Department for Environment Food & Rural Affairs

DARWIN INITIATIVE

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Darwin Initiative Main Project Annual Report

To be completed with reference to the "Writing a Darwin Report" guidance: (http://www.darwininitiative.org.uk/resources-for-projects/reporting-forms). It is expected that this report will be a **maximum** of 20 pages in length, excluding annexes)

Submission Deadline: 30th April 2018

Darwin Project Information

Project reference	24-029
Project title	Enabling Baka attain food security, improved health and sustain biodiversity
Host country/ies	Cameroon
Contract holder institution	Manchester Metropolitan University
Partner institution(s)	Zerca y Lejos (*ZyL*), CIFOR
Darwin grant value	£301,768.00
Start/end dates of project	2017-09-01 - 2020-08-31
Reporting period (e.g., Apr 2017 – Mar 2018) and number (e.g., Annual Report 1, 2, 3)	Sept 2017 – Apr 2018, Annual Report 1
Project Leader name	Prof. John E. Fa
Project website/blog/Twitter	In progress
Report author(s) and date	John E. Fa, 26 April 2018

1. Project rationale

Wildlife in tropical rainforests of SE Cameroon is increasingly under pressure from overexploitation that is driven by a burgeoning human population, as well as by uncontrolled outside commercial interests. In this region, rural poor as well as indigenous peoples, Baka Pygmies, live precarious lives. The latter group are at an even greater social and political disadvantage since many have been displaced from the forest to settlements along the main roads. The health as well as livelihoods of these people is at risk.

The relationship between the use of forest products, subsistence agriculture and human health remains largely unstudied. Often, assessments of the links between biodiversity and wellbeing centre upon single issues e.g. how bushmeat hunting affects people's nutrition or income, without considering other intervening factors. A better understanding of the multiplicity of issues that affect people and wildlife will help generate interventions that result in long-term benefits for both.

In 10 Baka villages (Fig. 1), along the Djoum-Mintom road in SE Cameroon, this project sought to gather data on subsistence food crops and wild resources produced and consumed to

determine their importance in satisfying the target populations' food needs. In parallel, we assess the human health status of villagers to determine levels of malnutrition and disease, and establish links with food consumed. On the basis of the evidence collected, we propose solutions by encouraging families to produce local foods that can bridge any nutrient gaps uncovered in our data gathering phase, to improve the general health of the study populations. We will achieve this by: 1) harmonising local production and consumption of domestic and wild foods across seasons, 2) generating domestic produce surpluses which can generate income to replace an over-reliance on wild meat trade, and this information will feed into 3) enabling hunting systems that encourage sustainable wildlife extraction as well as 4) understand the state of and pressures on threatened species. We aim to generate a system that can serve a model that can be rolled out to other Baka villages in the region to improve agri-food systems, and as a result reduce the impact on wildlife.

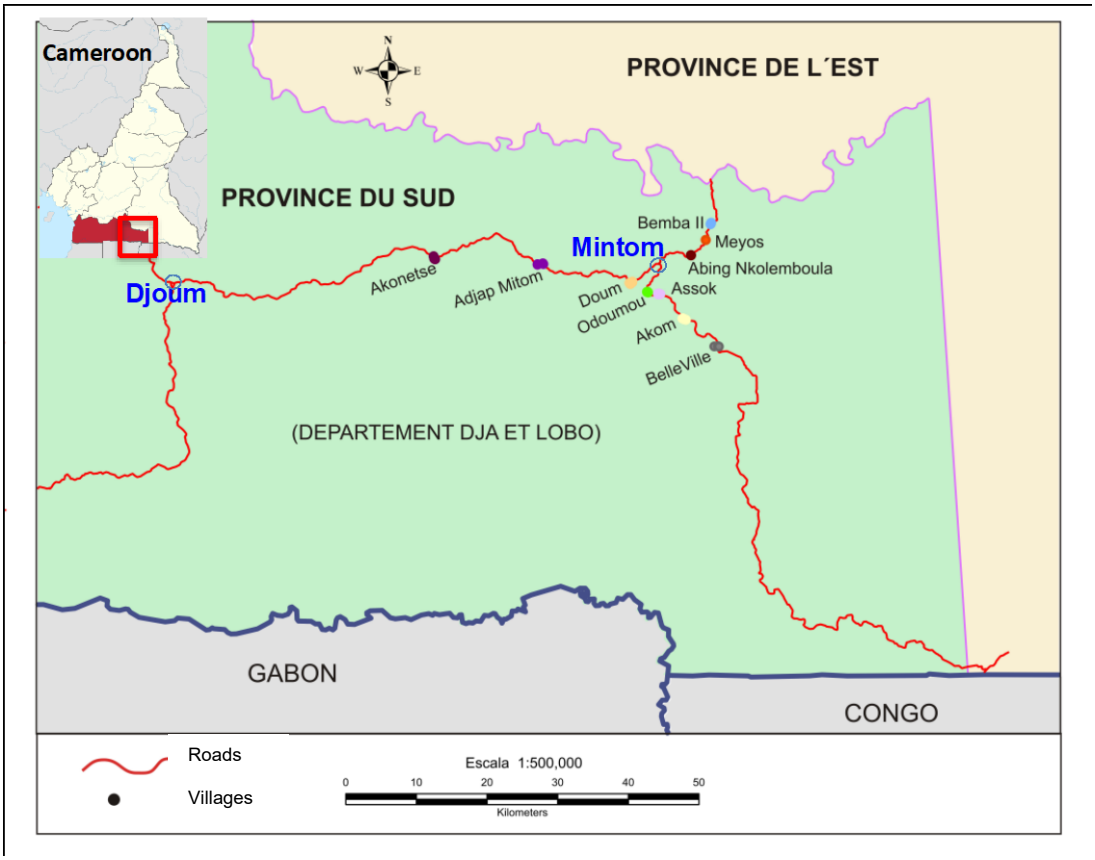

Fig. 1. Map of the 10 Baka villages involved in the present Darwin project.

Our interest in this project is to **alleviate poverty** and **improve general health** of the Baka in our study area by helping our target communities attain sufficient nutritional and economic autonomy and achieve food security. In so doing, we aim to reduce the impact of our target Baka population on threatened wildlife whilst encouraging sustainable extraction of the more common hunting-resilient bushmeat species. Resulting also from this, we will generate scientific evidence that can support our understanding and encourage the resolution of the problems at hand, but also communicate and disseminate our findings as peer-reviewed journal articles.

2. Project partnerships

Our project is a collaboration between the international development NGO, Zerca y Lejos (ZyL), an international forestry research institution (CIFOR), the Cameroonian government body responsible for protection of forests and wildlife (MINFOF) and Manchester Metropolitan University (MMU). The partnership between MMU and CIFOR was in place by the time the project started and formalized with the signing of a memorandum of understanding in Manchester in Feb. 2017. Under this MOU, the Darwin project was presented by CIFOR to

MINFOF as part of their umbrella collaboration accord. Meetings between our in-country leadership and MINFOF headquarters in Yaoundé will be held at regular intervals throughout the duration of the Darwin project to update the national authorities of our progress.

The positive partnership between ZyL and MMU has permitted the smooth functioning of the project on the ground without any obstacles. A main achievement has been the integration of a variety of activities such as the health and agricultural extension work directed by ZyL, and the ecological and wildlife use studies carried out by our MMU-ZyL team. The ZyL-MMU partnership has advanced through constant communication between the In-Country Project Coordinator (ICPC) and the Project Leader (PL), alongside the support from ZyL headquarters in Madrid, and various MMU departments (Head of School of Science and the Environment, Accounts) in Manchester.

Our project is based on a clear awareness of the rights of Indigenous Peoples to fully participate in decision making of matters that affect their rights. Thus, all our work incorporate perspectives from all Baka villages involved in our project, and therefore we will facilitate direct involvement in all planned research and interventions. At the start of the project we organised a first meeting with 9 village leaders, in ZyL-Djoum headquarters (Mission Catholique de Djoum) to introduce the aims and aspirations of the Darwin project (Annex 4.1.). This was followed by the formal launch of the project on 2 Dec. 2018, in which a total of 29 village representatives attended (Annex 4.2.). This meeting was also held in Djoum.

Via official letters of introduction from *Mr. Richard Eba'a Atyi*, Coordonnateur Regional, CIFOR Aftrique Centrale, we informed the following authorities of the project: 1) Madame the Ministre de Ia Recherché Scientifique et de l'Innovation in Yaoundé; 2) Préfert du Departement du Dja et Lobo in Sangmelima; 3) Sous-préfert de l'arrondissement de Djoum; 4) Sous-préfert de l'arrondissement de Mintom; and 5) the department delegate MINFOF of Dja et Lobo, Sangemelima, conservator of the Dja Biosphere Reserve (Annex 4.3.). These letters were followed by a visit from *Mr. Edouard Essiane*, from the CIFOR-Cameroon office, to the main authorities in the study region, emphasising the importance of our project.

As part of our commitment to enable a functioning Community of Practice around our project, we have held a number of meetings with international organisations (ZSL, Forest Peoples) operating around the Dja Landscape (DL), as well with our sister Darwin project (#24005) working on bushmeat with communities along the NW periphery of the DL.

3. Project progress

3.1 Progress in carrying out project Activities

Team

The full field team was operational from Nov. 2017. In September 2017, we appointed the project's ICPC, *Mr. Guillermo Ros Brull* (G.R.B.), on secondment from ZyL. Mr. Ros was already working in Cameroon with ZyL and was therefore able to start activities from 1 Sept. *Mr. Robert Okale* (R.O.), started as our Faunal Assistant (FA) in Oct. 2017, and *Ms. Eva Ávila Martín* (E.A.M.) as our Health Officer (HO) in Nov. 2017. Since Sept. 2017 we have also included in our team an agronomist, *Mr. François Fouda* (F.R.), whose salary is covered by ZyL.

Data collection program

Given the volume of data that has to be gathered by the end of Y2, we decided to deploy our efforts in two stages by tackling 5 villages in a first Phase (Bemba II, Nkolemboula, Doum, Assok, Belle-Ville) during Dec. 2017 - Jul. 2018, and the next five villages (Akonetyé, Adjab-Mimton, Meyos-Mintom, Odoumou, Akom) in Phase 2 between Aug. 2018 and Dec. 2018. We selected villages for each phase so as to achieve a broad geographical spread of settlements during the two distinct sampling periods.

Progress by outputs

Output 1: *Research outputs developed and shared with target audiences (local government, villagers and international development community)*

The stated plan is to deliver at least four articles by the end of the project on: 1) hunting and hunting sustainability by the Baka; 2) dietary and nutrition intakes of the Baka; 3) linkages between wild and domestic foods and human health in the Baka and 4) faunal status and changes over time in community areas inhabited by the Baka. We aim to publish all papers in open-access peer-reviewed journals. All databases and information gathered during the project will be available to our partners. Data collection during Y1 is contributing towards the above planned outputs.

Output 2: *Databases created and made available for use by nutrition practitioners and field managers.*

Our firm intention is for all data generated by this project to be distributed freely amongst the relevant authorities in Cameroon, and with colleagues and partners working in development and conservation issues. In our project we have placed particular emphasis on assembling nutritional composition of foods grown and collected by the Baka, particularly to understand the contribution made by wild foods to their nutritional wellbeing. Analytical data and information on macro- and micronutrients of domestic and wild foods in Central Africa is available, principally for the more common foods. However, there is still a lack of data on wild foods (e.g. the variety of yam species eaten, and even bushmeat). In our project, we will gather all available nutrient composition values of foods observed eaten (from existing databases such as the FAO's International Nutrient Databank), and where needed, collect samples for bromatological studies. Our collaborators in MMU (*Dr. Laura O'Connor*) as well as *Dr. Amy Ickowtiz* (Team, Sustainable Landscapes and Food, CIFOR) will assist us in performing these analyses.

Output 3: *Hunting use zones maintained with hunters and meat traders across 10 communities respecting agreed quotas.*

3.1. Participatory mapping of hunting zones

The project worked with 5 villages (Phase 1) in Y1 to develop participatory maps detailing hunting areas used by each community. We created maps, aided by remote sensing land cover analysis, involving focus groups with key informants from each village (Annex 4.4.). We organised one meeting per village to which a total of over 85 persons attended, from less than 10 in the smallest village (Belle-Ville) to more than 20 in Djoum. The resulting maps allow the community to identify forest regions that are important to provide them with wild meat (but also other wild products) and enable the better monitoring of these against non-community hunters and illegal use. The maps demonstrate that hunting areas vary in size, most of them starting relatively close to the settlements. Further analyses of these hunting areas will be undertaken once we have repeated the process in the five Phase II villages.

3.2. Hunter offtake and hunter follows

We recruited 10 village reporters (one per village) to oversee data collection from hunters. A total of 78 hunters from 51 households in the five Phase 1 villages have been providing data on prey animals hunted, hunting effort and whether the quarry was consumed by the household or sold. Data from 12 Mar. – 20 Apr. 2018 (total 40 days) have already been collected and stored. A total of 276 prey animals of potentially 29 taxa were documented; only one Cameroonian Law Protected Class A species (i.e. rare species or species threatened with extinction), the Mandrill (*Mandrillus sphinx*), 7 individuals, was recorded. With the inclusion of Phase 2 villages in Dec. 2018, we expect to have another 70-80 hunters providing us with regular hunting data in Y2.

Additionally, a total of 70 hunters (from Phase 1 and 2 villages) have agreed to wear a wrist-held GPS to self-monitor their hunting ranges. After instructions by R.O. on how to operate the

GPS, each village reporter issues a GPS to a hunter before he leaves for the forest and is then returned to the village reporter. We have conducted workshops with all hunters on the aim of this data-gathering phase and have agreed to participate voluntarily. As a small incentive, we decided to provide the sum of 2,000 CFA (just over £2) for hunters to carry the GPS. As of the end of Apr. 2018, six hunters have provided data on their hunting range movements (operational since Mar. 2018). All spatial data outputs from GPSs are stored digitally and uploaded onto a GIS platform. All village reporters are visited weekly by R.O., G.R.B. and E.A.M. to gather the hunter offtake datasheets and GPS outputs, and to check overall progress. Although it is possible that some hunters may attempt to cheat by making unusually short trips with no intention of performing any hunting-related activities (setting or checking traps, gun hunting), all resulting GPS tracks are checked shortly after collection and triangulated against the information gathered by village reporters on prey hunted per hunting trip by the hunter. If anomalies are found we will ask the hunter for clarification.

In order to further understand hunting impacts on prey species recovery, we have started discussions with the University of Bertoua to enlist two Cameroonian students to study the reproductive cycles of two of the more commonly hunted species (brush-tailed porcupine *Atherurus africanus*, blue duiker *Philantomba monticola*) following research our group has undertaken on Amazonian species. Knowledge of reproductive cycles of African hunted species is limited and could provide crucial information for setting hunting seasons.

Output 4: *Independent measures of population status of protected fauna available for management purposes.*

4.1. Camera trapping grids in identified hunting zones

We used camera trapping to record medium to large mammals and terrestrial birds in the hunting areas defined by our study communities. Our aim is to determine the state of hunted fauna in these sites by determining whether there has been selective local extinction of large-bodied species or populations (defaunation). As hunting intensifies, the first wildlife to be lost is commonly the more vulnerable larger-bodied species characterised by slower life histories (often frugivores) and usually of a high hunter or black market value.

Between 12 Jan. and 15 Feb. 2018, our MMU Faunal Analysts (FAN), *Dr. Selvino De Kort* and *Dr. Bradley Cain*, travelled to Cameroon to set up three camera trapping grids within the three community hunting areas. Before travelling to the field we held meetings with *Dr. David Olson* and *Dr. Thomas Bruce* from ZSL-Cameroon to ensure that our planned strategy was comparable to the trapping layout deployed by ZSL within the DL. Prior to this, we consulted *Dr. Rajan Amin* (who has developed camera trapping protocols for ZSL) followed by a number of planning and preparation meetings in Manchester with *Dr. Martin Jones* and *Dr. Robyn Grant*, also members of our faunal experts team, to finalise arrangements.

The MMU team, together with R.O., G.R.B., E.A.M. spent a total of 15 days in the field (7, 3 and 5 days per grid), during which time 36 camera traps in total (12 traps per grid) were set (Fig. 1., Annex 4.5.). We employed seven local guides (Baka and Bantu) to assist in opening up trails and portering equipment to our preselected grid sites. The trapping grids will remain operational until the end of June when a local assistant who has worked with ZSL in the past will be employed to retrieve all traps. Without counting trap losses, which is expected, we could achieve a maximum of 5,436 trap nights. These data will lead to the inventory of fauna and assessments of activity pattern, relative abundance and habitat preference. We also expect to use the data for estimations of occupancy.

Placement of the next three camera trapping grids in the Phase II villages is planned for early 2019, after the participatory hunting zone mapping has been done in Dec. 2018.

4.2. Hunter and fisher perception surveys

We designed and administered a four-part questionnaire to obtain basic information on hunters, their views on the merits of hunting as a livelihood, and perceptions of the state of fauna in their

hunting catchment areas. Questionnaires were applied by R.O. in each Phase I villages during Mar. 2018 to Apr. 2018. A total of 12 hunter perception interviews have been completed in Y1. Application of these interviews will continue until Dec. 2018.

Alongside the individual hunter questionnaires, R.O. and G.R.B. carried out focus groups with hunters and fishers during the participating mapping process to understand problems encountered by them in performing these activities. Most hunters contend that there are considerable difficulties associated with: 1) the activity itself (distances involved, risks, bad weather, likelihood of accident or disease); 2) the scarcity of game due to various factors (excessive and abusive hunting, hunting by neighbouring non-native and Bantu groups, non-traditional hunting processes and the dumping of toxic products into rivers by outsiders; 3) multiple forms of abuses perpetrated by neighbouring Bantu groups (e.g. game taken on credit and not reimbursed, prices are taxed, hunting fees not paid) and 4) Alleged violence and abuse committed by Eco Guards, including entering homes at night and carrying out searches and illegal seizures without mandate. These issues will be considered by us carefully and discussed further at a regional and national level to see to determine ways forward. Problems 3) and 4) are delicate issues that will involve political astuteness on our part.

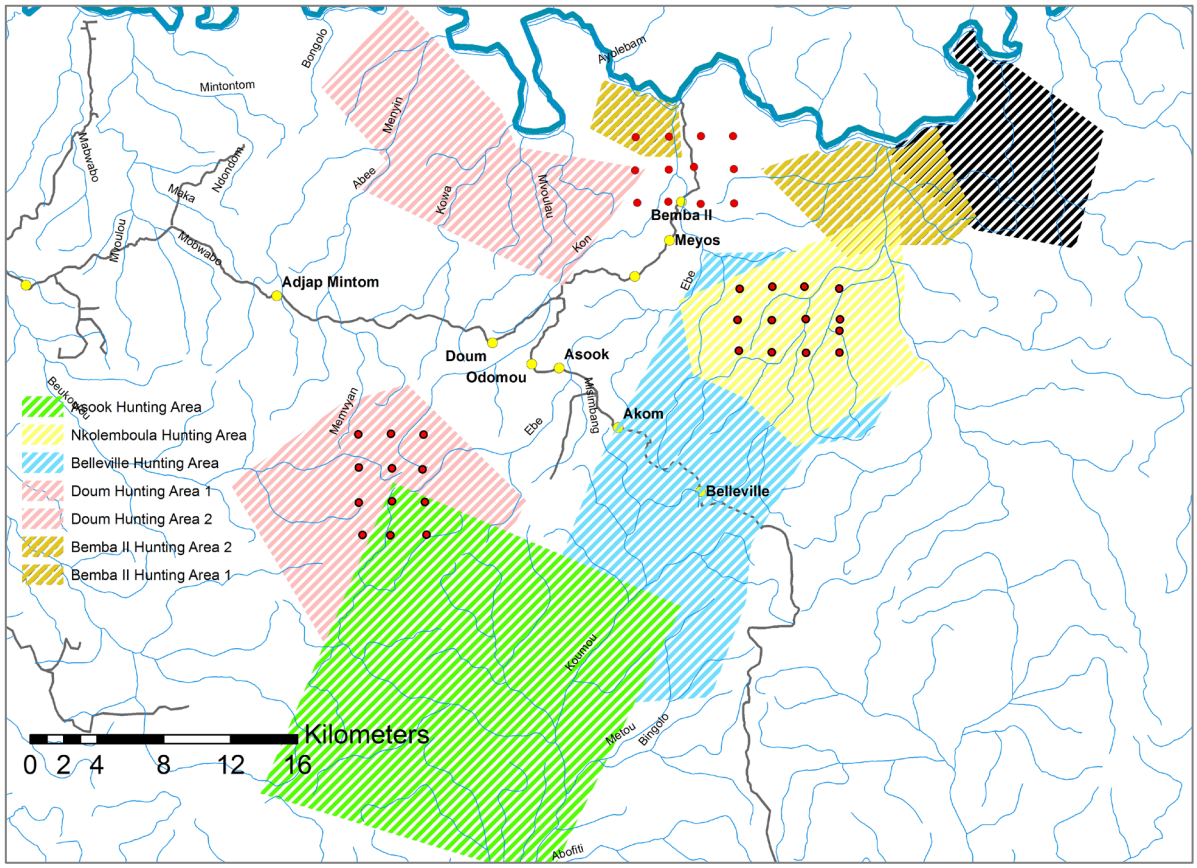

Fig. 1. Distribution of camera trap grids and hunting zones for the five Phase I villages.

Output 5: *Improvement of human health and livelihoods achieved through an increase in dietary intake, nutritional status, and medical interventions.*

5.1. Household income and wealth surveys

Household surveys (HHS) were used to measure household wealth by determining the value of physical assets as well as the value of products sold, wages earned, and items bartered (Annex. 4.7.). Information of income and food procurement activities such as hunting, fishing and agriculture (subsistence and cash crops) was also collected. These data will be used to correlate with health and nutritional status.

HHS were designed by the PL and G.R.B. and then piloted in the field. Surveys were

conducted by R.O. in Phase 1 villages during Y1. The survey enumerator first conducted focus group meetings with village chiefs and other villagers to discuss village-level information and gain permission for conducting surveys. Village population sizes and number of households were ascertained prior to conducting the surveys (Annex 4.6). All houses were geolocated and mapped in Google Earth, and given a unique number for use in our surveys.

In all 10 villages, we counted 202 houses (190 were inhabited) in which the known 53 families lived. Household composition is variable but during our census we ascertained a total population size of 722 persons. Given the relatively small number of households involved, all were chosen to apply our HHS questionnaires. R.O. met with village chiefs and other villagers to discuss village-level information and gain permission for conducting surveys. As of end of Apr. 2018, a total of 20 households have been surveyed and all 53 households will be completed by end of Jan. 2019.

5.2. Baseline survey of health status of Baka population

Villagers voluntarily participated in an intensive health screening campaign carried out on our behalf by a group of 11 recently graduated medical doctors (9 from Spanish universities and 2 from the University of Yaoundé); this campaign was funded by ZyL, and by contributions from team members. All medics were recruited by our partner institution through advertisements posted in various medical faculties in Spain, and through connections with the University of Yaoundé. Two dentists working with ZyL were also part of the team. The main aim of the campaign was to ascertain the nutritional status of a large sample of villagers and determine the prevalence of malaria and anaemia, as well as evaluate oral health.

The campaign lasted 3 weeks during Mar. 2018. Consultations with the Regional Health Delegate of the Southern Cameroon Region were held before the start of the campaign. Local authorities including the District Chief, the sub-préferts of Djoum and Mintom and local village chiefs were informed and our activities approved. Meetings were held with the village chiefs a week prior to the start of data collection, and the day before each campaign a reminder was sent to encourage as much of the village inhabitants attend the medical examinations. The team arrived at each village around 7:30 am so as to sample adults before they left for work. The chief and village schoolteachers in each village were responsible for summoning persons to the study.

We examined a total of 529 persons, of which 404 were Baka, 119 Bantu and 6 that did not give their ethnic background. All subjects were between 9 months and 70 years old. For the Baka, we covered 56% of the total population of the 722 inhabitants from the 10 study villages (Annex 4.9.). The average coverage per village was around 60%, ranging from 33% in Doum to 90% in Bemba II. Anthropometric measurements (height and weight) and brachial perimeter were taken for all individuals. We tested for the occurrence of malaria by using Rapid Diagnostic Tests (RDTs) and for the prevalence of anaemia with the aid of the HemoCue® Hb 201+ System. ZyL provided dental examination materials from their clinics.

The gathered data is currently being analysed and we will use this information to understand malnutrition levels in our study populations. We intend to publish these results in a peer-reviewed, open-access journal. Because there is a scarcity of information on indigenous peoples' health (out of 1,265 publications containing health and indigenous, a WoS search only produced 26 hits for Africa) we feel that our contribution can help contextualise the situation our study populations are in and compare with other groups.

Although we will use this data to correlate with the access to food of our study communities, it will be made available to the medical team working for ZyL on the ground so that they can intervene in cases of severe disease. We plan a second medical campaign at the end of Y3 to measure any changes in malnutrition levels.

5.3. Baseline survey of agricultural production and activity

ZyL started agricultural extension work in 2016 in three of our Baka villages (Doum, Assok,

Akom). Our aim in the Darwin project has been to integrate these ongoing agricultural activities with our work on use of wild resources. During Y1, ZyL has been active in encouraging the cultivation of food crops in these villages by creating capacity (mainly amongst women), to provide for household subsistence. Via focus groups and instruction sessions, led by F.F. and ZyL's Food Sovereignty Campaigners (*Ms. Marta Arnes*), a total of 59 farmers (31 women) were trained to grow a number of crops. ZyL provided seed plants of plantain, manioc, taro (known locally as macabó) and peanuts in Sept. 2016 and helped farmers clear 0.25 ha for agricultural land. The individual farmers chose these lands. According to *Mdme Ivette Bolombe* of the Service d'Affaires Sociales at Djoum, in charge of the PNDP (Programme National de Développement Pygmée), land tenure acquisition is a right for any Cameroonian citizen. In the 2017 campaign, and part of the Darwin project, farmers used seed plants from their own harvests from the 2016 campaign. Although actual amounts of subsistence crops grown per field is proving difficult to estimate because gathering of produce by families is continuous, our observations suggest that sufficient yields have been achieved. We will verify this from our food insecurity questionnaires and from our food consumption surveys. Evidence that sufficient amounts of peanuts have been collected is provided by the fact that on average between 16.4 – 19.6 kg of seeds were kept by each farmer for use in the following season. Farmers have also been trained on how to process and store seeds including the building of rodent-proof stores.

Because opening up agricultural fields requires the cutting down of adjoining forest lands (albeit secondary forest near villages), our project, alongside our ZyL agronomist and in consultation with CIFOR-Cameroon will be investigating the application of agroforestry techniques so as to reduce the need for further forest clearing. We were not able to engage a CIFOR-Cameroon consultant on agroforestry in Y1, as was originally planned, but will be doing so in Y2. Focus groups undertaken in the three participating villages to ascertain how they employed their time in different activities indicated that 40% of participants (n = 39) worked in agriculture, 36% gathered NTFPs, but only 24% of these hunted. Although still early, we have anecdotal evidence that may indicate that households given the possibility of growing their own crops for their consumption and sale, as promoted by ZyL, will dedicate less time to hunting for sale of wild meat. Data from all villages from our HHS (see above) alongside the records we are collecting on volumes of wild meat hunted by households with and without agriculture, will allow us to further ascertain the interplay between the households' commitment to these two activities.

5.4. Food consumption and nutrition surveys

Food consumed in the study villages will allow us to determine the level of their dependence on agriculture and on wild resources. After consultations with experts linked to our project, *Prof. Barrie Margetts* (University of Southampton) and *Dr. Laura O'Connor* (MMU) we decided to split the planned the work into two discreet periods during Y1. E.A.M., aided by a Baka assistant *Ms*. *Susanne Taylor Abolou* (S.T.A.) spent: 1) Dec. 2017 – end of Apr. 2018, visiting all target villages without applying any structured (qualitative or quantitative) questionnaires but spending time recording foods available, foods seen to be consumed, accompanying the women when preparing food and overall understanding the community, its culture and livelihoods. We also investigated appropriate methods for determining overall food insecurity in households and for measuring food consumption, and 2) in May 2018 we will apply food insecurity questionnaires in a sample of households in the five Phase I study villages.

To determine baseline food insecurity among a representative sample of households, we first piloted the USAID Household Food Insecurity Access Scale (HFIAS) survey tool. The HFIAS is composed of a set of nine questions that have been used in several countries and appear to distinguish food insecure from food secure households across different cultural contexts. We found that questions related to perceptions of food insecurity (e.g. "In the past four weeks, did you worry that your household would not have enough food?") were not understood. Given this, we simplified the questionnaire to allow determinations such as the number of days in which food was not available. Based on our observations of food preparation, food variety (usually low) and meal patterns we decided to apply the 24-hr recall method to quantity amounts eaten by household. We are also currently exploring the possibility of engaging women in recording

all foods eaten (as well as commensals) over a period of 7 days. Although have used this method successfully in Bioko Island a prerequisite is that the women can read and write – our preliminary perception (further details will emerge from our HHS) is that only a very small minority of women in our study villages are literate.

3.2 Progress towards project Outputs

Output 1: *Research outputs developed and shared with target audiences (local government, villagers and international development community)*

At this stage of the project, the focus has been on ascertaining baselines for all outputs. The publication will be published in Year 3 of the project.

Output 2: *Databases created and made available for use by nutrition practitioners and field managers.*

All data collected during this year will be entered into specific databases created for wildlife use, farm production, food and nutrition analyses.

Output 3: *Hunting use zones maintained with hunters and meat traders across 10 communities respecting agreed quotas.*

Hunting use zones have been delimited for Phase I villages. After all data has been gathered and analysed we will be able to agree on hunting quotas.

Output 4: *Independent measures of population status of protected fauna available for management purposes.*

Camera traps are laid out in the forest. By the beginning of Y2 data will be received and analyzed.

Output 5: *Improvement of human health and livelihoods achieved through an increase in dietary intake, nutritional status, and medical interventions.*

This output will result from the interlinking of all the data once available.

3.3 Progress towards the project Outcome

We are satisfied that the indicators set during the project application phase (and revised with the help of the Darwin consultant, for which we are grateful) remain relevant for monitoring progress towards achieving the project outcome and that we are on track with achieving this by the end of the project. As described in Section 3.1, Y1 activities have progressed well. Importantly, we have kept all communities adequately informed and motivated and this has been resulted in a significant participation by all villages in the Darwin project. We have equally involved national staff in our project and have taken steps towards opening up opportunities for Cameroonian students to work with us.

It is too early to determine whether the outcome of the project will be attained. However, we are confident that on the basis of our advancement in the first year we can achieve the outcome, if we are able to: 1) sufficiently engage with the communities so that a significant number of hunters control offtake of fast-breeding species to sustainable levels[1]; 2) convince hunters to reduce their dependence on the trade of large amounts of wild meat (and especially the sale of

[1] Measures of hunting offtake and effort, hypothesised to track underlying changes in prey population densities, have been suggested as an alternative method for monitoring sustainability. One commonly mentioned example is Catch Per Unit Effort (CPUE) of hunters. Instead of setting a hunting quota by estimating production, hunting quotas can be modified on a trial-and-error basis, guided by changes in CPUE, with managers aiming to keep CPUE at a constant. The advantages of this method are that hunting data are relatively easy and cheap to collect, and can be recorded by the local communities and hunter groups themselves with minimal training requirements. While CPUE may be correlated with species population densities, measuring CPUE on its own cannot provide accurate assessment of species population densities, unless combined with population surveys at various intervals of time. In addition, self-reporting relies on local hunter engagement, and if changes in CPUE result in lower, enforced, quotas, hunters may become less willing to supply this information.

larger, more lucrative, protected taxa); 3) demonstrate that that by generating alternative income sources from farming practices (to which women are active contributors), commercial hunting is less important for the household; and 3) prove that there is a positive link between nutritional returns from an adequate production of domestic crops and regulated wild meat extraction and better human health. We are aware that these are most challenging aims, but there is every indication from our Y1 that we are moving in the right direction. The learning generated by the project will provide valuable lessons in terms of balancing local human development with broader conservation concerns against the backdrop of entrenched poverty.

3.4 Monitoring of assumptions

We are aware that we have raised a large number of assumptions for this project. This is a reflection of our realisation that there are numerous of factor that can destabilise such a complete multi-layered project as ours.

Assumption 1: Relevant government authorities support project interventions.

Comments: Evidence the government authorities approve project, see Section 2.

Assumption 2: Government authorities have sufficient authority and presence in the area to control the exploitation of protected species, but allows hunting of fast-breeding taxa.

Comments: Enforcement practices by government authorities are perceived by the Baka communities as unfair. This issue will be monitored closely during the project

Assumption 3: Improvement in anaemia rates result from better nutrition from the project's intervention.

Comments: We will be testing this statement in our project.

Assumption 4: Supply chains are open and supported by local institutions.

Comments: There is evidence that the marketing of produce from family farms is accessible to producers, but too early to determine its fluidity.

Assumption 5: Local markets are open to new products.

Comments: Further into the life of the project we will be able to determine whether this is the case.

Assumption 6: System is in place to allow continuous data analyses to disseminate project learning before publications appear.

Comments: Interactions with partners and local authorities are encouraging, and informed of the potential publications.

Assumption 7: Written papers are used to disseminate results of project and used to further discussions with appropriate authorities.

Comments: Assumption seems to hold true on the basis of the rate of data acquired in the first year of the project.

Assumption 8: Server space available at MMU.

Comments: Not yet discussed with MMU. This will take place in Y2.

Assumption 9: CIFOR-C intervention consultant supports the project to better understand outcomes and future prospects.

Comments: Holds true from meetings with CIFOR's Regional Coordinator, see Section 2 and 5.3.

Assumption 10: Separate funding secured to support students.

Comments: We will be looking for funding from other sources to help Cameroonian students with per diems or travel.

Assumption 11: Local research assistants employed to support data gathering.

Comments: There has been no issue in recruiting research assistants in all villages.

Assumption 12: At least 50% of all known hunters participate in scheme.

Comments: Excellent response from hunters in participating in the project

Assumption 13: Hunters/traders motivated to contribute to the project.

Comments: Too early to determine whether these groups will contribute.

Assumption 14: Conditionality of no hunting of protected species created in line with health and agricultural support provided via Output 5.

Comments: This is still to be determined towards the end of the project.

Assumption 15: Hunting information obtained can estimate level of protected species offtake. Use of indirect methods to determine veracity of reports.

Comments: To be undertaken at the end of Y2.

Assumption 16: Increase in populations of protected species can be linked to the project's activities.

Comments: Our data will not be able to determine whether this is the case by the end of the project. However, but delimiting areas for subsistence

Assumption 17: Use of targeted interview techniques can verify if hunters participating in the project are taking protected species

Comments: To be undertaken at the end of Y2.

Assumption18: Food security measured as "physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".

Comments: We use WHO's definition to guide our work.

Assumption 19: Baseline information on health available from ZyL medics. Ethical premises of use of persons' medical records are clear.

Comments: No issues in using past medical data collected by ZyL.

Assumption 20: Agricultural extension programmes and training of women farmers will continue to be operated by ZyL.

Comments: This is a commitment that the organisation has made since 2001, and will continue beyond the Darwin project.

Assumption 21: Information of food production by families gathered at the start of the project.

Comments: We have been able to estimate production by various means e.g. quadrats in field to determine number of plants grown, interviews with farmers on amounts harvested. We have found it difficult to record actual amounts harvested due to

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

The first year of the project has focused on a detailed assessment of conditions on the ground, engagement with the communities and preparatory work for the establishment of a working model for sustainable wild meat extraction for subsistence, and improvement of domestic food production and an eventual impact of human health. It is too early to report a tangible contribution to the impact at this stage.

4. Contribution to the Global Goals for Sustainable Development (SDGs)

Our project is working towards Goals 1 (No Poverty), Goal 2 (Zero Hunger), Goal 3 (Good Health and Well-being), Goal 5 (Gender Equality) and Goal 15 (Life on Land).

5. Project support to the Conventions, Treaties or Agreements

The project will, through the promotion of a working model for sustainable wild-caught meat trade, contribute to the implementation of Articles 8c, 8d, 8i, 8j, 10a, 10c, 17.1, 17.2 of the CBD; however, the first year of the project has focused on data collection and, as such, it is too early to claim a tangible contribution to the CBD at this stage.

The CBD's focal point, Mrs. Prudence Tangham Galega, based within the Ministry for Environment, Nature Protection and Sustainable Development has been informed during CBD meetings in Dec. 2017 in Montreal, Canada. The PL will make an appointment to update Mrs. Tangham on the project's activities during his next visit to Cameroon.

6. Project support to poverty alleviation

Our target communities are Baka groups in southeastern Cameroon that have been displaced from their traditional hunter-gatherer lifestyles to live in roadside villages. In socio-economic and political spheres, the Baka are underprivileged in comparison to the more prevalent Bantu peoples in the country. Thus, our project is directly aimed at improving the lives of these rural indigenous peoples by working towards mechanisms that ensure a sustainable supply of domestic and wild foods, and by so doing better their health. We also aspire to raise farm incomes as a main element of an antipoverty effort, providing safety nets and building opportunities for self-sufficiency.

7. Project support to gender equality issues

Our project encompasses a vehicle for women's empowerment given that many women in our target villages are involved in agricultural activities led by ZyL. On the other hand, as household and food managers, women work closely with our HO on nutritional issues providing essential information on food insecurity issues, foods consumed and their preparation. This results in their empowerment and encourages their active participation in our project. Moreover, the recruitment of a female Baka key informant, S.T.A. (see Section 5.4.) to assist our work in the villages, engenders further trust in our project and promotes their active participation in community group discussions and makes sure that their points of view are considered.

8. Monitoring and evaluation

The validity of our output indicators set during the design phase of the project have been confirmed during the first year of our project as well as the specific milestones set for each (see sections 3.1-3.3 for more details). These milestones are incremental and easily evaluated as having been achieved or not. All our indicators are measureable, achievable and relevant, and can be done within a specific period of time within the project.

Baseline data on socioeconomic, health and biological variables for our project have been successfully gathered during the first year. After an initial period of consultation with experts and discussions within the team, we regularly monitor the way information is being gathered in the field as well as the quality of all information resulting for each milestone. Of particular importance has been the attention paid by us to preparing adequate and realistic protocols for collecting the needed data. Once these protocols have been in place, all data gathered has been discussed with our partners and colleagues.

Although we will be including other experts as our project evolves, during the first year we have relied primarily on our team to monitor and evaluate progress.

Table 1. Description of M & E strategy used in Y1 of the project.

Monitoring needed	Evidence/data available	Data sources	Regularity of monitoring	Person/s responsible	Resources
1.	Demographics,	Interviews	Weekly	ICPC, FA, PL	Covered by

Socioeconomic status of households	assets, income, wealth, livelihoods				project
2. Use of wildlife	Number/type of animals hunted, hunting effort, number sold or kept for own consumption	Village reporters	Weekly	ICPC, FA, HO, PL	Covered by project
	Geolocation of tracks used by hunters in forest	GPS records	Weekly	FA, HO*, ICPC, PL	Covered by project
3. Village hunting zones	Participatory mapping process with hunters	Maps	Reviewed by team for accuracy of locations mentioned by villagers during the mapping process	FA, ICPC, PL	Covered by project
4. Faunal status in village hunting zones	Camera trapping	Photos	Procedures checked by MMU FANs	FA, HO, ICPC, PL	Covered by project
5. Household nutrition	Food consumption patterns	Food lists	Once at the end of information gathering period	HO, ICPC, PL	Covered by project
	Food insecurity measures	Modified HFIAS Questionnaires	Weekly	ICPC, HO, PL	Covered by project
6. Human health		Medical examination records	Once at the end of medical campaign	ICPC, HO, PL	Covered by ZyL and volunteers

*E.A.M.'s (our HO) main responsibility is to understand food consumption patterns, nutrition and their links with health. However, because she has a background in biological studies she is also contributing to the monitoring of 2) and 4).

9. Lessons learnt

In the first year of the project we have concentrated on generating information from different activities that will allow us to understand the issues affecting the health and food security of displaced hunter-gatherer communities in Africa. We are increasingly confident that our system of data collection and interaction with the target communities and national authorities will permit us to respond to the challenges facing our project.

What worked well was the rapport we have been able to establish with our target communities. This is primarily due to the long-term relationship that our partner organization, ZyL, has cemented in its 17 years of support to the Baka in the region. Because of this, engendering trust for the Darwin project by the communities has been relatively easy. The main lesson learnt here is that links with local partners, a fact which is made explicit in Darwin project, is a fundamental launchpad for achieving results in any project. We deliberately chose to work ZyL particularly because of its long track-record of activities on the ground.

The contribution made by our national staff members, R.O. and F.F. cannot be underestimated. They have been stalwart contributors to the success of the project in Y1. Their professionalism and rapport with our communities have enabled us to generate a level of information that, in our

opinion, is unprecedented. Selecting good professionals from the project country not only will ensure that the project is successful but also that knowledge and expertise remains in the host country.

The payment of cash incentives for information is always a controversial issue in any project. After much deliberation, we decided to pay a nominal sum to hunters willing to carry a GPS so we could map their hunting territories. Our idea is novel since most hunter-follows have been done in the past by researchers shadowing an active hunter (or trying to keep up with them!!), but it is an activity that can be riddled with problems (e.g. interference with hunting activities, spooking animals, or hunters not feeling totally at ease with the presence of an outsider). However, by incentivizing hunters with money to sport a wrist-held GPS, there is also the risk that some will cheat and take 'aimless' trips so as to be paid. Our conclusion was that it made more sense for us to have as many hunters as possible with GPSs, and then monitor their movements and catches so as to detect any anomaly. The lesson learnt here is that if cash incentives are to be employed, the reasons for undertaking this work has to be constantly motivated through discussions with the recipients of the inducement.

We have encountered some issues with regards to how interviewees in our communities understand questions in tools such as the Household Food Insecurity Access Scale (HFIAS). We intended to apply the HFIAS questionnaire since it is widely used in a variety of countries worldwide. However, HFIAS questions largely focus on perceptions of food scarcity over a period of up to a month. On piloting this questionnaire we found that in translating such questions across two languages, from French to Baka, their meaning was lost. We have modified the questionnaire to allow respondents to give us a more relevant idea of what food insecurity meant to them (such as by asking how many days a family ate 'complement simple', i.e. only plantain and/or manioc with no sauces or meats). The lesson learnt here is that the level of abstraction (of feelings about certain life issues) in any particular culture needs to be thoroughly understood in order to adapt the tools accordingly.

10. Actions taken in response to previous reviews (if applicable)

This is the first annual report.

11. Other comments on progress not covered elsewhere

We have not encountered any significant difficulties during the year. The design of the project has been adequate for the first year of the project, and all targets have been met although we have only covered 8 months out of a year, since the project had to start later. On the basis of the information gathered in Y1 we will be in a better position to provide clear pathways for determining approaches for increasing domestic crop production and guaranteeing sustainable use of wildlife foods. A future challenge we may face is how to motivate these communities to balance these two strategies beyond the life of the project.

12. Sustainability and legacy

In terms of sustainability and exit strategy, at this stage, the project has focused on carrying out feasibility, assessment and baseline activities. The data collected, and sustainability considerations, will shape the model implemented beyond the life of the project.

The establishment of a Community of Practice ensures that lessons learned from the project are able to inform the wider conservation community in Cameroon.

13. Darwin identity

The project partners have referenced the Darwin Initiative at the project launch event and at project presentations to beneficiaries and key stakeholders and the Darwin logo has been displayed on all published material. The partners have explained the aims and objectives of the Darwin Initiative more fully to government stakeholders, the British High Commission in

Yaoundé, as well as national and local conservation actors working in Cameroon.

14. Project expenditure

Table 1: Project expenditure <u>during the reporting period</u> (1 April 2017 – 31 March 2018)

Project spend (indicative) since last annual report	**2017/18 Grant (£)**	**2017/18 Total Darwin Costs (£)**	**Variance %**	**Comments (please explain significant variances)**
Staff costs (see below)				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Monitoring & Evaluation (M&E)				
Others (see below)				
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2017-2018

Project summary	Measurable Indicators	Progress and Achievements April 2017 - March 2018	Actions required/planned for next period
Impact: Hunting and agriculture are managed sustainably to improve food security and health of rural populations through the effective and sustainable management of domesticated and wild food resources.		This project can provide us with unprecedented insights in the linkages between food production, wildlife use and human health.	[redacted]
Outcome Food security and health improved in Baka settlements (around 2,000 inhabitants) in southeastern Cameroon, through the sustainable use of wildlife resources, and implementation of environmentally friendly agricultural systems. We will focus on 10 representative villages during the project to roll out lessons learnt to the others in the region.	0.1 By end of Y2, at least a 10% increase in food security, 15% increase in dietary diversity in monitored households. 0.2 By Y3 there is a 10% reduction of revenues from the hunting of resilient species in catchment areas and a 10% decrease in number of protected (elephant, great apes) species hunted. 0.3 By Y3, a 10% decrease in anaemia rates in Baka communities from a current 60%6, as a result of encouraging adequate nutrition. 0.4 There is a 10% increase in number of households dedicated to subsistence-commercial crop systems in the10 villages. 0.5 By Y3, there is a 10% increase in income from agriculture and regulated bushmeat sale in 10 study villages.	In this first year we have established data collection protocols and have started gathering data on wildlife use, wildlife status and farm production. Data collection has been undertaken in two Phases (5 villages per phase) for variables that are less time sensitive, e.g. household surveys, hunter perception surveys. Hunter offtake data is being gathered in all 10 villages and hunter follows have commenced in Phase I villages. We have also mobilised a team of 11 doctors and dentists to perform baseline medical examinations in all 10 villages to determine malnutrition levels. Observations on food access and consumption were started in preparation for more quantitative food insecurity questionnaires and 24-h recalls. The success of our project will be judged by our ability to interlink all data gathered and use this as the basis for informing village-led initiatives to improve food production and sustainable wildlife use.	Continuation of data collection for hunter offtake, hunter follows, participatory mapping of hunting zones and camera trapping. We will start gathering quantitative information on food consumed and nutritional intake. Focus groups meetings with hunters on ways of regulating their offtake. Continuation of support of subsistence crop farmers.

Output 1. 1. Research outputs developed and shared with target audiences (local government, villagers and international development community)	1.1 Data analyses and project records on hunting and faunal abundance shared with MINFOF and other local and international partners. 1.2 Journal article on hunting pressures and hunting sustainability of bushmeat species submitted to open access journal by end of Y2. 1.3 Journal article on dietary intakes and food sources of key nutrients completed by end of Y2. 1.4 Journal article on links between forest, domestic crops and general health, especially of vulnerable groups (children, aged <5) completed by end of Y3. 1.5 Journal article on changes in population numbers of large mammals and birds in the area, in relation to hunting pressure submitted by Y3.	1.1 – 1.5 Data collection has started during Y1 towards the above planned outputs. We will publish two papers at the end of Y2 and another two by the end of Y3; Health data collected in Y1 analysed for a paper to be sent for publication by Aug. 2018; All planned scientific outputs will be shared with our collaborators before publication.
Activity 1.1 Assembling project resources (in-country). 1.2 Project launch meeting (in-country) for partners and target communities. 1.3 Identification and establishment of agreed parameters. 1.4 Establishment of Community of Practice (COP). 1.5 Partnership agreements between project, communities, CIFOR-C, MINFOF representatives. 1.6 Ongoing monitoring of data collection by communities and local partner with monthly reports. 1.7 Monthly reports published on website and dissemination of project newsletter. 1.8. Six-monthly review (data collection) of biological indicators and socio-economic surveys. 1.9 Six-monthly analysis of data by MMU. 1.10 Annual meetings of COP. 1.11 Six monthly project review meetings with local communities, hunters and		1.1 Achieved in Sept. 2017. 1.2 Achieved (see Annex 4.1). Reports of meetings available on request. 1.3 Achieved 1.4 Informally completed through meetings with different partners (see Annex 4.2). 1.5 Partnership agreements between project, communities, CIFOR-C, MINFOF representatives. 1.6 Ongoing monitoring of data collection by communities and local partner with monthly reports. 1.7 Not done. Priority in Y2. 1.8. Review of data collection procedures for all surveys undertaken in Sept. 2017. 1.9 Regular review of data gathered by PL and MMU staff. 1.10 No regular meeting organised partners have been met *ad hoc* (see Annex 4.2). 1.11 Weekly meetings held with all project collaborators in the Phase I villages.

traders and local game guards to enable feedback from beneficiaries. 1.12 Development of publication drafts and circulation for internal peer-review. 1.13 Submission of final publications to peer-reviewed journals.		1.12 Publication drafts not expected until the end of Y2. 1.13 Expected in Y2 and Y3.
Output 2. Databases created and made available for use by nutrition practitioners and field managers.	2.1 Electronic nutrient composition database of consumed foods in study area produced by Y3. 2.2 Spatial data on wildlife extraction patterns stored in GIS shapefiles by end of Y2. 2.3. Wildlife use and extraction data stored in electronic database for use by project partners. 2.4 In Y3 practitioner workshops organised to train users of databases generated by project. 2.5. In Y1 and Y3, baseline and postproject review workshops respectively organised with project partners and stakeholders. 2.6 In Y1, student projects organised and integrated into project activities.	2.1 Nutrient composition database from other sources have been started, and discussions with MMU and CIFOR to plan for bromatological analyses to be performed in laboratories in the UK and/or Cameroon; 2.2 All participatory hunting maps for Phase I villages stored as GIS shapefiles; 2.3 Gathered hunting data (offtake and hunter follows) during Y1 stored in Excel datasheets; 2.4 Practitioners' workshops planned for Y3, no action needed in Y1; 5) Workshops organised in Apr. 2018 between PL and field project team to review gathered Y1 baseline data in all project lines; 2.5 Workshops organised by the PL in Djoum held in Sept. 2017 and Apr. 2018 to review progress with our field team. 2.6 Four potential MSc projects organised with University of Bertoua in the Darwin project. Possible starting dates around June-July 2018.
Activity 2.1 Development of an electronic nutrient composition database of wild and domestic foods consumed in study area. 2.2 Collection of samples for nutrient composition database of foods 2.3 Preparation of nutrient composition database of foods for use in planned diet studies. 2.4 Spatial data on wildlife extraction rates, and areas hunted stored in GIS shapefiles and analysed (cross ref. Activity 3.4) 2.5 Spatial analyses of hunting areas and hotspots undertaken by MMU.		2.1 In progress. 2.2 Not yet started. Foods identified and catalogued for 2.3 Not yet started. 2.4 Spatial data on hunting zones and hunter follows stored in GIS platforms. Data shared between field team and MMU. 2.5 To be performed after all data gathered for Phase I and Phase II villages.
Output 3. Hunting use zones maintained with hunters and meat traders across 10 communities	3.1 By Y2, 100% of 190 households in study communities become signatories of reciprocal agreement to reduce illegal hunting and	3.1 Our meetings with all households in Phase I have been positive and there is a tacit willingness to participate in a collaborative scheme to monitor wild meat offtake to be developed by the end of Y2.

respecting agreed quotas.	participate in monitoring of wild species offtake. 3.2. By Y3, all participating hunters comply with hunting quotas agreed by them and the Darwin project. 3.3 By Y2, illegal hunting and sales of protected wildlife reduced by 50%. 3.4 During Y1-Y3 a maximum of 100 out of around 200 hunters in the 100 villages participate in providing hunting data to the project. 3.5 By Y2, hunting quotas of hunting resilient, fast-breeding species established in conjunction with 100% participating hunters.	3.2 Discussions with hunters on setting quotas and management of hunting practices to be undertaken in Y2 and early part of Y3 in preparation for agreement of way forward to be signed by hunters by end of Y3. 3.3 Baseline data on hunting of protected species collected in Y1. 3.4 A total of 51 hunters from Phase I villages are currently participating in our hunting data collection scheme and another 50 have expressed interest in working with us in Phase II villages to commence in Y2. 3.5 Hunting quotas discussed by the end of Y2, after all hunting data has been analysed.
Activity 3.1 Focus group discussions with hunters to establish working practices (cross ref. Activities 1.4 and 1.8) 3.2 Hunter interviews to establish hunting volumes and intensity 3.3 Training of village reporters to document hunted prey volumes and frequency. 3.4 Monthly village reports of animals hunted and numbers. 3.5 Participatory mapping of hunting zones around target villages.		3.1 Achieved (see Annex 4.2). 3.2 Started in Y1 for Phase I villages. 3.3 Achieved. All village reporters in Phase I villages collecting hunting data. 3.4 All data in Excel sheets are reviewed regularly and preliminary analysed done. 3.5 Participatory mapping of hunting zones successful in Phase I villages.
Output 4. Independent measures of population status of protected fauna available for management purposes.	4.1 Throughout Y1 and Y2, camera trapping data analysed and interpreted to determine abundance and distribution of prey and protected species. 4.2 Hunter perceptions surveys undertaken during Y1 and Y2 to determine status of fauna using traditional ecological knowledge (TEK) methods.	4.1 Camera traps set in Phase I villages in Y1, data to be gathered and analysed from Jun. 2018; 4.2 Started application of questionnaires applied to hunters in Phase I villages;
Activity 4.1 Baseline survey of wildlife status from hunter interviews.		4.1 Hunter surveys commenced for Phase I villages.

4.2 Capacity-building training for local members of monitoring networks. 4.3 Camera trapping grids operational in identified hunting zones in Activity 3.4. 4.4 Camera trapping data analysed by MMU to detect changes in presence and abundance large-bodied/protected analysed.		4.2 To be undertaken in Y3. 4.3 First three trapping grids operational in Phase I villages 4.4 Photos resulting from Phase I trapping grids to be analysed in MMU after Jun. 2018.
Output 5. Improvement of human health and livelihoods achieved through an increase in dietary intake, nutritional status, and medical interventions.	5.1 By Y3, there has been an increase in food security of 10% of households from initial baseline estimates in Y1. 5.2. By Y3 there will be a 5% drop in anaemia cases in children (<12 years) from baseline data obtained in Y1. 5.3 By Y3, at least 30 women farmers trained in agricultural improvement and farming techniques. 5.4 Number of households producing their own food and commercial crops will increase by 10% of baseline.	5.1 Baseline estimates of human health, food consumption and nutritional intake and background wealth and income surveys started in Y1; 5.2 Baseline data on anaemia rates achieved. 5.3 Currently, 59 farmers (30 women) linked to project, another 30 expected to be trained in Y2. 5.4 Baseline information of number of households producing their own crops obtained.
Activity 5.1 Training of household and farming survey assistants. 5.2 Baseline survey of home-produced foods and trade in sample households, 5.3 Socioeconomic surveys of sample households. 5.4 Baseline survey of health status in sample households 5.5 Nutritional assessment of sample households based on dietary recalls. 5.6 Baseline survey of agricultural production and activity in sample households. 5.7 Training of women farmers		5.1 R.O. trained to apply household and hunter perception surveys. F.F. trained to record food production in farms associated with project. 5.2 Home produced foods (e.g. livestock) is proving difficult to measure. Information on trade of foods produced or wild products extracted can be obtained from household surveys. 5.3 Household wealth surveys will be applied in all households in all villages. Phase II village surveys to be completed in Y2 5.4 Achieved in Y1. Second health survey planned for end of Y2. 5.5 Understanding of foods consumed and dietary customs revealed from qualitative surveys in Y1. Insecurity questionnaires and 24 recalls to be undertaken in Y2. 5.6 Surveys of food crops planted has been done in Y1 for Phase I villages. Data on quantities produced is challenging (see Section 5.3. above). 5.7 Over 30 women training in agricultural techniques in Y1.

Annex 2: Project's full current logframe as presented in the application form.

Changes made after guidance from the Darwin consultant, Dr. Benoit Rivard as shown in red).

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: Hunting and agriculture are managed sustainably to improve food security and health of rural populations through the effective and sustainable management of domesticated and wild food resources. (Max 30 words)			
Outcome: (Max 30 words) Food security and health improved in Baka settlements (around 2,000 inhabitants) in southeastern Cameroon, through the sustainable use of wildlife resources, and implementation of environmentally friendly agricultural systems. We will focus on 10 representative villages during the project to roll out lessons learnt to the others in the region.	0.1 By end of Y2, at least a 10% increase in food security, 15% increase in dietary diversity in monitored households.	0.1 Household surveys in 50% of the 190 households (around 700 persons) of the 10 study villages. Description of food consumed, analyses of food types and nutrient intake (using 24-hour recalls), and food-insecurity HFIAS questionnaires, undertaken in around 25% of all households (total 50 households).	Relevant government authorities support project interventions.
	0.2 By Y3 there is a 10% reduction of revenues from the hunting of resilient species in catchment areas and a 10% decrease in number of protected (elephant, great apes) species hunted.	0.2 Hunting zone maps from hunter participating meeting, hunter interviews, direct hunter offtake data from village reporters, hunter follows. Bushmeat market information.	Government authorities have sufficient authority and presence in the area to control the exploitation of protected species, but allows hunting of fast-breeding taxa.
	0.3 By Y3, a 10% decrease in anaemia rates in Baka communities from a current 60%6, as a result of encouraging adequate nutrition.	0.3 Medical records from all ZyL clinics analysed. Consumption rates of macro- and micronutrients from dietary records. Impact of parasite reduction and malaria suppression.	Improvement in anaemia rates result from both better nutrition from the project's intervention.
	0.4 There is a 10% increase in number of households dedicated to subsistence-commercial crop systems in the10 villages.	0.4 Surveys of fields dedicated to agriculture. Detailed records of agricultural production of all managed fields determined in Y1 as baseline, and production records kept during Y2 and Y3.	Supply chains are open and supported by local institutions.

	0.5 By Y3, there is a 10% increase in income from agriculture and regulated bushmeat sale in 10 study villages.	0.5 Income change from different sources calculated from data obtained in baseline household survey in Y1 and from two subsequent follow up surveys, at the end of Y2 and Y3.	Local markets are open to new products.
Outputs:			
1. Research outputs developed and shared with target audiences (local government, villagers and international development community)	1.1 Data analyses and project records on hunting and faunal abundance shared with MINFOF and other local and international partners.	1.1 Reports presented to MINFOF and others. Meetings with partner representatives to discuss findings.	System is in place to allow continuous data analyses to disseminate project learning before publications appear.
	1.2. Journal article on hunting pressures and hunting sustainability of bushmeat species submitted to open access journal by end of Y2.	1.2 Final draft versions of papers shared with local and international collaborators and partners for peer review, before being sent to relevant journals.	Written papers are used to disseminate results of project and used to further discussions with appropriate authorities.
	1.3 Journal article on dietary intakes and food sources of key nutrients completed by end of Y2.	1.3 Final draft version of paper distributed to stakeholders for review.	
	1.4 Journal article on links between forest, domestic crops and general health, especially of vulnerable groups (children, aged <5) completed by end of Y3.	1.4 Final draft version of paper distributed to local and international collaborators and partners for peer review, before sending to journal.	
	1.5 Journal article on changes in population numbers of large mammals and birds in the area, in relation to hunting pressure submitted by Y3.	1.5 Final draft version of paper for peer review distributed to local and international collaborators and partners before sending to journal.	
2. Databases created and made available for use by nutrition practitioners and field managers.	2.1 Electronic nutrient composition database of consumed foods in study area produced by Y3.	2.1 Open access nutrient composition database of foods made available from MMU server and disseminated widely to potential users.	Server space available at MMU.
	2.2 Spatial data on wildlife extraction patterns stored in GIS shapefiles by end of Y2.	2.2 Geospatial vector data of hunting areas shared with CIFOR bushmeat research initiative, ZyL and also made available to MINFOF.	CIFOR-C intervention consultant supports the project to better understand outcomes and future prospects.

	2.3 Wildlife use and extraction data stored in electronic database for use by project partners.	2.3 Copies of databases made available for use by project partners.	
	2.4 In Y3 practitioner workshops organised to train users of databases generated by project.	2.4 Workshop proceedings.	
	2.5 In Y1 and Y3, baseline and postproject review workshops respectively organised with project partners and stakeholders.	2.5 Reports on all baseline information gathered (use of wild resources, agriculture, health) and future directions distributed to project partners.	
	2.6 In Y1, student projects organised and integrated into project activities.	2.6 At least 4 Master's student projects, 2 from Cameroon resulting from research undertaken for Outputs 3-5 by 3nd of Y3.	Separate funding secured to support students.
3. Hunting use zones maintained with hunters and meat traders across 10 communities respecting agreed quotas.	3.1 By Y2, 100% of 190 households in study communities become signatories of reciprocal agreement to reduce illegal hunting and participate in monitoring of wild species offtake.	3.1 List of participating families in project created for each study community.	Local research assistants employed to support data gathering.
	3.2 By Y3, all participating hunters comply with hunting quotas agreed by them and the Darwin project.	3.2 Hunting data reports.	At least 50% of all known hunters participate in scheme.
	3.3 By Y2, illegal hunting and sales of protected wildlife reduced by 50%.	3.2 Reports on hunting of protected species. MINFOF intelligence reports on poaching in the region against baseline data gathered from hunter questionnaires in Y1.	Hunters/traders motivated to contribute to the project.
	3.4 During Y1-Y3 a maximum of 100 out of around 200 hunters in the 100 villages participate in providing hunting data to the project.	3.3 Data reports, electronic databases. Graphical representation of trends. Hunting zone maps. Written accounts of hunter workshops.	Conditionality of no hunting of protected species created in line with health and agricultural support provided via Output 5.
	3.5 By Y2, hunting quotas of hunting resilient, fast-breeding species established in conjunction with 100% participating hunters.	3.4 Analysis reports of catch per unit effort (CPUE) for each hunter of all species, and on quotas determined with hunters for resilient taxa.	Hunting information obtained can estimate level of protected species offtake. Use of indirect methods to determine veracity of reports.
4. Independent measures of population status of protected fauna available for management purposes.	4.1 Throughout Y1 and Y2, camera trapping data analysed and interpreted to determine abundance and distribution of prey and protected species.	4.1 Faunal status survey reports made available to targeted users to determine changes in fauna during project, and to be employed for management purposes.	Increase in populations of protected species can be linked to the project's activities.

	4.2 Hunter perceptions surveys undertaken during Y1 and Y2 to determine status of fauna using traditional ecological knowledge (TEK) methods.	4.2 Reports of status of hunted and non-hunted prey species produced, including analyses of depletion zones derived.	Use of targeted interview techniques can verify if hunters participating in the project are taking protected species
5. Improvement of human health and livelihoods achieved through an increase in dietary intake, nutritional status, and medical interventions.	5.1 By Y3, there has been an increase in food security of 10% of households from initial baseline estimates in Y1.	5.1 Food-insecurity HFIAS questionnaires. Reports of food types consumed. Nutritional intake data. Household surveys of income and expenditure to assess links between food insecurity and wealth status.	Food security measured as "physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".
	5.2 By Y3 there will be a 5% drop in anaemia cases in children (<12 years) from baseline data obtained in Y1.	5.2 Health reports from ZyL medical programme to determine linkage between overall health and nutrition and socioeconomic conditions of households from Y1 baseline data	Baseline information on health available from ZyL medics. Ethical premises of use of persons' medical records are clear.
	5.3 By Y3, at least 30 women farmers trained in agricultural improvement and farming techniques.	5.3 Agricultural extension programme reports and manuals.	Agricultural extension programmes and training of women farmers will continue to be operated by ZyL.
	5.4 Number of households producing their own food and commercial crops will increase by 10% of baseline.	5.4 Crop production records for all farmers participating in agricultural expansion programme.	Information of food production by families gathered at the start of the project.

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
2	Number of people to attain Masters qualification (MSc) –		Cameroonian					2
6A	Number of people to receive other forms of education/training	30	Cameroonian	50			50	50
11A	Number of papers to be published in peer reviewed journals						4	4
12A	Number of computer based databases to be **established** and handed over to the host country						3	3
14A	Number of conferences/seminars /workshops to be organised to present/disseminate findings						2	2
15A	Number of national press releases in host country(ies)						2	2
18A	Number of national TV programmes/features in host country(ies)						1	1
20	Estimated value (£'s) of physical assets to be handed over to host country(ies)							

Table 2 Publications

Title	**Type** (e.g. journals, manual, CDs)	**Detail** (authors, year)	**Gender of Lead Author**	**Nationality of Lead Author**	**Publishers** (name, city)	**Available from** (e.g. weblink or publisher if not available online)