STUDENT REPORTERS

ORM4Soil
Organic Resource Management for Soil Fertility

# Student Reporters #1

**Field Reports from Mali, Ghana, Kenya and Zambia**



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# Presenting the Student Reporters Series

The ORM4Soil project is in its third year of activity and our dedicated PhD students are progressing in their field work and data collection. The diversity of backgrounds and the interdisciplinarity of this international project is starting to reveal how the different teams and disciplines come together for a single mission: to gain more knowledge and promote the appropriate use of organic resource management to build soil fertility in different social and environmental contexts in sub-Saharan Africa.

Our students were challenged to become reporters themselves and communicate their research experiences and insights from the on-going research process from a reporter's perspective and with a personal touch. These field notes provide a first panorama of what is being done in the ORM4Soil map, a research network in the making and working together to bring soil building and long-term soil fertility to the agenda of academic research and policy making in their local realities.

This is the first number of the Student Reporters series.

*Fernando Sousa and Andreas Fliessbach*

# Composting of cow dung at Sege, Ghana: My experience and the potential role of IPs in the process

*By baba Mutala*

Before the ORM4SOIL project started in Ghana, a PRA study was conducted in two sites with contrasting climates, one with a humid climate (Kade) while the other had a sub-humid climate. The departing point of the study was the identification of local organic resources in the two sites which can be used or are being used to improve soil fertility for possible improvement and scale-up. The team was also tasked to find the socio-economic or socio-cultural challenges mitigating against the wide use or adoption of the technology.

At Sege, cow dung (cattle droppings) was the main organic resource used to improve upon soil fertility. However even though this resource enjoys wide use among the farmer population, there are inherent challenges making its adoption difficult. On the down side, cow dung is reported to spread weeds on farms, to hold a relatively low nutrient status and to have an unpleasant smell. Therefore in the light of the above challenges, the team in close collaboration with the farmers and with knowledge of the soils of the area at hindsight decided to test composting of the dung in a participatory way with farmers in order to address the challenges of weeds, smell and also improve upon the physico-chemical properties of the soil.

My first observation was that expectation on the parts of the farmers were high, because these farmers have sought solutions for these challenges for far too long. The next thing was that involving farmers in developing technology not only facilitates knowledge sharing, but made them feel like their voice is heard. Their interest in the whole participatory research process was also very encouraging. In the words of one farmer; "*if it is true what you tell me that composts can make more water available to my crops, then I can farm in the dry season too and I will not be idle and go hungry*"..

My experiences with the composting process and the challenges encountered therein indicates to me that locally organised Innovation Platforms might play an important role in the assessment and adoptability of this technology. First and foremost the selection of the best cow dung in terms of its structure and nutrient content needs to be taken seriously when aiming at higher quality compost. Training on the identification of quality indicators to enable farmers to choose the best material for composting might be facilitated during the IPs.

**Figure 1.** Compost pile at Sege, Ghana.

Secondly, because the composting process is labour intensive and requires the watering of the material, there is the need to involve the larger community in the process. IP meetings could be a relevant platform to discuss potential community based solutions, **such as a community composting shed where composting could be done and shared to farmers based on their cow dung contribution**.

This could share both the cost and the labour involved. Third but not the least, some training and awareness raising work must be developed with the farmers, since the technology is relatively new to them. Addressing such an important topic in a challenging area might be difficult but the enthusiasm of the target group is motivating. However, before the innovation can be disseminated, the local community must be engaged and assess it in a participatory way.

# Baseline survey – Field notes from Mali

*By Boubacar Diarra*

The Mali baseline survey was preceded by a three-day training session, attended by investigators recruited by Prof Konaté. Gender balance was taken into account in the recruiting process, and 33% of the chosen staff were female. We had the chance to share this training with Mr. Keel Guido who came from Switzerland to bring his expertise alongside that of the Malian experts.

The survey began with a three-day pilot mission, approaching the village chiefs of the respective villages of Koulikoro and Sikasso regions where the survey was to take place, and informing them of the timeline of the activities and chosen methods. A meeting was then held at Prof Gabriel Dembele's office in order to bring the team of researchers and surveyors together and agree on the detailed plan of the survey. It was also agreed that, because of the increasing insecurity in the eastern part of the region, it was decided the three villages initially identified in the Niamina area by the random sampling method would be replaced by the villages of N'gabacoro, Karadié and Chola in the Sirakola area.

The field works began in the town of Koulikoro, where three of its quarters were surveyed. Not all of the expected respondents could be reached on the first day, which began with a long delay due to the current state of the Bamako-Koulikoro road. One of the quarters was found to be too small and with insufficient farmers to fulfill the survey's goals. Thus, further random walks were carried out in the neighbouring quarter of Koulikoro Ba in order to complete the number of required respondents.

All respondents demonstrated an interest in the survey, although some stressed their concern about its purpose and benefits, as they believe it is not the first time that some of them have been the target of long interviews without receiving a proper feedback or favorable outcome. Mr. Fako, one of the respondents, spoke humorously in front of Prof. Gabriel, with whom they have participated in another project of the IER about seed production, saying: *"I'm keeping an eye on you, if there is no result within 3 years as you say, you will hear from me"*.

With the traditional hospitable manner, the respondents in several villages frequently offered chickens to the researchers. They often invited to share a meal despite we told them that our time to eat had not yet arrived and that we had our meals booked somewhere else. It was a funny experience where the generosity of the villagers prevailed over the obstinacy of the investigators wherever we went. Some even insisted that we would spend the night at their home, so that they could prepare us a meal. For them, the topic of soil fertility is so valuable that they found important to encourage us with such generous gestures.

The enthusiasm was such that in many villages we were approached by some who had not been chosen to be asked questions. The first respondents would approach others on the subject, with news spreading rapidly in the village and more farmers coming to us. Soon, each farmer wanted to be interviewed, which was not at all easy to solve in some places.

In some villages of the Sikasso region, we have had to use diplomacy to make our way because some villagers who have been deceived by NGOs or ill-intentioned people had bad images left. The mistrust of the populations is felt because they wanted to know if we really are not scammers. This happened to us in the village Dares-salam where we had to make an effort in order to be accepted, since some people were afraid of being misled by foreigners as in the past.

**Figure 2.** The challenging roads and distances within the region of Sikasso.

Respondents often mentioned that the questions referring to land ownership should take inheritance into account, since most land owners, except for the city dwellers, are generally the heirs of their land. In the Malian context, it may be that the land owner makes use of the land, but does not have the right to sell it. Land lending is common between locals and non-locals, although most often without any kind of return for the land owner. Thus, the term "social loan" was included.

Surprisingly for us, far from acting as if we were conducting a one-way inquiry, the farmers also wanted to ask us more pertinent questions, for example – "*how are we going to know the results of your research?".* We have explained that the tests were in progress and the results of these

tests would be communicated to them and within 3 years a new survey would be carried out, with the same respondents being targeted once more.

The respondents really appreciated our visits, with a note of hope that the results will enable them to improve their soil's fertility.

We have noticed that the farmers of the Koulikoro region have a sense of helplessness in the face of the decline in soil fertility contrary to those of Sikasso, where the phenomenon also exists but it is not regarded with great concern by much of the local population. Farmers have often expressed the wish to be provided support with agricultural equipment and have mentioned they are ready for change, because, according to them, soil fertility decreases from every year and the existing agricultural practices are the same as before.

As for the investigation team, it carried out its mission without much difficulty. That is why it has ended in beauty and with the hope that both sides will find themselves in other circumstances.

# Modified Fundikila – a potential sustainable soil fertility management practice in the Northern Zambia

*By Daniel Kalala*

Although initially developed by the Mambwe people of the Northern Province of Zambia, the *Fundikila* system is now practiced by most tribes in the North of Zambia. The system was developed as an alternative to the *Chitemene* system which had been practiced in the region since the seventieth century. As a result of population growth and widespread deforestation, the *Chitemene* system which involves the cutting down of trees or tree branches and burning them before the on-set of the rainy season, could no longer be practiced by the majority of the people. Instead the *Fundikila* system is increasingly being used as an alternative to the *Chitemene*.

**Figure 3**. Ready for burning (left Chitemene system – Chopped off trees and branches; right: field after burning.

Originally, the *Fundikila* involves the burying of indigenous grass in big ridges towards the end of the rainy season, from March to April, and before the start of the subsequent rainy season, in October or November, the ridges are flattened. Crops are then planted on the flat surface or on smaller ridges. Although the positive impact of the *Fundikila* on crop production has been widely reported by farmers, farmer organizations and researchers, it should be pointed out that this traditional farming system has two major short-comings. Firstly, due to the low nutrient content and the high percentage of recalcitrant materials such as lignin in the buried grass, the contribution of this system to overall soil nutrient content is not much, but rather the observed improvement in soil fertility could be largely associated with the increase in soil organic matter. Secondly, the system as it is currently practiced necessitates lapse periods or fallows of at least one year every after the *Fundikila* has been done. During the fallow period, the land is left idle to allow the growth of natural vegetation which will then be buried towards the end of the rainy season.

With population growth and increased land scarcity, this system also risks being abandoned just as is the case with the traditional shifting cultivation and the Chitemene systems.

Through the ORM4Soil project, a modification of the *Fundikila* was developed by the Zambian ORM4Soil project team in consultation with farmers from Kasama district of Northern Province. As opposed to the burying of indigenous grass, the modified *Fundikila* consists of burying a green manure crop planted at the beginning of the rainy season. The green manure crop can be planted as a fallow crop or most preferably as an interplant with the main crop, which is maize in most cases. The growing of the green manure as a fallow crop is, however, not highly preferred and is only recommended in cases where the soil fertility is extremely low that it can't support the growth of the main crop, or where the farmer is just starting to practice the modified *Fundikila* for the first time. The advantage of growing the green manure as an interplant is that the farmer can still grow his food crop while improving soil fertility. Currently studies are on-going to assess the use of velvet beans and black sunnhemp as potential green manures for use in the modified *Fundikila* system. Already there seem to be observable positive impacts from the velvet beans-based modified *Fundikila* (pictures below). The high nutrient content, especially nitrogen, and the high biomass production of the green manures combined with the aspect of continuous crop production without the need of fallowing, makes the modified *Fundikila* a potential solution to the short-comings of the traditional *Fundikila* and ultimately as a sustainable soil fertility management practice. From the on-going studies, it is envisaged that, in addition to evaluating the impact of the modified Fundikila on crop yield, the impact on soil chemical, physical and biological properties will also be determined.

# Innovation Platforms: The Zambian Experience

*By Louis Chikopela*

In Zambia, just as in the three other ORM4Soil countries, the national team is using Innovation Platforms (IPs) as an approach to help address the poor soil fertility problem in Chipata District of Eastern Province and Kasama District of Northern Province, where local IPs have been established in each District.
The District Agricultural Coordinators (DACOs) in the two Districts are the Patrons of the IPs and so far two IP meetings have been held in each district. The meetings have been well attended with an average of 20 participants per meeting. Participants in these meeting are drawn from different organizations which include; representatives (Extension, Forestry, Community and Research), Non-Governmental Organizations (NGOs), Agro Dealers, representative of local traditional leaders, Faith Based Organization (FBO), local media stations and farmers.
The IPs have proved to be an important and effective information sharing forum among members, were different experiences of the members in soil fertility management technologies are discussed. The IPs have helped to establish synergies among institutions that are engaged in improving soil fertility and in identifying and making use of local champions to help spearheading interventions activities. IPs have equally contributed to resource mobilization within the districts and influencing policy at local and national level.

A good experience, to attest to the fact that IPs are an important platform for sharing of information was with regards soil testing services that are available at the local research stations within the districts, both Kasama and Chipata were offering soil pH testing services, which members of the IP in both districts were not aware of, more interesting, was to note that the soil testing cost were actually affordable, as low as 0.84 USD per soil sample and that the research stations were now offering more specialized soil testing services such as determining the soil content of NPK (Nitrogen, Phosphorus, Potassium), which in time past, these services were only offered in Lusaka the capital city of the country. Farmers had to travel 850km from Kasama and 565 from Chipata to access these services. More and more farmers are now, not only showing interest, but accessing the services.

The Involvement of local traditional leader, His Royal Majesty Senior Chief Mzumane in the Chipata IP has proved resourceful. He has contributed effectively to the IP deliberations and has proved knowledgeable on most soil fertility management technologies. In the inception meeting during the formulation of the action plan the Senior Chief was assigned to discuss with his headmen, on enforcing the rules and regulations aimed at discouraging burning of residues, bush fires and uncontrolled animal grazing. In the second IP meeting he reported to the group that he took advantage of his regular quarterly traditional meeting with his headmen, to discuss the issues of soil fertility management and how best to enforce the rules and regulations. A total of 100 headmen participated and he reported to have held three meetings.

The Senior Chief was also summoning his subjects who were involved in charcoal burning as a way of discouraging the practice. Apart from the authority he carries as a traditional leader he is also farming 20 hectares of land where he grows mainly maize, but also pigeon pea, sunflower and cowpea.

This is a clear example of how IPs can identify and use the local "champions" such as traditional leaders to help influence and enforce decisions.

As a follow up on the action plan for the first IP meetings, WhatsApp platforms were established in both districts Chipata and Kasama. It was encouraging, to note that the Senior Chief has access to mobile phone with a WhatsApp application and he was able to use the forum to disseminate information about an upcoming field day that was to be held at his house in collaboration with Total Land Care (TLC) an NGO which promotes conservation agriculture in Chipata district. He also posted to seeking clarification on the proposed date of the next IP meeting. The WhatsApp forum has greatly supplemented the IP and has really proved to be an important tool to keep the soil fertility discussion alive beyond the 3 hours duration of physical IP meetings.

In the Kasama district, the NGO CARITAS is promoting the use of fundikila, while in Chipata CAMCO is promoting the use of compost. The IP has helped to establish synergies among institutions that are engaged in improving soil fertility. These institutions appealed for skilled man power to help in trainings and dissemination their respective activities, particularly from the ministry of agriculture in the districts. IPs have created a bridge between the institutions that have resources and those that do not have, but have technical competences.

IPs have contributed in resource mobilization within the districts. TLC has resources to support airing radio programmes on soil fertility management technologies on the local radio stations while National Agricultural Information Services (NAIS), a government department has recorded radio programmes which it fails to air on the local radio stations. The two with other members of the platform are now working together to air and develop new programmes. COMACO representative informed the IP meeting that his institution hosted quarterly round table discussions, and that the IP could take advantage of this opportunity, to host a panel of discussion on soil fertility arrangements are under way to host this discussion.

In Kasama district, the IP members have recognized the fact that the soils in the province are acidic and to reduce acidity there was a need for soil testing to know the level of liming required. The participants agreed to influence policy change in the government supported Farmer Input Support Programme (FISP) to ensure that the input package particularly under the recently introduced e-voucher should include lime as one of the inputs. The members equally deliberated on how to reduce the cost of lime by influencing the marketing of lime considering that the major cost was on transport from source to Kasama District.

**Figure 4.** Field visits to the agronomic trials provide valuable insights to different stakeholders.

Historically, the country has experienced situations where donor funded projects activities are only implemented in the project period. To sustain the IPs beyond the projects life, deliberate efforts have been made to ensure that resources are mobilized within the district by the members and synergies are established between and among all stakeholders. The sponsoring of the meetings by the ORM4SOIL will equally gradually reduce and members have already come on board to sponsor the hosting of the IP meetings.

The Zambian team, will continue to provide support to the local IPs to strengthen them further, while working on establishing a national IP which will learn from the experiences of the local IPs. The focus of the national IP will be to enhance the visibility of soil fertility issues, strengthening of technology dissemination pathways and influencing policy to support soil fertility management technologies in the country.

# Implementation of On-Station and on-farm trials in Kenya

*By Milka Kiboi*

The on-station trials, whose major goal is to evaluate the potential of different soil fertility management techniques to enhance agricultural productivity, are implemented in two sites i.e. Chuka in Tharaka-Nithi county and Kandara in Gatanga county. During the first cropping season (short rains 2015 season-October to December) a uniformity trial was implemented from which blocking was done based on crop performance in the two sites. The experiments were then laid down during long rains 2016 season (March to May). During the short rains season of 2016, both sites experienced significant decline in rainfall amounts leading to a decrease in crop performance. In general, the implementation of the experiments has been smooth thus far in both research sties.

The main challenge in Chuka on-station site at the beginning was soil erosion caused by excess runoff. Corrective measures were immediately undertaken by laying terraces and infiltration ditches across the field. On top of each terraces, *Tithonia diversifolia* was planted, not only to firm up and protect the soil, but as a source of biomass used in the experiment. In Kandara, insecurity from wildlife and human pest has been a major challenge. As a result, we hire night guards when the crop is mature and after harvesting. The site has also been experiencing recurrent termite infestation and this we controlled using a pesticide (i.e. Termigon™) on need basis. In addition, rooibos tea bag was highly infested by termites and as a result we buried more. From the on-station trials, we observed that treatments with combination of mineral fertilizer and organic inputs performed better in terms of grain yields during the long rain and short raining seasons of 2016 cropping in the two sites.


**Figure 5.** One of the treatments at the Chuka on-station trial.

For the on-farm trials, all the farmers implementing the trials appreciated being selected to run the trials and also the use of different combinations of organic resources. The farmers were very cooperative and supportive during training and data collection. They accurately recorded data and actively engaged us through phone calls to inquire where they needed more clarifications or reported various incidences happening in the experimental plots. Others were even willing to provide additional pieces of land for establishment of demonstrations. Such cooperation made working with such farmers very interesting.

The farmers implementing techniques with combination involving organic resources with rock phosphate under minimum tillage performed the best with farmers relating its performance with cob size and sweet taste. On the other hand, farmers that implemented technologies with *Tithonia diversifolia* reported that they did not observe any pests and diseases. Even though sole fertilizer performed well most farmers suggested they prefer a combination of mineral fertilizers with organic inputs citing high costs and negative impacts of inorganic fertilizers on the soil. In Chuka, we had one farmer who stopped implementing the experiment in the second season and we immediately found another farmer willing to take up the trial. In Gatanga all was well with the farmers who were selected to implement the trials.

However, the trials were widely distributed to cover a wide range of the study area. This therefore meant covering long distances from one farmer's trial to the next during data collection. The visits were very engaging and interactive because the farmers asked several questions, some of which were outside the scope of soil fertility. The many questions asked related to access to quality seeds and fertilizers and how to cope with the increasing rainfall uncertainty. It was also a challenge to deal with the farmers who believe that their way of farming is the right way. Such farmers questioned what change the project would bring in regard to soil fertility that they have not done since they have been using soil fertility inputs such as fertilizer and animal manure for a long time. To remedy the situation and retain such farmers, we acknowledged their experiences in farming but at the same time, encouraged them to embrace new ways of using the available resources at their disposal to get better yields. Additionally, due to old age, lack of writing skills and engagements in other activities, data recording was a problem. Therefore, there was close follow-up by the field technicians and field visits were conducted every fortnight by a MSc student.

# Baseline Survey in Kenya: A Rich Learning Experience

*By Pamellah Asule*

We completed the baseline survey in Gatanga, our second research site, on 23rd, December, 2016 after eight days of intense activity. The exercise began with a lot of apprehension on our part because of what we thought was bad timing so close to the Christmas holiday. Christmas eve was only nine days away from the date when we intended to begin the survey, but going by our experience from the first phase only a couple of months back, we needed at least twelve days to issue notices, recruit and train enumerators, and conduct the actual survey. We got everything ready and Laura Sang and I proceeded to the field in spite of our fears. Laura is the master's student in socio-economics, with whom we conducted the first phase of the baseline survey in August.

We did pull off the Gatanga survey, and as it turned out, the challenges we encountered were entirely different from those we had anticipated. At about 11 a.m. on our last day of the survey when the field activities were well underway, I sent this final text message to Dr. Wambui Kiai to fill her in on our progress: "from the look of things Gatanga baseline is done…no sign of Christmas here yet". Several other incidents that took place in the course of the survey in both research sites made it starkly clear that in as much as planning at the desk is a necessary part of the research process, the real issues play out in the field and one must be ready to solve them on the spot. In addition, the survey experience provided the opportunity for learning beyond what we had set out to capture in the standardized questionnaire.

Most of the farmers were eager to answer our questions, but also quick to complain that researchers often fail to bring back the results of their investigations once they have completed the research. During the training of enumerators, we had consistently emphasized the importance of feedback to farmers as an important part of the ORM4Soil project. They were able to explain that another group of project researchers was working with some farmers in the community to conduct trials of certain soil fertility improvement technologies. In addition, it was within the plan of the project to disseminate the results of these trials to as many farmers as possible in the area.

The farmers were curious to know more about the kind of trees to use in the improvement of soil fertility. The possibility of using *Tithonia diversifolia* to improve soil fertility also generated interest because the plant was readily available. In fact, farmers had the tendency of trimming their overgrown hedges dominated by the plant and disposing of the plant material anywhere except on their cropping land. A number of them were surprised to learn that the plant could actually be of value in improving soil fertility. Much as they seemed to appreciate the importance of investing in the improvement and maintenance of soil fertility, the farmers had other concerns as well. There was the suggestion that soil fertility improvement should go hand in hand with

provision of good quality maize seed and water for irrigation. They were also interested in accessing markets for their produce. As one farmer put it, "Suppose I harvest more maize as a result of improved soil fertility, where will I sell the excess produce?"

We relied on the enumerators to introduce us to the local administration every time we visited a new area and to guide us into the villages. The enumerators from both the sites also devised their own ways of conducting the random walk without running into each other. In Chuka, those covering the same local area coordinated their movements through their mobile phones, while the enumerators in Gatanga would mark every homestead visited by dropping tree branches at the exit point from the home.

The enumerators persevered through some rather difficult sections of the fieldwork, some of which involved travelling over long distances on rough terrain, often having to disembark from the vehicles to walk. On two occasions we were forced to go back many kilometres to find the right route again. They took it all in their stride, even when we got back home much later than we had indicated at the beginning of the survey. Laura had a way of making light of such times by going into "selfie moments" with the enumerators. Based on the strength of their experience from the ORM4SOIL baseline survey, three enumerators from Chuka have already taken part in another survey by a different organisation. The others are willing to participate in similar events in future and cannot wait for the ORM4Soil endline survey.

*I would like to acknowledge the contribution of all those who participated in and supported the baseline survey in Kenya including Dr. Wambui Kiai, Dr. George Nyabuga, Dr. Anne Muriuki, Dr. Felix Ngetich, Christoph Spurk, and Louis Chikopela. I would also like to thank Nathan Okoth and Eric Oduor for participating in the training at Chuka. Laura was actively involved in the entire survey in the two research sites and her contribution is highly appreciated.*

# Experiences from Ghana During the ORM4Soil Baseline Survey

*By Rebecca Baah-Ofori*

As part of activities earmarked for the ORM4Soil project, a baseline survey was conducted to do an initial situational analysis prior to the introduction of project influences through communication, field days and IPs on the adoption of new soil fertility management techniques. The team in Ghana scheduled to conduct its baseline in October 2016. Prior to moving out to the field for data collection, the team in Ghana hosted expert Christoph Spurk who participated in the training of field enumerators on the objectives of the baseline, basic techniques in questionnaire administration, translation and piloting.

**Figure 6.** Kade training session

The highlight of the training session was the discussion on using the random walk and kish grid techniques in sampling respondents in the various communities for the baseline survey. Initially, the enumerators were apprehensive because they thought of both techniques as cumbersome since all of them had not used these techniques in sampling before. To decrease apprehension levels, the research scientists led by Prof Spurk offered detailed explanation of both techniques and organized a demonstration session in selected communities at Kade for enumerators prior to actual data collection.

Following the training session, the baseline in Ghana commenced on Sunday 9th October and ended on Thursday 20th October 2016. Covering an average of two communities per day and working both morning and evening sessions, the team of enumerators spent 6 days in Kade and 5 five days in Sege.

While the team agreed to administer a questionnaire in every fourth household in Kade, enumerators decided to select every other house in Sege because of the small number of households in the area. Again, in order to facilitate greater coverage in a shorter time, the enumerators divided themselves into teams upon reaching a selected community and zoned the community into four. Then, beginning from the central point in town, each team takes a quarter of the community, collecting data by applying both the random walk and the kish grid techniques.

The baseline survey in Ghana was a huge success though there were a few challenges which were promptly addressed. A tactic that contributed to the exercise was that there was a debriefing session every evening where enumerators peer-reviewed one another's field reports as a mechanism of pointing how challenges that they were confronted with were addressed and for group ideas to be offered on how such issues can be better addressed should they recur.

Preliminary observations on the field was that more farmers in Sege perceived soil fertility to be an issue requiring immediate attention. However, in both project sites, the application of inorganic fertilizers was the main soil fertility boosting technique practiced. To a large extent, there appeared to be a general apprehension for the use of organic fertilizers especially in Kade. In Sege, there was a preference for animal source organic fertilizers than those from legumes. This notwithstanding, it appeared most farmers had low knowledge about organic soil fertility practices and demonstrated a willingness to learn and practice such techniques in future.

The Ghana team appreciates the efforts of all enumerators, community aides, AEAs, Community Information Centres (who gave prior notice of the coming of the enumerators) and respondents who participated in the baseline. Moreover, the team acknowledges the ORM4Soil project for the exciting opportunity to benefit from knowledge transfer while encouraging local innovation in realising the project objectives.

**Figure 7.** The team.

# Alley cropping system with *Gliricidia sepium*: An inexpensive organic resource management technology easily accessible to low-income farmers

*By Salif Doumbia*

Land, vegetation and water are the main natural resources of the Koulikoro region, in central Mali, and of Sikasso, in the south. These resources provide livelihoods to more than 80% of the local population through agriculture, livestock, fisheries and forest resources. Today, the productivity of these resources is declining as a result of anthropogenic pressure, inappropriate management practices and the adverse effects of climate change. To meet this challenge, there is an urgent need to introduce a systematic and integrated management system in these regions, which in the long term will improve the productive capacity of these resources to meet the growing needs of the expanding populations. An inexpensive and affordable alternative to low-income producers is the organic soil fertility management technology based on alley cropping with *Gliricidia sepium*.

At the request of farmers during a participatory rural appraisal (PRA) carried out in 2015 as part of the activities of the "Organic Resource Management for Soil fertility" (ORM4Soil) project, the alley cropping with *Gliricidia* technology was introduced in 2016 by 30 producers equally distributed among the villages of Mafèya in the region of Koulikoro and Zoumana-Diassa in Sikasso. These two regions are characterized by their diversity in rainfall and soil conditions. The treatments consist of two plots – one with *Gliricidia sepium* and the other as a control. Depending on the area, cowpea or groundnut were grown for the experiment. Cowpea was used in Mafèya and groundnut in Zoumana Diassa.

**Figure 8.** *Gliricidia* growing in an alley cropping system with cowpea in Mafèya.

Preliminary results from this experiment showed a significant increase in biomass and grain yields of both legumes in the plot with *Gliricidia sepium* compared to the control. The rate of increase in cowpea yields was 13% for biomass. For groundnuts, the recorded rates were 8% and 12% respectively for biomass and grain. The results of soil sample analysis taken before sowing and after harvest are still unavailable, but will potentially help to better explain these results.

Farmers' perceptions of the technology was assessed during field visits and is in line with the results obtained from the experiment. They stated that cowpea and groundnut plants in the alley cropping system with *Gliricidia sepium* grow well and produce better than those of the non-*Gliricidia* control – their usual production practice. According to them, this technology could not only help to improve crop yields and income, but also help solve shortages of animal fodder during the dry season.

The experiment will continue during the rest of 2017 and 2018 with the evaluation of the effect on grain yields in the alley cropping system with *Gliricidia* and without *Gliricidia*. Each year, soil samples and plants will be collected and analyzed to evaluate the effect of this tree species in restoring soil fertility and mineral nutrition of crops. Also, the draft of the manuscript of an article to be published is being prepared.