

Working document

Initial findings from household case studies
in the communities of Lawra and Nandom,
Ghana

Part 1

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May 2018



SAIRLA programme (Sustainable Agricultural Intensification Research and Learning in Africa)

SITAM project (Supporting smallholder farmers' decision-making: Managing trade-offs and synergies for sustainable intensification), addressing research question 6.

IIED and partners





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List of acronyms

FMNR	Farmer Managed Natural Regeneration
MoFA	Ministry of Food and Agriculture
SAI	Sustainable Intensification of Agriculture
SWC	Soil Water Conservation
VSLA	Village Savings and Loans Associations

Introduction

This working document includes the outputs from community level exercises undertaken by the Ghana partners of the SITAM project (under the SAIRLA programme) between January and March 2018 in two communities in Ghana. The document includes an initial analysis of farmers’ practices in relation to sustainable intensification of agriculture. It covers exercises from phases 1 and 2, as per the methodology document (S64 M6 case study methodology, revised February 2018).

Field work was carried out by staff from the Centre for Indigenous Knowledge and Organisational Development (CIKOD) and the University for Development Studies (UDS), with the initial training and technical support provided by IIED and Groundswell International. To comply with the European Union General Data Protection Regulation (GDPR), we have replaced the names of respondents with household numbers that are identifiable by the research team.

Key findings and insights

- Farmers in both communities (Tanchara, in Lawra District, and Ko, Nandom District) believe that they are practicing “Sustainable Intensification of Agriculture” (SAI):
 - Although they are not doing so at large scale, most farmers are practicing “Farmer Managed Natural Regeneration” (FMNR) in their individual farms.
 - The same applies for using and/or composting manure, mostly due to limited manure, water and labour availability.
 - When inorganic fertilisers are used, they are supplemented with manure or compost and applied on different fields every time to reduce the risk of soil degradation.
 - Although traditional varieties are still used, the use of improved/hybrid varieties is becoming more common (mostly due to negative changes in rainfall patterns, reducing the length of the cropping season).
- Farmers have perceived the following as positive effects of SAI:
 - Increased soil fertility
 - Crop diversification (introduction of soy bean)
 - Women empowerment (because women participate in trainings and exchange visits)
 - Increased yield and reduction of hungry
 - Small ruminants increase manure production and household’s income
 - Increase in groundnut yield through the distribution of improved seeds
- They have also perceived the following negative effects:
 - Loss of indigenous seeds
 - Increased dependency on improved seeds, fertiliser and tractor services
 - Herbicides and pesticides are making fields unproductive, introducing new species of weeds to the community and killing living organisms
- Both communities have been exposed to several project interventions during the past 20 years – see also “S64 M3b Ghana livelihoods & intervention analysis.pdf”. These include awareness raising about and training in agroecological intensification by CIKOD.
- The participants from Tanchara (“community 1”) mentioned that, although only few households benefited from technical support, there has been widespread adoption of most of the approaches and techniques taught due to sharing among farmers, who are attracted by the observed positive effects of their implementation (e.g. increase in yield, improvement in the soil fertility and number of trees both on the fields and in the bush).
- The provision of improved groundnut seed, chemical fertiliser, small ruminants and trainings on compost making were mentioned by community 1 as being the ones that have contributed the most

to food production and income. Trainings on FMNR and agroecological farming techniques were considered the ones contributing to positive trends in natural resources.

- In Tanchara, labour availability was identified as a strong influence on defining the size and number of farms the household will manage: less labour availability will force farmers to concentrate on their home fields, leaving bush fields fallow (which contributes to an increase in tree cover). On the contrary, households with higher labour availability will tend to expand their bush fields, leaving less area to fallow.
- The participants from Ko ("community 2"), on the other hand, highlighted land availability as the determining factor for their approach to farming management: households with more land tend to practice more extensive farming than households with less land, who opt for intensifying.
- Both communities have mentioned lower water availability as a negative change in the environment, which is partially due to changes in the timing and amount of rain. Community 2, in particular, is experiencing problems of silting in their streams and dam, especially due to the construction of roads nearby and to farming activities near the streams / water sources. They are aware of the trade-offs between better roads and higher yields, and reduced water availability.
- Both communities have experienced severe cattle robberies, which has diminished the availability of draught animals. Thanks to activities from different NGOs, households (and particularly women) have increased the number of small animals they keep, especially ruminants, as a coping mechanism. Poultry however, as it is exposed to more diseases, is diminishing in number. The lack of veterinary services, especially for the treatment of animal diseases, has a very negative impact on animal husbandry in the two communities.
- Participants from community 2 have indicated that some of the respondents of the quantitative survey must have understated the number of livestock they owned out of fear of being taxed. The implication being that livestock ownership could be slightly above what the survey captured.

Findings

In Ghana, research has only been completed for phases one and two so far, collecting information at community level from Tanchara, in Lawra District (community 1) and Ko, Nandom District (community 2). Information was obtained through focus group discussions and from key informants along the different exercises and validated by their community at the end of each phase.

Natural resources base

Land resources

The farm size of most households from both communities has decreased in the last years due to a reduction in three main factors related to land productivity: rainfall, available labour and soil fertility. Shorter rainy seasons with a delayed onset seem to happen more frequently in the region nowadays. Participants from Tanchara mentioned diminishing family sizes as the main reason for lower labour availability, while the decrease in manure availability and labour to apply it on the fields is considered a large cause for lower soil fertility. To cope with scarce labour, almost all the farmland from community 1 has been reallocated closer to the settlements (farmers virtually do not have far away bush fields to reduce work effort). Community 2 has also perceived a reduction in the quality and quantity of both home and bush fields; however, in their case the main drivers for this change are population increase (which means more labour, but higher competition for land) and continuous cultivation, which reduces soil fertility. To improve the situation, farmers from Ko are adopting tied ridging and other soil water conservation (SWC) practices.

Other resources

The use of farmer-managed natural regeneration (FMNR) practices and recent by-laws addressing indiscriminate cutting of trees are the main drivers of an increased number of trees, indicated by both communities. Participants from Tanchara also mentioned that, as fields are gradually concentrating around the homesteads (thus becoming "home fields"), tree cover on fallow land is increasing. Community 2 is further protecting trees and bush by organising fire volunteers.

Both communities reported that in the past the quality and extension of forests and bushland, as well as the amount of grass for fodder and thatching, had diminished because of cutting of trees and bush fires. The participants from Ko also mentioned the higher number of settlements in and around the forested area (which leads to tree felling) and farming activities around the forest as a cause of deforestation and forest degradation. These factors, coupled with unsustainable farming practices (leaving bare soils and abusing of herbicides and chemical fertilisers) and continuous hunting activities (which involves burning of bush and grassland), also led to a reduction in the quality of hill and fallow land. Community 1 and 2 have already started noticing a reversal in these general trends thanks to the community by-laws protecting trees, and to the concentration of farming on home fields (which helps increase grazing/pasture on these areas and thus slowly improve their quality).

Water availability, however, has diminished in both communities. Participants have perceived a reduction in rainfall volume and a significant change in rainfall patterns. Community 2 experienced an improvement in water availability ten years ago due to the construction of a dam in the nearby stream. However, the combination of lower rainfall and increased soil erosion (due to road construction, farming activities and bush burning) have reduced the water that can be collected in the dam.

Farm characteristics, farming systems and technology adoption

Livestock production

The participants from Tanchara indicated that, although not in large numbers, every household keeps at least one kind of small ruminant or pigs as a source of income. However, very few households own cattle due to an increase in cattle theft; this, in turn, affects the availability of draught power to cultivate the land. Frequent disease outbreaks are another important obstacle to livestock production in both communities.

Livestock ownership is perceived as a sign of SAI by community 1, not only because cattle can be used to plough own land (saving the costs from hiring oxen or tractor services) and as a draught animal in general (e.g. to carry harvest or compost), but also because livestock provides manure and can be a source of income to buy farm inputs or hire labour. This would allow the farmer to expand the land under cultivation, or to obtain a quick revenue when selling animals. The decision to sell will be pushed by food shortages and other household needs, while farmers will be prone to buying livestock in case they had surplus food or if there were traditional rites for which they needed animals.

Crop production

There is a wide range of crops grown in the study area, the main ones being maize, groundnuts, millet and sorghum. Negative changes in rainfall patterns have led to the gradual loss of indigenous varieties in both communities, as the late onset/early end of the rainy season forces farmers to use early maturing varieties. However, when validating the results from the quantitative survey, participants from Tanchara highlighted that although guinea corn (a traditional variety) is grown in small quantities on proportionally small areas, it is still grown by almost every household for funerals and other traditional ceremonies.

Farming practices

When asked about their farming practices, communities 1 and 2 highlighted different issues. Community 1 members indicated that, except for groundnut, most crops are now grown on ridges or mounds, especially yam and maize. Community 2 mentioned that the type of soil (softer or harder, higher or lower fertility) influences the external inputs used: neither do soft soils need tractor ploughs nor do fertile soils need mineral fertilizers. They highlighted rainfall patterns as the main influence on the type of crops cultivated: more farmers now produce early maturing crops due to the shortening of the rainy season. The participants from Ko also stated that the lack of livestock makes it difficult for compost to be produced, as only a few crop residues and tree leaves are available (which is not sufficient for rich compost nor for large amounts of it). They also mentioned that composting is highly labour intensive. Both communities 1 and 2 stated that, although some people might not be practicing it, the majority practice some form of FMNR on their individual farms.

Sustainable intensification of agriculture

In both communities there has been an increasing number of households using fertilizer, tractor ploughing and hybrid seeds over the past 5 years. The major factor influencing the decision to use these external inputs is rainfall: external inputs are considered to be faster and easier to use than compost/manure, labour and local seeds to compensate for the effects of its irregular pattern and short duration of the rainy season. Community 2 also highlighted that the type of soil (softer or harder, more or less fertile) influences the external inputs used. Neither do soft soils need tractor ploughs nor do fertile soils need mineral fertilizers.

Regarding intensification in general, community 1 perceived changes in rainfall (especially reduction) to be its main driver. Community 2 members mentioned that varying asset levels (particularly land) influenced the households' degree of intensification: households with more land extensify rather than intensify, households with less land do the opposite.

The use of chemical fertilisers in Tanchara, although growing, is still quite low – the main causes for this low use being their high cost, lack of cash to buy them, and the availability of manure (which makes fertilisers “less necessary”). Fertilisers are applied on all crops except Bambara beans, with most of it being used on maize fields (the preferred staple crop). According to the participants, farmers choose to use chemical fertilisers in lands of lower fertility, when the pattern or amount of rainfall would have a negative impact on crop yields, or where they perceive that a significant increase in yield is possible. On the negative side of fertiliser use, participants mentioned that chemical fertilisers kill microorganisms, harden the soil and increase soil temperature. However, they see possible synergies in the use of fertilisers in combination with manure or compost, and with crop rotations. Applying manure directly after ploughing favours the microorganism population in the soil, which will contribute to even higher yields when chemical fertilisers are applied later (after weeding). Applying fertilizer on a maize plot and then planting a different crop the following year (millet, sorghum and/or groundnut, without applying fertilizer) allows for both higher yields from all crops and a healthier microorganism population. According to the farmers, applying only manure will not result in high yields: manure requires a long time and large amounts of water to release its nutrients and be effective.

Hybrid seed use is also on the rise. The participants from Tanchara stated that this is mostly because these varieties have a short growing period (which reduces the length of the lean season) and produce higher yields with less manure (they are more efficient in their nutrient use). However, there are negative aspects to the use of these seeds: not only does the use of fast growing varieties collide with the performance of traditional harvest ceremonies, but they also oblige farmers to purchase new seed every year, as the seeds harvested from hybrid varieties does not produce high yields. Farmers make the decision to use hybrid seeds depending on different factors: the severity of the current lean season (planting fast maturing varieties will reduce the hunger gap, which is particularly harsh in the rainy season), the importance of the traditional harvest rites for the household, and their capacity to purchase new hybrid seed every season. Participants from Ko expressed their lack of optimism in the sustainability of improved early maturing seeds because of the lack of control of the source.

External environment

Infrastructure and services (inputs, credit, advice)

Until about 5 years ago, subsidised chemical fertilisers had been the main form of support that farmers received. More recently they have started benefitting from technical advice provided by different organisations (e.g. CIKOD, RESULTS and MoFA for community 1), which have mostly influenced land preparation and forest conservation. Farmers from both communities now frequently use tied ridging or bunding (SWC techniques), and plant in rows. They are also better at practicing FMNR and enforcing the community by-laws thanks to these recent support services. The provision of improved groundnut seed, chemical fertiliser, small ruminants and trainings on compost making were mentioned by participants from Tanchara as being the ones that have contributed the most to food production and income. Trainings on FMNR and agroecological farming techniques were considered the ones contributing to positive trends in natural resources. As main outcomes from the increased support services, farmers have mentioned increased soil fertility (mostly due to composting) and soil moisture increase (both resulting in higher yields), and the distribution of higher-yielding varieties that are better adapted to the current climatic conditions. Participants highlighted that the effects of these techniques will depend on how they are applied: if done in the wrong way, they can even have negative effects on yields or land.

Social and cultural context

When validating the results from the quantitative survey, participants from Ko indicated that some of the respondents might have understated the number of livestock they owned for the fear of being taxed -the implication being that livestock ownership could be slightly above what the survey captured.

There are small trade-offs between the production of improved varieties and the performance of traditional ceremonies. For example, some ceremonies require the production of traditional beer, which is made from some traditional sorghum varieties - one of the reasons why they have not been

completely displaced by improved varieties so far. Moreover, the time at which improved/hybrid varieties (especially improved sorghum varieties) are ready for harvest does not coincide with the time of performing traditional harvest ceremonies.

Households trends and strategies

Food security, income

Both communities indicated that the results of the quantitative survey on food security are an underestimation of reality. Participants from Tanchara stated that, although only a few, there are indeed some households in community 1 that are able to feed their families throughout the year and beyond. Community 2 said that respondents underestimated their level of food security because they did not want to be left out in case the project would offer any form of support for the needy.

When interrogated about coping mechanisms, community 1 indicated the sale of livestock in the first place (used to buy farm inputs, food and provide for household's needs), followed by borrowing of food and money (to buy food) and obtaining loans from 'susu' and Village Savings and Loans Associations (also known as VSLA groups)¹ (to buy food as well).

Assets and income

Both communities have indicated that their households are better off now than they were five years ago. Community 1 argued that in recent years many households have moved from having “very low” to having “low income”. This is a result of new livelihood programmes and strategies (especially the distribution of small ruminants, the formation of VSLA and the improved processing of agricultural production), and because more household members are contributing to the household income (sending remittances from other areas or working in the local informal sector, e.g. construction or trading). They see the increased number of phones among households in the “very low” category as a sign of improved living conditions.

The participants from Ko stated that now more households are food secure (able to feed themselves from own production) than before. Furthermore, the changes in housing style (more households now have houses with metal roofs and cemented walls and floors) are an indication of more wealth. This is all partially due to the fact that more households now have relatives that have gone through high education and are working in the formal sector, sending remittances back home. The participants also believe they have more assets now than before.

Trade-offs

The main trade-offs and synergies identified so far are:

- Trade-off: mechanised (tractor) vs manual land preparation
- Trade-off: use of improved vs traditional varieties
- Synergy: use of chemical fertilisers in combination with manure
- Trade-off: land use intensification vs extensification
- Synergy: FMNR and side-benefits from higher tree populations
- Trade-off: application of water conservation measures vs labour use

¹ A 'Susu' consists of a group of people in which each individual contributes with a certain amount on a regular interval, and in turns each member of the group can borrow the amount collected for his/her personal use. The individual only owes contributing to the other members of the group on the agreed time interval.

Village Savings and Loan Associations are saving schemes in which groups of people make regular contributions to common savings, in order to be able to take small loans from these savings when needed.

- Trade-off: road construction vs silting of water dam and streams

More details can be found in Annex 1, where the different aspects of each trade-off and synergy have been collected.

Difficulties experienced and action taken

One big challenge to the execution of this phase is that most of the participatory rural appraisal activities and semi-structured interviews are extensive and require a lot of time. Participants from both communities usually complained of tiredness after the first one hour into activities. Also, because of the limited time, some questions and responses lacked some deeper exploration. A solution must still be agreed upon, but some questions might be prioritised to ensure the most important information is collected before the participants lose interest and/or run out of time.

In the case of Tanchara, participation of community members was good, but questions had to be repeated and rephrased several times before they gave their responses. It emerged from their remarks after the interview that they thought these exercises were an indirect way of monitoring CIKOD’s project, and therefore they wanted to be certain before giving their response. After the team explained again that this is a separate study and that it will not be used to monitor nor evaluate any other project, the participants assured they would contribute more in the next exercises.

In some of the exercises, P2.4 for example, there seems to be a mismatch between some questions on the semi-structured interviews and the reporting format of key findings. Reviewing the semi-structured interview to focus on questions related to the key finding expected to be reported on, but giving room for probing, would be of help.

Regarding the work from the research team itself, the greatest difficulty is the overlapping of activities from the different projects in which they are involved – there is a strong competition for the very limited labour/working time available, as many activities are happening during this period. Moreover, farmers were often difficult to reach during this time, as they were participating in local events and ceremonies. The team is discussing the option of hiring external enumerators to support the activities of SITAM.

Way forward

In the next phases, the team hopes to address the difficulties experienced on the field. They hope that, with more personnel and with the participants having a better understanding of SITAM, they will be able to “dig deeper” and to explore further on gaps in the previous exercises, such as the ones listed in the next section.

Issues to explore further / follow-up

- Migration and working in non-agricultural sector (e.g. mining)
- If farmers were obliged to sell their crops quickly after harvest to be able to pay for tractor services, the whole family may be affected (lower income, less food secure). The question is whether the benefit from using tractors (in terms of timely land preparation) outweighs (in terms of increased production) the disadvantage (lower returns from sale due to early sale).
- Subsidies for tractor use – how do they work, and how many farmers (and who from amongst the case study farmers) are making use of them? Are there any farmers using tractor services by private / unsubsidised providers?
- In terms of cost per unit land, how do tractor services compare with hiring manual labour? And what is the difference in terms of timely land preparation?
- Is there a risk of farmers’ becoming indebted because they need to purchase fertiliser or other inputs? Has this happened to any of the case study households?

- Where farmers refer to seeds for new crop varieties being distributed: where did the seed come from (what organisation), and was it distributed free of charge, subsidised, or at cost?
- In the debate between intensification vs extensification: would it be feasible to combine intensive production of higher value crops (such as groundnut, sesame) with extensive production of staples?
- Would it be feasible to arrange support groups to work more efficiently on labour intensive tasks (e.g. seeding and weeding)? Do they already exist in the region?
- Are products from trees (especially from FMNR) being commercialised?
- Farming along water courses: what are the consequences (positive and negative)? The trade-offs are higher yields vs lower water availability for rest of the community and livestock. How does land ownership influence it? Which would be the options for a farmer whose entire land is located along a water course?

ANNEX 1: Trade-offs and synergies identified

Trade-offs and synergies in sustainable intensification – preliminary tracker for Ghana (based on P1 and P2)

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influenced by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
Implement use – mechanised vs manual land preparation	Trade-off: Tractors allow for fast land preparation, especially important when rains are erratic, or the season is shortened (late onset of rainy season) and can reduce labour needs. They also sow in line and can make ridges along the plants, improving soil water conservation and fertility. However, they are costly: farmers feel urged to sell their harvest fast (i.e. when market prices are low) to pay for tractor services.	Across domains: production vs financial burden	Tractor service providers; subsidies. Presence of soft soils in the farm (no need for mechanisation)	Wealth (enough to afford hiring tractor services) Presence of soft soils (can be prepared fast without using tractors). Rainfall	Positive OR negative effect on households making the decision: the benefits from using tractors might or might not outweigh the disadvantages of it (lower returns from rushed sales when markets are flooded and prices are low),	Would it be possible to introduce a delayed pay-back time for tractor use services? Would the government be able to cover for these expenses? Economic analysis of the cost of land preparation (i.e.: from how many ha on is it worth it to mechanise?) and of the revenues obtained when selling immediately after harvest. Functioning of subsidies; who access them, how, how many.	Engage with subsidy entities; form cooperatives of tractor service providers so that they can reduce their costs and work more efficiently. Strengthen farmer cooperatives so that they can hire tractor services at reduced prices?	Lack of spare parts; higher fuel prices; reduction in employment opportunities due to mechanization.	
	Trade-off: Fast land preparation, but cannot have trees on the land (which clashes against FMNR – farmer managed natural regeneration). Extra labour is needed to till areas under tree canopy.	Across domains: production vs environment	As above	As above, and whether the farmer actually has trees on his / her land, or intends to practice FMNR in the future	Positive: potentially higher yield due to timely land preparation (so farm household wins in short term), negative: compaction of soil , need to remove	How serious is soil compaction (and other effects on soil physical properties) from tractor ploughing? Is it possible to practice FMNR only on boundaries, or leave trees in rows?	Increased productivity could lead to increased biomass production overall, improving soil organic matter / soil physical	Poorer farmers may not be able to afford tractor services – so risk of increasing inequalities in the communities	

SITAM WORKING DOCUMENT: "INITIAL FINDINGS FROM HOUSEHOLDS CASE STUDIES" – GHANA

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influenced by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
					trees from land (the environment suffers – and the farmer in the longer term) Increases cost of land preparation In the case of soft soils, tractor ploughing puts unfertile soil on top of the upper, most fertile layer of soil.		properties (if managed properly)		
Input use – hybrid vs traditional seeds	Trade-off: Hybrid seeds use is increasing because its short maturity period matches up with short rainfall and high yield even when amount of rainfall is small. However, local varieties are sometimes needed for traditional ceremonies (especially those that mature at the same time as harvest rites take place), and are adapted to the local soil and climatic conditions (although these are changing).	Within domain (different technologies)	Seed sellers; market preferences. Availability of hybrid seeds nearby.	Climatic conditions; use of traditional varieties for festivities and ceremonies. Wealth (enough to afford hybrid seeds)	Positive OR negative effect on households making the decision?	Are farmers receiving advice on which hybrid varieties would suit their needs best? Are they aware of the value and importance of using their traditional varieties as well? Are there differences in the nutritional value of the different varieties and in terms of management needs (fertiliser, weeding etc.)	Ensure that there is a market niche (or own consumption) for both products, as well as reliable supply of hybrid seeds (development of economy). Improve post-harvest.	Increase in price of hybrid seeds; reduction in demand of local varieties; adverse climatic conditions (especially drought or flood) Potential risk of farmers' becoming indebted because they need to purchase fertiliser or other inputs.	
Input use – manure vs chemical fertilizers	Synergy: apply manure after ploughing to retain micro-organisms and improve soil fertility, then use chemical fertilizers to	Within domain (different soil management practices)	Availability of chemical fertilizers nearby.	Wealth (enough to afford chemical fertilizers)	Positive OR negative effect on households, depending on their decision.	HH have stated that they produce compost, but only at small scale: is their production enough? How reliable	Using both will gradually improve soil fertility and reduce dependency on	Decrease in labour availability for composting and applying	

SITAM WORKING DOCUMENT: "INITIAL FINDINGS FROM HOUSEHOLDS CASE STUDIES" – GHANA

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influenced by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
	increase yield. Fertilizer dissolves easily into the soil for plants absorption even with dew or short rain, but it hardens the soil. Manure requires long and good amount of rainfall to decompose well for plants absorption, but its use maintains the soil structure. The use of chemical fertilizers is increasing, but its benefits are only maximised when used in combination with manure.				Improvement in crop yields. Continuous/sole use of chemical fertilisers hardens soils.	is the supply of chemical fertilizers? What advice do farmers receive on how to use them? How feasible is compost production for farmers, considering they have limitations in terms of transport and water availability?	chemical fertilizers.	manure. Increase in price of fertilisers or reduction of their availability.	
Land use – Intensification vs extensification	Trade-off: households with large amounts of land would cultivate extensively, given the same amount of labour available, whereas households with less land need to intensify.	Across spatial scales	Land use/land tenure systems.	Availability of land and labour	Positive OR negative effect on households depending on their decision. Positive: potentially increase forest cover, grazing fields and fallow lands Negatively: decreases in forest cover, grazing fields and fallow lands. Increases erosion	Tenure systems? Sense of land ownership? How many hectares can a person comfortably manage? (break down by <60/>60, male/female, mechanised/not, intensive/extensive...); who are the hhs that have more land? (do we have any in our case study cohort?)	Arrange support groups to work more efficiently on labour intensive tasks (e.g. seeding and weeding)	Changes in tenure systems; pressure by land acquisition by externals (e.g. foreign companies)	
Protection of trees and forests – FMNR	Synergy: well managed trees and forests provide fuel, fodder and food, as well as shade for animals. Moreover, their leaves and	Within a domain	By-laws for the protection of trees and forests.	Labour availability	Households and communities; environment Improved soil fertility (long term).	Which species deserve especial protection? Are there potentially useful species (or uses) that the	Payment for ecosystem services; agroforestry.	Fire; changes in by-laws; changes in perception of	

SITAM WORKING DOCUMENT: "INITIAL FINDINGS FROM HOUSEHOLDS CASE STUDIES" – GHANA

Decision	Trade-off / synergy – description	Category	Influenced by (external environment)	Influenced by (other factors)	Who and how affected and how (+ or -)	Further to explore	Possible synergies / opportunities	Threats	Emerging recommendation
	roots can improve soil fertility to different degrees. (However: excess of trees can be an obstacle to mechanization – see above)				Negative: reduction of available farming area.	communities are not aware of? Have communities received training on FMNR? Do they exchange ideas with other communities in the region?		the importance of trees.	
Use of labour for water conservation measures (rather than for other activities)	Trade-off: although sometimes highly labour consuming (and hence competing with other uses of labour), water conservation measures can greatly increase soil water availability.	Across domains (inputs vs water availability)	Climatic conditions	Availability of labour and building material. Technical know-how. Willingness to apply SWC.	Households making the decision could benefit from more water availability. Other activities might suffer from competition for labour.	Are there rain harvesting infrastructures being built (for own consumption or for watering the homestead garden)? Why (not)? Do farmers take water availability into consideration when deciding which crop and variety to plant? Do they have information on rainfall (e.g. from meteorological services)? What else could labour used for SWC be potentially invested in otherwise?			
Road construction	Trade-off: Good roads make transport of goods and labour within community easier. However, as the sand is washed into water bodies, they lead to silting of water dam and streams.	Across domains		Availability of Government construction/development projects	Silting of water bodies leads to water shortage for dry season gardening and animal watering				

ANNEX 2: Notes from the exercises

Phase 1 – Exercise 1.1 - COMMUNITY 1: Tanchara, Lawra District

SITAM FIELD EXERCISES (COMMUNITY LEVEL) REPORT

Phase	1
Activity/Exercise	1
Activity Title	Community feedback on the main findings of the quantitative survey
Community	Lawra, Tanchara
Date	22 nd February, 2018
Time	11:30 am – 2:40 pm

The main aim of the activity was to validate the main findings of the quantitative study and also to discuss the effects of these findings on SAI, and to identify possible trade-offs and synergies. The main findings presented to the community were as follows in the categories in the table below.

Categories	Main Findings
Household Size and characteristics	Dependency Ratio
Land resources	Total farm size Farm size change (last 5 years)
Livestock	Cattle Small ruminants (mix of sheep, goats and pigs)
Crops grown, and amount produced	Overall value of crop produced Crops grown
Farming practices	Chemical fertilizer applied (kg/ha) Pattern of seed used Proportion of farmlands on which manure was applied Proportion of farmlands with zero/minimum tillage or mulch Proportion of farmlands with boundaries binds or tied ridges Proportion of farmlands with ridges or mounds Proportion of farmlands with FMNR
Income and credit	Number of income sources
Food security	Number of months households depend on self-production

Each of these findings were presented on flipchart with various groupings and their corresponding frequencies and tallies (a full tally bar represented 10 households).

In attendance were; the regent, nine (9) out of the ten (10) sectional heads, women, youth and some other community members. Though majority of the participants were men, some few women and youth were present as well. In total ten (10) out of the thirty-two (32) participants were women. It took 3 hours, 10 minutes to complete the exercise.

The table below shows the main findings discussed and community responses

Main findings	Community responses
Dependency Ratio	There was a general agreement among community members with this finding
Total farm size	There was a general agreement among community members with this finding
Farm size change (last 5 years)	There was a general agreement among community members with this finding
Number of cattle per household	Members agreed with this finding of the study
Number of households with combination of sheep, goats and pigs	Though some agreed, others disagreed, because they think every household keep at least one kind of small ruminants or pigs as a source of income
Overall value of crop produced	Disagreed because of low yield
Crops grown	They agreed with the proportion of households growing the different types of crops but, disagree with the proportion growing guinea corn. They argued that, though guinea corn is grown in small quantities on small proportion of land, almost every household grow it for funerals and other traditional rites/purposes.
Chemical fertilizer applied (kg/ha)	They agreed with the finding
Pattern of seed used	They agreed with the finding
Proportion of farmlands on which manure was applied	They agreed with the finding
Proportion of farmlands with zero/minimum tillage or mulch	They agreed with the finding
Proportion of farmlands with boundaries binds or tied ridges	They agreed with the finding
Proportion of farmlands with ridges or mounds	They disagreed with the finding and argued that, apart from groundnut farms/plots, other plots are mostly ridges or mounds especially yam and maize farms/plots
Proportion of farmlands with FMNR	They disagreed with the finding and said that though some people might not be practicing it, majority practice some form of FMNR on their individual farms
Number of income sources	They agreed with the finding, but said their main sources of income are sale of agriculture products (crops and livestock)
Number of months households depend on self-production	They generally agreed with this finding but disagreed on the number of households having surplus food after 12 months. They said, some households do still have food from self-production after 12 months though very few households

Farm size change (last 5 years)

Why the observed pattern (majority of households decreasing their farm size in the last years) and factors influencing this decision?

- Less available farm labour
- Less availability of manure
- Shorter rainfall
- Family size
- More infertile lands
- Number of cattle per household

Livestock

Why the observed pattern of very few households owing cattle?

- Loss cattle due to theft
- Less land for grazing

Because of this, they do not use cattle to plough their farms. They agreed that, ownership is a sign of SAI because of the below stated points;

- Manure
- Source of income to buy farm inputs, hire labour
- Available animal for ploughing (less expensive to hired labour and other methods)

Effect on SAI in terms of production

- Expansion of land under cultivation
- Ability to easily convey manure to farm
- Ability to easily convey harvest home and residues as well for composting

Number of households with combination of sheep, goats and pigs

Extent to which ownership of sheep, goats and pigs reflect SAI

- Manure
- Source of income to buy farm inputs, hire labour
- Influence households in deciding whether to invest or sell livestock
 - Shortage of food (sale)
 - Households need (sale)
 - Surplus food (investment)
 - Traditional rites purposes (investment)

Chemical fertilizer applied (kg/ha)

Why the observed pattern of fewer households using it?

- Use of manure
- Cost of it
- Less available fund to buy it

Crops on which it is applied: All except Bambara beans and beans, but much application is on maize. There is also an indirect use of it by deliberately applying on maize plot and planting millet, sorghum and groundnut the following year.

Condition under which chemical fertilizer is used:

- Less fertility of lands
- The pattern and among of rainfall (less or shorter or irregular rainfall)
- Perception of increase in yield

Effect on environmental dimension of SAI

- Kills micro-organisms
- Harden soil
- Increases temperature of the soil

NB: Possible synergies on fertilizer, manure and crop rotation

- Use of manure after ploughing to keep micro-organisms in the soil and then apply fertilizer after weeding to increase yield
- Apply fertilizer on a plot and then plant a different crop the following year without applying fertilizer for high yield and to maintain micro-organisms in the soil.

Manure

Effect of manure on SAI: There was an argument that, manure alone cannot give good yield. They argued that, the use of manure required much time and enough rainfall to be effective.

Hybrid seed

Factors influencing decisions to use hybrid seeds:

- Mature faster than local seed (short maturity period) which reduces the hunger gap/lean season

- High yield
- Require less manure

Effect on social dimension of SAI

- The use of fast maturing improved/hybrid seeds (for example, sorghum) does not conform to the time of performing traditional rites to permit harvest of crops.
- Seeds harvested from improve/hybrid crops are not good enough for the next farming season decrease yield from them. Which means, every year, they have to buy new seeds from the market

Factors influencing the decision to use local or hybrid seeds

- Lean season: Because the lean season is severe in the rainy season, it influences on whether they should plant hybrid seeds for early maturing to reduce the hunger gap or local which takes a longer period to mature for harvest increasing the gap.
- Traditional rites: They decide whether to plant hybrid seeds which would mature early, but they would be unable to harvest until the tradition rites are performed or to plant local seeds which maturity period matches with the traditional rites.
- Seeds for planting in the next season: Harvested seeds from hybrid are most often not good to store for the next farming season. So, they therefore decide whether to use local seeds which harvest can be store for the next planting season or to use hybrid seeds and have to buy again the next season.

Food security

Coping mechanisms:

- Sale of livestock to buy farm inputs, food and provide for household's needs
- Borrowing of food and money, but mostly money to buy food
- Obtain loans from 'susu'/VSLA groups to buy food

Phase 1 – Exercise 1.1 - COMMUNITY 2: Ko, Nandom District

Phase	1
Activity/Exercise	1.1
Activity Title	Community feedback on the main findings of the quantitative survey
Community	Nandom Ko
Date	14 th February, 2018
Time	3:30 pm – 5:05pm

In attendance at the meeting were all the section heads, the Assemblyperson of Ko, about 43 women, 56 men and 23 youth.

The main aim of the activity was to validate the main findings of the quantitative study and also to discuss the effects of these findings on SAI, and to identify possible trade-offs and synergies. The meeting lasted about 1hour, 35minutes. The main findings presented to the community were as follows in the categories in the table below. Insert the duration of the community meeting

Category	Main Findings
Household Size and characteristics	Household Size Dependency Ratio
Land resources	Total farm size Duration Fields are cultivated
Livestock	Cattle Small ruminants (mix of sheep, goats and pigs)
Crops grown, and amount produced	Crops grown
Farming practices	Chemical fertilizer applied (kg/ha)

Category	Main Findings
	Proportion of farmlands on which manure was applied Proportion of farmlands with FMNR
Income and credit	Number of income sources
Food security	Number of months households feed on self-production

Each of these findings was presented on flipchart with various groupings and their corresponding frequencies and tallies (a full tally bar represented 10 households).

The table below shows the main findings discussed and community responses.

Table 2

Main findings	Community Responses
Household Size	There was a general agreement among community members with this finding
Dependency Ratio	There was a general agreement among community members with this finding
Number of Livestock owned (goats, pigs and sheep)	Community members agreed with the finding
Number of cattle per household	Community members first disagreed then later on agreed though reluctantly after explanations of the sampling done during the quantitative survey. They mentioned that some of the respondents understated the number of livestock they owned for the fear of being taxed. The implication being that livestock ownership could be slightly above what the survey captured.
Proportion of land on which manure is applied	Community members agreed to this finding
Amount of Inorganic fertilizer applied (Kg/ha)	They agreed to this finding
Crops grown	Community members validated this finding
Total Farm Size	They agreed with the finding
Food Security (Number of months households are able to feed from self-production)	Community members disagreed with this finding saying that respondents underestimated their level of food security because they did not want to be left out in case there was any form of support for the needy.
Duration fields have been cultivated	They agreed with the finding
Proportion of farmlands with FMNR	They disagreed with the finding and said that though some people might not be practicing it, majority do it on their individual farms
Number of income sources	They agreed with the finding

A general question was asked to seek community members' opinions on the key findings presented to them taking into consideration Sustainable Intensification of Agriculture.

Community members gave various answers that suggests that though they do not have the capacity to produce manure on greater scale, they are doing it on the little scale.

They are also practicing FMNR on their individual farms.

Community members also revealed that in situations where inorganic/chemical fertilizers are used, they are not used in isolation but are supplemented with manure. They are also not used every year on the same plot of land.

In summary, community members in their opinion are practicing Sustainable Intensification of Agriculture.

Phase 1 – Exercise 1.2 - COMMUNITY 1: Tanchara, Lawra District

Phase	1
Activity/Exercise	2
Activity Title	Community Analysis of Key Findings with respect to Sustainable Intensification of Agriculture
Community	Lawra, Tanchara
Date	1 st March, 2018
Time	11:10 am – 12:25 pm

The objective of this exercise is to;

Deepen the analysis of selected key findings of the quantitative HH survey, with respect to SIA.

Deepen the explore community perceptions of factors influencing decisions relating to sustainable agricultural intensification, the trends in SIA reflected in differences in farming system across farm households.

Three (3) selected key findings were presented to the community as explained in the two tables below

	Variables	Method of rating	Category
Asset rating	Rooms, bicycles, motorbikes, cart, phone, TV, tricycle, gun and sewing machine	All assets were sum-up. The total number of item/assets the household has was used for the rating as shown in the next column. Reason: we observed the number of households' asset have equal corresponding with the value of these assets	Very low (1 – 2 households assets) Low (3 – 5 households assets) Medium (6 – 9 households assets) High (10 – 14 households assets) Very high (15+ households assets)
External inputs rating	mechanisation and inorganic fertiliser hybrid seed was part of the discussion but not because it was insignificant to influence it	Inorganic fertilizer was the major determinant of the rating because the level of mechanisation among households were in close range and the number of households using hybrid seed were insignificant to influence the rating order wise	Very low (0 – 10 kg/ha) Low (10 – 30 kg/ha) Medium (30 – 50 kg/ha) High (50 – 90 kg/ha) Very high (90+ kg/ha)
Adoption of environmentally friendly techniques	Manure, boundary bunds or tied ridges, mounds or ridges, zero/min tillage or mulch and FMNR	At least, one technique or none at all	Yes – at least one technique No – no technique used

In presenting each of these, the variables under each were read to them and the method categorization.

In attendance were; the regent, sectional heads, women, some other community members. There were ten (15) participants in all. Out of this number, nine (9) were men and six (6) were women.

External Input Rating	Very High	30	61	14	47	52
	High		22, 49	12	74, 2	
	Medium		11, 72	13, 76, 26, 51, 9, 8	23, 15	10, 48
	Low	1, 57	20, 21, 38, 39, 70, 53, 62, 4, 63	33, 44, 81, 79, 71, 69, 32, 64	68, 16	
	Very low	7, 59, 43, 19, 67, 46, 3, 28, 18	40, 5, 25, 24, 58, 6, 65, 80, 60, 45, 35, 27, 55, 54, 41, 56, 73	29, 31, 75, 34, 42, 36, 37, 66	17, 50, 77, 78	
		Very low	Low	Medium	High	Very High
		Asset Rating				

The numbers in the table represents the households that were interview during the quantitative study. This matrix was drawn based on the rating of their asset (on the vertical) and use of external inputs (on the horizontal). Households that use no environmental friendly technique are the ones coloured in red.

The table below shows the main findings discussed and community responses

Main findings	Community observation
Asset rating	Rating reflect the possession/ownership of asset of households in the community
External inputs rating	Reflects pattern of use of external inputs by households
Adoption	

Trends over the last 5 years

Assets – It is the same pattern in all the other categories except “very low” and “low”. They argued that 5 years ago, households in “very low” were more than households in “low” category. Their reasons are that (1) there are now available livelihood programmes/strategies, and (2) more households members are contributing to the household income.

This is to say that, higher number of households is recorded in the low category because of the following reasons stated above. They think that, the observed increase in the number of households’ members in the “very low” category having phones in an indicator of the change.

Use of external inputs – increasing pattern of households using fertilizer, tractor and hybrid seeds since the last 5 years. The major factor influencing their decision on using these external inputs is rainfall. Because of the irregular pattern and short period of rainfall, they use these external inputs to catch-up with the season. These are considered to be fast and easily adapt to the rainfall pattern than compost/manure, labour and local seeds.

The following decisions (trade-offs) were identified and are influenced by the amount and pattern of rainfall.

Labour vs tractor

Tractors are used because of irregular rainfall to plough fast before the land dry up and also because of short rainfall period in order to catch up with the farming season.

Local seeds vs hybrid seeds

Hybrid seeds use is increasing because its short maturity period matches up with short rainfall and high yield even when amount of rainfall is small.

Manure vs fertilizer

Fertilizer dissolves easily into the soil for plants absorption even with dew or short rain, however, manure requires long and good amount of rainfall to decompose well for plants absorption. The use of fertilizer is increasing.

Adoption of techniques –the number of households that are adapting techniques has increased steadily over the last 5 years.

Intensification of farming practices

Community members' response on households farming practices becoming less or more intensive was 50/50. This is so because they retain their soil nutrients and water by practicing water and soil conservation techniques and on the other hand uses fertilizer and improved/hybrid seeds for short term good yield.

Sustainability of farming practices

On whether their farming practices are becoming more or less sustainable, they stated that, rainfall is the major determinant.

Synergies/Complementarities identified:

Use of tractor services to plough fast, sow in line and make ridges during weeding and earthen-up to conserve water and soil fertility.

Applying manure after ploughing to retain micro-organisms and improve soil fertility, then use fertilizer to increase yield.

Observation

Participation of community members was good, but questions were repeated and rephrased several times before they gave their responses. It came out from their remarks after the interview that, they thought it is an indirect way of monitoring CIKOD's project and they wanted to be certain before giving their response. Though we explained to them early that this was a study, we repeated it again and assured them it was not a monitoring technique to be used in evaluating any of the project implemented there.

Phase 1 – Exercise 1.2 - COMMUNITY 2: Ko, Nandom District

Phase	1
Activity/Exercise	2
Activity Title	Community Analysis of key findings in respect to Sustainable Intensification of Agriculture
Community	Ko, Nandom
Date	22 nd February, 2018
Time	3:35 pm – 4:50pm

Participants

The Assembly Man, Heads of all the sections, about 28 women, 34 men and about 12 youth were present during the activity.

Procedure used

The indicators of the various variables (Assets, External Inputs and Adoption) were put together and scales designed to categorize households into very low, low, medium, high and very high in the case of assets and external input usage. Indicators such as the number of rooms, bicycles, motorcycles, TV sets etc. were put together to measure the assets of a households. Similarly, mechanization, inorganic fertilizers and type of seed (hybrid seeds) were also put together to measure the level of usage of external inputs of households. In the case of adoption, the various soil water conservation practices, inorganic manure usage and FMNR were used to check if households were used.

Different colour cards were then used to represent different categories of the scales and the households that were adopting and those that were not. The cards were then pasted on a big brown sheet and presented to community. It should be mentioned that the various steps were carefully explained to community members to ensure that they all understood the process very well.

Visual

External Input Rating	Very High	142, 129		147	106, 99	
	High		149, 98	139, 114, 145	110, 89	136, 93, 150
	Medium		107	102	148, 116, 135	119
	Low		85, 111, 94, 96, 131, 86	109, 88, 104, 87	144, 120, 92	118
	Very low	125, 115, 132, 101, 113, 140	91, 100, 97, 134, 112, 90, 105, 130, 137, 139, 143, 133, 117	124, 141, 121, 108, 84, 123, 95, 127, 146, 83, 126, 128, 122	82, 103	
		Very low	Low	Medium	High	Very High
		Asset Rating				

Main Findings

Assets

Community members believe they have more assets now than before. This is because more Households are food secure now (are able to feed themselves from self-production) than before. More households have relatives that have gone through high education and working in the formal sector thus remitting them back home. Furthermore, the changes in housing style (more households now putting up houses roofed with iron sheets and cemented walls and floors is an indication of more wealth.

Factors influencing Change in external input usage

The type of soil (softer or harder, more or less fertile) influence the external inputs used. Neither do soft soils need tractor ploughs nor do fertile soils need mineral fertilizers.

Rainfall patterns are also influencing the type of crops cultivated. Specifically, more farmers are now concentrating on the cultivation of early maturing crops.

Intensification of Farming Practices

Community members were not conclusive as to whether the farming practices were more or less intensive. They mentioned that varying asset levels (particularly) land influenced how intensive or otherwise a household could be. Households with larger lands extensify rather than intensify. Similarly, households with less land intensify rather than extensify.

Sustainability

There was no direct response to sustainability.

Phase 2 – Exercise 2.1 - COMMUNITY 1: Tanchara, Lawra District

Phase	2
Activity/Exercise	1
Activity Title	Community Physical Map
Community	Lawra, Tanchara
Date	16 th April, 2018
Time	8:51 am – 11:10 am

Objectives of the exercise

The main objectives of this exercise are as follows; produce a physical map of all the village land or territory, identify all the natural resources available to the community, and understand trends in quality and quantity of key natural resources over time.

Composition of participants

In total, six (6) people from six (6) out of the ten (10) sections of the community participated in the exercise. There were three (3) members of each gender. Each participant has a fair idea of at least two sections of the community.

Process of drawing the map

The map of the community was first drawn on a floor using different objects to represent various physical features of the community. The map was drawn by first indicating major road of the community using chalk, then the ten (10) sections with sticky note pads. A masking tape was used to join two (2) sticky notepads together indicating that, the section of the community is on two (2) sides of a major road. Other objects were used to represent various physical features of the community.

Categories	Main Findings
Roads and trails	Two parallel lines drawn with chalk
Sections	Sticky notepads
Hills	Stones
Forest, fruit trees	Leaves
Bush areas, communal fallow lands, grass for thatch roof, grazing fields	Dry grass
Streams	Sticks
Farmlands	Soil
Dam	Stick forming a box
Wells	Circles drawn with chalk
Boreholes	Drawn with chalk

After this, the map was then drawn on a craft brown paper with markers.

Community physical features related to farming

The community shares boundaries with Pavuu and Tongo to the North, Babile to the South. To the East are Daru and Guru and the West is Kunyuokuo. It has different soil characteristics namely "tansegla" (closely related to loamy soil) in Gbelinkaar, Susu and Ko sections to the north. "Tanzie" (good for construction) is found in Tanchara Pere and Saazu to the north-western part. The soil in the southern part is "tanbiire" (sandy soil) covering part of Tanchara Pere, Tanchara Saazu, Dangne, Deboziiri sections. To the East is "yara" (clay soil) covering Koro 1, 2 and 3.

Almost the farm lands are located close to their settlements in each section. They virtually do not have far away bush fields. The major reason accounting for this is the reducing households' farm labour due to migration. Less available manure to apply on these fields also play a part, but minor.

Though the fertility of their fields has reduced, land degradation is not that widespread and severe except small portions of Koro. Because of the concentration on home fields, there are more bush fallow lands which are increasing trees cover areas. As a result of this, there is an increase in the overall number of trees especially young ones in the community. The number of the trees on there are also increasing through the introduction of the Farmer Managed Natural Regeneration (FMNR) and by-laws on indiscriminate cutting down of trees.

Coupled with protection through community by-laws, the concentration on home fields helps increase grazing/pasture areas and improve on their quality. But, livestock are restricted in the rainy season and allow to browse freely in the dry season. They are most often found grazing in the areas between Tanchara Pere and Susu, Koro No. 2 and Gbelinkaa, and Koro No. 3.

In terms of the presence of surface water, there are two streams running through all the sections of the community. However, these easily dry up shortly after the rainy season.

There are only small rocky areas located around the Koro part of the community.

Trend of selected natural resources

The change in the quantity and quality of some selected natural resources were assessed by participants over the last 10 years. The table below shows their assessment for each and their reasons to back such assessment.

Trends in Natural Resources	Changes in quantity and quality over last 10 years	Reasons for these changes (causes)
Bush fields	Reduced	Less application of organic matter especially, cow dust. Bush burning Erosion
Home fields	Same	Constant application of compost/manure
Forest/bush	Reduced	Cutting down of trees Bush burning
Density and type of trees on farm land	Increase	FMNR
Highly degraded land no longer farmed	Increase	
Pasture areas	Increase	More fallow lands due to less farm labour
Firewood source area	Increase	Though available, there is a decrease in the quantity a woman can harvest because of by-laws
Water bodies (streams)	Reduced	Rainfall pattern (less rainfall)
Fruit trees	Reduced	Cutting down for charcoal

It was identified that, the number of household farm labour and the quantity of compost/manure available influence the decision on the size and number of farms the household should concentrate on.

Fewer households' farm labour – concentration on home fields – more fallow bush fields – increase in the number of trees and areas it covers.

More households' farm labour – expansion to bush fields – less fallow fields – less area covered by trees.

Phase 2 – Exercise 2.1 - COMMUNITY 2: Ko, Nandom District

Phase	2
Activity/Exercise	1
Activity Title	Village Physical Map
Community	Nandom, Ko
Date	19 th April, 2018
Time	3:22 pm – 5:46 am

Participants

Eight (8) community members participated in drawing the village physical map. Out of this number, six (6) were males and two (2) were females.

Village physical features

The relief of Ko could be described as undulating with a couple of hills with popular one called the "Yesu Tang" literally meaning the Jesus' Hill and low-lying areas around. The community has no specific grazing field except the area around the Yesu tang. There is one forest and a relatively dense tree population in individual farm fields. The most common trees that can be found in Ko are dawadawa, shea trees, ebony trees and yellow berry trees. Home fields are located around the houses. The home fields are immediately joined by bush fields thus making it difficult in some cases to distinguish between home and bush fields. The land of the community is characterized by loamy soil (Tensepla) around Domagye, Red soils (Tenzie) around Zimoper, and sandy soil (Tenbiire) around Tokuu. There is also a dam and a stream in Ko where animals drink from.

P2.1: TRENDS IN NATURAL RESOURCE	Changes in quantity and quality over last 10years	Reasons for these changes (causes)
Hills	Quantity still the same Quality reduced	The same number of hills still exist Quality reduced due to Continuous tree felling Population increase Settlements on and around the hills Farming activities Bush burning and continuous hunting activities
Dam	Quality better because it used to be a small stream before it got reconstructed into a dam	Can now hold water all year round after small stream was reconstructed into dam
Forest	Quality and quantity reduced	Settlements in and around the forest area led to the felling of trees Farming activities around the forest have led to depletion

P2.1: TRENDS IN NATURAL RESOURCE	Changes in quantity and quality over last 10years	Reasons for these changes (causes)
Grazing fields (Same area around the Maria Hill)	Quantity the same while quality has reduced	Quality reduced due to Continued tree felling Population increase Settlements in and the grazing field Farming activities Bush burning and continuous hunting activities
Home and Bush fields	Quantity and quality fields reduced	Population increase Continuous cultivation reduced soil fertility Adopting tied ridging and SWC practices to improve the situation
Streams	Quality and quantity reduced	Low rainfall Farming activities (tractor ploughing) Road construction Bush burning left soils bare and easily eroded into streams making shallow and easy to dry up

Phase 2 – Exercise 2.2 - COMMUNITY 1: Tanchara, Lawra District

Phase	2
Activity/Exercise	2
Activity Title	Trend in Community Environmental Resources
Community	Lawra, Tanchara
Date	17 th April, 2018
Time	9:14 am – 11:30 am

Objectives

The main objectives of this exercise are as follows;

- Determine the evolution of the quality and quantity of natural resources of the village over the past ten years.
- Assess the main causes and factors influencing these trends, with a particular focus on how exploring how these factors affected, (or were affected by) decisions made by the household concerning their farming system.

Composition of participants

Six (6) women and four (4) men made up the number of participants who took part in the exercise. Though the number increased, all the six (6) people who took part in the first exercise (P 2.1: Community Physical Map) were present.

Method of carrying out the exercise

Participants were asked to discuss and select the best time period of each of the natural resources in the check list below. The time periods were; "Today", "5 years ago" and "10 years ago". It was first carried out on the floor before been transfer to a brown craft paper. A score of "10" indicates the best period of the resource in terms of quality and quantity. Nine (9) points are then distributed between the two remain periods based on the participants assessment.

Below is the check list that was used:

- home fields
- bush fields
- Seeds

- trees on crop lands
- forest/bush areas
- Firewood
- Roofing poles
- Wild fruits
- water sources (streams, brooks, wells)
- communal fallow lands
- pasture area
- Grass (for thatch, mats)
- livestock (cattle)
- Livestock (small ruminants)
- Poultry
- Compost/manure

The table below shows the natural resource and its corresponding reason for rating.

Natural Resource	Today	5 years ago	10 years ago	Reason for rating
Home fields	4	5	10	Low yield
Bush fields	3	6	10	Low yield and less application of manure
Seeds	3	6	10	Less use of indigenous seed and extinction of some through the effect of rain on production and the introduction of improve seeds
Trees on crop lands	10	6	3	Constant pruning (FMNR)
Forest areas	10	8	1	Less cutting down of trees because of community by-laws
Firewood	10	1	8	FMNR
Roofing poles	10	7	2	
Wild fruits	10	6	3	
Water sources (streams, brooks, wells)	1	8	10	Easily dries up
Communal fallow lands	10	5	4	More concentration on home fields due to reducing households' farm labour
Pastures	2	7	10	Bush fires
Grass (for thatch, mats)	1	8	10	Bush fires
Livestock (cattle)		9	10	Due to theft
Livestock (small ruminants)	10	6	3	Support from NGOs, households focusing on small ruminants because of loss of cattle, increasing number of women owning some.
Poultry	2	7	10	Constant outbreak of diseases and lack of veterinary services
Compost/manure	3	6	10	Lack of cattle

The rating for these natural resources as indicated in the table below shows the ones that are improving, the ones degrading and the reasons for the change over these time periods.

Natural resources that are improving	Reasons for positive change
Trees on crop lands	Constant pruning (FMNR)

Forest areas	Less cutting down of trees because of community by-laws
Firewood	Constant pruning (FMNR)
Roofing poles	Less cutting down of trees because of community by-laws
Wild fruits	
Communal fallow lands	Reducing households' farm labour
Livestock (small ruminants)	Support from NGOs Households focusing on small ruminants because of loss of cattle Increasing number of women owning some
Natural resources that are degrading	Reasons for negative change
Livestock (cattle)	Due to theft
Seeds	Less use of indigenous seed and extinction of some through the effect of rain on production and the introduction of improve seeds
Poultry	Constant outbreak of diseases and lack of veterinary service
Grass (for thatch, mat)	Bush fires
Water sources (streams)	Less rainfall, siltation through erosion because of bush fires and farming along it
Bush fields	Less application of manure, bush fires

Practices that affected (changed) the natural resources.

The practices under the control of the community members that affect change in the natural resources are FMNR, by-laws against indiscriminate cutting down contributes positively to the change, whilst bush burning (though there are by-laws) and farming along water bodies contributes negatively.

Trade-offs related to the environmental sustainability dimension

Through the setting of bush fires to hunt for bush meat, farmers are trading off the soil fertility for bush meat. (Burning the bushland not only leaves the top soil exposed so it is easily washed away, but also kills microorganisms, both effects leading to low soil fertility).

Though they are increasing their yield by farming along the streams, they are contributing to the drying up of these streams.

They also decide either to continually prune trees and reduce bush fires to improve soil fertility in the long run or continually dependent of chemical fertilizer.

Phase 2 – Exercise 2.2 - COMMUNITY 2: Ko, Nandom District

Phase	2
Activity/Exercise	2
Activity Title	Trends in Community Environmental Resources
Community	Nandom, Ko
Date	23 rd April, 2018
Time	1:10 pm – 3:24 pm

Participants

The of composition of six (6) men and two (2) women that participated in drawing the village physical map were the same people who carried this activity.

Natural Resources that are improving	Reasons for positive changes
Trees	We could see houses and other objects from far distances Increased practice of tree growing and planting Byelaws to prohibit the felling of trees formulated and implemented The existence of fire volunteers
Farm Fields	Increased population has brought about increase in human resource/farm labour Increased need for other resources especially financial resources to cater for school fees and other household financial needs
Human Resources	Education has resulted in the increase in skilled professionals from all fields
Forest	We could see houses and other objects from far distances Increased practice of tree growing and planting Byelaws to prohibit the felling of trees formulated and implemented The existence of fire volunteers
Natural Resources that are degrading	Reasons for negative changes
Dam	10 years ago, there used to be larger volumes of water in the dam and all year round which is not the case today Low levels of rainfall Farming and construction activities around have made it easy for soils to be eroded into the dam making it shallow
Hills	10 years back, there used to be a lot of grasses, trees and wild fruits for that matter and bush animals on the hills Bush fires and indiscriminate tree felling on the hills have led to the degradation of the hills in the community The construction of houses for the purpose of settlements on and around the hills has also compromised the quality of hills in Ko
Livestock/Animals	Because a lot of people want to get rich quick, they have stolen almost all our livestock Livestock disease outbreaks are common today thus killing a number of livestock in the community
Streams	10 years ago, the volumes of water in our streams used to be higher Farming and road construction makes it easy for rains to erode soil into the streams
Seed (Indigenous Seed)	Changing/worsening rainfall pattern have led to the gradual loss of indigenous/local seed. Rainy season sets in late and ends early thus the need for earlier maturing seeds
Compost/Manure	Lack of livestock have made it difficult for compost to be produced Only crop residues and leaves from trees are available which are not sufficient for rich and larger volumes of compost production Compost preparation is highly labour intensive
Soils	Bush burning have left soils bare and easy to erode The high usage of chemicals (weedicides) has compromised the quality of soil Chemical fertilizers harden soils
Rainfall	Delays in the starting of the rainy season Rainy season is now shorter than it used to be
Sunshine	Sun does not shine so much in recent times due to the existence of forest and the increased tree density in the community.

Worth Noting

Though community members rated that there are more human resources today than 5 and 10 years back, they are of the opinion that people die much younger in recent times than before. Furthermore, they believe that the death rate is high in recent times than it used to be.

Phase 2 – Exercise 2.3 - COMMUNITY 1: Tanchara, Lawra District

Phase	2
Activity/Exercise	3
Activity Title	History and Sources of Agricultural Technical Services and Inputs
Community	Lawra, Tanchara
Date	18 th April, 2018
Time	9:20 am – 11:30 am

Objectives of the exercise

The main objectives of this exercise are as follows;

- Identify the nature, type and source of agricultural technical support received by households in the community
- Determine how this support has changed over time, and why.
- Assess the positive and negative effects of this support, including on sustainable intensification

Composition of the participants

Eight (8) community members participated in this exercise. Four (4) of them were men and the other four (4) women. Each came from different section of the community. The number includes the six (6) people who participated in the community physical mapping.

These participants were asked the type of support they received, the sources and the proportion of households benefiting from the support. The table below shows the details of each of the support they received.

Type of Agricultural Support	Source of Support	Proportion of Households Benefiting
Awareness Raising	CIKOD and RESULTS	Few
Training/Follow-up		
Compost making	CIKOD and MoFA	Few
A/E techniques	CIKOD and MOFA	
FMNR	CIKOD	
Sowing in lines	RESULTS	
Improved Seeds		
Groundnut	RESULTS	Some
Maize		
Soya		
Chemical Fertilizer	RESULTS and MOFA	More
Herbicides/Pesticides	MOFA	More
Agricultural Credit	-	-
Tractor Services	RESULTS	Few
Veterinary Services	-	-

Changes in the support services and inputs over time

Few people were the direct beneficiaries, but there has been widespread of the adoption because of (i) sharing among farmers, (ii) observed increase in yield, improvement in the soil fertility and number of trees both on the fields and in the bush.

Positive and negative effects on sustainable intensification

Positive effects:

Increasing soil fertility

crop diversification (introduction of soya)

empowering women

Negative effects:

Loss of indigenous seeds,

increasing dependency on improved seeds, fertilizer and tractor services

These agricultural technical support services contributed to changes in farming practice or resource management in the method of land tillage, method of sowing, pruning of trees and enactment of community by-laws on indiscriminate cutting down of trees and bush burning. The changes are helping in increasing soil fertility, water on fields for crops, and seeds available to match with the rainfall pattern and improve yield.

Trade-offs and synergies

The following decisions were made as a results of the availability of new types of agricultural inputs and technical support. However; rain, cost, yield, soil nutrients, time and effort were equally taken into consideration.

Trade-offs

- Local seeds vs improved/hybrid seeds
- Compost/manure vs fertilizer
- Random sowing vs sowing in lines (the latter involves forming ridges along the planting lines, which improves water and nutrient conservation)
- Multiple seeds per hole vs a single seed per hole (farmers obtained higher yields when planting one seed per hole because of the reduced competition among seedlings)
- Cost of hiring labour vs cost of tractor service

Synergies

They use both chemical fertilizer to increase yield in the short term and compost/manure to maintain soil fertility for a long-time solution

They also develop synergies by ploughing with tractors to meet the rainfall, sow in lines and then form ridges during weeding and earthen-up to conserve water and soil nutrients.

Phase 2 – Exercise 2.3 - COMMUNITY 2: Ko, Nandom District

Phase	2
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Activity/Exercise	3
Activity Title	History and Sources of Agricultural Technical Services and Inputs
Community	Nandom, Ko
Date	24 th April, 2018
Time	12:56 pm – 3:54 pm

Participants

The same community members who carried out the first two exercises (P2.1 and P2.2), participated in this exercise.

Findings

Community members basically have the perception that the form of agricultural technical support they have received over the past 10 years has not really changed. For instance, input support has always been in the form of subsidizing fertilizer which means community members make a deposit of some cash in order to access them. The lack of substantial change in these agricultural technical support services could also be partly due to the fact that some of the technical support systems came in rather recent times. Most of CIKOD's technical supports are only about 5 years now.

When asked about how these technical supports have influenced their farming practice, participants revealed that their way of land tillage has changed as a result of some training they have received. They used not to practice tied ridging or bunding (soil water conservation practices) but now they do, kind courtesy training and follow up trainings. Furthermore, they now practice row planting which they consider as more convenient.

According to the participants, the effects of these technical support systems depend largely on how one applies them. For instance, pruning trees without checking the tree population may result in the development of a mini forest on one's farm meaning there will be too much shade which will intend affect some crops negatively. On the other hand, trees provide some fruits and fuel wood for domestic use. Dry leaves that fall on farms eventually decompose and improve the nutrients of soils. Similarly, the application of fertilizer has the tendency of hardening the soil of one's farm. However, integrating fertilizer with compost/manure helps keep soil softer. According to them, integrating compost and chemical fertilizer increases yield than applying only chemical fertilizer or compost.

Phase 2 – Exercise 2.4 - COMMUNITY 1: Tanchara, Lawra District

Phase	2
Activity/Exercise	4
Activity Title	Community Feedback on Trend and Influences on Farming Systems
Community	Lawra, Tanchara
Date	19 th April, 2018
Time	9:45 am – 12:00 am

Objectives

The main objectives of this exercise are as follows;

- Verify and deepen data from Physical Map (P2.1), Trends in Environment (P2.2) and History and Sources of Technical Services and Support (P2.3)
- Review and discuss the key findings from these exercises, with a particular focus on the emerging list of trade-offs and synergies obtained from each

Composition of the participants

There were twenty-five (25) people who participate in this exercise, though we initial started with a lesser number. They included eight (8) sectional heads. Twelve (12) were men and thirteen (13) women. All those who participated in all the first three (3) exercises were also present.

Community Feedback on Trend of Natural Resources

Trends in Natural Resources	Changes in quantity and quality over last 10 years	Reasons for these changes (causes)	Community Feedback
Bush fields	Reduced	Less application of organic matter especially, cow dust. Bush burning Erosion	All Agreed
Home fields	Same	Constant application of compost/manure	14 agreed but, 7 disagreed because of the use of tractor which turned compost/manure applied upside down and improve seeds, and low yield
Forest/bush	Reduced	Cutting down of trees Bush burning	4 agreed, but 16 disagreed because of protection and education form CIKOD and forestry commission
Density and type of trees on farm land	Increase	FMNR	All agreed
Highly degraded land no longer farmed	Increase		After discussing, all agreed there is a reduction because of the number of years they been allowed to fallow. Most of the fields that are not farm is because of labour not due to degradation.
Pasture areas	Increase	More fallow lands due to less farm labour	8 agreed because they do not take their livestock to far distance for grazing 12 disagree because of more home fields
Firewood source area	Increase	Though available, there is a decrease in the quantity a woman can harvest because of by-laws	All agreed. They also added FMNR as one of the reasons for its increase
Water bodies (streams)	Reduced	Rainfall pattern (less rainfall)	All agreed, but added erosion due to bush burning and farming practices

Fruit trees	Reduced	Cutting down for charcoal	All agreed that only shea and dawadawa are decreasing, but the other are on the increase.
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Community Feedback on Rating of Natural Resources and Reasons

Natural Resource	Today	5 years ago	10 years ago	Reason for rating	Community Feedback
Home fields	4	5	10	Low yield	All agreed
Bush fields	3	6	10	Low yield and less application of manure	All agreed
Seeds	3	6	10	Less use of indigenous seed and extinction of some	All agreed because of the reduced use of local seeds, the increasing use of improved/hybrid seeds and the effect of rain on local seeds production
Trees on crop lands	10	6	3	Constant pruning and protection	All agreed
Forest/bush areas	10	8	1	Less cutting down of trees and bush fires because of community by-laws	All agreed
Firewood	10	1	8	FMNR	All agreed
Roofing poles	10	7	2	FMNR	All agreed
Wild fruits	10	6	3	FMNR	All agreed
Water sources (streams, brooks, wells)	1	8	10	Easily dries up Very shallow (filled with sand)	All agreed, they add their farming practices as one of the contributing factors
Communal fallow lands	10	5	4	More concentration on home fields due to reducing households' farm labour	All agreed
Pastures	2	7	10	Bush fires	All agreed
Grass (for thatch, mats)	1	8	10	Bush fires	All agreed
Livestock (cattle)		9	10	Due to theft	All agreed
Livestock (small ruminants)	10	6	3	Support from NGOs, households focusing on small ruminants because of loss of cattle, increasing number of women owning some.	18 agreed, but 5 disagreed because of they recorded much deaths these days

Poultry	2	7	10	Constant outbreak of diseases and lack of veterinary service	All agreed
Compost/manure	3	6	10	Lack of cattle	All agreed

Trends having positive effect on farming

Natural Resource	Reasons
Trees on crop fields	Leave decompose to add nutrients to the soil Increase soil moisture
Communal fallow lands	the time these fields have been allowed to fallow
Small ruminants	Sell to buy farm inputs Produce manure

Trends having negative effect on farming

Natural Resource	Reasons
Water sources	Reduce gardening activities Reduce water available for livestock
Cattle	Reduce manure available for crops Reduce animal traction
Small ruminants	Reduce crop residue available for compost making
Grass	Reduce soil cover

In all of this, all different types of households are affected.

Community Feedback of Agricultural Technical Service and Inputs Support

Type of Agricultural Support	Source of Support	Proportion of Households Benefiting	Community Feedback
Awareness Raising	CIKOD an RESULTS	Few	All agreed
Training/Follow-up			All agreed, but added training on fish farming to the list
Compost making	CIKOD and MoFA	Few	
A/E techniques	CIKOD and MOFA		
Sowing in lines	RESULTS		
Fish farming	RESULTS	Few	
Improved Seeds			All agreed, but added okra, onions and tomatoes for gardeners to the list
Groundnut	RESULTS	Some	
Maize Soya			
Okra, onions, tomatoes	RESULTS	Some	
Chemical Fertilizer	RESULTS and MOFA	More	All agreed
Herbicides/Pesticides	MOFA	More	All agreed
Agricultural Credit	-	-	All agreed
Tractor Services	RESULTS	Few	All agreed
Veterinary Services	-	-	Disagreed
Small ruminants	RESULTS	Few	
Fingerlings	RESULTS	Some	

Type of Agricultural Support	Source of Support	Proportion of Households Benefiting	Community Feedback

Positive effects of the agricultural support

- Increase in yield and reduction of hungry
- Small ruminants increase manure production and household's income to meet its needs.
- Increase in yield of groundnut through the distribution of new seeds

Negative effects

- Herbicides and pesticides are making fields unproductive, bring about the introduction of strange weeds to the community and kills living organisms
- Support contributing most to food production and income
- Small ruminants
- Groundnut seeds
- Fertilizer
- Training on compost making
- Support contributing to positive trends in natural resources (quality and quantity)
- Farmer Managed Natural Resource (FMNR)
- Agroecological farming techniques (A/E)

Community feedback on trade-offs and synergies

Decision	Community feedback
P 2.1	
Concentration on home fields	All agreed
P 2.2	
Through the setting of bush fires because of hurting activities, farmers are trading off the soil fertility for bush meat.	All agreed
Though they are increasing their yield through farming along the streams, they are contributing to drying up of these streams	All agreed
They also decide either to continually prune trees and reduce bush fires to improve soil fertility in the long run or continually dependent of chemical fertilizer	All agreed

They all also agreed to the following trade-offs influence by rain, cost, yield, soil nutrients, time and effort.

Trade-offs

- Local seeds vs improved/hybrid seeds
- Compost/manure vs fertilizer
- Random sowing vs sowing in lines
- Multiple seeds per hole vs a single seed per hole
- Cost of hiring labour vs cost of tractor service

Synergies

- Use chemical fertilizer to increase yield in the short term and compost/manure to maintain soil fertility for a long-time solution
- Ploughing with tractors to meet the rainfall, sow in lines and then form ridges during weeding and earthen-up to conserve water and soil nutrients.

Summary of factors involved in each key decision

Key issues & decisions	INPUTS involved	OUTCOMES – expected or observed		KEY INFLUENCES
		ECONOMIC	ENVIRONMENTAL	
Concentration on home fields	Labour		More fallow lands Increase in trees and forest cover	Migration
Seed usage	Type of seeds	Increase yield		External support services and inputs Rainfall pattern
Compost usage	Livestock Crop residues	Increase yield	Improve soil fertility	External support services and inputs (training and distribution of small ruminants) Rainfall pattern
Chemical fertilizer usage		Increase yield		External support services and inputs Subsidies
Land tillage	Technologies and practices	Yield	Soil cover	External support

Phase 2 – Exercise 2.4 - COMMUNITY 2: Ko, Nandom District

Phase	2
Activity/Exercise	4
Activity Title	Community Feedback on Trends and Influences on Farming Systems
Community	Lawra, Ko
Date	26 th April, 2018
Time	1:55 pm – 4:15 pm

Participants

At the start of the exercise, twenty-one (21) community members were present. This included the eight (8) of them who carried out the first three (3) exercises (P2.1, P2.2 and P2.3). The number increases as the exercise goes on and the end of it, forty-one (41) community members were recorded.

Findings

Basically, community members to a larger extent agreed with most of the key findings that were presented to them. They however, disagreed with the trends in sunshine. There was also a little contradiction. While the key informants were of the opinion that tree population has become denser in recent times due to intervention from EPA and CIKOD to plant and grow trees respectively, some community members perceived otherwise.

Community members believe they are just coping with changes in the trends. According to them, the rainy season use to start earlier around the April but here is the case April is about ending and yet it is not raining. Due to the delay in the onset of the rainy season, it is difficult to determine which crop to plant first. According to them, by the time a household finishes planting one crop, it gets late to plant another. Larger households with stronger household labour force are better off because they are able to till their lands to plant early enough to harvest before the rains cease.

Furthermore, community members expressed their lack of optimism in the sustainability of improved early maturing seeds because of the lack of control of the source. That notwithstanding, they are

compelled to adopt them because the traditional/local seeds yield less due to the nature of the rainfall pattern (shortened period of the rainy season).

According to community members, the excessive use of chemical fertilizer hardens soil and leads to the growth of some weeds (e.g 2020 enables the growth of Donvaar") in the farm. It is thus necessary to integrate chemical fertilizer with compost/manure.

Emerging trade-offs

Though community members mentioned that they still plant some of their local seeds, the use of improved/hybrid seed is more common. Examples of some of the improved/hybrid seeds used by farmers in the community include Dorado, Soya beans, rice and maize. It is therefore evident that community members are gradually giving up their local seeds and rather scaling up on the use of improved seeds. It should however be mentioned that this as will be seen later is partly dependent on the current rainfall patterns.

Though low rainfall is partly responsible for the degrading trend in their dam and streams, they believe road construction is equally responsible. Road construction has increased erosion of soil into these water bodies thus making them shallow. However, they enjoy using the better roads they have today implying that to some extent, they are accessing good roads at the expense of their dam and streams which now hardly hold water throughout the year.

Synergies

As has been mentioned earlier, the integrated use of chemical fertilizers and organic fertilizers (compost/manure) results in greater yields and by extension, income.

Conclusion

One thing that came out quite clearly throughout the activities is that even though these changing trends are having their effects on livelihoods, community members are adjusting and coping appropriately. One big challenge with regards to execution of this phase is that most of the PRA activities and SSI questions are extensive and require a lot of time. That being said, community members usually complain of tiredness after the first one hour into activities.