

**Personal report: Compulsory internship for the Master in
Environmental Sciences**



**Sustainable agriculture in Ghana:
Elaboration of organic farming concept for
Obrobibini Peace Complex & Survey of cocoa
performance in dynamic agroforestry systems**

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1. Introduction

During my Bachelor in Agricultural Sciences at the ETH, I could acquire a lot of knowledges about different agricultural systems worldwide with a focus on the Swiss agriculture. However I only had the opportunity to apply these theoretical knowledges in a practical context on Swiss farms. Wishing to stay working in the future in Switzerland, I was willing to acquire professional experiences abroad. For all these reasons, searching for an internship taking place outside of Switzerland was an evidence for me. Furthermore as being studying in Master in Environmental Systems Science, I was looking for an internship which could simultaneously combine my Bachelor as well as my Master cursus. Therefore the internship proposed by the Dr. Christian Andres was completely fulfilling my expectations. This internship was taking place in Ghana and was divided in two different projects. The first one, located in Busua by the NGO *Obrobibini Peace Complex*, was mobilizing theoretical and practical knowledges with the creation and implementation of an organic vegetables garden for eight weeks. The second project, assessing the overall performance of cacao produced in Dynamic Agroforestry System (DAFS) was rather theoretically oriented and was occurring in two villages in the Western region of Ghana during six weeks.

2. Project in Obrobibini Peace Complex (OPC)

2.1 Presentation of OPC

Founded in 2017, OPC is an NGO based in Ghana willing to gather people from different cultures in order to exchange learnings and experiences. Thus the team is composed of an association of persons coming from low income countries as well as from high income countries. OPC is building centres which are acting as platform enabling the exchange of learnings and the full development of people's potential. More concretely, these centres are aiming to improve the life conditions of people in need through different aspects such as sustainable agriculture, waste recycling or natural sanitation. The first centre is now in construction in Busua, in the Western Region of Ghana, with different structures intending to sustainably influence the health and environment of poor people.

2.2 Work at OPC

2.2.1 Objectives

I had different clearly defined objectives concerning my work at OPC in order to create an operating vegetables garden in organic production. Namely these objectives were developing a feasible cultural

calendar, raising seedlings, terracing the land, planning and setting up an irrigation system, create a composting system, planting and finally setting up a biological pest control.

2.2.2 State at arrival

At my arrival in Busua with another student making his professional internship at the ETH, a small area of the OPC land was already dedicated to vegetables gardening. However no maintenance practices were applied. That means no weeding, watering, treating or fertility measures were ongoing (Picture 1).



Picture 1: the garden at our arrival

2.2.3 Achievements

The first action taken was to maintain the garden already in place with weeding and watering activities. Moreover we decided to tackle first the fertility issues by building a compost and enhancing the already present planting beds with poultry manure and palm shafts. The next process was to construct a nursery and plant inside some different Swiss and Ghanaian seeds as trial. From this step the main focus was to design the beds in prevision to the coming irrigation system and to properly prepare them for seedlings. At this time we began to plant the first seedlings and assessed which plants were more successful than other. Then we started with the garden intensification meaning

concretely the preparation of long lines of beds, the building of a wire structure for climbing vegetables as well as a larger nursery (Picture 2). The seedlings were ready to be planted in accordance to our previous observations about the different plants growing effectiveness. This time coincided also with the beginning of an effective biological pest control as we get a working spraying machine. The irrigation system was then installed and completed (Picture 3). From this point we began to enlarge the garden area by preparing new beds beyond the borders defined until this moment. To properly maintain this garden, a precise weeding, watering and pest controlling through biological pest control schedule was designed and applied.



Picture 2: intensification of the garden without the irrigation system



Picture 3: intensification of the garden with the irrigation system

2.2.4 Team and organisation

As the aim of OPC is to join people from different cultures, we were daily working and living with a team of Ghanaian citizens. The number of Ghanaian people working with us was not constant but ranging from two to five people. In order to have an efficient working team, the development and setting up of a daily as well as a weekly schedule was one of the first coordination measure that we implemented. In fact, it means that the team was meeting once per week in order to discuss what have been achieved in the previous week and the tasks of the following week. In this way each person was aware of the upcoming program and the different activities that will be undertaken. These weekly meetings were also a privileged time to express and discuss any personal concern or opinion about another member or about the work at OPC.

On a daily basis our goal was to implement an effective and working routine. For example, as one principle of OPC is to share cultures and knowledges, the meals were always prepared and eaten collectively. In practice our days in Busua were starting at 6.30 am with the preparation and the eating of the breakfast. Therefore, we had the opportunity during this time to discuss more precisely the specific task of each member for the day. After that we had to move to the land which were situated at a walking distance of 20 minutes and there starting our daily activities. Frequently the

different works were achieved by group of two in order to maximise the exchanges and the transfer of knowledges. We were occupied on the land usually until 2 or 3 pm and then coming back all together to the place where we were preparing the meals. The rest of the day was devoted to the cooking, the preparation of horticultural decoctions or some administrative works. This program was running five days a week, the sixth day was used as a market day and the seventh one as a free day.

2.3 Challenges faced at OPC

2.3.1 Practical challenges

The implementation of an organic vegetables garden in Ghana is not an easy task from a practical point of view. Firstly many specific materials, equipment or substances which are considered as essential or basic in Switzerland are simply not available or extremely difficult to acquire in Ghana. Concerning for example the pest control, as we were in organic production, we had to drive four hours to find the product of our choice (neem oil) as all the other alternatives, like copper or pyrethrum, are simply not available or too expensive in Ghana. Therefore, we had to choose some more local products, like chilli or garlic, to manufacture accessible and efficient pest control. Moreover we had to face some quality issues regarding the material. One example of this is the best quality spraying machine sold on site which was working three times before it broke and which we finally decided to import from Switzerland. These examples apply for most of the material and specific elements that we had to use in Ghana which complicated significantly the task of implementing an organic vegetables garden, especially under time pressure.

A further important challenge was the adaptation to the local tropical climate. Indeed as mentioned before, most of our practical knowledges concerning agriculture was based on a temperate climate. However the environment is totally different under tropical conditions and the vegetables are necessarily affected by it. To illustrate this matter, we can for example quote the problematic presence of pests like grasshoppers or big ants destroying the plants and seedlings or the dryness and lack of nutrients of the soil which was essentially composed of sand. Thus we had to adapt our practices to this environment in order to implement an efficient and producing garden. Moreover, as being originated from temperate to cold climate, the physical work under hot weather conditions was a great challenge at the beginning of the internship.

2.3.2 Cultural challenges

Cultural differences were undoubtedly the most challenging aspects we had to face.

Firstly, the notion of time and work is perceived totally differently in Ghana. Thus if we are used to respect a very precise schedule in Switzerland and adapt our day according to our professional obligations, the Ghanaians, or at least the ones with whom we were working, are for their part not

familiar with any time discipline and do not show the same professional conscience. It was for example almost impossible to have the breakfast every day at the same hour as the team members were not able to come at a precise time in the morning. Or even when companies had to come to the garden to install some material like for example the solar panels, they were unable to fix with us a specific time of appointment, simply informing us that they would call us when they will reach the place. Thus, the act of planning is not so common in Ghana. In addition, planning the things for us was difficult, firstly because of this lack of time notion and secondly, because usually everything needed more time than expected because of lack of adapted material, of efficient transport etc. Thus one major lesson that we learned from Ghana is to be patient and not always counting on the most time efficient solution.

Secondly, my position as a white woman in the organisation was not easy. Indeed when we arrived, the different status inside the NGO as well as the operations of the organisation were not yet clearly defined. Thus, we started to take initiatives and especially concerning the vegetables garden, which puts us directly in a leading position whereas it was not entirely our place. It was then very difficult to reverse the roles and make them taking initiatives as it was quite comfortable for the rest of the team to let us manage the operations. Moreover despite this leader position that we involuntarily took, it was difficult for them to consider me as “a leader”, as it is not the usual position of a woman in Ghana. Concretely, I noticed that for them I was not considered as a reference person when they had a question or a remark which was then directly addressing to the male intern working with me. Thus I had to accept to a certain point that as a woman, I couldn't have the same impact and respect that I could have in Switzerland.

3. Project with the Cacao in Dynamic Agroforestry System (DAFS)

3.1 Presentation of DAFS

Ghana is the second largest cocoa producer worldwide with the main part of production coming from monoculture. These monocultures are highly unsustainable involving low biodiversity, poor soil quality and high susceptibility to pests and diseases. Dynamic agroforestry systems characterized among others by the presence of shade trees and the practices of high-density planting and selective weeding, represent an alternative to this traditional system. However though promising, the actual bio-physic-chemical as well as socio-economic performance of these systems are still yet not well known.

In Ghana the DAFS plots currently in place are situated in five different villages around the town of Sankore (at the border between the Western and the Brong Ahafo regions).

3.2 Work with DAFS

3.2.1 Objectives

In order to have a more precise idea of this system efficiency in real conditions, my task was to establish a pairwise comparison of DAFS and traditional production system plots. For that purpose, data samplings were conducted based on several indicators like for example cocoa tree health, system productivity or aboveground carbon. Moreover to have a comprehensive approach of the sustainability of the system, qualitative data were also compiled regarding the socio-economic performance of DAFS through farmers interviews. The analysis and results of these data will be presented in the Master Thesis of Mrs. Katherine Schmidt, with whom I achieved the different data collections and samplings.

3.2.2 Achievements

Concerning the DAFS plots data, we were able to assess all the 16 plots implemented in the region. Regarding soil health, we were collecting per plot two undisturbed soil samples (top and sub-soil) as well as ten disturbed ones (five top soil and five sub soil) taken at five randomly selected locations inside the plot and homogenously mixed at the end to have only a unique disturbed sample for top soil and another for sub soil. For moisture dynamics and general climatic parameters, soil humidity as well as air temperature and relative humidity were measured on each plot. Concerning plant health, 20 cocoa trees were randomly chosen per plot to firstly determine their dimensions and secondly assess their vigour. Moreover cocoa mortality was evaluated by counting the number of cocoa seedlings having died per plot and the amount replanted. As comparison the same measurements (except cocoa mortality) were collected on five traditionally planted plots labelled as Reference plots. About the socio-economic performance, we were able to conduct 15 interviews of farmers owning and operating today a DAFS plot (categorized as “lead farmers”) and 17 interviews of farmers interested to implement a DAFS plot on their land (classified as “second ring farmers”).

3.2.3 Team and organisation

As mentioned previously, we were two students working together to gather all the data. We started first with the soil and climate data that we had to collect on each plot. For this purpose, we hired one young farmer native of the village of Alavanyo which was helping us for practical tasks such as localizing the different plots, measuring them or taking the soil samples but also working as a translator as most of the farmers were not speaking English. Moreover, we had to seek the help of an additional worker to transport the measuring equipment and dig the holes necessary for soil samples. From a geographic point of view, the DAFS plots are distributed around two villages where we decided to stay, namely Alavanyo and Abofrem. Thus, depending on the localisation of the plot and

the availability of the owning farmer, we were able to visit and assess one to three plots per day. The days were starting around 5 am in order to avoid the hottest hours and to have the chance to visit as many plots as possible. However it should be mentioned that most of the plots were difficult to access and needed a minimum of twenty minutes driving or walking. Thus, from the early morning to around 2 pm, we were heading to the different plots and taking measurements. After this time, we were usually coming back to the village where we resided and there preparing the meals and organising for the next day.

Concerning the interviews, it was not possible to have such a regular schedule. Indeed as we needed the farmer's availability for around thirty minutes, it was our responsibility to find the most convenient moment in order to not bother them. For instance, some days we started conducting interviews at five o'clock followed then by ten others whereas other days we were only able to make one interview at night. Thus the days without interviews were used to work on the one already conducted. For most of the interviews we needed the participation of our translator.

All in all, I spent two weeks in Alavanyo to achieve the plots measurements, two weeks in Abofrem for the soil data and the interviews and finally two weeks again in Alavanyo to accomplish the interviews.

3.3 Challenges faced with the DAFS project

3.3.1 Practical challenges

One major challenge faced during my work about the DAFS project was the mobility. Indeed, although we had the chance to have our own car, moving around the villages was a tedious enterprise. Firstly the village of Alavanyo, where I stayed for one month, was totally off-centre. As a matter of fact, we had to drive more than 45 minutes on unpaved, bumpy and rough road in order to reach a slightly more passable route. Thus as the DAFS plots were located in three villages around Alavanyo, we had to count on a minimum of one and half hour drive in the morning to reach them. In addition, the car was not made for such roads which required first of all the development of special driving skills in order to not damage the car. Nevertheless, despite these driving competences, numerous of mechanical and technical repairs on the car were needed. Furthermore as a tiny village, Alavanyo hasn't any food market, fuel pump or any convenient stores. Therefore, we had to plan very efficiently our weeks and our purchases in order to avoid some exhausting and inefficient round trips. However, incidents such as a flat tire, had forced us to drive unexpectedly to the next town. In the contrary, the village of Abofrem, where we stayed for two weeks, was easily accessible and close to a larger village.

Secondly, we faced some material issues regarding for example, the specific equipment required to realize the soil samples. Indeed, for this purpose, a soil borer is needed and the one that we had at our disposal had already been used before. Thus after only a few uses we observed some technical degradations like some cracks or breaks on different parts of the tool. Finding a qualified person being able to repair these different parts was not simple and even, for some parts, it was quite impossible to repair. Thus in some cases we had to be pragmatic and inventive and find another way to use the tool without some original parts. Furthermore, as the soil samples were to be flown back by plane, we had to find an appropriate container and convenient materials to pack them. If this operation would be considered as effortless in Switzerland, it took us several days of reflections as well as different visits of shops in order to find the adequate components.

3.3.2 Cultural challenges

During this part of my internship, a real challenge that appeared is the language and communication matter. Indeed, although English is the official language of Ghana, only rich and educated people have learned it and are able to speak it. Thus, when we wanted to meet the cocoa farmers, either to go on the DAFS plot or to conduct an interview, we always had to be with our translator. In addition, we were not able to organise directly with them the meetings which was then entirely in the responsibility of our translator. But as the farmers were difficult to reach on the phone, were busy with other works or were promising things that they were finally not achieving, we always had to put pressure on our translator, keep on questioning and remind him so that he efficiently organized the different tasks. Thus it was laborious for him to adapt to our work rhythm and efficiency demands as well as it was complicate for us to comply with a less effective schedule and accept that we couldn't control totally the program.

In addition, as mentioned before, Alavanyo and Abofrem are two tiny villages and adapting to their way of life, not only for practical reasons but also cultural, was quite challenging. Indeed the villages in Ghana are a real social organization where numerous of rules and codes of conduct are prevailing. This includes some civility rules like for example meeting the village chief to explain the actual mission when staying in a village, the duty to attend a church for a reputation matter or the daily practices which are only achieved at a certain time of the day (cooking, bathing, etc.). These are only some few examples of the various tacit rules and traditions that are existing in a Ghanaian village and which should be respected in order to maintain a decent reputation. Thus, it took me a while to integrate all these social principles to follow in order to not offend my hosts.

4. Conclusion

To conclude I can say that my professional internship in Ghana was a great professional as well as personal experience. Indeed, in one hand it allows me to apply my theoretical knowledges learned at the ETH in a concrete context and above all in a context outside of my usual framework. Thus, I could observe how the ETH gave me some essential and universal keys from which I was able to adapt and react in unusual situations. Moreover, based on these knowledges, I appreciate to let my creativity develop independently within the OPC project whereas I had to apply them in a more scientific framework with the DAFS part of my internship.

In the other hand this internship was personally a very powerful experience. As a matter of fact, I had the chance to do unforgettable encounters which combined with the different experiences and adventures, have influenced durably my mindset and my self-confidence. For instance, open-mindedness and a greater tolerance towards the people and their acts are some essential skills that I acquired throughout my stay in Ghana and which will be a great support in the rest of my life.

Thus, this internship offers me the possibility to see a world previously unknown through getting out of my comfortable zone while gaining from it a great deal of theoretical and personal learnings.

5. Acknowledgments

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