Study on simplification of Participatory Forests Resources Assessment Approach (PFRA), Forest Management Planning (FMP) and Village Land Use Planning (VLUP) processes in Tanzania

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June 2024

The United Republic of Tanzania
MINISTRY OF NATURAL RESOURCES
AND TOURISM

SUOMI

FINLAND

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July 2024

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Acronyms

BA	Basal Area
CBFM	Community-Based Forest Management
CBH	Circumference at Brest Height
CCRO	Customary Certificate of Rights of Occupancy
DBH	Diameter at Breast Height
DFO	District Forest Officer
DNREO	District Natural Resources and Environment Officer
FAO	Forest Assistant Officer
FBD	Forest and Beekeeping Division
FHP	Forest Harvesting Plan
FITI	Forest Industry Training Institute
FMP	Forest Management Plan
FMU	Forest Management Unit
FO	Forest Officer
FORCONSULT	Independent consulting firm of the College of Forestry, Wildlife, and Tourism of Sokoine University of Agriculture (SUA)
FORVAC	Forest Resource and Value Chains Programme
FTI	Forest Training Institute
GIS	Global Information System
GN	Government Notice
GPS	Global Positioning System
JB	Job Basic Number
JFM	Joint Forest Management
LMDH	Legal Minimum Diameter for Harvesting
MAST	Mobile Application to Secure Tenure
MCDI	Mpingo Conservation and Development Initiatives
MJUMITA	Mjumuiko wa Mitandao ya Misitu Tanzania
MNRT	Ministry of Natural Resources and Tourism
NLUPC	National Land Use Commission
NTFPs	Non-Timber Forest Products
ODK	Open Data Kit
PD	Project Document
PFRA	Participatory Forest Resource Assessment
PLUM	Participatory Land Use and Management
PO-RALG	President Office - Regional Administration and Local Government
SUA	Sokoine University of Agriculture
SWOC	Strength, Weakness, Opportunity, and Challenges

TFCG	Tanzania Forest Conservation Group
TFS	Tanzania Forest Conservation Group
TZS	Tanzania Shillings
USD	United States Dollar
USFD	United States Forest Department
VEO	Village Executive Officer
VLFR	Village Land Forest Reserve
VLUP	Village Land Use Plan
VNRC	Village Natural Resources Committee

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EXECUTIVE SUMMARY

The assignment was undertaken firstly because there was a variety of approaches to the planning processes undertaken in Community Based Forest Management (CBFM) – Village Land Forest Reserves (VLFPs) processes in Tanzania and it was time to take stock of lessons from strengths and weaknesses of the different approaches and prepare lessons to set a roadmap for a single best practice approach. Secondly the processes, Village Land Use Planning (VLUP) and Forest Management Planning (FMP) process including the Participatory Forest Resources Assessment (PFRA) are considered to be too costly – especially with recent increases in government Daily Subsistence Allowance (DSA) rates, so that the costs are becoming an impediment to scaling up CBFM as well as renewing the plans. This study looks at ways to streamline and make them more cost effective.

Key lessons and recommendations

- The VLUP and FMP processes are both too costly, especially with increases in DSA costs in 2022, hindering scale up of CBFM. Depending on the size of the village/complexity of the site, the VLUP process costs roughly from TZS 25 million (10,000 Euros) up to TZS 75 million (30,000 Euros) per village and FMP process costs between TZS 15 million (6,000 Euros) and TZS 50 million (20,000 Euros), depending on the complexity and size.
- Of the approaches that are being practiced in the field, both MCDI and MJUMITA offer the most practical approaches – particularly because they are very participatory, engaging communities who those have higher ownership of the process and plans. The SUA approach was found to be too technical and complicated for communities.
- Costs of the processes could be cut significantly by using satellite images and participatory exercises, harnessing local knowledge more then only focusing the expensive field surveys and ground truthing on a sample of areas. Where field work would still be necessary in the VLUP process is where there are contested areas and there needs to be thorough engagement with stakeholders. This should reduce field work to length of no more than 10 days.
- Forest Management Plans should be extended to 10 years as 5 years is too short for strategic planning for a natural forest, this also will reduce the cost of renewing significantly and enable time for communities to build up funded tor the renewal process.
- The renewal of the FMP and the VLUP should only focus on necessary updates, rather than a completely new process, again making use of remote sensing and participatory approaches.

1. INTRODUCTION

This report presents the results of a consultancy commissioned by the Forestry and Value Chains Development Programme (FORVAC) to identify the options for simplification of the Participatory Forests Resources Assessment Approach (PFRA), which forms an important aspect of the Community Based Forest Management (CBFM) process. The consultancy comprises a rapid review of the efficacy of the Participatory Forest Resource Assessment (PFRA) approaches and provides recommendations on how to streamline the PFRA processes and make it more cost-effective. Additional recommendations are provided on other aspects including land use planning and streamlined policy recommendations linking PFRA and village land use planning (VLUPs) are provided.

The rationale for the study was that there had been a range of different approaches used for these processes, so lessons needed to be learned on the strengths and weaknesses of each to help draw out lessons and help point towards a more unified approach in the future. Also there had been concerns expressed about the high costs of the processes, which pose a barrier to both scaling up CBFM and renewing plans when the current plans expire. These costs have also increased significantly due to increases in costs such as Daily Subsistence Allowance (DSA) costs for government officials taking part in the exercises etc. Therefore this study is a timely exercise to help generate lessons firstly on best practice so that a more uniform approach can be developed and in identifying ways to streamline the approach to make it more cost effective.

The study was conducted through intensive desk reviews, of several documents that are related to PFRA including the National PFRA Guidelines, and other approaches that are applied by several actors in the FORVAC project area were reviewed. Consultations were conducted through key informants and discussions were held between field experts and communities in Kilwa, Ruangwa, Nachingwea, Liwale, Songea, Natumbo and Tunduru districts.

Limitations

Some limitations are counted in this report; include seasonality of the year; when field study was conducted it was raining heavily in the southern part of the country, such that some remote village were not reached due to road conditions. It was also a bit difficult for high level appointments and remote consultation, especially with the Land Use and Planning Commission were not secured. Furthermore, this study was limited for the FORVAC project area. It is assumed that there are several organizations/projects that support CBFM in Tanzania which may have their own participatory inventory methods that worth to be explored at national level, even at regional level-learning.

1.1. Context on Participatory Forest Resource Assessment

The National Forest Policy 1998 was enacted to enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of natural resources for the benefit of present and future generations. The policy recognizes the importance of participatory management systems of natural and other forests. The move towards Participatory Forest Management (PFM) was derived from two factors: firstly, recognition that neither central government nor local governments have the human and material capacity to manage the nation's forest resources sustainably without the support of communities living close to the forest. Secondly, there was a political will to decentralize government functions to the lowest levels of government. Tanzania had put a legal framework to promote PFM approaches that bring aboard all stakeholders, including communities, to manage forest resources. PFM attempts to secure and improve the livelihoods of local people dependent on forest resources. The legislation put forward two approaches, i.e., Joint

Forest Management (JFM) and Community Based Forest Management (CBFM). The latter has defined guidelines that gives mandate to communities to fully participate in forest management at their jurisdictional land.

Both the National Forest Policy (1998) and Forest Act (2002) support Community Based Forest Management (CBFM) in Tanzania. The Village Land Act (1999), the Local Government Act (1982), the Forest Act (2002), and the Forest Regulations (2004) provide the legal basis for communities to own and manage forest resources on village land. Furthermore, the Forest Act incentivizes communities to manage the forests in their jurisdictions and in a way that it should be sustainable and profitable to reduce poverty.

Village land use planning, backed by the Village Land Act (1999), supports setting aside village land for protection, i.e., Village Land Forest Reserves (VLFRs)., VLFRs are forests that fall within the Village Areas and are owned by the community as a whole and declared as a reserved forest area by the Village Council, acting on the recommendation of the Village Assembly. The Participatory Forest Resources Assessment (PFRA) is the basis for conducting forest inventories in VLFRs. Under the legislation, communities have a unique role in developing Forest anagement plans (FMP) and, in some cases, Forest Harvesting Plans (FHP), to sustainably manage their forest resources.

1.2.   Background on Forestry and Value Chains Programme

The Forestry and Value Chains Development Programme (FORVAC) is a 6-year (7/2018-7/2024) Programme funded by the Governments of Tanzania and Finland. The implementing agency of the Programme is the Forest and Beekeeping Division (FBD) of the Ministry for Natural Resources and Tourism (MNRT), in close cooperation with Tanzania Forest Service (TFS) and the President's Office Regional Administration and Local Government (PO-RALG).

 (FORVAC aims to contribute to increasing economic, social, and environmental benefits from forests and woodlands while reducing deforestation. The expected outcome of FORVAC is "*Sustainably managed forests and forest-based enterprises generating income for community members and revenue for community social services.*" The result will be achieved through the following outputs: 1. Sustainable forest management mechanisms established, forest-based value chains developed, and private sector Involvement in the forest sector increased; 2. Stakeholder capacity on CBFM and forest value chain development enhanced, 3. Extension, communication, and monitoring systems developed, and 4. Legal and policy frameworks for CBFM and forest value chains strengthened.

FORVAC was designed to continue the work from the previous programmes such as National Forest and Beekeeping Programme II (NFBKP) and Lindi and Mtwara Agribusiness Support (LIMAS) started in Lindi and concentrated on supporting 'secondary' CBFM issues related to generating significant benefits from the forest, instead of starting from the 'primary' CBFM issues, including village land use planning, forest management planning, and gazettement of Village Land Forest Reserves (VLFRs). However, many of the villages in Liwale and Ruangwa Districts that had approved FMPs did not manage to renew their FMPs without external support from FORVAC. Herewith, the current forest management planning process has become complicated and costly for CBFM communities to prepare and finance every five years.

1.3.   Rationale for the PFRA study

External evaluations of FORVAC conducted in 2021 – 2023 have been positive and appreciative of the work on CBFM, especially the support for the governance of forest

resources under community ownership and tenure. However, the external evaluations identified some processes to be very complex and expensive, including village land use planning (VLUPs), VLFRs establishment, (PFRAs, the development of FMPs, and capacity building of village CBFM governance institutions.

Communities have been setting aside village land forest reserves through an intensive process of land use planning. In doing so, several steps have to be completed to reach the final stage and the PFRA is one of such steps. FORVAC thought of exploring options for simplification of some of the processes that would relieve time and resources for the project to improve the core aspects on value chains development. Therefore, the rationale of this study was to recommend a simplified approach that will support communities to efficiently conduct PFRA, develop FMPs, and consequently support management of VLFRs, sustainable harvesting and increased forest-based income generation through CBFM wood value chains development.

The main objective of the study on simplification of PFRA was to identify options for increased cost-effectiveness for local communities to implement PFRA without substantive external finance. The consultant was supposed to examine approaches to PFRA and conduct a rapid review of the effectiveness of the approaches, including identifying lessons learned and providing concrete recommendations for any streamlining, efficiencies, and harmonization. The study reviewed different approaches that existed from secondary data. Primary reviews were conducted with stakeholders, including villagers, government actors, institutions that developed PFRAs and NGOs/academia who have been involved in PFRA activities.

Specific tasks conducted include the following:

1. Undertook concise review of the PFRA process with different stakeholders through SWOC analysis[1]
2. Provided concrete and feasible recommendations on how to streamline/make more cost-effective and harmonize PFRA approaches.
3. Analyzed process steps – what needs to be done next in terms of reform of the PFRA approach.
4. Provided wider recommendations on streamlining the entire forest management process and the VLUP.

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[1] A SWOC analysis is a method used to assess internal and external environments. It involves identifying Strengths, Weaknesses, Opportunities, and Challenges

2. FRAMEWORK AND METHODOLOGY OF THE STUDY

2.1. Framework of the PFRA study

This study was suggested by FORVAC in order to have a better understanding on the possible simplification of PFRA processes, not only by stakeholders but also for communities who are engaged in CBFM in more than 50 villages in the project area. The framework for this study covered reviewing several documents as well as field visits to Kilwa, Ruangwa, Nachingwea, Liwale, Namtumbo, and Songea Districts. Field consultation focused mainly on interviewing the district forest experts and associated departments like, natural resources, and land departments. Focus group discussions with VNRC members were conducted and field demonstrations on PFRA processes were performed.

Bearing in mind the time allocated and financial resources, the study was conducted in two sessions. The first groups were the key informants, basically district staff and NGO experts, while the second session involved meeting the communities in nine (9) villages in a more guided discussions on the PFRA process. The field demonstrations were undertaken in the nearby VLFRs; the PFRA teams performed few measurements, which provided input to the inventory discussions. The participatory study was conducted in simple Swahili, local knowledge and experiences were welcome and participants were free to suggest various issues related to PFRA for improvements. A mix of qualitative and quantitative results was gathered and analysed reflecting all opinions which framed the final recommendations for this study.

2.2. Methodology of the PFRA study

The methodology comprised the following activities:

Documents review. A desk study of documents and materials, including FORVAC reports and information were read before and during the consultation process and visits to the project areas. The documents included a National PFRA guideline which was developed by the Ministry of Natural Resources and Tourism (MNRT) through the Forestry and Beekeeping Division (FBD). Different PFRA manuals and reports from Mpingo Development Initiatives (MCDI), Sokoine University of Agriculture (SUA), Tanzania Forest Conservation Group (TFCG) and Mjumuiko wa Mitandao ya Misitu Tanzania (MJUMITA) were consulted. Other documents included a US Forest Department (USFD) PFRA analysis study, the FORVAC Programme Document (PD), the FORVAC Market Systems Analysis (2018), and other documents that were considered relevant.

Key Informant Interviews, and meetings with stakeholders: Interviews were conducted with key respondents from relevant district departments and non-government organizations. These include organizations that are currently supporting PFRA such as MCDI, MJUMITA, TFCG, and SUA. The district natural resources and land departments, district forest conservators from TFS, district legal and community departments, land officers, and members from district Participatory Land Use Management (PLUM) teams.

Direct interviews with communities: Direct interviews with communities were conducted. The PFRA team members, who in all cases are the Village Natural Resources Committees (VNRCs), responsible for conducting PFRA and drafting the FMPs. Field demonstrations were carried out in the forest and observed the practicality of the methods, while recording time and efficiency of collecting data and its correctness.

3.   PARTICIPATORY FORESTS RESOURCES ASSESSMENT METHODS

The National Participatory Forests Resources Assessment (PFRA) Guidelines were prepared by the Forestry and Beekeeping Division of the Ministry of Natural Resources and Tourism (MNRT) in 2007. The guidelines were based on ideas and suggestions from practitioners of CBFM from a range of locations and projects in Tanzania. Since then, several projects have been using the guidelines and some NGOs have gone further in improving the PFRA guidelines and/or developing their own guidelines. This has provided several versions of inventory guidelines. However, with varied modifications, the inventory principles remained to be the same in most cases.

The sections below discuss the National PFRA guidelines, along with other PFRA methods as implemented by NGOs i.e. MCDI, MJUMITA/TFCG and an academic institution, the Sokoine University of Agriculture (SUA). The NGOs/academia approaches represent examples in the landscape, but elsewhere in Tanzania, might be several other approaches that are similar to these few here.

3.1.   The National PFRA Guidelines

Under CBFM situations where villages or community groups may actually be utilising and harvesting their forests productively (where sustainable utilisation is a management objective) for their benefits, there is a greater need for the entire PFRA process. According to the National PFRA Gridlines (MNRT, 2007)[2], there are seven steps involved in conducting the PFRA process, of which two steps are optional. The steps include: 1/Planning and Preparation, 2/Forest Product Utilisation; 3/Forest Mapping (provisional); 4/Forest Walk; 5/Sample Plot Assessment; 6/Information Compilation and Analysis and 7/. Preparation of (provisional), Forest Management Plan.

The PFRA guideline provides the above steps in more detailed descriptions, including the formation of the PFRA team to be selected among communities and VNRC members with established selection criteria. The PFRA guideline begins with the assessment team moving into identification and prioritizing community forest products. The community needs are quantified in volumes or loads of products. After that, the guideline requires the PFRA team to obtain a map with large-scale copies of the forest. From this map, the PFRA team prepares the participatory forest resource map, which leads into establishing small Forest Management Units (FMUs). However, the guideline indicates the last step could be provisionally set but is not mandatory.

The PFRA team undertakes a quick forest walk and assesses each FMU visually while estimating the Basal Area (BA) for each FMU. During the actual assessment, the PFRA team establishes transect starting points in order to locate, assess and record sample plots for the entire VLFR. The PFRA guideline has set aside sampling intensity values that can be used to calculate number of sample plots depending on the size of the forest that is being inventoried. The table 1, below gives an overview:

Table 1. Sampling intensity category as per National PFRA guidelines

FMU area	<10ha	10-50ha	50-100ha	100-200ha	>200ha
%Sampling	3%	2%	1.5%	1.0%	0.8%

Note: For small area <3ha, the minimum number of plots is 3, for large areas >300ha, the maximum number of plots needed is 60. *(Source: National PFRA guidelines -2007).*

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[2] Ministry of Natural Resources and Tourism. 2007. PFRA Guidelines

The PFRA team finally compiles and analyses sample plot information and produces histograms and charts. Furthermore, the PFRA team will be required to complete the estimated sustainable offtake from the assessment form in quantities. This will also include assessment of supply and demand balances of forest products from the VLFR.

The national PFRA guidelines are quite robust and follow the typical forest inventory principles, which require intensive training, supervision from experts/foresters, and support in order to complete all steps.

3.2. MCDI PFRA approach

The Mpingo Conservation and Development Initiative (MCDI) implements a participatory forest inventory approach where each village conducts a sample-based inventory in the VLFR, focusing on marketable timber tree species. The current forest MCDI participatory resource assessment approach is designed to provide simple assurances that local communities are using forest resources in an ethical and sustainable way for long-term, forest-based opportunities.

The PFRA method from MCDI works with Village Natural Resources Committees (VNRCs) in the implementation of a participatory forest inventory in the forest. Usually the VLFR is considered as the single Forest Management Unit (FMU). The PFRA method is largely guided by the FSC Group Certificate Scheme[3]. The MCDI guideline method does not approach the resource assessment with all species, but rather considers only harvestable stocks. Furthermore, it does not include or consider for potential threats that may happen in a given plot such as defected trees. The PFRA method determines only for the "allowable cut" although the regenerating stock is also considered but only on important commercial species. The PFRA is conducted within the harvestable area and areas of interest including sensitive area for protections.
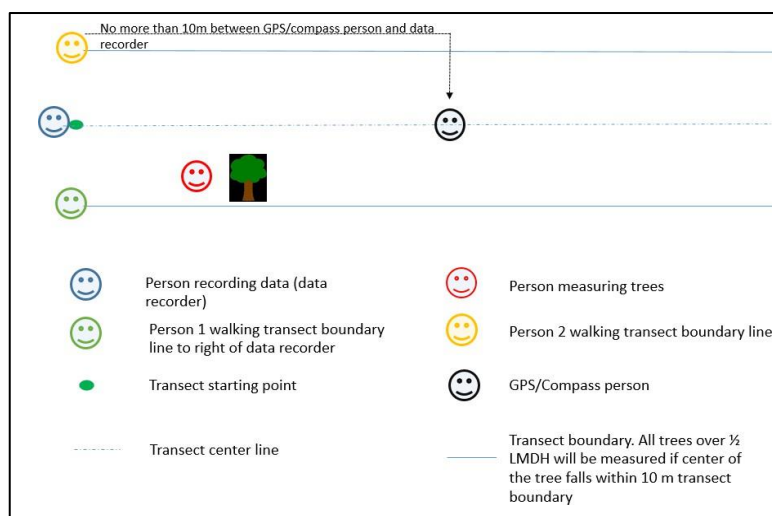
Figure 1. Transect layout with crew assignments (Source: MCDI, 2022)

The method does not involve a fixed sampling intensity but rather a model. To develop this model, PFRA team surveyors should focus on recording 50+ trees of the species of most interest, and 20+ trees for species of lesser interest. The method uses transect as sampling design and number of transects required therefore cannot be known precisely in advance, although an experienced facilitator who is familiar with the area may be able to estimate, and advise the PFRA team accordingly. Instead, an initial number of transects (4-5 is usually appropriate) should be walked, with more added later if necessary. In case the axis of the forest management unit (FMU) where transects are traversing is

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[3] The FSC Group Certificate Scheme is a program established by the Forest Stewardship Council (FSC) to facilitate forest management certification for groups of entities such as community based forest management.

much shorter than if the transects are roughly parallel to the longer axis (6-8 may be appropriate in this case as a starting number). Figure 1 above indicates the MCDI PFRA Model

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Box 1. Anecdotal sentiments on PFRA activities in the field

> **Ngeya VNRC in Kilwa district:** We conducted PFRA with the support from MCDI and had all the necessary data and information from our forest. We only measured trees that were mature enough for timber harvesting. Although we measured saplings, but we had no interest on them as they have no timber values.
> **Barikiwa and Chimbuko PFRA teams in Liwale district:** We measured all trees of various DBHs. However, we did not measure all trees which were crooked, defected or showed signs of being dead, because were of less interest to timber buyers and we had plenty of good trees in our forests. Furthermore, we had challenges in measuring volumes for standing trees and round wood as we thought it would be the same volumes.
> **Ngunichile VNRC in Nachingwea district:** PFRA was conducted by men only as the forest was quite far from the village centre. Women were not allowed to participate, and we thought this was going to be difficult for them. Again, due to long distance and the PFRA team had to camp in the field it was practically impossible to have women in the team.

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3.3. SUA approach

Sokoine University of Agriculture through FORCONSULT had been working in the FORVAC project area. FORCONSULT was contracted as service provider for developing Forest Management Plans for five villages in Songea Rural District.

According to FORCONSULT, the PFRA approach was generic and based on hard science. PFRA was conducted by professional experts and foresters from the university with minimal involvement of communities in understanding the inventory exercise rather than carrying tools, and escorting the inventory team in the VLFRs. For the case of VLFRs, the PFRA was based on sampling intensity[4] between 0.34 – 0.5% that had commonly been used in miombo woodlands especially in developing harvesting plans, yielding estimate precision of around 5%.

An example of the PFRA is the one conducted at Mitumbati village, in a VLFR of 7,698 ha with a boundary length of 37.7km. The SUA method, established forest inventory plots with a square grid of 748 m. At each intersect, a cluster of four plots were laid out as shown in Figure 2. A cluster therefore consisted of four plots laid out at the corners of a square measuring 100 x 100 m. The plots were circular with radius of 15 m (0.071 ha). Total number of clusters and plots were 145 and 580, respectively.

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[4] The sampling intensity refers to the proportion of a population that is sampled. It's a critical concept in statistical sampling, especially in fields like forest inventory and social science research.
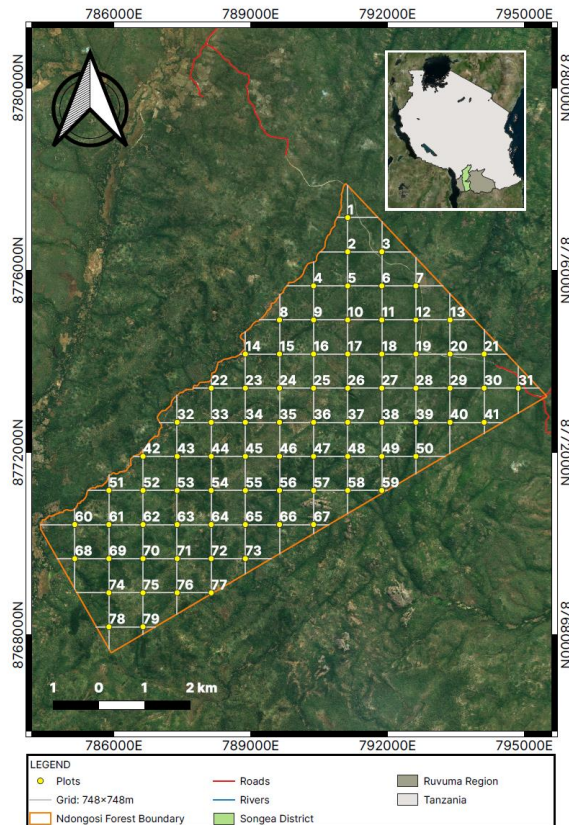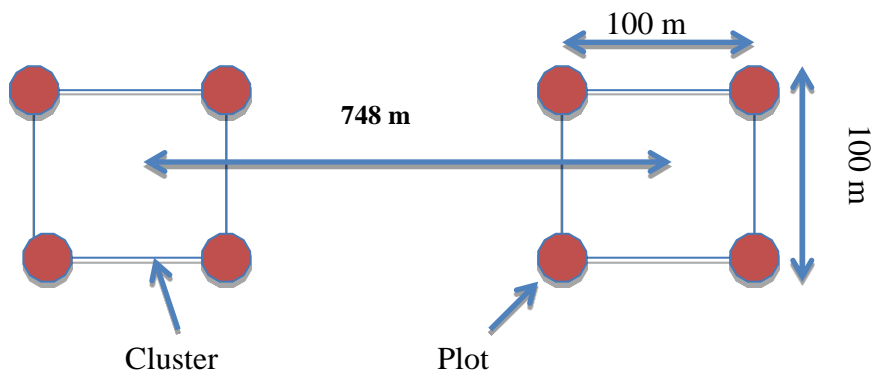
Figure 2. PFRA Cluster and plot layout (Source: FORCONSULT, 2020)

The positions of the clusters were established based on the existing GIS layers (shapefiles) of the respective VLFR. The coordinates were fed into handheld GPS and ready for traversing in the field. Moving to the next plot in the cluster followed a clockwise direction. After completing measurements on the fourth plot at the lower right-hand corner of the cluster, the PFRA crew moved to the next

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Box 2. Anecdotal sentiment on PFRA in Nachingwea and Songea rural district forest officers

All inventories were conducted by experts from SUA through a consultancy service. Data collection in the field was conducted by experts. The VNRC members supported the SUA team on light work, such as carrying equipment and holding tape measures in the field. Short training was conducted to the district staff and finally all Management Plans for communities were completed by experts and brought back to the communities. Villagers had little opportunities to discuss on some aspects including bylaws and penalties.

cluster at the pre- determined distance of 748 m. With a sampling intensity of 0.5%, it was obvious the results were quite general that may not give good estimate of allowable cut at species level.

3.4. MJUMITA approach

In 2022, MJUMITA has worked with the Forestry Training Institute (FTI-Olmotonyi) and the Forest Industries Training Institute (FITI) to develop guidelines that will help communities realize the financial benefits of managing forests more sustainably for harvesting charcoal and other forest products through community-based forest enterprise development.

According to MJUMITA, the PFRA method is conducted after completing certain steps. The first step is forest mapping, which is an important aspect of the resource assessment to ensure the boundaries of the forest are well -defined and the area is known. This helps to produce maps for the Forest Management Plan. Forest mapping also enables resource assessment information to be calculated accurately; within small units, i.e. Forest Management Units (FMU).

The PFRA method begins with the stratification of the VLFR into homogenous sampling units called strata (Figure 3). In each stratum, at least two sampling units are selected randomly or systematically depending on the conditions of the forests. Criteria for dividing into small units is guided by vegetation types e.g., area of open miombo, closed miombo, grassland, etc. Geographical location and health conditions of the forests e.g., burnt areas, pests or disease-attacked areas, and wind-thrown areas that are also considered. Consideration of species is also considered. This is done for the advantage that accurate estimates may be obtained for each stratum and efficiency in sampling is enhanced since more attention may be given to more important strata.

Figure 3. Figure 3: Example of stratification showing strata for Charcoal harvesting (Source: MJUMITA, 2019)

MJUMITA and TFCG, through Transforming Tanzania's Charcoal Sector (TTCS) project, has have further made some improvements on forest inventory including the use of 'zigzag' transects (Figure 4) and recording the transect data using a smart phone connected to a Bluetooth GPS. Zigzag transects are more efficient than parallel transects because upon reaching the end of a transect, rather than having to walk to the start of the next transect without collecting data, the team simply turns in a different direction that takes them back across the forest where they can continue collecting data immediately. The drawback is that the zigzags require careful planning using GIS software to ensure that the zigzag transects are drawn using a standardized grid and are unbiased. Recording transect data using a smart phone connected with a Bluetooth GPS allows the data to be shared easily and allows for recording the location of every recorded tree automatically. This can help to identify the

distribution of certain species across the forest and help to identify patches where certain species are more likely to be found, which can aid in harvesting.
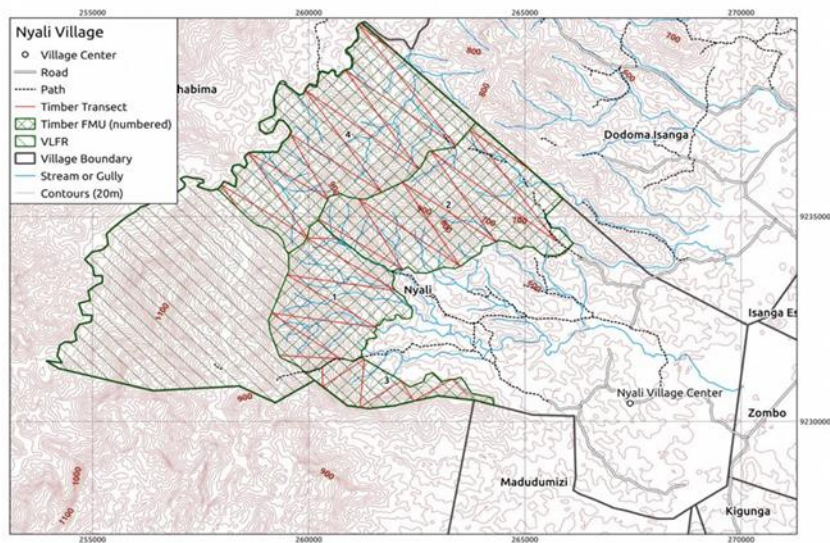
Figure 4. Example of map showing zigzag transect (MJUMITA, 2019)

4. PFRA FINDINGS, LESSONS LEARNT FROM THE FIELD AND SWOC ANALYSIS

4.1. Lessons Learnt from PFRA activities in the field

In the Kilwa district, where MCDI have worked for so long time, VNRC and PFRA teams had wide knowledge and experiences in conducting inventory within VLFRs. PFRA teams had understanding on objectives for conducting PFRA. Team organization and handling of equipment for inventory was quite known to them. However, for these long-time VNRC members, it was evident that PFRA teams were not aware on how the sampling design was set and selection of inventory method was chosen. By belonging into the FSC group schemes, communities thought it was one of the requirements by the scheme. This creates a gap that prompts further training and awareness raising on the overall methods and simplification for conducting PFRAs.

In Ruangwa district, PFRA was conducted through the support of a service provider, MCDI, and communities had also wide knowledge on performing PFRA. However, when asked on data analysis it was evident that the experts did the final analysis and communities were not involved, rather receiving the final volumes.

In Liwale district, under the service provider, the MCDI, VNRCs complained that the final PFRA report missed some species which they thought were quite plenty in their VLFRs. The arguments were that, PFRA should be conducted in areas where there is plenty of commercial species. Sampling plots tend to miss some of the valuable timber species, and inventories should focus on commercial trees over lesser -known timber species. This reflects on less understanding on sampling designs and requirement for further training.

In Tunduru district, PFRA was problematic when trees were encountered without straight boles. Measuring such trees were either neglected or wrongly measured at the DBH/CBH. Similarly, trees that were damaged or dead were not measured and hence loosing unnecessary volumes hat could be included. Two facilitators worked in this district, include WWF Tanzania and MCDI. While in Songea district SUA as service provider worked solely with minimum community engagement.

It was reported that, in some cases PFRAs were rushed in order to complete the assignment as soon as possible due to allocated time and resources. This leads to erroneous volume calculations and when Forest Harvesting Plans are implemented, they do not reflect the available species volumes. Sometimes PFRA team members were demotivated because of long travel distances to the forests, for example some VLFRs were at least 25 km from the village centres. Risks of animal attacks and snake bites were some of the fear by the PFRA teams to conduct inventory without proper personal protective equipment (PPEs) or game scouts.

District foresters had the capacities for conducting PFRA trainings, but had no resources for supporting VNRCs, unless projects provide resources. However, by lacking common PFRA guidelines to be adhered to, inventory methods are dictated by the facilitating project. In some cases, the newly employed foresters, such as in Kilwa, recently graduated from forestry institutions, had no proper knowledge or experience in conducting forest inventory. This again remains as a gap at local governments and NGOs fills the gaps.

The VLUPs and VLFRs were all supported by projects, and heavily funded ~~from~~ by donor money. It was evident that some of the FMPs and VLUPs have come to an end and needs reviews. In Kilwa and Ruangwa districts, the Land Tenure Improvement Project (LITIP) financed by the World Bank is supporting district-wide revision of VLUPs, while other districts have little or no funding for revision. Altogether, some FMPs have come to an end and still need project support for the next revision.

However, some villages had made first and second timber harvests, generating significant revenues. Yet no set aside budget had been allocated for PFRA or FMP revisions. This calls for capacity building and training for sustainability and income diversification such that communities will be able to fund PFRAs and/or VLUPs.

4.2. National PFRA Guidelines

The National guideline is well written with detailed information on every step that needs to be considered during PFRA assessment. However, through consultations with stakeholders, it was evident that, very few if none have tried the full usage of the national PFRA guideline without some modification or improvement on it. The national guidelines suggest sampling intensity based on mensuration principles and the method should be conducted on round plots that are pre-determined on the map with strata based on vegetation types.

From the discussions with TFS Conservators in Nachingwea and Tunduru districts, who participated in conducting inventory for general land, it was evident that resource assessment using the National guidelines was quite subjective with minimal sampling intensity and random sampling, and circular plots were applied. Forests on general land were mapped basing on strata and the interests were on availability of commercial species. As a result, volume estimations become a problem and some species, especially the lesser known species are not covered, creating potential danger for an over-reliance for availability commercial species in the inventory. The socio-economic information and data were collected along with inventory, and this was considered a positive strength for this method. The SWOC analysis for the National guidelines is indicated in the below table 1. Further analyses on the National PFRA guidelines are provided in Annex 1.

Table 2. SWOC analysis for PFRA method as per National PFRA guideline

Strength	Weakness
• It applies typical forest principles and is more detailed with seven steps to be completed in order to arrive at a good inventory. • Sampling intensity targets are based on local forest mensuration standards • Suggest to use all necessary equipment and forest tools • The guidelines link with CBFM guidelines and suggest some steps to be completed during CBFM, such as embellishment of Village Land Forest Reserves. • Requires a high level of input from foresters/experts that may minimize errors.	• Community participation and ownership of the inventory process is limited. It requires intensive training, supervision from experts/foresters, and supports in order to complete all steps. • Lacks trade off in terms of labor costs; the investment of effort required by communities, and the financial cost of that effort (both to communities and technical facilitators) • Yields a lot of data on resources which may not be exploited or utilized • Uses 95% confidence limit for data analysis even on small plots leading to weak results in case of insufficient data from small plots. • Sample plots, whether 10m-square or 20m-square takes up a lot of time to assess for everything to be counted. • In cases of round sample plots, they are time -consuming to set out and by moving from one plot to another and accurately locating them. • Sampling intensity is limited between 0.8% - 3% depending on the size.
Opportunity	**Challenges**
• Sample plots are good for surveying trees, seedlings and saplings up to small trees and large bushes. • The method is well suited for large inventories where lots of data can be collected in large strata and plots. • The method demands the presence of trained foresters who can help the communities to measure all the required parameters.	• Over-reliance on the high confidence limit may leave out useful volumes/results if a lower confidence limit is chosen • Wasted effort counting trees of no commercial value, and poor sampling design in small community forest areas. • Restricts freedom to adapt other sampling intensity according to the specifics of the resource and size of the area under assessment.

4.3. MCDI Method

The MCDI method has gone under review and has been improved with a new version that was in place by 2022. Several aspects have been considered in the new version, to include assessment of all trees and non-timber forest products (NTFPs). The method takes into consideration regenerants such as saplings and seedlings. Usually, seedlings are less than 10cm in circumferences, while saplings with circumferences between 10cm to 74cm are categorized as growing to reach the harvestable circumferences in future. Trees with circumferences above 75cm are considered to be mature and harvestable, while the extra circumferences are considered as old trees that are best for seed banks.

The VNRC members in Kilwa, Ruangwa, and Liwale districts explained that one of the weakness (Table 3), of the MCDI method is that the VLFR maps are provided to them with pre-determined transects. They did not know the criteria for selection or positioning of transects. This could have been done in participatory way together with communities who have better knowledge of the forest. This was observed as a weakness but when comparing round plots with transects, the latter was much better for them.

In the field, when demonstrating the PFRA method, it was evident that the PFRA team in Kilwa understood the calibration of the starting point for transects and team organization was quite well organized. However, persons who were measuring circumferences of trees and edge boundary keepers tended to walk ahead of the GPS man and data collectors struggled to hear and capture all information as the team was walking very fast.

Photo 1. PFRA team members measuring a tree. Ngeya VLFR. In Kilwa

Table 3. SWOC analysis for MCDI method

Strength	Weakness
• Participatory review of concepts and methodology with VNRCs and village council at the onset of each forest resource assessment. • Most economically efficient and accurate method to assess timber stocks. • Careful calibrations at the beginning of each transect in the field which is pre-determined on the GIS map and the selection of sample size of transects of the VLFR. • Proper measuring a width of 10 meters with 5-meter boundary on each side of the centre line of transects. • Use of GPS units, which enables repeat measure to locate (permanent) transects points. • District and MCDI staff help to train the communities on the PFRA theories and field assessments require minimal supervision. This has advantages to communities to be	• Quick fix in the field: Data collection requires sustained focus but due to a fast pace during data collection in the field there is potential for errors, such as recording trees outside of the transect boundaries, entering an incorrect value into a data sheet, or taking an imprecise measurement of circumference. • Maintaining breast height consistency is somehow unperfected by the team, who presumes the measurements are taken at breast height without considering the height of team member/person. This normally happens when the team does not use DBH measuring stick • The MCDI method adds 10% distance on each transect to cover any underestimates which may frustrate communities. • Data collection on merchantable trees, does not designate with explanation if the tree(s)

confident, feel the sense of ownership and familiarity with the methods. • Data recoding ~~are~~ is guided with entry forms ~~which~~ that have color codes which minimize mistakes.	are defected or straight bole, this would help in calculating the merchantable or non-merchantable volumes. • Recording standing dead trees - time is lost in determining whether a tree is dead or alive, especially when most of the trees shade leaves during the dry season. • Recording non-timber species, is basic and simple with no additional information such as usage or potential market values, e.g. medicinal values.
Opportunity • Slowing down the PFRA exercise in the field may increase the quality of measurements and reduce errors such as recording mistakes. • The PFRA team can acquire equipment using their own sources, especially for repeat assessment when revenue has been accrued from timber sales. Equipment like Logger's tapes to replace calipers or normal tape measures, are relatively cheap and simple to use. • The method can be improved by using calibration stick with a standard length of 1.3m and the circumference measurement could be improved by using loggers' tape over tailors' tape measure. • Counting regenerants, i.e. saplings and seedlings may help to estimate above ground carbon stocks	**Challenges** • The PFRA team once trained tend to complete the task as soon as possible especially when there is quite a number of transects in a given sizeable VLFR. This may trigger errors in data collection sometimes is hard to notice once there are no major outliers. • Use of tailor's tape is quite easy because of cheap costs, but limiting for measuring large trees and somehow lose and do not stick to the tree bark, affecting the reading for circumference at breast height (CBH) for calculating DBH. • Volumes from defected trees are not considered, leading to loss of revenues and other value chains that may be obtained from defected trees. This also applies to NTFPs that are not fully considered as they may find markets in pharmaceuticals and cosmetics industries as well as carbon markets.

4.4. SUA Method

The SUA follows more or less the national guidelines. The SUA method is quite comprehensive, tedious and labour intensive. As mentioned before, the PFRA method is conducted by professional foresters with minimal involvement of communities. The method is highly dependent on precision scientific procedures with no flexibility.

In the Songea district, the VNRC members struggled to understand the methods and had no knowledge of the participatory inventory due to a lack of full engagement by the facilitator. Except for species identification which was done by local VNRC members, everything was done by the service provider, including data analysis, writing management plans, and drafting the bylaws. However, the district experts applauded the method because the sampling intensity was at 100% such that the whole VLFRs were mapped with plots and every plot was covered by the expert team. Time and costs were quite high depending on the size of the forests but ranged from 5 to 7 days to complete one VLFR.

The below table 4, summarizes strength, weakness, opportunities and threats on this method.

Table 4. SWOC analysis for SUA method

Strength	Weakness
• The method typically follows the scientific rules with high- level precision. • In some areas it follows the national guidelines as proposed by MNRT. • The method involves high trained foresters with extensive understanding of forest inventory and use of tools. • Volumes are calculated using volume tables, although models are applied using digital systems.	• Communities are rarely involved in data collection but rather performing simple tasks. • Uses complicated formulas for sampling intensity, sampling error and calculation that cannot be comprehended by communities. • Sampling intensity follows certain rules with high standard error such that volume calculations of small forests are skewed. • Uses sample design based on both random and systematic plots, which may yield inconsistence results.
Opportunity	**Challenges**
• Uses strata and radius plots that considers all vegetation types and generates enough data for decision making. • Laying plots in the whole VLFRs gives opportunity for assessing all resources including timber and non-timber in a given plot area.	• The method cannot be replicated anywhere but rather heavily depends on highly trained foresters • The method requires all necessary tools that forestry best practice needs which is quite uncommon for communities and district forest office to acquire them. This makes the PFRA method so difficult for district staff and communities to undertake a meaningful inventory.

4.5.   MJUMITA Method

While the MJUMITA method follows the realms of the national PFRA method, the improvement on this model is considered to be biased on data collection for charcoal and timber only. Transects layout on forest map are purposely determined for timber stock assessment, while charcoal stock assessment involves laying out concentric plots for coupe harvesting.

Engagement of communities is quite crucial for this method. For example, in Nachingwea district, MJUMITA and TFCG used random sampling design through stratification. Sample plots were randomly selected on a large map with pre-determined strata by looking at the satellite map of a given area or village land forest. By using Open Data Kit (ODK), data were captured and analysed using the model, with focus on timber and charcoal harvesting. The method lacked analysis of the growing stock and focused on mature trees.

Photo 2. Measuring crooked tree was a challenge for Liwangula PFRA team. Tunduru

The below table 5, summarizes the strength, weaknesses, opportunity, and threats of this method:

Table 5. SWOC analysis for MJUMITA model

Strength	Weakness
• Tree volume computation uses existing allometric equations in assessing the growing stock of species and their biomass • Uses legal minimal diameter of timber tree species for timber harvesting as provided in the government GN • Focus only on two aspects of forest utilization i.e. charcoal and timber harvesting which is quite focused and keeping the objective of the PFRA	• There is no valid justification for the calculation of population variance since the selection of sampling units is not based on the laws of chance. • Systematic sampling becomes biased in inventory if the natural geographical pattern of the terrain happens to coincide with the fixed pattern of sampling. For example, if all sampling units fall in valleys, or if all fall on ridges. The former will result in overestimation since valleys are usually more fertile.
Opportunities	**Challenges**
• The method focuses only on timber and charcoal harvesting, which are core focus of projects supported by MJUMITA • Digital computation and using allometric equations offer to assess carbon stocks for reporting and verification in case of carbon trade.	• Quite subjective and the sampling intensity and designs are biased on particular objectives that favors the project at hand • This could lead to overharvesting if not controlled especially on focusing on productive resources like timber and charcoal only.

4.6. Comparative analysis of PFRA approaches

All PFRA methods that were reviewed, offers opportunities for conducting inventory and arriving at final results that could help communities to write FMPs. The approaches provided strengths that suits different objectives and purposes of any given inventory but the methodologies differed and this were translated as weaknesses, which may result into different outcomes. This also has an implication on resources such as time, fund and human capacity utilization. The whole idea is to accommodate participation off communities, within the mind of reducing costs and taking more ownership of the inventory process of which will ensure a self-driven CBFM process and sustainability of activities, including PFRA, even beyond project support.

- The National PFRA guidelines are too complex and need further simplification of steps and requirements. This calls for MNRT to review and produce a simplified version that will be used by all actors and practitioners of CBFM in Tanzania.
- The MCDI approach could be further simplified but offers opportunities for communities to adapt and possibly undertake PFRA at very minimal costs and supervision
- MJUMITA approaches offer wide range of improvements and could also be streamlined and simplified to accommodate multiple purposes beyond timber and charcoal.
- The SUA approach is a bit complex and requires high level expertise. This is far beyond from the concept of participation of communities and needs complicated data analysis methods.

In summary, the MCDI model seems to be supportive with CBFM and has been developed in line with the National PFRA guidelines. Although the model focuses on certification principles, which also promotes sustainable forest management, it is quite simple while maintaining the inventory principles, and seems to be easy for communities to quickly understand and implement the steps. The MCDI model can be scalable to other parts of the country and can be adapted at the national level.

5. VLUP PROCESS

5.1. Preparation of VLUPs

Land use planning, management, and governance of Village Land Use Plans (VLUPs) are considered crucial for sustainable management of forest resources. The National Land Use Planning Commission (NLUPC) has put up guidelines for Participatory Land Use Planning, Administration, and Management (PLUM) (MLHHSD. 2020) that have to be adhered to when developing the Village Land Use Plans. These guidelines provide a structured approach to integrated and participatory village land-use planning, management, and administration.

The objective of the National guidelines is to build the capacity of villagers for planning and implementation of the selected land use management measures. Furthermore, the guidelines provide steps to implement measures for improved land use management in allocated land uses as well as promote sustainable utilization of natural resources for socio-economic development. They also provide steps to implement for climate change adaptation and mitigation measures. However, Land Use Planning and titling is an expensive and time- intensive process that requires a great deal of community consensus and costly.

From the discussion with stakeholders in the project area, it was felt that the process for establishing VLUP was time consuming, ranging from 10 to 14 days, even more depending on the size of the village, but also was considered to be an expensive, and technically complicated process. The costs were estimated, at minimum, from TZS 15 million up to 25 million per village; mostly being the cost of enabling district PLUM teams to facilitate the process at village level. However this was before the increase in DSA costs in 2022, the estimates if the same process was followed now was considered to be, depending on the size of the village/complexity of the site, the VLUP process costs roughly from TZS 25 million (10,000 Euros) up to TZS 75 million (30,000 Euros) per village.

According to the study by Enabel, (2020 b), the NLUPC has been promoting the use of online mapping and data collection tools, mobile applications, and remotely sensed data in undertaking land use planning, titling through issuing CCROs, and monitoring the implementation of VLUPs. One such useful tool is the Mobile Application to Secure Tenure (MAST), which has been piloted in Iringa and Njombe Regions in the Southern Highlands of Tanzania, to test participatory approaches to facilitate adjudication process, capturing land parcel information, and to lower costs for the issuance of CCROs. MAST tools are relatively low technology and lead to time and cost savings when compared to the traditional approach. Through MAST, community members can efficiently collect information necessary to enhance tenure security; for example, names and photographs of people using and occupying land, names of neighbours who share a border, details about land use, and a basis for their land claims. The NLPUC guidelines' fifth and sixth steps demand even more costs for producing and issuing CCROs which is a major burden for communities, district and many projects, and thus the adoption of MAST in the FORVAC project area could save much costs and time.

5.2. Challenges and support for setting aside VLFRs

In the southern landscape and within the FORVAC project area, the majority of communities depend on land resources for agriculture and many depend on slash-and-burn for cultivating crops especially sesame and cashew. Setting aside VLFRs on village land has not been easy in some villages during land use planning. The most recognised land conflict in the landscape, especially where CBFM approaches were not initiated before or has not yielded financial benefits, include competing land use for crop cultivation and may harbour vermin and wildlife for raiding crops. Conflicts between crop cultivators and pastoralists, who have been moving into the southern landscape as well as population increase forcing communities to settle in ecologically sensitive and protected areas, are some of the recent problems. Boundary conflicts are also observed between villages especially who have realized the benefits of forest through CBFM engagement. Step 5 of the Participatory Land use planning guidelines recognizes establishment of VLFRs according to the CBFM guidelines (Box 3). In most cases the VLFR management process are supported by projects, while few are supported by local government own funds, but not to the fullest completion of the steps.

Box 2. Steps which are involved in establishing village land forest reserve (VLFR), as sourced from CBFM guidelines and linking to the Participatory VLUM process.

- Awareness raising through Village council and Villageassembly meetings;
- The village assembly elect the Village Natural ResourcesCommittee (VNRC);
- The VNRC together with forest and other technicians undertake data collection and agreed on VLFR boundaries
- Carry out Participatory Forest Resources Assessment(PFRA) to determine forest resources at the proposed VLFR;
- Develop management and utilization measures for each Forest Management Unit (FMU) based on forest and beekeeping guideline 2007 and CBFM regulations of 2004;
- Data analysis and preparation of management plan to be reflected and implemented through village and district council budget, and any other stakeholders;
- Presentation of management plan to the village council and village assembly;
- Presentation of management plan to Ward Development Committee (WDC);
- Presentation of management plan to District Council for approval;
- Registration of the VLFR into District Forests register;
- Implementation of management plan (Community Action Plan);
- Review of management plan after 3 years

On the other hand, management of the VLFRs was considered to be good and in line with overall VLUPs of any given village. VLFRs were protected by village bylaws and were respected by communities as land for forest resources to be protected. In cases of revenue and incomes generated from VLFRs communities were even more taking care of the forests through regular patrols and minimizing any illegal activities. For example communities in FORVAC districts in Lindi region had generated between TZS 150 to 400 million (USD 59,000 to 156,000) from the VLFR in 2023[5].These are quite significant

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[5] ERET. 2023. External Review and Evaluation Services of Forestry Programmes in Tanzania. MFA

incomes to foster community livelihoods and social development that, in most cases would have less or no budget from the central or local government.

5.3. Suggested simple processes on undertaking VLUPs

From the land use planning and implementation process, the following are suggested:

- For communities with timber revenues or any other income from the forests, they could set aside budgets for land management along with other sectorial supports from agriculture, water, livestock, or land & settlements. In this way it will reduce the burden of each land sector to manage its own land parcel as well as reduce land use conflicts in the village jurisdictions. Furthermore, the NLUPC guidelines are quite bureaucratic and complicated, requiring much time in planning and training at district level i.e. PLUM team and the VLUM teams in villages.

- The VLUP approaches could be adjusted with fewer inputs from the costly district PLUM team since the local institutions at village level could be enabled to deal with most of the land use management issues themselves at minimal costs and time spend. This could include undertaking intensive trainings for village institutions and their committees. The committees include: Village Council, Village land use management committee, village natural resources committees, village water users' committees, village health committees or any other relevant committees, a village council may deem necessary to establish as directed by the Local Government Act (District Authority Act, 1982).

- Consultations with MNRT and other public, non-government organizations (NGOs) and private institutions at national, regional and district level in building on the lessons learned from long time Participatory Land Use Planning and Management undertaken in the country, with focus on land management and implementation of land use plans, streamline the establishment of VLFRs process and developing FMPs. This should also be coupled with supporting local institutions and other similar sectors (water, livestock, agriculture, etc.) for capacity building and improving governance of the village land.

- In collaboration with NLUPC, use of technology and digital methodology should be fully adopted in the project area. The methodology used for the VLUP process in Iringa and Njombe, especially the use of MAST and satellite imageries is good, as this will reduce time and increase engagement of communities and district PLUM teams, while building their capacities and active participation.

- Support the communities in completing step 5 and 6 of the PLUM in order to authoritatively ascertain the existing land rights, ownerships, and secure boundaries of the village land and customary rights. This will effectively reduce land conflicts at a very high level between land users.

6. SIMPLIFICATION OF PFRA APPROACH

The study has gone through reviewing a couple of PFRA methods that are used by different stakeholders, especially in the southern landscapes. The National PFRA guidelines provide the basis for undertaking PFRA, but they have gone through several modifications by partners and users of the guidelines. Some challenges have been identified on the national PFRA guideline by stakeholders, yet the principles for conducting forest inventory remain the same.

All inventory approaches under this study exemplified their strengths and weaknesses, mostly as perceived by stakeholders and users and according to the intended purposes and objectives of the inventory. The study reviewed the documented procedures for PFRA from MCDI, MJUMITA, and SUA. The study further interviewed communities and experts in the FORVAC project areas whereby gathered information could form the basis for the simplification of the PFRA approaches in the future. The comments are also based on field observations whereby communities, through their VNRC members, demonstrated the PFRA activities in the forests and narrated on the steps for the inventories conducted in their VLFRs.

Box 1, below and Table 7, **summerize the first three (Step 1, 2 and 3) as key steps for simplification of PFRA and additional step four (4) and five (5) for usage of the PFRA information**. Detailed information on every steps are also explained in the below sub-chapters.

> **Box 3. Key Process Steps for PFRA activities**
>
> 1. **Planning and Preparations:** This is the first step, whereby the objectives and purposes for conducting PFRA are explained to the whole village and communities agrees on the management objectives of the VLFR. The VNRC members are trained on conducting PFRA as well as mobilizing all necessary field equipment and VLFR map.
> 2. **Sample Plot Assessment:** Establishment of transects and locate sample plots on the map together with PFRA team. Conduct inventory according to the established sampling parameters using simple tools, including tape measures, recording forms and GPS. Assessing and recording sample plot information should be carefully entered into the recording forms.
> 3. **Information Compilation and Analysis:** Participatory data compilation and analyzing sample plot information should be done together with PFRA team. Final data analysis should be done by a qualified forester to carefully estimate sustainable off-take and allowable cut volumes.
> 4. **Preparation of Management Plan (and harvesting plan):** Present the compiled information to village council and village assembly. Drafting of bylaws and agree on allowable cut volumes for different tree species.
> 5. **Approval of Management Plan:** Pre-approval at village assembly and approval at District Councils for the management plan and harvesting plan, with iterative support from district foresters, lawyers and facilitators. Approval of the management plan by the Director of Forestry is mandatory.

6.1. Planning and Preparations phase

This is the very first step in conducting PFRA. For the planning and preparation phase, it is important that good planning is done before the actual PFRA is undertaken. Preparations range from understanding the basic concepts, purposes and objectives for conducting PFRA. Raising awareness to the communities, through village assembly, village council and VNRC members is necessary. This will also help to find out the community preferences on forest utilization and forest products. Furthermore, conducting training for the VNRC members is also crucial, that will capacitate the PFRA team, to understand the methods and practices on several aspects before the actual inventory.

It is also important to prepare large and printed satellite maps, ~~such~~ so that PFRA team can visualize the entire forests with visible features. This will help ~~for~~ with participatory planning especially in pre-determining the sampling design and this should be done together with PFRA team. The PFRA team with their local knowledge on the geographical setup of the forests will help the experts/foresters or facilitators to understand the forest condition and status when combined with visual knowledge on the printed map of the area. Pre-determining sampling size and intensity will also be supported by local knowledge, although it has to be carefully determined to avoid individual biases. For example, during the field interviews, most VNRC members who conducted PFRAs in the project area, acknowledged that they were not involved in pre-planning for the sampling design, including determining transects or plots setups. It was rather the expert telling them the number of plots/transects and starting points/directions they would follow in the VLFRs. A set of criteria should be agreed between facilitators and PFRA teams and consideration should not be given to where certain species of trees dominate. Such manipulation will invalidate the entire inventory, and could lead to overharvesting of particular species in a given forest.

Some of the suggested criteria include:

- Sampling Intensity – for community timber and charcoal harvesting, should be between 5-20%. See more in section 6.2
- Sample plot – systematic sample plots should be used for community forests. Transects sample plots are explained in section 6.2
- Locating the Starting point should be carefully pre-determined on the VLFR map and agreed between facilitators and PFRA team.

In terms of equipment, simple tools including tailors' tape measures, long tape measures (up to 30 metres), record forms, and writing pads should be prepared in advance. The GPS will always be carried by the foresters and experts who will lead the waypoints and leading the PFRA team to identify the starting point of transects or plots. However, through training, it would also be useful to impart knowledge to some of the quick learners among the PFRA team members on the use of GPS and calibration of other equipment for inventory.

6.2. Sample Plot Assessment

In forestry inventory sample plots are necessary in order to conduct a meaningful inventory. The sampling design and sampling intensity are key considerations when planning on inventory. The sampling intensity varies according to the purpose of the inventory but is also dictated by size of the forests. Based on the size of the forests, the decision should be taken on how many sample plots are needed and on the location of transects and sample plots. It is very important that the locations of transects are unbiased.

For community forests in the project area; the sampling intensity ranged from 5 - 20%. This is because of the overall objectives focusing on timber harvesting in almost all VLFRs.   The transect sample plot approach involves using a team to walk a 10m wide transects and record the names and Diameters or Circumference at Breast Height (DBH or CBH) of all of the potential trees that have a DBH/CBH of species. The PFRA team involves at least four (4) people. One person walks with a compass bearing or GPS track to keep the team moving in a straight line along the predetermined transect line. Then, two persons walk parallel 5 m out from the centre using a piece of rope 5 m long to check if trees are in or out of the transect. Finally, the fourth person records the data of trees encountered on a transect data sheet. It is very important that the team walk in a straight line and not deviate off the transect, leading to record trees outside the transect line. It is estimated that a well-trained PFRA team will walk at most 10% more than the true distance of the transect. Since the transect is 10 m wide, one (1) km of transect is equal to sampling one (1) ha of the VLFR.

If the axis of the VLFR or forest management unit (FMU) is closer to the boundaries, then transects will be traversing much shorter, and more transects will clearly be needed. When transects will be roughly parallel to the longer axis, then 6-8 as a starting number may be appropriate. Depending on the management objectives, for timber harvesting, all trees with large diameter i.e. >145cm should be recorded as harvestable. For example, under national harvesting regulations, Rosewood species (*Ptrecarpus angolensis* or *Mninga*) trees must have at least a DBH of 45.0 cm or CBH 141.3 cm as legal minimum diameter for timber harvesting.

6.3.   Data and Information Compilation

Data collection is key to getting quantitative information about the stocking (numbers and sizes of trees) in any given forest or forest management unit under inventory. There should be one Assessment Form to summarise all the information from sample plots for a single FMU. All data recorders need such form in case of more than one PFRA team to collate all data from different transects or plots.

One of important data to be collected is Diameter at Breast Height (DBH). This could be measured directly using foresters' calliper or measuring circumferences using tailors measuring tapes. The latter is high recommended as one of simple tools and easily acquired by communities. Depending on the objectives of the inventory trees can be measured at different DBHs or circumferences and later on calculated into actual DBH by experts.

With the support of a facilitator or expert, the PFRA team should add up the number of measured trees (of a particular size/diameter class and species) recorded from all the sample plots. In the case of many transects or plots, the easiest way to do this is to give each PFRA team member one or two completed Assessment Forms. Participants call out the number of trees recorded on their forms to a recorder who adds the numbers together (using a calculator). These numbers can then be converted to one total FMU record.

6.4.   Data Analysis

Data analysis involves careful calculation of several parameters and one of the important outputs is the volume of trees. In some cases, biomass stocks such as charcoal harvesting and carbon stock interests, would need a qualified expert to complete data analysis. In all the VNRC interviews it was evident that data analysis should be performed by a qualified forester or an expert rather than PFRA teams.

With the development of digital solutions, data are usually analysed by computers using simple trained formulas, statistical applications or software in some cases. The national volume tables are still in use

but are often not used by foresters, and the tables are based on miombo vegetation landscapes. However, it was obvious that VNRC were not involved in data analysis rather than to be informed on the total volume for different species found in their VLFRs. This may be flawed in cases where there are vested interests by district foresters or unplanned biasness. It is important that data analysis and volume calculations are done together with VNRCs/PFRA teams.

In order for that data analysis is as simple as possible, the MCDI approach, for example; assigns trees to one of three size classes defined according to the governments' Legal Minimum Diameter for Harvesting (LMDH). The size classes are color-coded (Table 6) for easy reference and drawing of simple bar charts. They are defined as follows (DT = diameter of tree):

- Red *(not yet harvestable)* : $0.5 \times LMDH \leq DT < LMDH$

- Green *(harvestable)* : $LMDH \leq DT < 2 \times LMDH$

- Blue *(extra large trees / seed trees)* : $2 \times LMDH \leq DT$

For timber harvesting objectives, it is recommended to set criteria for LMDH and usually should be in line with government Size Classes for harvestable LMDHs. This range from 55cm and above while small and medium LMDHs ranges from 24 and 45cm, respectively. For Tanzania LMDH varies according to species as well as size classes assigned to particular to each species. For example, all Class I timber trees have a LMDH of 24cm (e.g. *Dalbergia melanoxylon, Combretum imberbe*), 45cm (*Pterocarpus spp., Millettia stuhlmanii*) or 55cm (all the rest). The table below defines the minimum LMDH categories and its equivalent CBH of each size class.

Table 6. Legal Minimum Diameter for Harvesting as per Forest Regulation and categorized by MCDI by colour code

LMDH (cm)	Size Class minimum CBH (cm)		
	Red	Green	Blue
24	38	76	152
45	71	142	284
55	87	173	346

Source: MCDI PFRA guidelines.2022

6.5. Preparation of Management and harvesting Plan

After conducting PFRAs, the FMP for VLFRs is prepared with clear management objectives that are set by communities. In most cases within the FORVAC area, Village forest management plans were focusing on sustainable harvesting of timber and non-timber forest products. VNRCs were responsible for drafting management plans and presenting them to the village councils. Bylaws are agreed and approved by the village assembly before final endorsement by the district councils.

Forest officers and experts guides the VNRCs on developing forest harvesting plans (FHP) basing on the PFRA results and analysis. The FHP contains names of species and associated volumes. The allowable cut is calculated and presented to the community along with FMP. Both FMP and FHP are scheduled for review after every five years.

Identified challenges were based on less involvement of communities in calculating the allowable cut and some believed that they had more volumes and species abundance than believing the calculations from experts.

Table 7.Steps and processes, which could be adopted or adapted for simplification of the PFRA method.

Steps	National PFRA Guideline instructions (shortcomings)	Simplification of the major step (Suggested)
Planning and Preparations	1. Forestry tools are suggested, of which some are quite expensive and cannot easily be handled by PFRA teams from VNRCs 2. The national PFRA guidelines lack trade-off in terms of labor costs; the investment of effort required by communities, and the financial cost of that effort (both to communities and technical facilitators)	1. **Explain the purpose of PFRA to the whole village, including hamlets/sub villages and find out communities' objectives and purpose** for management of the VLFR and preferences on forest product utilizations. Estimated quantity of forest products and non-timber forest products can also be established. 2. **Train the PFRA team members** (mostly composed of VNRC members and tree identifiers with local forest knowledge) and agree on roles & responsibilities. 3. **Obtain equipment and simple tools**. These include GPS, tailors tape measure, long tape measure, writing pads, data collection forms and pencils. Machetes and other available local tools for tracking in the forest could be provided by PFRA team. 4. **Acquire Forest Map –** it is suggested to the facilitation team i.e. foresters, to print a large satellite map with high resolution so that all features can be easily identified by the PFRA team. Locate sample plots on the base map, and conduct participatory pre-planning for the systematic sampling design. This will help to gain the knowledge from the PFRA team who knows the VLFR better. Lay out the sampling plots on the map with forest management units (FMUs). In case there is a new VLFR that has been approved from the VLUPs, an application for registration and acquire Job Number (JB) for the reserve should be done immediately from the FBD headquarters. Boundary inspection should be done by zonal TFS officers and/or Land surveyors to complement the JB number designation.

Sample Plot Assessment	1. The guidelines suggest several sampling design and mostly square and round plots, which are guided by sampling intensity. This is suitable for general inventory, probably not for CBFM with small and medium sized areas not exceeding 20,000 Ha	1. **Transects with plots:** Find transect starting point and locate sample plots. It is important that the PFRA team understands the starting point and in case of two PFRA teams, one team should begin on the other end of the VLFR or transect and meet at the mid points. The sampling intensity should be between 5 – 20% depending on the size of the VLFR.
		2. **Data recording:** Assessing and recording sample plot information should be carefully entered into the recording forms. One or two members of the PFRA team should be chosen among others depending on the sample plots. A member with good knowledge on data recording should be selected. This will minimize errors and missing correct data while the team is conducting the assessment.
Information Compilation and Analysis	1. Data Analysis is mostly conducted by experts and shared back as final documents. 2. Production of histograms and charts is also unnecessary, and communities may not need them.	1. **Participatory data analysis: The** compilation and analysis of sample plot information should be participatory. While the PFRA team can merge and collate all data forms from various sample plots, the final data analysis should be done by a qualified forester. This can be done in the village or in the office with computer facilities.
		2. **Estimate sustainable off-take quantities** should also be carefully done by experts/foresters. Any overestimate could lead to depletion of forest products or certain species of interest. While the national PFRA guideline remains silent on establishing allowable cut, it is suggested that for better estimates of allowable cut a confidence limit of about 75% should be adopted.
Preparation of Management Plan (and Harvesting plan)	1. The PFRA guidelines do not cover all the processes involved with preparing management plans but cover only steps for assessment of the forest resources use of information for management planning. **2.** Confidence limits are calculated at 95%, which is too high and may lead to overharvesting of some species if not done properly.	1. **Presentation of the compiled information to village council and village assembly.** This gives opportunity for communities to get an insight of the forest resources that exist in their VLFRs. These include tree species that are suitable for timber harvesting as well as other usage as identified at the preparation phase. 2. **Drafting of bylaws** is conducted at this phase and communities are guided by district foresters/district lawyers on establishing workable bylaws. 3. **Drafting of Harvesting Plan** is also done at this stage, using information from the PFRA team. Total volumes and Annual Allowable cut volumes are presented and agreed at the village assembly.

Approval of Management Plan	1. Provisional steps for approval of the Management Plan is not covered in the PFRA guideline	1. **Pre-approval at village assembly and approval at District Councils** are considered to be levels of approving the management plan and harvesting plan. Both Management and harvesting plans goes into iterative support of district foresters and lawyers, who guide the communities to set bylaws with relevant penalties which could be applicable at village level. 2. **Approval of the management plan by the Director of Forestry** is mandatory according to the legislation with field visit by senior ministerial staff for inspections.

6.6. Other PFRA associated issues

6.6.1. Costs and Time

Both VLUPs and VLFRs take quite a lot of time and resources. A large part of these costs is used to pay out on daily subsistence allowances for district staff who act as facilitators for all these processes. Over the years, the Government of Tanzania has been issuing circulars for increments of the daily subsistence allowances. For example, by 2022, the daily subsistence allowances reached Tanzanian Shillings 200,000/day (80 USD/day). This has huge impacts on VLUPs and VLFRs processes which are mostly funded by development partners and donors.

In recent estimation based on interviews with implementers of the processes, it is expected that under current costs, the village land use plan depending on size and complexity would cost in the range of TZS 25 million (10,000 Euros) to TZS 75 million (30,000 Euros) per village. The FMP process costs between at the very lowest TZS 15 million (6,000 Euros) and as high as TZS 50 million (20,000 Euros), depending on the complexity and size. Amounts include all costs up to the final approval of the VLUPs and FMPs. VLUPs have to be renewed every 10 years, while FMPs are renewed every 5 years. The enormous costs for these processes are quite prohibitive for a sustained CBFM without donor support and communities with limited revenues cannot afford. One very practical and feasible recommendation is to extend the FMP from 5 years to 10 years, this would align the VLUP and the FMP timeframes and in natural forests with slower growing trees a longer planning horizon is more suitable for an FMP.

It is suggested that for such endeavours, intensive training for communities should be conducted such that a small number of facilitators can provide training and guide the communities to perform field activities. The training activities will be designed to engage participants, encourage active participation, and provide practical, hands-on experiences to help them develop the necessary skills and competencies in basic equipment handling like GPS, tape measures, data recording, etc. For example, for the Village Land Use Management Committees (VLUMs), if members of these committees are carefully selected among the communities with the right criteria, combined with intensive training before conducting land use planning, and later supervised by one of two key and relevant district planning staff; this could cut much of the costs. Similarly, for developing FMPs or renewal of management plans, minimum supervision could be undertaken by experts once the communities are well trained. Intensive training should be on data collection and minimizing errors. Data analysis should be supervised by well-trained facilitators in collaboration with communities.

For cost saving, it is estimated that about TZS 12 – 15 million, could be enough for undertaking VLUPs and approximately TZS 9 million for developing FMPs, while the PFRA costs could be TZS 5-10 million per village depending on management objectives. For VLFRs that have potential huge timber resources, communities could retain some of the revenues for sustained revision of VLUPs and FMPs. However, this should go along with the right training on business and sustainability planning that has to be well understood by the communities.

6.6.2. Equipment

Basic equipment for inventory could produce similar results as high-end scientific inventories. With the exception of a hand-held GPS unit, which is a bit costly, the rest of the inventory materials and equipment are available and could cut costs for communities. Typical forestry inventory uses Vernier Callipers, which are versatile for taking diameter measurements and, essentially, the diameter at breast height (DBH) for trees. The DBH is used to calculate volumes of tree species. But this expensive equipment could be replaced with Tailors' tap measures that measure circumferences, which can be converted into volumes of the trees through easy calculations.

Other basic tools, such as machetes and sickles, are available among community members, while data collection forms and printed satellite maps of the areas could be supplied by experts or facilitators. Oil paints could also be available for marking trees with different objectives i.e. for timber harvesting or mother trees for seeding.

6.6.3. Human Resources

For conducting participatory assessment, at least one expert/facilitator should be available to guide communities. This will minimize errors and data completeness. The key idea is to conduct sufficient training so that PFRA members are fully aware of objectives for conducting good PFRAs. Depending on the level of understanding by the PFRA members, some individuals could be assigned to undertake GPS readings while calibration of the starting points and double-checking GPS readings can be done by an expert. Similarly, for data analysis, PFRA team members could work together with an expert or facilitator to calculate final results including volumes using simple methodologies with the help of upgraded digital systems.

6.6.4. Capacity building

Continuous capacity building and training of the VNRC and PFRA teams should be planned on a quarterly or semi-annual basis. Facilitators or foresters from the districts should provide regularly training on key concepts related to inventory, taking measurements, management plans, harvesting plans and volume data management, marketing, communication, and community institution management. A well trained PFRA team will minimize common errors such as writing decimal points with numerical numbers, correct entry for species names, keeping boundary margins for plots and correct measuring of circumferences or diameters at breast height (CBH or DBH).

Financial management and business planning is also key for learning, which promotes the sustainability of the resources and self-sufficiency in case of lack of project support in future.

7. RECOMMENDATIONS

7.1. At Field Level

1. **Participatory Forest Resource Assessment or Inventory should be conducted by communities with the support of technical facilitators/foresters.** This approach has numerous advantages from the positive engagement of the resource-owners i.e. the communities together with their local knowledge and understanding of all resources that are available in the VLFRs. By engaging communities in PFRA, both facilitators/foresters and PFRA teams get to see the real status of the forests while tracking in the sample plots.

2. **PFRA should have defined objectives and purposes:** Conducting PFRA should entail defined objectives and functions that will guide PFRA approaches to be used. **Inventory objectives and functions could include conservation of biodiversity; water catchments, honey production, timber harvesting, charcoal production, ecosystem services etc. and therefore PFRA can be conducted with multiple objectives/functions within one VLFR**.

3. **Sampling Design:** The method for PFRA sampling design depends on the purpose of the management. **However, it is recommended to use systematic sampling design, preferably through 'transects' with sample plots for total counts.** The transect design with 10m width and at least 4-5km long, allows the communities to undertake thorough counts and physical observations of the forests. A sample plot with a radius of 15m (along transects) allows the PFRA team to make total counts of trees and saplings/seedlings which helps to understand the forest conditions. Illegal activities such as logging, snares for bushmeat, and illicit drug cultivation can be easily spotted through transect/plot designs. Depending on the objectives of the management plan, transect designs are suitable for timber, charcoal and even carbon stock estimates and therefore should be widely promoted in CBFM.

4. **Sampling Intensity**: the sampling intensity is guided by the objective of the PFRA and management purpose. For community forests, sampling intensity between 20 – 30% has been commonly used in the FORVAC landscape and mostly facilitated by NGOs. **While sampling intensity is dictated by management objectives, it is recommended that; there should be a common established sampling intensity in CBFM, preferably from 5% - 25%, depending on the size of the VLFR.** This could further be guided by the intended functions of the PFRA, but it will would be useful if a common sampling intensity could be established at landscape level. This will also help to have common calculations when estimating volumes for various species.

5. **Data Analysis should be 'participatory' with basic elements are explained and calculated together with community PFRA teams**. PFRA teams should be well trained in data collection to minimize errors. Data collection using traditional data entry forms are still useful and can be easily done by community inventory teams. Although simple tools such as Open Data Kit (ODK) can train the inventory teams, it needs investment in terms of training and smartphones and is less recommended for communities.

Much as hard science applies during data analysis, there are simple tasks for initial analysis such as collating data capture forms and merging of all information from the field. This can be done

using simple calculators with VNRC members under the supervision of facilitators. This will help to get ~~the~~ a sense of ownership and understanding of the basis for all volume calculations. In most cases volume tables are not used, but rather computer formulae that provide final volumes. It is also important to explain to the PFRA teams and communities on the final species volumes and the overall objectives for promoting sustainable forest management rather than utilization for quick incomes. Analysis for saplings and seedlings are always neglected, however it is equally important to consider them for volume assets, which is the basis for other benefits such as carbon stocks and trades.

6. **Capacity building for PFRA inventory teams**: in all cases, the VNRC members undertake PFRA with the support of technical experts, from district offices and NGOs. **Thorough training should be provided to the PFRA teams before conducting actual inventory**. This will seek to enable systematic and focused capacity development for the PFRA teams. Good training will help to understand the purpose of conducting PFRA as well as minimize errors in the field. Through training, the importance of PFRA for financial profitability or conservation will be adequately understood as a basis for decisions making, when carrying out forest management. Currently, not much effort is put into channeling money and resources for undertaking PFRA in their VLFRs.

7. **Digital upgrading to support VLUPs and PFRAs**: In collaboration with NLUPC, the project should support the use of technology and digital methodology to undertake VLUPs in the project area. Use of MAST has been successful in Iringa and Njombe, and can be scalable in the FORVAC areas. This will reduce time and costs while increasing engagement of communities and their capacities for repeat assessments or reviews. The MCDI's PFRA method with digital interface, could be adopted or adapted to form foundation for review of the National PFRA Guidelines.

8. **Costs aspects should be well considered and the estimates are suggested hereunder:** It is estimated that, about TZS 12 – 15 million, could be enough for undertaking VLUPs and approximately TZS 9 million for developing FMPs, while the PFRA costs could be TZS 5-10 million per village and depending on management objectives. These estimates are assuming that the facilitation teams or experts will spend less time in the field with focused efficiency while capacitating the communities to undertake VLUPs and PFRAs. With the use of google maps – satellite, and other satellite maps a lot of discussion can be done on the satellite image without need to be on the ground everywhere. Where there is a need to consult on the ground stakeholders for example in contested areas then indeed actual field work should be needed. However as a rule of thumb all field works should be aimed to completed within a maximum of 10 days. The combination of satellite images and participatory exercises using local knowledge should keep field work time and therefore DSA payments to a minimum. For VLFRs that have potential huge timber resources, communities must retain some of the revenues for the subsequent revision of VLUPs and FMPs, this should be raised during the FMP process. However, this should go along with right training on governance, business and sustainability planning that has to be well understood by the communities.

7.2.   At Institutional Level

1. **Conducting thorough revision followed by piloting of the National PFRA Guidelines**: the existing guidelines were approved in 2007, and several Regulations and Orders have been were issued. The recent Forest Policy Implementation Strategy (2022), promulgated several government notices (GN) to match its implementation. While all these happening, the PFRA guidelines ~~has~~ have not been revised for a quite long time, and several inventory activities have been simplified. Basic comments and suggestions for review on the National PFRA guidelines are provided in Annex 1. A task force with forestry experts should be established to support this review. It is also recommended to pilot the revised draft guidelines on a small scale first, then assess whether they are useful, practical in terms of process and outcome for communities and cost effective etc. before finalizing the guidelines and scaling up the process.

2. **Developing Business Plans that will help in guiding the Management Plans.** Many of the communities have their management plans for at least harvesting once from the VLFRs. Significant incomes have been realized as a result of timber sales and forest products. Much of the revenues were directed towards village social development projects and at least 35-40% of all incomes were plowed back for forest management e.g. Patrols. **However, it is recommended that communities develop feasible Business Plans that will enhance improved planning for value addition and marketing of forest products.** In this way, harvesting plans will be much guided to avoid under- or over-harvesting of the forest resources. The latter would be the worst-case scenario and not sustainable. The Business plans could include other potential value chains, such as beekeeping, which has multiple benefits including attracting markets for ecosystem services such as carbon trades.

3. **The duration of the Forest Management Plan should be increased from 5 years to 10 years for both cost and strategic planning reasons.** This would of course reduce the frequency of renewing the management plan, and this reduce the cost burden. Also, from a forestry point of view with especially natural forests requiring a long-term planning horizon, a 5-year time frame is simply too short for longer term strategic forest management interventions and therefore a 10-year frame would be more suitable for the longer-term planning needs of a natural forest.

4. **Renewal of both the Forest Management Plan and the VLUP should be a streamlined process ONLY focusing on updates to minimize costs.** The renewal process for FMP and VLUPs should focus on updates only, rather than a repetition of the original process. This should therefore be undertaken at a fraction of the cost of the original FMP and VLUP especially if no significant updates are required. One update that should be explored during renewal is expansion. It must be noted that often communities did not include all suitable forests and sometimes chose forests that were very far away for the VLFRs which leads to challenges in patrolling, managing and utilizing the forest. Therefore, the communities should be encouraged to voluntarily expand the VLFRs if they so wish during the renewal process.

5. **Duration of the Village Natural Resources Committee (VNRC) should be extended to five years.** The CBFM guidelines provide the time frame for VNRC members to be re-elected in every third year. But also, the guidelines, suggests the re-election of VNRC members, where they are inactive or formation of new committees. In some villages and due to governance issues, the VNRC members have been re-elected multiple times even before

the third year and before the expiry of the Forest Management and Harvesting Plans. This has an impact on the capacity building for new VNRC members who had no prior knowledge on existing Management Plans. It is recommended that, refresher training and new trainings have to be undertaken for the incoming VNRC members, which takes time and resources. **It is recommended to keep the stay of VNRCs up to five years, with continuous governance training and high mentoring from experts, before the commencement of another election in order to match with mid-term of Management plans**.

6. **Management of VLUPs should be adhered.** The VLUPs are developed based on community needs such as agriculture, livestock, settlements, protection/production forests etc. However, setting aside village forest reserves takes more steps by establishing village committees to look after the VLFR with all protection and bylaws. Other land sectors, lacks closer land management as a result, land uses and management becomes uncontrolled and conflicts arise, and sometimes affect VLFRs. **It is recommended for other relevant sectors within VLUPs to take further steps in supporting communities and building capacities for land use management, especially on agriculture and livestock grazing areas**.

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Annex 1. Comments in the National PFRA guidelines on Key PFRA steps and Activities.

The last column, contain explanation and justification for some of the steps/activities to be mandatory, optional or not necessary in order to simplify PFRA for communities to actively engage. All the steps marked as MA = represents a 'Mandatory' activity; NC = Not necessary activity and could be dropped and OP = represents Optional activity that can be conducted or not

Main Step	Activities	Mandatory (MA), Not Necessary (NC) or Optional (OP)	Explanations
1. PLANNING AND PREPARATION	Explain the purpose of PFRA to the whole village	MA	
	Form the PFRA team	MA	
	Agree PFRA team roles & responsibilities	MA	
	Obtain the equipment	MA	
	Train PFRA team members	MA	
2. FOREST PRODUCT UTILISATION	Find out villagers forest product preferences	MA	
	Quantify villagers forest product requirements	OP	This can be optional as the community demands can change any time before the next review cycle. In some cases, where there is large forested land, communities obtain their demands outside of the VLFRs
3. FOREST MAPPING	Produce or obtain a forest base map	MA	
	Prepare large-scale copies of the base map	OP	Given the limited financial resources, it is not important for the PFRA team to produce copies of the VLFR map. However this could also be provided by experts/facilitators.
	Prepare the participatory forest resource map	NC	The above forest map can serve the purpose and hence not necessary

	Divide the forest into FMUs (provisionally)	OP	This is optional; depending on the objectives of the PFRA, whether timber, charcoal, carbon etc. in case of multiple benefits, the forest can be divided into FMUs.
4. FOREST WALK	Assess each FMU visually	NC	Depending on the need and objectives of the PFRA, it is optional to visually assess each FMU, however with satellite maps, this can be easily observed on the map. Calculating Basal Area Is not necessary as the final data analysis using digital systems Basal Areas can be obtained. NB: Forest Walking Step: is not necessary and any prior recording during Forest Walk is probably a waste of time and resources.
	Assess Basal Area (BA) for forest each FMU	NC	
	Record other FMU information Assessment Form	NC	
	Finalising FMUs and FMU A (each FMU) boundaries · PFRA team work	NC	
	Do an obstacles and & discussions opportunities assessment for each FMU	NC	
	Decide management objectives for each FMU	MA	
5. SAMPLE PLOT ASSESSMENT	Locate sample plots on the base map	MA	
	Find transect starting point and locate sample plots	MA	
	Assess and locate sample plots	MA	
6. INFORMATION COMPILATION AND ANALYSIS	Compile and analyse sample plot information	MA	
	Produce histograms & charts	OP	It is optional to produce charts and histogram, however if computers are used it can be produced only for visualization
	Estimate sustainable offtake	MA	
	Assess supply & demand balance	NC	This is also not necessary – as the FMP (and Business plans) will cover all aspects of marketing.
7. PREPARATION OF MANAGEMENT PLAN	Present compiled information · Village meetings to Village Council and Village Assembly & discussions	MA	
	Develop harvesting rules and by-laws	MA	
	Draft the (provisional) management Plan	MA	

Annex 2. Key interview guiding questions under each objective from the ToRs

Objectives/Tasks	Key Questions
Concise review of the PFRA process conducted by different stakeholders (e.g. SWOC analysis)	a) What are the strength and short comings of the National PFRA guideline? b) What are the strength and short coming of the MCDI, SUA and MJUMITA models? c) What is the comparative analysis of all approaches? d) What are the opinions of the practitioners (VNRCs, Forest experts, etc.) under each model? e) Is the data collection methods simplified or user friendly? f) What are the technical compliances that would need communities (VNRCs) to understand before undertaking PFRA?
Concrete and feasible recommendations on how to streamline/make more cost effective and harmonize	a) What resources (funds and manpower) would each model take to implement in the field? b) How can all methodology be harmonized?

Analyse process steps – what needs to be done next in terms of reform of the approach	a) What are the processes for undertaking PFRA exercise?
	b) What needs to be done in reforming the steps and approach
	c) Are the steps well understood by VNRCs?
	d) For communities
	    a. How does it take to start the PFRA
	    b. What needs to be done before PFRA
	    c. Are the steps well understood by PFRA team members?
	    d. Is he PFRA exercise important to them? And why?
	    e. Can they demonstrate
	    f. How is the data collection done
	    g. Who collects which data sets?
	    h. Who analyses the data?
	    i. Do they find it easy or difficult to set plots/transects, conduct PFRA, and analyze the data?
	    j. Are they able to draft the FMP? Do they use the PFRA information?
	e) For experts
	    a. How are the LUPs conducted in
	    b. Is the VLUP necessary for establishing VLFR?
	    c. What happens during LUPs in relation to VLFRs?
	    d. What is it and are their benefits in conducting PFRA in VLFR?
	    e. How it gets started with PFRA for VLFR?
	    f. How do they move to support PFRA? How easy and difficult in conducting PFRA? What are the challenges
	    g. Do the communities understand the PFRA process? Under which methodology – National model, MCDI model or SUA model?
	    h. Is the data analysis conducted by communities or experts?

Provide wider recommendations on streamlining the entire forest management process and the VLUP process would be a welcome addition	a) How the processes for undertaking VLUPs can supports PFRA process? b) How the VLUPs can be made easier and cost effective? c) How can the VLUPs be managed by communities at very minimal costs? d) How can PFRA be simplified?

Annexes 3. List of Participants.

	PARTICIPANT LIST DURING PFRA STUDY		
	Forestry and Beekeeping Division		
	Name		**Designation**
1	Emmanuel Msofe		Assistant Director - PFM
2	Wanjala Mgaywa		Assistant Director – Policy
3	Emma Nzunda		National Project Coordinator
	National Land Use Commission		**Designation**
1	Prof Magigi Kadigi – emailed and no response yet		NLUPC Commissioner
	Forest and Value Chain Project		**Designation**
1	Peter O'Hara		CTA – FORVAC
2	Petro Masolwa		Ruvuma Cluster
3	Marcel Mtunda		Liwale Cluster – Lindi Cluster
4	Eustack Mtui		Ruangwa and Nachingwea – Lindi Cluster
	National NGOs/Academia		**Designation**
1	Rahma Njaidi		CEO – MJUMITA
2	Makala Jasper		CEO – MCDI
3	Charles Meschack		CEO – TFCG
4	Simon Lugazo		TFCG Project Manager
5	Prof Josiah Katani		SUA
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	Name	**Designation**	**Institution**
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2	Charles Joseph Sumuni	VEO	Mchichili village
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4	Asia Saidi Kaimba	VNRC member	Mchichili village
5	Zuhura Adamu Mkwakwata	VNRC member	Mchichili village
6	Twaha S. Ndongaji	VNRC member	Mchichili village
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13	Adija Abasi Pindingu	VNRC member	Mchichili village
14	Hamza Abdallah Ungala	VNRC member	Mchichili village
15	Juma Hassani Ndale	VNRC member	Mchichili village
16	Fatuma Chiputa	VNRC member	Mchichili village

17	Rajabu Ibrahimu Mtoi	VNRC member	Mchichili village
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12	Zainabu S. Rangi	VNRC member	Nahanga village
13	Hussein A. Bandali	VNRC member	Nahanga village
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15	Bakari S. Chilongala	VNRC member	Nahanga village
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17	Ally M. Ligajamba	VNRC member	Nahanga village
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4	Edina J. Mayaya	VNRC tresurer	Lipuyu village
5	Issa S. Chawila	VNRC member	Lipuyu village
6	Dastani I. Matuko	VNRC secretary	Lipuyu village
7	Erick S. Athumani	VNRC member	Lipuyu village
8	Issa B. Mbuta	VNRC member	Lipuyu village
9	Shida S. Lingutu	VNRC member	Lipuyu village
10	Rajabu A. Lipunguti	VNRC member	Lipuyu village
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12	Moses M. Liwanje	VNRC member	Lipuyu village
13	Gabriel H. Mbunga	VNRC member	Lipuyu village

	Name	Designation	Institution
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15	Kelvin K. Kalosi	VNRC member	Lipuyu village
16	Shakifu G. William	VNRC member	Lipuyu village
17	Abdallah Chimbe	VNRC member	Lipuyu village
18	Asha F. Stivini	VNRC member	Lipuyu village
19	Sotery B. Chikawe	VNRC member	Lipuyu village
	Name	**Designation**	**Institution**
1	Seifu Saidi Ng'wang'wa	Village chairperson	Ngunichile village
2	Sadati Ally Mahundu	VEO	Ngunichile village
3	Joshua John Mbughi	WEO	Ngunichile Ward
4	Ayuob Steven Mihayo	WAO	Ngunichile Ward
5	Kasimu A. Matumbuko	VNRC chairperson	Ngunichile village
6	Hija M. Mraponi	VNRC secretary	Ngunichile village
7	Hatibu A. Andrea	VNRC member	Ngunichile village
8	Fatuma K. Nana	VNRC member	Ngunichile village
9	Issa M. Chitanda	VNRC member	Ngunichile village
10	Said S. Matete	VNRC member	Ngunichile village
11	Modesta B. Chinguile	VNRC member	Ngunichile village
12	Yusufu O. Naliwile	VNRC member	Ngunichile village
13	Yolenda A. Pangalasi	VNRC member	Ngunichile village
14	Abdallah Mchapa	VNRC member	Ngunichile village
15	Mwanahawa S. Malikita	VNRC member	Ngunichile village
16	Salimu C.Milingo	VNRC member	Ngunichile village
17	Selemani I. Upete	VNRC member	Ngunichile village
18	Zainabu P. Omari	VNRC member	Ngunichile village
19	Hassani Abdul Baltazar	VNRC member	Ngunichile village
20	Ally Athumani Ndumu	VNRC member	Ngunichile village
	Name	**Designation**	**Institution**
1	Lington Nzunda	DNRECO	Nachingwea DC
2	Paiton Kamnana	DFO	Nachingwea DC
3	David A. Mkiramweni	ABO	Nachingwea DC
4	Andrea J. Axwesso	AFO	Nachingwea DC
	KILWA DISTRICT		
	Name	**Designation**	**Institution**
1	Ally R. Kinunga	Village chairperson	*Ngeya village*
2	Rehema N. Khalid	VEO	*Ngeya village*
3	Ismail H. Malibiche	VNRC member	*Ngeya village*
4	Abeid S. Kilunda	VNRC member	*Ngeya village*
5	Ahmad A. Mbepo	VNRC member	*Ngeya village*
6	Kuluthumu E. Kasembe	VNRC member	*Ngeya village*
7	Abdallah S. Mtemangani	VNRC member	*Ngeya village*
8	Milali Paul Kalogo	DFO	Kilwa DC
9	Pili R. Mbaga	FAO	Kilwa DC

10	Ngolo L. Lukala	FAO	Kilwa DC
11	Phabian B. Mayaya	TO	Kilwa DC
12	Paul A. Hilari	EMO	Kilwa DC
13	Glory Massao	GEM - FSC	MCDI
14	Yuvenal Pantaleo	Project Manager	MCDI
15	Benjamin Kisoka	FO	MCDI
16	Emmanuel Mlimbito	FO	MCDI
	Liwale Disritc		
	Name	**Designation**	**Institution**
1	Deograius Simwanza	DNREO	Liwale
2	Richard Rarimo Balazar	TFS Conservator	Liwale
3	Yukunda Florence Kombo	Forest Assistant	Liwale
4	Mzelela M. Sucha	Assistant Wildlife Officer	Liwale
5	Jma Jabiri Mnoche	Village Chair	Chimbuko
6	Thabit Ally Mahangabana	VEO	Chimbuko
7	Hamza A Makuba	VNRC Chair	Chimbuko
8	Zaruna Mchungurike	VNRC treasurer	Chimbuko
9	Rukia Menga	VNRC member	Chimbuko
10	Tependane Lihindi	VNRC member	Chimbuko
11	Abdu Kijambilo	VNRC member	Chimbuko
12	Rehema Pume	VNRC member	Chimbuko
13	Shaibu Tendre	VNRC member	Chimbuko
14	Asharaf Mandandu	VNRC member	Chimbuko
15	Anafi Ngatomela	VNRC member	Chimbuko
16	Saidi Kalunda	VNRC member	Chimbuko
17	Mwazana Mchite	VNRC member	Chimbuko
18	Mohamedi Ngumbila	VNRC member	Chimbuko
19	Shamim Makingo	VNRC member	Chimbuko
20	Musa Mpikamuno	VNRC member	Chimbuko
21	Khalifa Saidi Kimbwanda	Village Chair	Barikiwa
22	Martha Yusuph Masimosya	VEO	Barikiwa
23	Hamis Makanwa	VNRC Chair	Barikiwa
24	Jafari Kimbwanda	VNRC Secretary	Barikiwa
25	Amina Kinaki	VNRC treasurer	Barikiwa
26	Kassim Ndengulike	VNRC member	Barikiwa
27	Baita Likwekwe	VNRC member	Barikiwa
28	Tausi Kinguwili	VNRC member	Barikiwa
29	Asia Mpoma	VNRC member	Barikiwa
30	Shamsi Mapua	VNRC member	Barikiwa
31	Mashaka Mmopa	VNRC member	Barikiwa
32	Mwanaidi Ngwani	VNRC member	Barikiwa
33	Ally Mbondamwike	VNRC member	Barikiwa
34	Aviwe Mchenkenje	VNRC member	Barikiwa
35	Hamis Mpompo	VNRC member	Barikiwa

	Ruvuma Regional Office		
	Name	**Designation**	**Institution**
1	Africanus Chale	Regional Forest Officer	RAS - Ruvuma
2	Paul Onesmo	Forest Officer	RAS - Ruvuma
3	Zakayo Kaunda	District Focal Person	Songea Rural DC
4	David Kikasi	DBO - Songea Rural	Songea Rural DC
	Namtumbo District		
	Name	**Designation**	**Institution**
1	Gravas Mwalyombo	DFO/DFP	Namtumbo DC
2	Maulidi Fussy	Disrict Land Officer	Namtumbo DC
3	Stanley Chetesa	Forest Officer	Namtumbo DC
4	Desderius Ndakize	DBO - Namtumbo	Namtumbo DC
	Tunduru District		
	Name	**Designation**	**Institution**
1	Dunia Almasi	DNRECO	Tunduru DC
2	Abdallah Hamis	Forest Officer	Tunduru DC
3	Denis Mwangama	TFS Conservator	Tunduru DC
4	Samsoni Lemmy	Forest Officer	Tunduru DC
5	Ausi Rashidi Chingandilo	Village Chair	Liwangula Village
6	Omary Laddah	VEO	Liwangula Village
7	Mohamed Y. Ibrahim	VNRC member	Liwangula Village
8	Rashid Anafa Kazembe	VNRC member	Liwangula Village
9	Fredrick Ismail Mlola	VNRC member	Liwangula Village
10	Rehea Abdala Kikuju	VNRC member	Liwangula Village
11	Maishaa Abasi Changawe	VNRC member	Liwangula Village
12	Amina A Chikawe	VNRC member	Liwangula Village
13	Seria Leanad Kazembe	VNRC member	Liwangula Village
14	Neema Saidi Hussein	VNRC member	Liwangula Village
15	Rajab Majidi Yassini	VNRC member	Liwangula Village
16	Kaisi Isaa Bakari	VNRC member	Liwangula Village
17	Mustapha Hamim Saidi	VNRC member	Liwangula Village
18	Gaibu Hakim	VNRC member	Liwangula Village
19	Mkwanauni Mustapha	VNRC member	Liwangula Village
20	Rehema Ligate	VNRC member	Liwangula Village
21	Vitus Edward Vicent	Village Chair	Mkowele Village
22	Faustin Danstani Hasani	VEO	Mkowele Village
23	Bela Agrey Malemba	VNRC treasurer	Mkowele Village
24	amina Rashid Stamili	VNRC member	Mkowele Village
25	Feis William Malembe	VNRC member	Mkowele Village
26	Sarfina Maliki Bahari	VNRC member	Mkowele Village
27	Asha Athumani Nanjeka	VNRC member	Mkowele Village
28	Emmanuel Dawa	VNRC member	Mkowele Village
29	Adam Shaibu	VNRC member	Mkowele Village
30	Adam Sadiki	VNRC member	Mkowele Village
31	Owen Malembe	VNRC member	Mkowele Village
32	Johnson G Fute	VNRC member	Mkowele Village

33	Oliver M Muo	VNRC member	Mkowele Village
34	Asaf Isa Maulana	VNRC member	Mkowele Village
35	Juma Rashid	VNRC member	Mkowele Village
36	Suleiman Somanga	VNRC member	Mkowele Village
37	Francis Malembe	VNRC member	Mkowele Village

Annex 4. Workplan for study on simplification of PFRA approach

Activity	Descriptions	Stakeholders	Time and Date
1. Field consultations	1.1 Travel to Kilwa – meeting with MCDI and stakeholders in Kilwa district (DFOS, DFCs), 1.2 Organize meetings with Communities in 2 villages 1.3 Organize demo PFRA in the field and observe the process and steps	MCDi field staff, DFO, DFC, district staff who participated in PFRAs Village Natural Resources Committee members and village leaders, patrol teams	10th March – 13th March 2024
	1.4 Travel to Ruangwa – meeting with Cluster Coordinator Mr Mtui and district staff – discussion on PFRA methodology and reflect on the field techniques	Head of department, DFC, DFO, DFC, district staff who participated in PFRAs 2 Village Natural Resources Committee members and village leaders, patrol teams	14th March 2024
	1.5 Travel to Nachingwea	Head of department, DFC, DFO, DFC, district staff who participated in PFRAs 2 Village Natural Resources Committee members and village leaders, patrol teams	15th March 2024
	1.6 Travel to Liwale – depending on flexibility of the district staff to work on Saturday, otherwise work on report. 1.7 Organize field demo to observe how PFRA is conducted in the field (record short video)	Head of department, DFC, DFO, DFC 2 Village Natural Resources Committee members and village leaders, patrol teams	16th March 2024
	1.8 Work on report s and travel to Songea	work on report	17th March 2024
	1.9 Meeting with DFO, DFC for Songea rural	Head of department, DFC, DFO, DFC	18th March 2024
	1.10 Travel to Namtumbo	Head of department, DFC, DFO, DFC, district staff who participated in PFRAs	18th March 2024
	1.11 Travel to Tunduru	Head of department, DFC, DFO, DFC, district staff who participated in PFRAs 2 Village Natural Resources Committee members and village leaders, patrol teams	19th March 2024

2.	Remote consultations	Online consultation with SUA – department that was contracted by FORVAC to undertake PFRA in Ruvuma Online consultation with MNRT – FBD staff responsible for Guidelines (CBFM, PFRA, FMP and FHP)	Consultant	25th – 29th March 2025
3.	Report writing	3.1 Report writing 3.2 Submission of draft report to CTA for reading and perhaps presentation (internally)	Consultant FORVAC CTA and the team (Clusters Coordinators to attend online) on a selected day	1st – 12th April 2024 In the week of 22nd – 26th April 2024
4.	Presentation of draft recommendations	4.1 Presentation of final results to FBD and key stakeholders – this could possibly be in a form of workshop bringing together key individuals who will critically go through all recommendations including associated activities development of VLUPS, FMP etc 4.2 Compile final inputs to the final deliverable	Consultant and stakeholders	In the week of 22nd April to 26th April 2024 31st April 2024