
	flowering
A	cashew and fruit orchards weeding
B	other upland croplands weeding
(a)	cassava harvest takes place specially after April and before the rains
(b)	cassava can be planted after October if the soil has the needed moisture

The landscape in Cubucaré and Tchon di Guiledje, is a mosaic of forests, mangrove, savannah and agricultural fields. In reality, it includes forested areas at different degrees of regeneration, mangroves in different degrees of regeneration after the abandonment of swamp rice farming, and savannah with different degrees of regeneration after fire. The agricultural fields also present different crops assemblages. In summary, this is an extremely variable and complex environment.

Notes on the agricultural practices in the studied villages

From an agricultural point of view a well regenerated forest means a field for a good rice plantation, whereas a less well regenerated forest means an adequate field for groundnut production.

In F1 and F2, several upland farms were identified where rotation of rice-groundnut is done following a two-phased sequenced within a band of land: in the x year rice is cultivated in a certain place, in the year x+1 groundnut is cultivated

where the rice was before and the farmer clears another area attached to the previous one to grow rice. This forms a continuous area of land of rice plus groundnut cultivation. Other crops like cassava, beans, pumpkin, maize, sorghum and banana could be grown in association. In F1 everyone who were born in the village already know where they will farm next year, each man has his row of parcels of land that is managed along time. If someone wants a parcel from another owner he has to talk and ask it to the owner.

In general, trees, burnt trunks and pigeon pea plants were used to mark the limits of croplands from different owners. Other taller trees, such as *Ceiba pentandra* are landscape markers that have long term significance, especially in Cubucaré.

Balanta village B has a lot of swamp rice polders in production because it is the main crop. In the agricultural year of 2009 nobody had invested in upland farming. The orange trees are confined to a few around the houses. There are several cashew orchards but they were small and few in number.

However, in N1 and B villages rice cultivation has reported to have decreased:

> *"Before there were only a few people but the rice lasted for all the year and sometimes they could not finish it. The 'rain was raining with strength', there were fewer people. Now there are a lot of people. In that time there were only three 'fogons*[1]*, and three houses."* (testimony of a farmer living in N1)

In this village there is a mixed agriculture system of swamp and upland rice cultivation balanced by the yearly results: *"if one year the swamp rice does not produce well, in the next year we will 'go' more for upland rice farming. If there is one year that we clear more area of forest, the next year we 'go' more for the swamp rice production. We have to buy rice, for that we sell oil-palm fruits, tomato, manufactured soap, chickens and goats*".

In the northern part of Tombali and southern Boé region there is a lot of itinerant camping to grow upland crops. People live in these camps for rice cultivation and stay nearby the growing crops until they are ready to harvest. In Boé, the upland farming is, as in Cantanhez, based on shifting agriculture that uses forest soil. A forest regeneration of four to six years corresponds to an early stage in forest recovery while more than seven years is considered a good place to farm. In the village BF1 the first year a 'heavy' variety of rice is grown, in the second year groundnut together with a 'quick' rice variety and the newly cleared area increased to cultivate also 'heavy' rice.

[1] An economic unit that may or may not correspond to a household. One household may have more than one 'fogon' (in Creole).

Before there was only rice but now we have rice, groundnut, maize and cashew to sell. (fulani informant)

3.1.2 Products, crops and foodstuffs

The crops and manufactured products cited were (i) cereals: upland rice, swamp rice, sorghum (*Sorghum bicolour*, in Creole 'midjo cabal'[2]), millet (*Pennisetum typhoides* in Creole 'midjo preto'), maize; (ii) tubers: cassava, potato, cocoyam (*Colocasia escolenta*, in Creole "manfafa"), yam (*Dioscorea* sp., in Creole 'nhambi di terra'[3]); (iii) legumes: peanut, blackeyed pea (*Vigna unguiculata*, 'fizon mancanhe' in Creole), pigeon pea (*Cajanus cajan*, in Creole 'fison-congo'); (iv) fruits: oil palm fruits used for oil production (*Elaeis guineensis* fruits, locally named as 'tchebén'), Angola palm (locally named in Creole as "palmera di granja"), cashew (*Anacardium occidentale*, in Creole 'caju'), banana, mango, papaya, jack fruit, pineapple, orange, lime (the most important variety are 'limon di terra'), "French" lime[4], lime for exportation (only described by one wealthy fulani farmer), other two types of citrus locally named in Creole as 'mandarina' (*Citrus reticulata*) and 'trangelina', also tamarind (*Tamarindus* sp., in Creole 'tambarindo') and several types of citrus seedlings; (v) nuts: kola (*Cola nitida*) and cashew nuts; (vi) other vegetables and products: sugar cane, pepper, cucumber, onion, carrot, aubergine, 'tifa' (in Creole) an herbaceous plant that Temudo [1998] related to *Solenostemon* sp., honey, pumpkin (in Creole 'bobra'), tomato (in Creole "kamate"), okra (*Abelmoschus esculentus*, in Creole 'candja'), nightshade (*Solanum incanum*, in Creole 'djagatu'), fonia (*Digitaria exilis*, in Creole 'fundo' exclusively cited by fulani), roselle (*Hibiscus sabdariffa* in Creole 'baguitchi'), aubergine, 'comenta'[5] (Creole name), sesame (*Sesamum indicum,* in Creole 'bene'; Figure 2)[6]

[2] In Boé it is called 'midjo fletcha', other Creole terminology used by the fulani of southern Gabu.
[3] Three varieties were cited in F1: white yam ('nhambi branco in Creoloe), red yam ('nhambi brumedjo' in Creole) and wild yam ('nhambi di mato in Creole).
[4] The reference "french" corresponds to the varieties introduced during a project of the 'French cooperation' working in the area during the early 90s. Its main aims were identifying production constraints and developing methods to overcome those in swamp rice production, upland farming and fruit production (Gessain 1990).
[5] The English and cientific name of this plant was not found. During the main fieldwork photographs have to be taken in order to identify the plant.
[6] It was reported to be eaten as rice and cooked as peanut soap.

Figure 2 – ‘Bene’ in Creole.

In southern Boé bushbuck, red-flanked duiker[7] and roan antelope[8] are the main sources of ‘mafé’ (the sauce that goes with the rice in the meals).

3.1.3 Immigration and rural exodus

Several young people want to go away from their villages, to Bissau or to other bigger cities, like Bafata, Gabu or Buba to study or work. A farmer statement about the lack of young man force illustrates the problem:

> *“School is tiring us, modernization helps us but also tires us. Among my children, only one stayed here* [in village B]. *The others come to ask for rice and they are back only during the rainy season, during the school holiday. Moreover, some get into ‘banditry’.”*

While some young people are moving out of Cantanhez others are moving in. Since a recent past, migrants from Guinea have been comming to Cantanhez National Park, especially to the north, ‘Tchon di Guiledje’, where they can speak fula with fulani people. More people will mean more upland croplands, especially in ‘Tchon di Guiledje’, where the fulani do not practice swamp rice cultivation. However, allowing people from Guinea to stay means a long term insurance in case of war:

> *We are not going to leave the forest,* [meaning they are not going to stop farming in forest soil]*, we can fight with each other* [referring to NGO and park allies] *but that will not happen. Now it is harder to find a place to farm. The State says that we should not send the foreigners away* [people from Guinea] *but we cannot eat all of us. However, if we send them away, if there is conflict again in Guinea-Bissau and we want to go to Guinea they will expel us as well.”*

One farmer in F2 stated that his intention is to plant cashew in every agricultural field so that nobody is able to claim his land. Even though he already has three cashew orchards and does not have the workforce to weed all of them on time (before the flowering begins). Crops like mango, orange, lemon and cashew are used as property markers. Marking territory with trees is recognized as

[7] *Cephalophus rufilatus*, in Creole ‘frintamba’
[8] *Hippotragus equinus*, in Creole ‘boca branco’

a legitimate claim over land property. Like this recent migrants are not allowed to plant cashew trees.

'Tchon di Guiledje' (F1 ad F2) seems to be affected by the diminishing of household labour and the hiring of daily wage workers is common. From 8-12 am workers are paid 500 XOF and from 8-14h 1000 XOF[9] (without considering the food, which is ensured by the owner of the farmer). For certain exceptional events, like weddings, people work for free.

3.2 Perceptions of Crop Damage

The interviewees have reported different damage agents and diverse sources of harvest loss. The reported sources of damage that lead to diminished harvests accomplish several factors that are local and crop-specific and others that potentially affect the majority of crops. For example, 'improper ditches' could never have an extensive effect on numerous crop types because it only concerns the ditches needed for swamp rice production. The same happens to the effect of 'salt water' that limits swamp rice harvests and is not possible to damage upland rice. At the same time 'lack of watering' only refers to the species grown in backyards, an activity performed by women. Another example is the damage caused by domestic cows; cows cannot damage the cassava plantation of fulani in Cantanhez, where they are not cattle owners, unless they are living together with balanta, the cattle raisers in Cantanhez. As was stated before Cantanhez is ecologically and socially patchy. This culturally and biologically diverse landscape creates different scenarios of potential crop damages.

3.2.1 The extension of damage: foodstuffs described as susceptible

Number of crops affected by different sources of damage

The different types of damage were categorised post interview by the research[10] depending on the origin/type of damage. A matrix of presence/absence of different types of damage for each crop was built. The crops named by the farmers were included in at least one of the following categories: no damage, damage induced by the cash economy, damage induced by people, damage induced by environmental factors, damage induced by domestic animals and damage induced by wildlife.

From a total of 34 crops numbered by the informants, the damage caused by the market and by domestic animals was not reported for numerous crops. The damage caused by people and environment were reported to affect 12 and 13 types of crops, respectively. The most extensive type of damage was described as a consequence of wildlife raiding, which affects 27 different crops (Table 1).

[9] 0.75 Euro and 1.52 Euro, respectively.

[10] The farmers were not questioned by these categories; they were defined during data analysis.

Table 2 – Categories of damage and how extensively these are present in different crops (34 crop types).

Category of Damage	**Nr crops**
No damage	9
Damage induced by the cash economy	1
Damage induced by people	12
Damage induced by domestic animals	4
Damage induced by environmental factors	13
Damage induced by wildlife	27

The cashew nut was the only crop described to be affected by the cash-economy (Table 3). The two points raised were the price farmers are able to sell it (2 informants) and the lack of money to pay daily wage workers to clean the vegetation in the orchard during the dry season (1 informant). This has to be accomplished before January when the cashew flowers. If the weeding is done after this period the flowers will fall while vegetation is cut. The informant who described this later constraint was a fulani farmer living in 'Tchon di Guiledje', in this area the payment for daily wage workers seems to be more common than in the south of Cubucaré peninsula.

Table 3 – Types of damage induced by the cash-economy and their extension to different types of crops.

Types of damage induced by the market (total 1)	**Nr crops**	**Crops**
Price	1	cashew
Lack of money to pay daily wage workers	1	cashew

The goal of guarding rice fields seems to mainly concern the chasing of birds; (Table 4); 'birds' as source of damage were always referred to in the context of upland rice (discussed next). This may be due to a different perception of risk: since the potential of harvest is higher in swamp rice production, the guarding may be taken more seriously and consequently it is not perceived as a source of harvest loss. Actually, the visited swamp rice polders were all being guarded, mainly by children. A comparison of guarding effort between the two types of rice cultivation could be analysed after the main fieldwork.

The 'distance between stalks' for peanut and the 'lack of manure' for cocoyam were cited by only one farmer and it will be important to know if these were single reports or will be corroborated by other farmers or by informal talks. For its turn, 'late sowing' and 'lack of weeding' seem to have an extensive effect on different crops and were cited by several farmers. All the answers of 'lack of weeding' were given by fulani people in their territory. This maybe due to the almost complete absence of groups of work; this task may overlap with peanut

threshing and rice harvest and could be less likely to be successfully performed if the work is mainly individually developed. Blackeyed pea was reported to be damaged by weeds during informal talks.

Table 4 – Types of damage induced by people and their extension to different types of crops. The numbers between brackets refer the number of farmers reporting a certain crop to be damaged by the respective type of damage.

Type of damage induced by people (total 12)	Nr crops	Crops
Late sowing	5	upland rice (3), cassava (1), peanut (2), cocoyam (1), pigeonpea (1)
Lack of watering	3	citrus seedlings (1), canja (1), onion (1)
Lack of guarding	1	upland rice (1)
Improper ditches	1	swamp rice (1)
Lack of weeding	6	cassava (3), peanut (4), cocoyam (1), cashew (3), pepper (1), jack fruit (1)
Distance between stalks	1	peanut (1)
Lack of manure	1	cocoyam (1)

Peanut has been described to be damaged by domestic goats, cattle and pigs. In one of the villages (N2) people were planting cassava nearby the houses because they had no goats. They state it is impossible to grow cassava near the houses and raise goats at the same time, fences are not able to keep goats from damaging cassava and tree seedlings. In that village people have decided to grow cassava nearby the houses and stop raising goats because the damage of baboon and bush pig to the cassava planted in the bush was considerable.

Blackeyed pea seems to suffer damage from goats and domestic pigs; potato is damaged by cows (Table 4).

Table 5 – Types of damage induced by domestic animals and their extension to different types of crops. The numbers between brackets refer the number of farmers reporting a certain crop to be damaged by the respective type of damage.

Types of damage induced by domestic animals (total 4)	Nr crops	Crops
Cow	3	swamp rice (1), potato (1), peanut (1)
Goat	2	blackeyed pea (1), peanut (1)
Domestic pig	2	blackeyed pea (1), peanut (1)

In the village B during informal talks farmers state that cows have damaged cassava when the fences were not build yet. This ethnic group is the one raising cattle and therefore they build strong and double fences to keep those animals

apart from the crops (Figure 3). Some balanta villages have fences to prevent cattle from passing to the area where swamp rice is grown (Figure 4).

Except for the balanta the domestic animals are not perceived to produce relevant damage. Single reports correspond to damage occurring in the orange warren, banana warren or while rice is drying on the floor of the village.

During one semi-structured interview the village chief described that there are no conflicts arising between the village inhabitants when a cow destroys the rice of someone. He stated "*we are all brothers and no one as to pay anything to anyone*". The problem arises when we [the balanta] are living with other ethnic groups.

Figure 3 – Fences in a balanta village (B) surrounding a cassava cropland.

Figure 4 – Door that avoids the passage of cattle in a balanta village in Komo Island. There is small entrance in the left where people may pass through the door.

The reported sources of damages that seem to have a broader effect on foodstuffs is the lack of water in terms of rain availability; this affects upland and swamp rice farming, peanut, fruits and other products (Table 6). During informal talks fog was described to provide the water supply to some plants after the rainy season is over.

The lack of mature forest constrains upland farming. The description 'too many grasses/herbaceous plants' is related with the lack of mature forest since

farmers state that when the forest is not mature enough there are many grasses preventing the rice from growing properly (Table 5). The lack of mature forest may have several explanations: (i) actual decrease of mature forest, (ii) increasing number of people relying on upland farming, especially in the fulani territory; (iii) park legislation that constrains access to land, especially in the nalu territory, considering the actual park zonation (see Figure 15). Interestingly, although it is still difficult to arrive to a conclusion, the informants referring to the lack of manure forest are two nalu (N1 and N2) and two farmers from Boé region (BN and BM). Therefore, the hypothesis arising from this is as follows: although in the fulani territory there is less forest available, the park legislation is not so harsh and people do not perceive the lack of adequate forest as a main constraint. On the other hand, in the nalu territory there is forest available but several areas were defined as protected areas and people were not allowed to farm there. Boé province, on the other hand, has actually less forest available since the landscape is much drier, the forest sparser and also drier and the soil is rocky and less fertile.

Table 6 – Types of damage induced by environmental factors and their extension to different types of crops. The numbers between brackets refer the number of farmers reporting a certain crop to be damaged by the respective type of damage.

Type of damage induced by environmental factors (total 13)	**Nr crops**	**Crops**
To many gresses/harbaceuous plants	1	upland rice (1)
Lack of water	13	upland rice (5), swamp rice (1), cassava (1), peanut (2), blackeyed pea (1), pumpkin (1),orange (1), lime (1), cashew (2), oil palm fruits (1), tomato (1), 'mandarina'[11] (1), cucumber (1)
Lack of fog	2	upland rice (1), blackeyed pea (1)
Lack of mature forest	1	upland rice (4)
Lack of appropriate land ('good land')	1	peanut (1)
Sahara dust	2	upland rice (1), cashew (1)
Salty water	1	swamp rice (3)
Wind	1	swamp rice (1)
Fog	1	tomato (1)
Sun	1	tomato (1)

The effect of salty water (Table 6) was described by two balanta and one nalu farmer and is related to the previously referred 'improper ditches' (Table 4) since a damaged, small or narrow ditch lets the salty water get into the rice polder. A nalu farmer evidenced that when the water lilies are growing inside the rice fields it means that the salty water did not enter.

[11] Creole name for a variety of citrus.

The effect of 'wind' (the farmer stated that the plant 'drinks wind' and dies) was described by one nalu farmer in N1. However, another nalu farmer in N2 explained that this effect is not originated by wind but by an insect that cuts the nourishment of the plant. This shows the different individual background knowledge and preciseness of agricultural problems.

Moreover, there was one source of harvest loss that was only reported when doing reconnaissance walks in the swamp rice polders during a reconnaissance walk. "Ash of salt" refers to the salt deposition in the ground that doesn't allow the swamp rice to grow. In nalu this is called 'behe' and 'bifnhui' in balanta. Moreover, it was still possible to identify a few round depressions in the swamp rice fields from the Portuguese bombing of the swamp rice polders in the colonial war. This, together with the ditches' destruction meant a long term effect on harvest loss.

In Creole, the word 'santcho' (monkey) includes all primate species except baboon and chimpanzee, which have specific names. The king colobus was never referred to maybe due to its low abundance or maybe because it is shy and does not have a conspicuous, if any, crop raiding behaviour. Except for dwarf galago (*Galagoides demidovii*) and senegal bushbaby (*Galago senegalensis*), which are known to occur in the area [Barata pers. com, PNUD 2000:111], all other primates were reported to be extensive and intensive crop raiders, especially on fruits (Table 6a).

Table 7 – Types of damage induced by wildlife and their extension to different types of crops. To facilitate the table interpretation it was divided in sections: (a) primates; (b) bovidae and bushpigs; (c) rodents; (d) carnivores, lagomorpha, chiroptera and birds; (e) fishes and invertebrates. The numbers between brackets refer the number of farmers reporting a certain crop to be damaged by the respective type of damage.

Table 7a

Types of damage induced by wildlife (total 27)	**No crops**	**Crops**
PRIMATES	**17**	
monkey	6(13**)	cassava (1), peanut (1), orange (3), cashew (1), oil palm fruits (1), mango (1)
chimpanzee[12]	11	peanut (1), maize (1), millet (2), orange (6), lime (2), cashew (4), oil palm fruits (1), banana (2), mango (2), 'mandarina' (1), grapefruit (1)
baboon[13]	13	upland rice (3), cassava (5), peanut (1), blackeyed pea (2), pumpkin (1), maize (1), sorghum (1), orange (2), cashew (1), oil palm fruits (1), kola (1), banana (1), mango (1)

[12] *Pan troglodytes verus*, in Creole 'dari'
[13] *Papio papio*, in Creole 'kon'

western red colobus[14]	2	orange (1), kola (2)
cambell's monkey[15]	7	upland rice (3), balckeyed pea (2), maize (3), millet (1), sorghum (2), banana (1), mango (1)
patas monkey[16]	3	upland rice (1)*, peanut (1)*, orange (1)*
green monkey[17]	6	upland rice (1), cassava (1), peanut (6), blackeyed pea (1), orange (1), cashew (1)

* it is only referred to the two interviews from Boé, where the species occurs.
** 6 informants directly mentioned 'monkey' and 13 mentioned 'monkey' or any other species of monkey.

Chimpanzees and baboons seem to exhibit the most extensive crop raiding activity among the primates. The former relies on orange, cashew, banana, mango, lime and millet. One farmer said: "*The chimpanzee attacks the banana stalk more often when there is less fresh water available and it does not enter the field using the same path."* This species was reported by one farmer to not eat the banana fruit, but to only chew the stalk. Only monkeys eat the banana fruit.

Chimpanzee and baboon's damage to cashew are represented by two different types of loss: (i) eating the juicy false fruit, which is economically important for balanta people, since they consume and sell the wine produced from the false fruit; and (ii) breaking of cashew tree branches, which leads to a long term loss to the farmer. The also later refers to the damage by the insect *Analeptes trifasciata* (Table 6e and discussed next). In 2007 I was also told by farmers that often chimpanzees collect the cashew fruits, sit and eat, leaving the pile of nuts together.

The damage produced in orange is reported as harsh. The majority of the informal talks with farmers complaining about chimpanzees referred to losses on orange production. One farmer stated that chimpanzees sleep nearby the orange orchards to eat them in the early morning. Another stated that the chimpanzees only feed on his oranges when they 'finish' the oranges of the villages nearby. Some of these farmers were very angry, both in 2007 and 2009.

The chimpanzee seems to be the only primate foraging on lime, a growing investment of farmers in Guinea-Bissau. Many seedlings are being grown and traded, and lemon juice is both used for cooking and sold. Mango foraging was also reported, however it does not seem to be very important in terms of losses because the mango is mainly for local consumption. Since everyone has access to mango and there is a high amount of mango rotting on the floor, it does not have a

[14] *Procolobus badius*, in Creole 'fatango'
[15] *Cercopithecus campbelli*, in Creole 'canculma'
[16] *Erythrocebus patas*, in Creole 'santcho fula'or 'santcho brumedjo'. The former is used for non fulani ethnic groups. 'Fula' means 'fulani' in Creole and therefore 'santcho fula' means 'fulani monkey'. This is due to that fact that this species is only present inland from where Fulani came from and where they settled. The fulani farmers, by their turn, call this species 'santcho brumedjo' meaning 'red monkey' and they find the other name slanderous. This species in not present in Cantanhez but it is present in the Boé region.
[17] *Chlorocebus sabaeus*, in Creole 'santcho tarrafe'. This species is common in the mangrove areas and its name in Creole means 'mangrove monkey'. Several farmers state that there are two types of green monkey: one smaller and thiner because has less access to fresh water and another that inhabits the forested savannah that grows bigger and healthier because of fresh water availability.

price in the local market. Two informants described the millet being consumed by chimpanzees. During informal talks the chimpanzee was described to also feed on pigeonpea.

The baboon is the primate species described to feed on a wider range of foodstuffs, from upland rice, cassava and peanut, to blackeyed pea and fruits (Table 6a). Previously described to be very common and abundant in the southern region of Guinea-Bissau its density is reported by local people to have decreased. Along informal talks, baboons were described to damage cashew flowers when they are displaying in cashew nut orchards by making them fall.

The abundance of oil-palm tree in West Africa is described to have been influenced by human settlement due to its usefulness for cooking and trading [Sowunmi 1999]. Oil palm fruits are also used by chimpanzees, baboons and monkeys. In this region the chimpanzee shows a strong preference to nest is this species [Sousa et al. submitted] and some farmers state that when they build their nests and the leaves die it loses strength to give fruits. This is a case of indirect competition but apparently it is not perceived as conflicting. Also, chimpanzees were described to feed on honey, which is produced in manufactured beehives.

The western red colobus is arboreal, feeds on mature and young leaves [Lee 1988:80] and although seeming to be a shy crop raider it was reported to intensively feed on kola nuts (Figure 5). This fruit has a deep social and religious meaning, great usefulness and has a good price in the market. I personally observed twice (in the two times I visited the same kola orchard) a group of a minimum of 6 individuals crop feeding on kola nuts. A farmer was guarding the orchard with his fire arm but he stated (without being asked) that it was only to frighten them. The farmer did not seem to feel comfortable with my presence and went away after a short period. He was complaining about this group of colobus that was damaging without even eating the nuts (Figure).

Figure 5 – Kola nut raided by a western red colobus.

Cambell's monkey and the green monkey are easily seen feeding in upland farms. This is described by farmers as more extensive for cambell's monkey and more intense over peanut for the green monkey. Also, I observed evidence of green monkey in a set of swamp rice fields but the owner was not interviewed during the pilot study and no other farmer reported this damage. However, during

an informal talk he stated: "*if the rice is ripe the santcho tarrafe* [green monkey] *eats it, if not it only damages*".

The bovidae damage corresponds mainly to single reports (Table 6b). However, the damage of African buffalo in swamp rice was confirmed by footprint. Bushbuck damage on pepper and blackeyed pea were also reported. The latter report was confirmed by bushbuck droppings close to damaged crops (Figure 6).

Figure 6 – Damage of bushbuck in blackeyed pea and bushbuck droplets in the damaged area.

Table 6b

BOVIDAE	**5**	
bushbuck[18]	3	potato (1), blackeyed pea (1), pepper (1)
bay duiker [19]	1	blackeyed pea (1)
african buffalo[20]	2	upland rice (1), swamp rice (1)
SUIDAE	**8**	
bush pig[21]	7	upland rice (2), cassava (5), peanut (6), potato (1), blackeyed pea (1), cocoyam (1)
red river hog[22]	2	cassava (3), peanut (2)
common warthog[23]	2	upland rice (1), banana (1)

Bush pigs are intensive crop raiders of cassava and peanut (Table 6b), two important crops both for food security and for rice exchange. The Creole term for bush pig ('porco di mato') includes both species occurring in the area. However, on a few occasions people named the specific name for *Phacochoerus africanus* ('porco preto') and *Potamochoerus porcus* ('porco brumedjo'), names that distinguish their skin color, black and red, respectively. Damage by bush pig was also observed in swamp rice but the owner was not interviewed during the pilot study and it was not reported by any of the four interviewed farmers growing this crop.

[18] *Tragelaphus scriptus*, in Creole 'gazela'
[19] *Cephalophus dorsalis*, in Creole 'cabra-mato'
[20] *Syncerus caffer*, in Creole 'bufalo'
[21] in Creole 'porco di mato'
[22] *Potamochoerus porcus*, in Creole 'porco brumedjo'
[23] *Phacochoerus africanus* in Creole 'porco preto'

Rodents such as cane rat and porcupine were described to have both an extensive and intensive crop raiding activity (Table 6c). The cane rat is reported by more than 10 farmers to produce damage in upland rice, cassava and peanut; also blackeyed pea, pumpkin and maize were reported to be damaged by this species by 3, 4 and 5 farmers, respectively; and finally, two have pointed out millet and potato. I also registered damage of this species in swamp rice fields.

Table 6c

RODENTS	**15**	
greater cane rat[24]	10	upland rice (11), cassava (11), peanut (14), potato (2), blackeyed pea (3), pumpkin (4), maize (5), millet (2), sorghum (1), banana (1)
ground squirrel[25]	1	cassava (1)
squirrel having arboricoral habits[26]	1	kola (1)
squirrel[27]	8[28]	cassava (1), peanut (7), potato (1), blackeyed pea (2), pumpkin (1), cashew (1), tomato (1), kola (1)
crested porcupine[29]	9	cassava (10), peanut (9), potato (2), blackeyed pea (1), pumpkin (6), cocoyam (2), maize (1), sorghum (1), yam (1)
'savannah rats' (literally translated from the Creole 'ratos di lala')	1	upland rice (2)

Like the cane rat, the porcupine is recognized by several farmers as a forager of cassava, peanut and pumpkin; being also named for potato and cocoyam damage by two informants (Table 6c). It seemed difficult to distinguish between the evidences of cane rat and porcupine damage. Footprints, skulls and claws will be collected whenever possible to establish a behavioural and physical conection to the signs of damage.

[24] *Thryonomys swinderianus*, in Creole 'farfana'
[25] probably *Heliosciurus rufograchium*, in Creole 'saninho di tchon'
[26] *Funiciurus pyrropus, Heliosciurus gambianusm* or *Xerus erythropus*, in Creole 'saninho di riba'
[27] *Heliosciurus rufograchium, Heliosciurus gambianus, Funisciurus pyrropus, Xerus erythropus*, in Creole 'saninho'
[28] This reffers to other answers than those respecting to the ground squirrel or the squirrel having aroboricoral habits
[29] *Hystrix cristata*, in Creole 'porco espinho'

The names given to the ground and 'upper' squirrel are related to their patterns of activity: squirrels of the floor and squirrels of the trees. Squirrels were broadly recognized as peanut foragers. Mice were reported to damage the swamp rice, which, after harvesting, stays in the ditches to dry out.

Genet, hare and bat were mentioned once for peanut, blackeyed pea and mango, respectively (Table 6d). Birds were reported by several farmers as rice and peanut foragers (Table 6d). A farmer mentioned that rice damage is more important when the rice panicule has 'milk' - a soft, and sometimes still liquid, material that gives rise to the grain. Before or after this phase it is less accessible to the birds. *"Birds and 'bitchos' damage the rice when it has 'milk', when it is ripe they have 'no strength' to eat it."* Other specificities on rice damage are: "*rats only eat the rice panicules that bend down, they cannot get the others. Termites only eat the rice when it is small. These do not damage in a way that can upset the farmer*." However, "*rice bends down because of birds' weight and then the rats can reach it if the swamp rice polders are not flooded.*" Situations and contexts where crop raiding takes place are not simple or homogenous.

Table 6d

CARNIVORES	**1**	
genet[30]	1	peanut (1)
LAGOMORPHA	**1**	
african savannah hare[31]	1	blackeyed pea (1)
CHIROPTERA	**1**	
bat[32]	1	mango (1)
BIRDS	**13**	
bird[33]	8	upland rice (11), swamp rice (4), cocoyam (1), maize (2), millet (1), sorghum (1), cashew (1), mango (1)
senegal parrot[34]	1	cassava (1)
common bulbul[35]	1	pepper
village weaver[36]	1	millet (1)
helmeted guineafowl[37]	2	swamp rice (1), peanut (2)
double-spurred francolin[38]	5	swamp rice (1), cassava (2), peanut (4), potato (1), blackeyed pea (3)

[30] *Genetta pardina* or *Gennetta thierryi*, in Creole 'gato lagaria'
[31] *Lepus microtis*, in Creole 'lebre'
[32] in Crelo morcego
[33] in Creole 'catcho' that include all birds, from the large to the small. However, in general they have specific names to refer to different species or types.
[34] *Poicephalus senegalus*, in Creole 'pirikito'. There are four species of parrots described to Guinea-Bissau but only this was reported to occur in Tombali
[35] *Pycnonotus barbatus*, in Creole 'catcho inguli malagueta' meanig 'bird that shallows chilli pepers'
[36] *Ploceus cucullatus*, in Creole 'catcho calderon'
[37] *Numida meleagris*, in Creole 'galinha do mato'
[38] *Francolinus bicalcaratus,* in Creole 'choca'

dove or pigeon[39]	4	upland rice (1), swamp rice (2), cassava (1), peanut (5)

'Invertebrates with a typical insect look' include all categories of invertebrates presented bellow (Table 6e) and are reported to have an effect on several crop types, such as rice, peanut, blackeyed pea, orange, lime, cashew and mango, among others. Mangrove crab and fishes have a restricted effect to swamp rice. The fruit fly was also reported as 'bitcho', which is the general word to name 'insect-looking invertebrates', diseases originated from bacteria or virus. The same happens to 'grasshopper'. The longhorn beetle that 'sows' the branches of the cashew tree is referred in Creole as 'bitcho serrote' (Figure 7). In Boé region this species was not reported.

Table 6e

FISH	**1**	
fish[40]	1	swamp rice (1)
INVERTEBRATES	**18**	
Invertebrates with a 'typical insect look'[41]	16	upland rice (4), swamp rice (1), peanut (2), potato (1), blackeyed pea (3), pigeonpea (1), maize (1), orange (5), lime (2), cashew (2), tomato (1), mango (2), pepper (1), roselle (1), aubergine (1), 'comenta' (1)
grasshopper[42]	3	orange (1), 'mandarine' (1), grapefruit (1)
fly[43]	3	blackeyed pea (1), cashew (1), mango (1)
longhorn beetle (stem girdler)[44]	1	cashew (8)
mangrove crab[45]	1	swamp rice (1)
termite[46]	5	upland rice (2), pigeonpea (1), orange (1), lime (1), pepper (1)

[39] There are several Columbidae species described for Guinea-Bissau. The species described for Tombali are *Turtur afer* (blue-spotted wood dove) and *Streptopellia semitorquata* (red-eyed dove). More research is needed.
[40] In Creole 'piss'
[41] In Creole 'bitchos'; this term includes 'insect-looking invertebrates', diseases originated from bacteria, virus or other pathogenic organism.
[42] In Creole, 'gafanhoto'
[43] One of the local NGOs identified two species *Diptera tephritida* and *Bactrocera invadens* in its report: AD. 2009. Experiência da AD no combate à mosca da fruta. Bissau, Guiné-Bissau: Acção e Desenvolvimento. 37 p.
[44] *Analeptes trifasciata*, in Crele 'bitcho serrote', literally translated to 'handsaw insect'
[45] *Uca tangeri* sp., in Creole 'cacre'
[46] In Crele 'baga baga'

Figure 7 - *Analeptes trifasciata,* in Creole 'bitcho serrote'.

Primates, rodents, birds and invertebrates are the groups described to have a more extensive effect in terms of the number of different types of crops and foodstuffs affected.

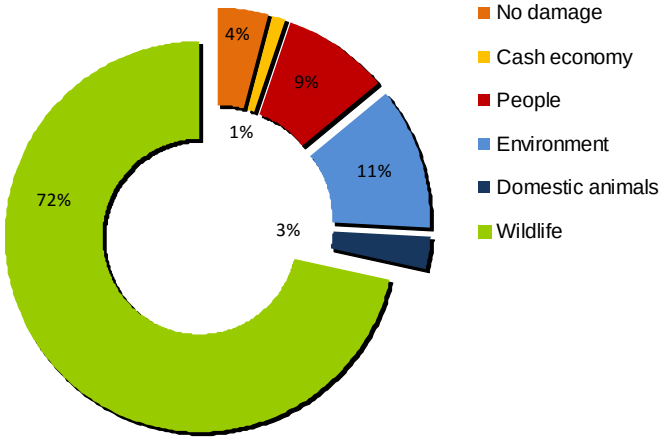


Figure 8 – Different sources of damage. This refers to how many different sources of damage are cited considering all the interviews and responses regarding all crops named.

Considering all sources of damage regarding all crops, 72% are related to wildlife activity (including invertebrates, as flies and insects; Figure 8). As was already mentioned, this is also the category that affects a higher number of crops (Table 2).

Two informants also added 'sickness' as a source of harvest loss affecting the banana. This disease was reported both in N1 and N2 and was described to have appeared in 2009. Some crops were described, at least by one informant, as being 'damage free', such as: lime (3 of the 8 informants growing lime), 'bene' (see Figure 2), okra, roselle, citrus seedlings, Angola palm and tomato.

Three types of birds (doves, double-spurred francolin, passerines and also other larger birds are referred to as 'catchos') and ground squirrels were described

as the plagues of the upland and swamp rice during sowing. During the upland rice sowing the same group of species were identified as causing damage, together with the green money.

3.2.2 The reported intensity of damage for each crop

Sources of damage more frequently reported for each crop

Participants named several sources of harvest loss for each crop. Information about farmers' reports of damage per crop depends on how many of the interviewees were growing what crops. The upland rice (12 farmers), swamp rice (4 farmers), cassava (15 farmers), groundnut (14 farmers), potato (4 farmers), blackeyed pea (8 farmers), pumpkin (6 farmers), cocoyam (5 farmers), maize (5 farmers), millet (3 farmers), sorghum (3 farmers), orange (8 farmers), lime (8 farmers) and cashew (12 farmers). Despite their importance, reported information about some of these crops was considerably scarce, such as the swamp rice. More information is expected to be collected during the next phase. Also, others like pigeon pea, oil palm fruits, tomato, chilli and kola nuts were very little reported.

The cane rat was referred to be one of the three most referred sources of damage for nine crops: 92% of the informants who grow upland rice, 73% of the informants who grow cassava, 100% of the informants who grow groundnut, 50% of the farmers who grow potato, 50% of the famers growing blackeyed pea, 67% of the informants growing pumpkin, 100% of the farmers growing maize and 67% of the informants farming millet (Table 7). At the same time, the porcupine was cited for five crops as one of three most important sources of damage: 67% of the informants growing cassava, 57% of the farmers growing groundnut, 50%, 100% and 50% of the informants growing potato, pumpkin, cocoyam, respectively. Likewise, the rodents are reported to be the major raiders of upland rice, cassava, groundnut, potato, blackeyed pea, pumpkin, cocoyam, maize and millet (Table 7).

Primates were within the three more frequently referred in five cases. 'Monkeys', as locally described, were named by 75% of the informants cultivating orange, which together with the chimpanzee are most important orange foragers (Table). The campbell's monkey was named by 60% of the informants as a maize forager, such as for the sorghum with 67%. A farmer made the following behavioural description:

> *"when monkeys want to crop raid, some go up in the trees and the others stay in the ground. The ones that are above they try to keep farmers' attention by shaking their heads".* nalu farmer

The chimpanzee is also within the first three most cited sources of loss of millet (67% of the informants), lime (25% of the informants) and cashew (33% of the informants). The fruits are also reported to be significantly damaged by insect-like invertebrates, these were cited by 63% and 25% of the informants growing orange and lime respectively. From five farmers growing banana, two named the chimpanzee and the banana disease as the major source of loss. Longhorn beetle was reported as a first source of cashew loss with 67% of the farmers reporting it

and, after the chimpanzee, the lack of weeding is named as the third most cited cause of harvest loss with 25% of the informants referring it (Table 7).

Other environmental cause of harvest loss ranked within the first three is ‘the lack of water’, which corresponds to: (i) the lack of water of the upland rice, which is related with the intensity and duration of the rainy season and (ii) the salty water in the swamp rice, which may be a consequence of little rain, more ‘sea strength’ (as was referred by several farmers during informal talks) or inappropriate ditches in the swamp rice polders (Table 7).

Table 7 – First three more frequently named sources of damage for several crops.

Crop		insect-like	longhorn beetle	birds	dove	choca	cane rat	porcupine	bush pig	monkey	cambell's monkey	chimpanzee	salty water	lack of water	lack of weeding
upland rice	n/Nfarmers			0,92			0,92							0,42	
	n/Nanswers			0,18			0,18							0,08	
swamp rice	n/Nfarmers	0,50		1,00	0,50								0,75		
	n/Nanswers	0,10		0,19	0,10								0,14		
cassava	n/Nfarmers						0,73	0,67	0,53						
	n/Nanswers						0,23	0,21	0,17						
groundnut	n/Nfarmers						1,00	0,64	0,57						
	n/Nanswers						0,18	0,12	0,10						
potato	n/Nfarmers						0,50	0,50							
	n/Nanswers						0,20	0,20							
blackeyed pea	n/Nfarmers	0,38				0,38	0,50								
	n/Nanswers	0,11				0,11	0,14								
pumpkin	n/Nfarmers						0,67	1,00							
	n/Nanswers						0,31	0,46							
cocoyam	n/Nfarmers							0,50							
	n/Nanswers							0,25							
maize	n/Nfarmers			0,60			1,00				0,60				
	n/Nanswers			0,20			0,33				0,20				
millet	n/Nfarmers						0,67					0,67			
	n/Nanswers						0,33					0,33			
sorghum	n/Nfarmers										0,67				
	n/Nanswers										0,33				
orange	n/Nfarmers	0,63								0,75		0,75			
	n/Nanswers	0,23								0,27		0,27			
lime	n/Nfarmers	0,25										0,25			
	n/Nanswers	0,33										0,33			
cashew	n/Nfarmers		0,67									0,33			0,25
	n/Nanswers		0,28									0,14			0,1

The bush pig is reported to attack cassava and peanut by 53% and 57% of the informants growing these crops, respectively. Finally the birds are reported as being one of the three main causes of harvest loss for four crops: upland rice (92% of the informants), swamp rice (100% of the informants), maize (60% of the informants) and balckeyed pea. Specifically, the double-spurred francolin was named by 43% of the informants growing blackeyed pea and pigeon/dove, was referred by 67% of the informants growing swamp rice (Table 7).

3.3 Reported and measured crop damage

The terms 'reported' and 'measured' crop damage were adopted. There is a certain chance that reported damage does not faithfully illustrates the farmers' perceived damage, neither the measured damage corresponds to the actual damage, since these are both approximations and estimations. A farmer can choose not to tell his/her actual perceptions but build up a narrative based on the interviewer's expectations or based on a personal view that leads to a transfiguration of the actual perception, which consciously or unconsciously builds up a new perception. At the same time, what the researcher 'perceives as the other's perception' suffers a process of interpretation by the researcher. Especially when the subject involves controversial issues about the local-scale sphere, which directly affects the farmers, isn't it expected to exist politicized reports? I expect it to be difficult to distinguish a simple and straightforward report from an intentional, consciously built report, which intends to communicate a specific opinion/view.

Regarding the differences of reported and measured crop damage and considering the data collected during the pilot study, the two crops that could be analysed were orange and cassava.

3.3.1 Orange

Reported damage

From the interviewed farmers, eight participants grow this fruit tree (38% of the interviewees). Seven people numbered primates as crop foragers and seven named the chimpanzee as a crop raider. The other primates named were the green monkey (1), baboon (2), western red colobus (1), patas monkey (1), and 'monkeys'. (3). Although the information is still based on a few interviews it is curious to highlight that: (i) the western red colobus, was only cited in a balanta village (B) that is located nearby a well conserved forest; (ii) the patas monkey was only named in Boé region since it does not exist in the south; (iii) in the 'Tchon di Guiledge', where the forest is much sparse and is located far from the village, people only referred to the chimpanzee as a primate orange forager; and on the contrary, in the south of Cantanhez, in the 'Tchon Nalu', balanta (B) and nalu farmers (N1, N2) reported primates other than the chimpanzee: 'monkey' and chimpanzee (N1 and N2) and

‘monkey’, chimpanzee, baboon and western red colobus (B). As well, in Boe region, a farmer reported patas monkey, baboon and chimpanzee.

Considering only the groups ‘primate’ and ‘insect-like invertebrates’, five informants named invertebrates while seven cited primates as sources of harvest losses. Although a quantitative analysis is being followed, the small sample size makes this a merely exploratory approach (Figure 10).

Estimated damage

During the estimation of the actual damage occurring in the orange trees, 90 trees were sampled around the studied villages. All trees were located nearby the villages’ (N1, N2 and F2) houses. It was not possible to distinguish the differences of damage evidences among different species of primates, except for the chimpanzee that presents a very specific pattern of damage (Figure 9). From the sampled trees, there were 13 trees with evidence of primate damage, 1 with rodent damage (squirrel) and 85 showing losses induced by invertebrates (84 by the fruit fly and 13 by termites).

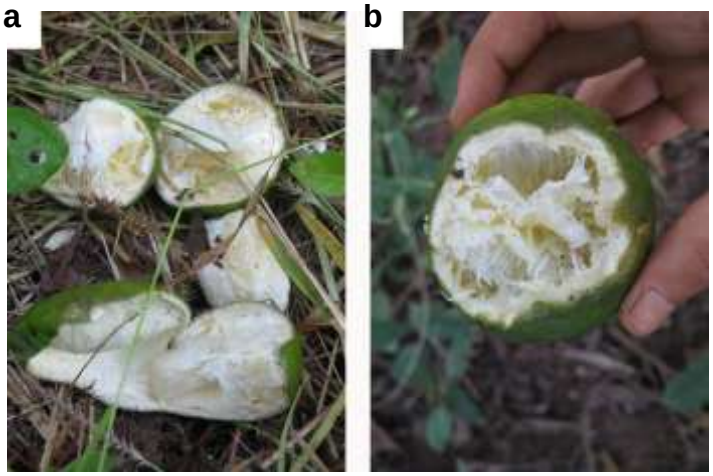


Figure 9 – Damage in orange by (a) chimpanzees and (b) monkeys.

Up to this stage the reported damage of primates versus invertebrates seems to overestimate the damage of this latter group. It is convenient to highlight that this approach does not take into account the number of oranges damaged but only the number of trees that present each type of damage. Even though it seemed that if a quantitative approach based on the number of damaged oranges would have been made, the damage from invertebrates would be even more evident.

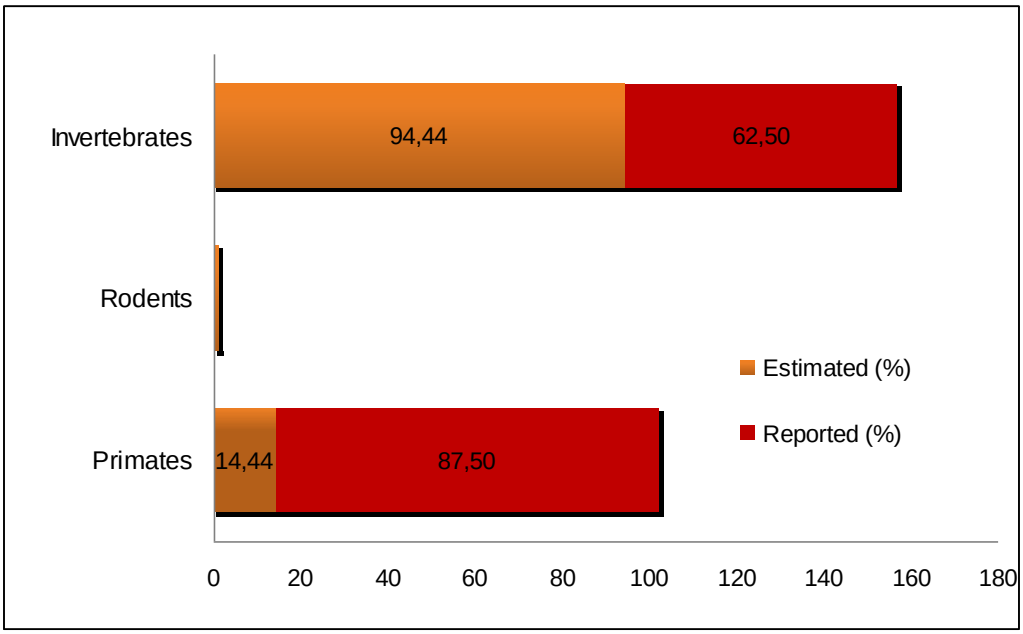


Figure 10 – Estimated and reported damage in orange fruits. The percentage of the estimated damage does not sum 100% since a few trees presented damage from more that one group (total of 90 orange trees). The same happens for the reported damage because several farmers named both groups as crop raiders (total of 8 farmers).

3.3.2 Cassava

Reported damage

From the 21 farmers participating as informants in the semi-structured interviews, 14 were growing cassava. All numbered rodents as crop raider species: cane rat (11 citations), porcupine (10 citations) and squirrel (2 citations). The bush pig was named 8 times, three of these respected to the red river hog (only cited by fulani people). Seven interviews named primates, baboon (5 citations) and 'monkey' (3 citations), and two informants named birds (double-spurred francolin and dove/pigeon).

Two effects other than wildlife were reported. The lack of weeding was described by three fulani farmers from the 'Tchon di Guiledge', also late sowing was referred in this region. An environmental constraint, the lack of rain water, was named in the same region.

Estimated damage

There were 4182 cassava stalks sampled in this pilot survey and from these 3623 showed no evidences of damage (86,63%). Once again this analysis does not take into account the quantity of tubers damaged but only the presence or absence

of root damage in each plant. The damage could vary as much as one root damaged to as harsh as all the roots taken out from the land, preventing the plant to survive. The great majority of damage was done by rodents (465 stalks): cane rat (350), porcupine (104) and squirrel (11). The pattern of damage by cane rat and porcupine are similar although the porcupine seems to be able to dig deeper than the cane rat.

Bush pig damage was easy to identify due to the messy marks in the soil but it was impossible to distinguish the two species. This group species damaged 44 cassava stalks. Termites were the only invertebrate damaging cassava that feed on the planted cuttings. There were 42 cuttings unable to grow due to termites.

The ranking of 1st, 2nd and 3rd most important cassava raiders from reported and sampled data coincide: rodents, bush pigs and primates. The small sample size of interviews does not allow major considerations.

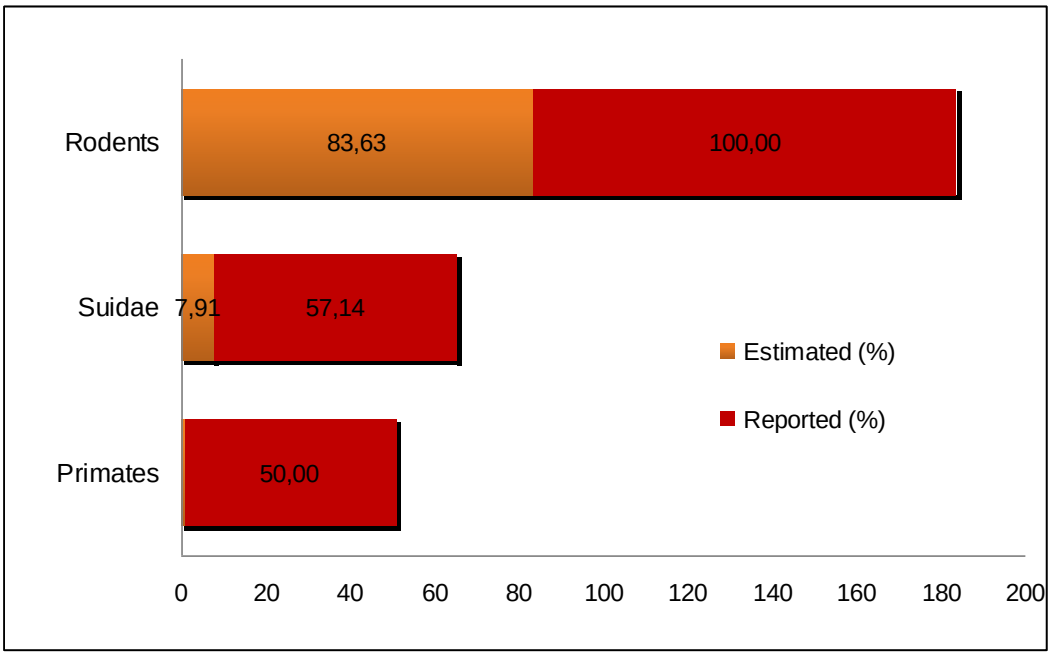


Figure 11 – Estimated and reported damage in cassava. The percentage of the estimated damage does not sum 100% since a few plants presented damage from more that one group (556 cassava stalks). The same happens for the reported damage because several farmers named both groups as crop raiders (total of 14 farmers).

3.4 Control Measures

Methods to control crop losses were post-grouped in categories that vary from lethal to non-lethal strategies and to responsive or preventive methods. Therefore it was possible to, as objectively as possible, distinguish the following groups: (i) preventive strategies of non-lethal methods put in place before any damage occurs; (ii) interventions after damage in which farmer's attitude is to remain defensive or attentive; (iii) non-lethal interventions taken to respond to specific episodes; (iv)

general non-lethal techniques to diminish damage; (v) lethal techniques; and (vi) magic-religious methods.

Preventive strategies accomplish 12 different methods from 94 answers (the number of answers are shown within brackets and take into account all crops): guarding (44), weeding (21), short term fencing (in Creole, 'tapada', Figure 12) (12), oil palm fencing (1), quick farming (6), early and quick harvest (2), cover the harvested crop (1), dig a gutter (2, for swamp rice farming), leave burnt trunks in the field (1) and staying in the cropland until the evening (4).

The task of guarding the croplands is usually performed by children. Some farmers having no children or very young children (such as the case of one informant whose son was afraid of staying alone in the swamp rice fields) have trouble keeping up with the task. Other farmers, having children attending school make the effort of replacing them while they take their classes. Other preventive strategies that were not reported but were observed by the researcher include scarecrows (Figure 13a), 'binhale'[47] (Figure 13c), a rope tied to stick that when in rotation makes a loud noise and frightens the birds (Figure 13b), a red cloth tied to a stick and a tape strip tied to stick[48].

Figure 12 - Short term fencing made with burnt trunks placed in the cropland limit, in Creole 'tapada'

[47] This is a sticky material that is taken from a liana
[48] The sound this makes shaking with wind was reported to fright the birds and cane rat.

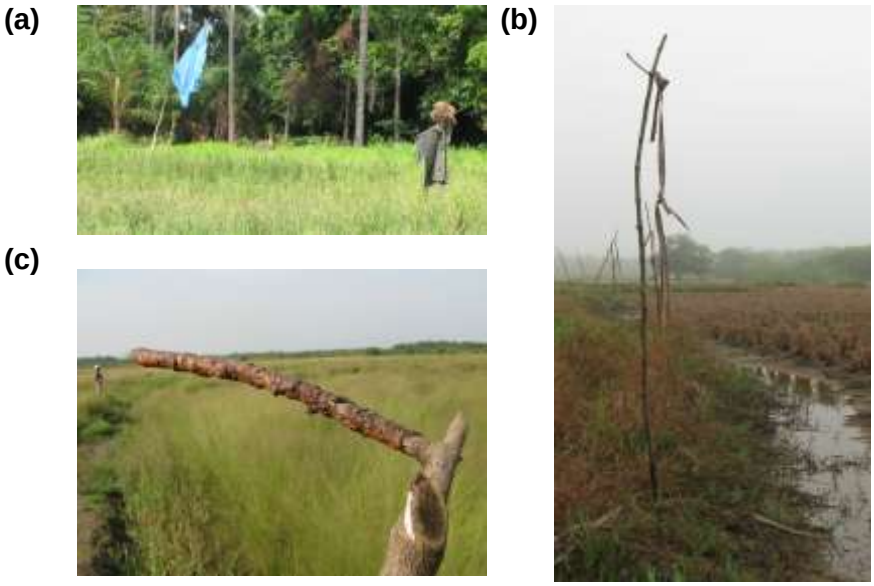


Figure 13 – Preventive control methods to bird raiding: (a) scarecrow and cloth tied to a stick; (b) rope tied to a stick; (c) 'binhale' (see footnote 60).

The strategies hereby defined as 'prepared to intervene' are: guarding the cropland using a fire arm during the night (8), guarding with a fire arm (7), shooting[49] (31). The species-specific methods are usually a consequence of a previous crop raiding episode, and are as follows: burn tires (2), pieces of crab left in the cropland (2), attracting ants (1), oil palm fruits left in the cropland (5), mixture of peanut powder and onion or *netetu*[50] (7), mixture of *maconde*[51] powder and *farroba*[52] (1), set a small fireplace (2), burn a trunk (3) and burn a cloth (3). The 'oil palm fruits' strategy was described by two farmers for different crops and the 'crab' method was mentioned by one farmer, all of these nalu. This is based on the same principle as the 'ants' strategy. By leaving oil palm fruits or crab pieces in the cropland the ants are expected to come and the cane rat will be chased away since this animal cannot handle ants (farmers' reports).

The strategy of burning rice husks around the cropland was named to chase away cane rats. In the same way, the description of peanut powder mixed with *netetu* or onion was indicated to mitigate cane rat damage in upland rice, peanut, cassava, blackeyed pea, maize, millet and sorghum. Since these are grown all together, in reality it means that this procedure is taken once in a specific cropland. At the same

[49] The term in Creole 'foguear' means shooting. The actual meaning of this word has to be explored. 'Montear' means explicitly 'hunting' while 'foguear' means using the fire arm, although apparently it does necessary means to target the animal. More effort has to be taken to understand the meaning of the term.

[50] *Netetu* is a fermented producted from African locust beans (*Parkia biglobosa*), in Creole, 'faroba'. It is used as a condiment and has microbiological properties. More information about *netetu* properties in D'dir B, Gningue RD, Keita NdG, Souane M, Laurent L, Cornelius C, Thonart P. 1997. Microbiological and organoleptic characteristics of commercial netetu. Cahiers Agricultures 6(4):299.

[51] One of the common names of blackeyed pea

[52] name in creole of *Parkia biglobosa*. The same species used to manufacture *natetu* (see footnote 33).

time, the methods of 'burning a cloth' and 'burning a trunk' were described by the same fulani farmer to mitigate the porcupine damage in peanut, pumpkin, cocoyam.

General non-lethal techniques (68) are: chasing (16), chasing with a catapult (46), hit tins (1), hit a trunk (2), talk (1). In Boé farmers stated that the monkeys are chased with a catapult because, by doing that with bullets a lot of them had to be wasted. Hitting in tins and a trunk was reported as control against chimpanzee foraging.

The lethal methods used to mitigate crop damage (48) include: salt to the termites that attack the citrus trees' trunks (2), manual killing applied to control the longhorn beetle that damages the cashew trees (2), use of snares (25), ask a hunter to kill the crop raiding animals[53] (3), hunting (14), chemicals were reported to mitigate the insect damage in mangos (1) and in an informal talk one farmer used chemicals in a large scale in his 'mandarines'. This farmer is a partner of the local NGO in the 'Tchon di Guiledge', he has a large orchard and is one of the very few people using chemicals to control invertebrate plagues, describing how expensive it is for the large majority of the people:

> *"The grasshoppers eat the leaves of the citrus trees and make the production to decrease. It is necessary to use chemicals to pump the orchard in the beginning of the rainy season. One litre costs 10.000 XOF[54] and it is enough to two orchard treatments. The grasshoppers' damage also diminish if the orchard is clean of vegetation, this costs the work of four people in August and October, 60.000 XOF[55] each time. When there are not many, they kill the grasshoppers with their hand."*

Building traps and snares or hunting, demand specific technical skills and methods. Several people do not know how to do it. The cane rat snare is very specific and can get also snakes and squirrels (Figure 14). This trap was reported by one farmer to be successful on mitigating the number of cane rat raidings: *"If I get one individual in one place, or even if I do not get it, it takes time until they come again*".

[53] Generally the hunter keeps the meat. I tis only divided if the owner pays the bullets.
[54] 15 euro, considering an exchange rate of 1 euro = 660 XOF
[55] 91 euro, considering an exchange rate of 1 euro = 660 XOF

Figure 14 – Trap for cane rat

Religious/magic methods respected to bird foraging concerned Islamic writings[56] and asking to the 'baloba' (animist altar, see footnote 2). A nalu farmer said, "*Before, our elders did magic ceremonies to diminish crop damage but now we do not do it anymore, our parents stopped it*." The same farmer stated that the damage done by cane rat and chimpanzee are impossible to control, and added: "There is no solution".[57]

Considering the answers about all crops, preventive methods were most frequently cited and non-lethal methods were the second more frequently cited.

The highest number of different methods emploed regarded the control of damage by cane rat (14), bush pig (14) and porcupine (13). For the squirrel and chimpanzee damage there were 7 and 6 different mitigation methods described, respectively. Others were named in a decreasing diversity of mitigation methods employed: birds (5), baboon (5), monkey (5), insect-like (3), helmeted guineafowl (3), dove/pigeon (3), termites (2), and double-spurred francolin (2).

Only the cane rat, bush pig and porcupine have species-specific non-lethal methods in response to previous raiding events. Non-lethal techniques were mostly named for the chimpanzee (16 answers), baboon (10), monkey (10) and birds (8). Methods based on non-lethal strategies in which the farmer is ready to lethally intervene were referred to foraging by 'monkey' (11 answers) and baboon (7 answers). Lethal techniques were mostly reported to the cane rat (25 answers), porcupine (9) and bush pig (6). Except for the squirrel, helmeted guineafowl, insect-like and termites, no other species were named in relation to obviously lethal strategies.

There was no control method named for the buffalo, genet, and gazelle. Fish damage in swamp rice was reported by one farmer to be controlled by water management.

[56] Coranic writings perceived as powerful. These are written in the wooden board, washed and the water spread around the rice fields.
[57] In Creole: "Manera ka tem"

4. Perceptions of change in wildlife

In one report from a farmer living in N1, several animals are described as decreasing, such as bay duiker, western red colobus, king colobus and the baboon. The decrease of the first is explained because it is hunted and it does not have many offspring, the same happens for the baboon but for this case only the intense hunting is described as the factor leading to its decline. Baboon meat is specially sought for party days such as 24th September, Carnival, Easter, 1st May, 1st June, 3rd August, 19th September, Christmas and New Years Eve to sell for Bissau from where there is a considerable demand.

In N1 the king colobus was reported to decrease in numbers because the forested areas are decreasing and the western red colobus is described to be a sensible species that fear shooting. The same farmer states that primates, as the green monkey and the campbell's monkey, have increased in number. For their turn, the buffalo, bushbuck, yellow-baked duiker (*Cephalophus sylvicultor)*[58], and armadillo are described as stable. Other farmer stated: "*Baboon damage is decreasing and farfana damage is increasing, together with the squirrel, porcupine, campbell's monkey, chimpanzee, 'bitchos' and birds*." Local people say that the chimpanzee is increasing because it is not killed.

Baboons are reported to have decreased in all circumstances:

> *"During the baboon times there were fewer cases of snakes killing people*[59]*, and snakes killing goats. When I was a kid I frightened the big groups of baboons that entered in the peanut croplands. I would hide under the piles of dried peanut plants that remain after the peanut being harvested and I would get to catch the little baboons by hand when surprising them."* fulani farmer in F2

> *"In 1977/78*[60] *when people came back and there were a lot of animals, it was impossible to go to "Cabral Mountain"*[61] *without seeing baboons; they had come close to the village. However they are easily killed while sleeping and a lot can be killed at once."* fulani farmer in Boé

All farmers state that the number of cane rats is increasing. Farmers in Quinara, another region in Southern Guinea-Bissau, state that this species is increasing because now people refuse to burn the savannah to hunt them because of the risk of burning cashew orchards (Fernando Sousa and Manuel Bivar, personal communication). The diminishing of the savannah burning was also reported in F2:

[58] in Creole 'muntum'
[59] In this village, the descriptions say that three people were killed by snake bites. During my stay one woman was bitten in the hand, she felt sick but she survived.
[60] This refferes to the post-independence period; the independence was unilaterraly declared from Boé region in 1973 and the war finished in 1974. After this period, the refugees came back to southern Boé.
[61] A hill located close to the village. It has the name of the independence movement leader, Amilcar Cabral.

"In 2000 was the last year that we burnt the savannah. The savannah is decreasing because it is not burnt. During the monopartidarism people did not play with the control. Who ever let the fire escape would pay a fine, and we really had to pay it. People today do not want to burn the savannah to avoid burning the orchards. If there was union we could do a proper fire stopper. The savannah where we went today is not burnt since some time, which makes the accumulation of the vegetation and turns the growing of the new herbs that are good to roof the houses more difficult. The forest 'wins' the savannah if the burning does not occur because the fire burns the first forest fringe that makes the savannah to grow vigorously."

There were several reports about the increasing numbers of cane rat. In Cantanhez this is reported to be related with the decreasing baboon numbers. Hereby are present some:

"The cane rat is increasing because people are also increasing. They live in groups of one male and several females and they have a lot of offspring. The forest guards say that the large cane rats are owned by the state and cannot be hunted. There is a lot of food for them and are not hunted. Before the baboon chased every animal, including the cane rat, the baboon hunted it. (…) Because people eat them, they went away. Thus, cane rats and snakes came." (fulani farmer)

Other fulani informant, also from F2, considered: *"Now, as there is no baboon, what damages our fields are the cane rat and the porcupine"*

Other farmer also stated that the baboon looks for the cane rat and the bay duiker to eat.

"The cane rat is increasing because they are hard to find and because the baboon is decreasing. We do not know how to make those traps, the nalu know."
(balanta farmer)

The situations or agents reported to promote the harsher damages are: lack of water (1); lack of cleaning (1); porcupine (3), because it's nocturnal; grasshopper (1), cane rat (3); squirrel (1), chimpanzee (2), monkey (2), baboon (1), birds (1) cow (1).

5 People-Chimpanzee-Conservation Interactions

In 2007, chimpanzees feeding on oranges were observed in the nearest orange trees from the village, including a female with her young. Women screamed to chase them away but at least three individuals kept on coming raiding the same tree silently (*pers obs.*).

People state that chimpanzee raid on the fleshy fruit part of the cashew leaving the nut, which is what is economically important for farmers, in piles in the

orchards. They used to tell this as a subject to laugh about. Only once, a balanta farmer was angry about a cashew nut branch that was broken by chimpanzee (*pers obs.*). In 2008 one chimpanzee juvenile got shot by a farmer because the group was crop raiding (Rui Sá *pers comm.*). In 2009 there was an episode in Medjo in December of a man being bitten by a chimpanzee. Several informants told me the same story: he tried to defend his oranges with a fire arm and shot a female. The male took the gun off him, bite him and took his finger off. The man was in the hospital until the end of January.

Local people have unexpected encounters with chimpanzees while going to orchards to collect fruits, in their backyards, while getting water in natural springs or in the forest when going to collect wild fruits. The children have no courage to chase them away, but they try by using the catapult, making noises or hitting cans. The farmers say that chimpanzees are not afraid of women.

Everyone states that the chimpanzee is increasing and it is the animal that gets nearer to the village. Although a chimpanzee density estimation was calculated, it is still impossible to know the population trend in the area [Sousa 2007]. People have a great proximity with chimpanzees, they describe their behaviours in a detailed way: breast feeding, nest building, the vocalizations and crop raiding: "*The chimpanzee came to visit our orange but he left it in the place because it was not ripe still. Visited one papaya and pulled out a branch and ate the leaves. He only eats the leaves when there is no fruit*" (report from N2 village).

Also, six adult chimpanzees and one infantile were seen crossing the non paved road very close to the village N2 and they raided the orange trees just close to the houses. An informant from this village said they do not live in the village forest, which is in a peninsula in the south of the village, but they come to raid the oranges. In the village N2, the following happened (my report):

> *At midday we walked along a chimpanzees' path by following their fresh footprints after hearing their vocalizations. Already nearby the village they seemed to be up in the trees. After some moments of silence there was a shooting. One male come in our direction running away from the shooting. Then everything was silent and apparently the group split.*

Two farmer's reports:

"Chimpanzees are shot when thhe steal oranges. Generally we shoot not to kill because it is like shooting a colleague." Or "We do not want to kill the chimpanzee because it is not eaten and we cannot sell or give it to someone."

One informant in 'Tchon di Guiledge' has a large 'mandarine' orchard, se describes the following:

The majority of the 'mandarines' that chimpanzees eat, there are those they take to eat faraway. They prefer grapefruit and come to the middle of the orchard to eat them. Only if I put snares".

This farmer estimates the chimpanzee damages 10 kg each time he visits the orchard. He says that in December 1 kg equals 5 fruits but when it is ripe 1 kg equals 3 fruits. One 'mandarine' tree was reported to produce approximately 100 to 150 kg – 300 to 450 fruits when it is ripe. The same farmer said that a group of 20 individuals visit his orchard. Chimpanzee evidences of foraging were observed.

6. MAIN REMARKS AND PERSPECTIVES TO THE MAIN FIELDWORK

This preliminary study was important for testing the methods and refine the focus of the main fieldwork. The reported and sampled damage will be compared and studied for different cultural and ecological backgrounds. This variability will allow a further understanding of how it is to live alongside wildlife in a protected area, and the way people-wildlife interaction varies.

There is a need for a higher number and more in-depth interviews. Also more crop damage sampling is needed. Several types of damage were cited by only one informant to a certain crop which may refer to a misunderstanding, to an isolated episode or, as it is very likely, a consequence of small sample size.

For more than one occasion quantitative methods provide incomplete information. For example, in the interviews the water management problems in swamp rice production were under estimated in the interviews' outcome. Only one informant stated 'improper ditches' and several stated 'salty water' but during informal talks many more informants talked about the effect of improper ditches. In this analysis the former was characterised as human induced damage while the second was characterized by environmentally induced. Farmers referring to improper ditches are perhaps attributing responsibility to the reduced workeforce needed to to build proper ditches, while those referring to 'salty water' to describe the same situation are attributing responsibility to the supposed increased sea strength. This will be further analysed. Several aspects may constrain the reports of control methods used by farmers: islamic taboos and park legislation.

Like this the major hypotheses of the main fieldwork are:

1. The increasing commercialization of agricultural products is likely to influence people's perceptions of crop raiders and crop damage, and thus willingness to tolerate wildlife;
2. The perception of risk is determined by the control measures that farmers are authorised to use;
3. Perception of damage and of crop-raiders is mutable and influenced by farmers' critical positions towards conservation policies and land management;

4. Two different ecologically different environments as Boé and Cantanhez regions lead to differences of crop raiding activities and perception of damage.
5. Reported crop damage of chimpanzee and other primates is enhanced compared to the measured damage (for chimpanzee this is expected to be evident for orange);
6. People-chimpanzee interaction varies and this depends mainly on the crop type and on the conservation initiatives;
7. Once conservation counterparts comittements and expectations are not fulfilled there is an increase on the antagonism between farmers and certain species;
8. Reported damage could be a way of transmitting dissatisfaction and criticism.

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