ENGINEERING SERVICES FOR SOUTH SUDAN FEEDER AND TRUNK ROADS

YAMBIO COUNTY FEEDER ROADS INVENTORY AND MAPPING OF SETTLEMENT AND POTENTIAL AGRICULTURE AREAS

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SOUTH SUDAN FEEDER AND TRUNK ROADS PROGRAM

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ACRONYMS

CB	Capacity Building
CO	USAID Contracting Officer
COP	Chief of Party
COR	USAID Contracting Officer Representative
CLA	County Land Office
CPA	Comprehensive Peace Agreement
DG	(SMPI) Director General
DI	Damage Index
FTRP	(South Sudan) Feeder and Truck Road Program
GPS	Global Positioning System
LBG	[redacted]
IMT	Intermediate Means of Transport
IRD	Integrated Rural Development
NGO	Non-Governmental Organization
QIP	Quick Impact Projects
RSS	Republic of South Sudan
SMPI	State Ministries of Physical Infrastructure
SSRA	South Sudan Roads Authority
WES	Western Equatoria State
USAID	United States Agency for International Development
UNOPS	United Nations Office Project Services
YC	Yambio County

1.0 EXECUTIVE SUMMARY

Prior to the signing of the comprehensive peace agreement (CPA) in 2005, South Sudan has suffered decades of protracted civil war and civil strife, which not only affects the human population but also exacerbated damage on civil and societal orders, legal structures, productivity and basic economic infrastructures like roads, bridges, communication lines and others. One of the most affected sectors is the rural area, which contains about 60-84of South Sudanese households. Following the declaration of independence on July 9th, 2011, the Republic of South Sudan (RSS) continued to witness a rapid expansion and development of urban areas, while rural parts of the country encounter challenges linked with rapid degradation in the standards of rural infrastructure, including feeder roads. These roads connect the population of outer Payams, Bomas and the surrounding villages with the county headquarters or urban centers, especially markets. The degradation of these roads, and the resulting collapse of these linkages has culminated in many rural areas remaining inaccessible throughout the year, and especially in the rainy season.

Yambio County of Western Equatoria State (WES) is one of the counties affected by this challenge, which has been particularly severe because Yambio County is one of the most agriculturally productive counties in RSS. The state of feeder roads in the county has been cited as one of the key detrimental factors withholding the rapid development of the agricultural sector in the county, largely due to lack of access to feeder roads from farms to the markets. The pervasive challenges that relate to poor feeder roads networks in Yambio County (YC) are compounded by a lack of accurate data on the productivity of each feeder road in terms of provision of services, traffic, realization of local revenue, and promotional development of agriculture through linking farmer to the town markets.

Simultaneously, food security is a priority for both national and state government bodies, especially for the National and State Ministries of Agriculture, including the WES Ministry of Agriculture, Forestry, Environment and Rural development. The aim of this campaign is to encourage citizens and farmers to grow their own food for consumption and to supply the local markets, in order to reduce food insecurity, promote food self-sufficiency and improve farmer income by selling of surplus agricultural outputs in the local markets.

The South Sudan Feeder and Trunk Roads Program (FTRP) is a project funded by the United States Agency for International Development (USAID), currently supporting the Western Equatoria State Ministry of Physical Infrastructure and public utilities (SMPI) and Yambio County Authorities in areas of feeder roads. The project aims to work with these two institutions to identify high-traffic feeder roads, to plan and prioritize agricultural development along these feeder roads, and to promote community based feeder roads works through a collaborative and participatory implementation strategy. As a means by which to establish a binding framework for execution of its program, FTRP has conducted an inventory of feeder roads, settlements and potential agricultural areas in Yambio County between February 12, 2015 and March 20, 2015.

The USAID Mission in Juba, Tetra Tech management, and the FTRP technical team, in a collaborative process and in consultation with the key stakeholders, have determined the content, scope, nature and key indicators for this survey, and have planned the deployment of the technical team to the field. The thematic and generic data desired to determine each component of the exercise was widely discussed. Primary information includes roads conditions (formalized rural roads network system) length and width, bridges, culverts, demographical data and settlement trends, major traffics, agricultural activity along the roads, group farmers, structures of the existing markets, complementary economic activities and technological growth attained by individuals or group of farmers for example local processing plants. The dependable and reliable technologies deployed to assist the technical team during this tracking, geo-data collection and mapping exercise includes iPad, GPS, manual tape measures and camera. The four-person support team are knowledgeable on the agriculture, culture, roads and geography of Yambio County.

Once the field findings and the report compliment are completed, critical technical analysis will be carried out on the collected geo-data and social-economic information. This could avail focused stage for a strategically systematic linkage between departure points to the next step for rendering a positive identification of priority feeder roads and setting plan of actions of implementation stages.

The survey generated the following new information:

- Map of Yambio County, indicating major feeder roads, Payams, and Centers
- Technical in-depth information on the condition of roads, bridges and culverts
- Demographic and settlement patterns and settlement typologies
- Map, indicating potential agriculture land
- Understanding of roads usages, identified by location
- Recommendations for possible FTRP interventions

2.0 BACKGROUND

Since the signing of the CPA in 2005, the South Sudanese government has experienced challenges related to governance, infrastructure, stability, development and service delivery to citizens. The state of the roads in the country has been at the center of these challenges. Trunk and feeder roads, as well as the bridges on those roads, are exposed to extensive damage as a result of exceeding the life-spans of the roads and bridges without major maintenance. Poor road conditions and linkages impede the provision of basic services to the citizens at the periphery of urban centers.

Figure 1 Village residence posed for a picture with inventory team in Nyaka Boma

Donor countries and the South Sudanese government are proactively engaged to ensure service delivery, governance and development. USAID is among these donors, and has initiated many development projects to assist the people and the Government of RSS. An example of an international development project undertaken by USAID is the construction of the tarmacked Juba-Nimule high way.

One of the most critical challenges for the new nation is diversifying its economy from extractive industries into other sectors, such as agriculture, energy, forestry, livestock, tourism, fisheries and infrastructure. Development of these sectors can create inclusive private sector development, responsive to demands of citizens. Additionally, development can create jobs, improve standards of living, encourage good governance and promote stability, sustainable peace and development.

Despite significant contributions of agricultural products, domestic fuel, building materials and farm land from rural areas to the urban centers, transportation infrastructure has experienced limited improvement in the rural areas. In Yambio County of Western Equatoria for instance, the maintained section of feeder road is estimated to be below 100 kilometers, and that is only recently maintained (2010-2015) as a result of donor (USAID, WFP, UNOPS) involvement and other under quick impact projects (QIP). These 100 kilometers are part of 392 total kilometers of feeder roads in this area, as shown by the recent exercise of Yambio County feeder roads inventory.

Records gathered from this inventory largely indicate that larger percentages of the feeder roads are either partially or totally impassable at present. This has resulted in delayed service delivery to citizens in

areas where roads are impassable roads, and in inaccessibility to broader-based markets. As a result, local farmers who experience losses of crops through damages have no initiative to expand crop production, which remains stagnant. Significant number of bridges and culverts on feeder roads of Yambio County are old and others have been worn out completely. Bushes encroach most parts of feeder roads and drainage systems are covered up by heavy soils, washed by rain into drainage systems or even road-ways. In addition, soil erosion has created pot-holes of all shapes, sizes and depth in some sections of the feeder roads.

In addition to the USAID funded feeder roads projects, implemented by UNOPS, FTRP provides a way in which to work collaboratively with SMPI and Yambio County Land Authority to establish feeder roads maintenance mechanisms, while obtaining direct involvement of the community to create community led road maintenance. Formation of roads groups along agriculture activity can yield practical benefits to rural farmers. These farmers depend entirely on feeder road connectivity to access local and town markets to conduct transactions directly with consumers, or with mini agro-factories, which requires agro-inputs in the form of raw materials. FTRP will identify willing communities throughout Yambio County Authority to participate in maintaining feeder roads. All selected communities will be organized into groups and trained on basic road maintenance skills, assembling road machinery and demonstrating road maintenance through this pilot project with an appropriate, cost-effective and environmental friendly approach, such as the use of mixed technologies (labor-base plus machineries).

Figure 2 Nabiapai feeder road maintained by USAID implemented by UNOPS

2.1 OBJECTIVES OF THE FEEDER ROADS SURVEY/INVENTORY

The main objective of this feeder roads inventory is to provide technical data on the condition of existing feeder roads, demography and settlement patterns and economic activities, and to identify potential agricultural zones, in the context of promoting participatory roads maintenance mechanism with special emphasis on Yambio County. Additionally, the aim is to enable key stakeholders and the CLA and SMPI technical teams to profile and analyze prevailing challenges related to feeder roads and to develop workable strategies to address these challenges in a participatory manner. Subsequently, this will support relevant the state apparatus, such as the CLA and SMPI, with capacity building trainings in roads maintenance and community organizing skills. Additionally, the survey aims to analyze existing local government structures and permeable administrative guidelines that reflect the role of the community and their limitations in addressing feeder roads challenges – especially those linking farmers with markets or potential agricultural zones.

Land tenure system, and land, boundary and natural resource based conflicts are at the center of development. As such, it is crucial to highlight the relevancy of defined and accepted tenure systems and methods of land uses and land management. Proper understanding of the important role of roads, land tenure, land uses, natural resources is vital, and the resulting holistic approach through societal organization aims to increase direct social economic benefits gained through sustained agriculture and passable feeder roads.

Therefore, the feeder roads inventory exercise focused on the following specific objectives:

- Accurately track, map, process and store well-reviewed feeder road data for Yambio County. This can help FTRP and partners in the process of planning and implementation of road maintenance projects.

- Identify, track and map the inhabited areas along the roads, showing settlement patterns and roads that links up one section of a human settlement with another.
- Identify and map potential agricultural zones that can be put to better use by the community to earn income through agriculture projects.
- Conduct basic road assessment to ascertain the damage index and other deliverables like conditions of the existing bridges and culverts. The assessment report is an important tool in planning road maintenance in future by FTRP and partners.
- Identify, study and analyze the local administrative structures with in the county, Payams and Bomas. Study both structural and administrative limitations and opportunities that exists in terms of ability to participate in design, plan, qualification, implementation, monitoring and evaluation of feeder road projects with the local authorities with in the county.
- Identify a framework for the engagement of SMPI and the County through training and capacity building specifically in areas of roads, community mobilizations and organizational development. The capacity building is important to impart knowledge and skills in data collection, data process, data analysis, data storage and data management – an important tool in tailoring road works while implementing FTRP program activities in Yambio County in the future.

Figure 3 Locally constructed bridge on river Uzee

Rationale for the inventory of feeder roads in Yambio County

Although South Sudan is governed through decentralized systems – whereby institutional powers are decentralized and channeled from the national government to the state government, implying mandates to the latter to carry out activities such as feeder roads management and administration – access to resources continues to remain one of the most critical challenges, which has affected the rural population and poses further challenges to peace, economic growth and private sector development. This manifests through the poor network of feeder roads, the inaccessibility of markets for local farms, and the limited supply of civic amenities to rural populations e.g. farmers produce easily rots, perpetrating a culture of limited domesticated subsistence farming among farmers. FTRP, in addition to other crucial obligations, is tasked with the responsibility of maintaining roads sections in agriculturally productive areas in three Equatoria States and with using this exercise to develop the capacity of Counties, SMPI and community organized groups in order for them to acquire technical skills in managing roads. At the center of this capacity building program is skills and knowledge development through capacity building training and field activities. Based on these dire needs, FTRP has conducted an inventory of feeder roads in Yambio County.

3.0 METHODOLOGIES

3.1 INTRODUCTION

Data collection methodologies employed by the team members during the feeder roads inventory exercise in Yambio County include simple approaches, such as interviewing informants and recording observations. The team rendered utilized GPS Kits installed in iPads, hand-held GPS units, metallic measuring tape and a camera to record technical data. This equipment is used for tracking, mapping of coordinates, measuring dimensions of feeder roads, bridges and culverts and to photograph key features. Key areas of focus during

this exercise included roads, bridges, culverts, settlements, market centers, agriculture fields and potential agriculture areas.

GIS Consultant Mr. Ronya Thomas and Mr. Gibson Aarona were responsible for tracking, mapping and labeling of coordinates for agriculture sites. Mr. John Singira was responsible for identifying agriculture sites in coordination with Mr. James Walla. Engineer Steven Atura and Mr. Samuel Wugopai carried out the assessment of bridges and culverts, and determined road damage index (DI) for each section of feeder roads being assessed. While Wilson Peni, the paramount chief of Yambio County, and James Walla carried out community outreach – both informing the populace and gathering their opinions. Because each sub-operation is interlinked to the broader objective of the exercise itself, the team acted inclusively throughout the exercise, in order to create a comprehensive report on the key indicators, which will assist project managers to establish decisions and plan of action for the next stages of project.

3.2 GPS FIELD DATA PROCESSING

In the process of tracking and mapping of the feeder roads network, settlements, centers and potential Agriculture sites in Yambio County the following methodologies were used. A Global Positioning System (GPS) Kit installed on the IPad was used to track and map all key indicators mentioned above. The primary data collected from the field is later exported to Google Earths by means of electronic transmission known as ''data downloading'. Later the data is processed into useful information and then stored in electronic data management system under well labeled and easily identified file names for retrieving purposes. Finally the data is re-exported to GIS System for production of maps. This is because GIS has more functionalities that easily help in building a map with number of classifications and Symbollogy as indicated on the map that shows Payams in Yambio County (see figure 1-1).

3.3 GPS COORDINATE LABELING

During the feeder roads inventory exercise, the mapping of the feeder road network, potential agriculture sites, settlement along the feeder roads, bridge and culverts was carried out by GPS kit installed on an IPad. The data is recorded on decimal degree format of coordinates which later on is plotted on the map exactly where each feature is located in the map.

3.4 SETTLEMENT TYPOLOGIES IN PAYAMS AND BOMAS

The rural settlement patterns in Payams, Bomas and villages of Yambio County is a scattered one. The determinant factor for each settlement includes environmental factors such as source of water (river, stream and boreholes), the good fertility of the soil to support agriculture and grazing, security and existence of basic civil amenities facilities like Primary Health Care centers, Schools, usable feeder roads and markets. History of peaceful coexistence among community equals plays pivotal role in determining settlements.

The settlement is a mono-community with a history of peaceful coexistence among same tribe or sub-tribes with strong cultural ties. The settlement tends to be concentrated in Payam and Boma centers and drastically decline towards peripheral of deeper villages. One of the basic reasons for this is that Payam and Boma headquarters are believed to have comparatively fair services like schools, health centers, sources of clean drinking water, security and market for the locally produced agricultural outputs. 90 percent of rural people depend mainly on agriculture and domestic animal husbandry as a primary source of livelihood.

Each household has farm land inherited under the customary land tenure system and it is clearly demarcated with neighbor's farms to avoid land conflict. The state of creativity and technology is primarily rudimentary. Most of the agro-produce/outputs sold by rural farmers are unprocessed. The Payams and Bomas are governed under two separate pervading wings. Administratively, Payam and Boma are

administered by Payam administrator and Boma administrator, while on the other hand under traditional authority, there is a Payam chief, Boma chief and Village headmen whose major roles includes resolution of conflicts, adjudication of miner criminal cases in local courts, meditation between conflicting parties and coordination of government and NGOs activities and the grassroots. The challenges that are associated with poor states of feeder roads in Payams and Bomas of Yambio County are self-evident in the daily frustration expressed by farmers over loss that they experience almost every season due to inadequate feeder roads network which can directly link them with consumers in town, in an essence town markets price is fairly stable.

Figure 4 Settlement in Gangura Payam of Yambio County

Because of this sentiment, many farmers constantly connect their ability to add production in terms of land cultivable to the current state of the existing feeder roads. One banana farmer in Birisi Boma explained, "If only the road and bridges is improved why can't we produce surplus and sell and build good houses, buy motor cycles or even cars to take our produce into the market and pay school fees for our children!"

Improvement on feeder roads that lead to agricultural productive Payams and Bomas in Yambio County incorporate important advantages. For instance, reduction in transport fare can reduce the farmer's burden of paying extra pounds per specific load. Road improvements can also reduce travel time intervals and minimize loss associated with rotting of certain goods or products like fresh fish, reaped bananas or pineapples. In the long term, farmers can be inversely motivated to start indoor sales where by a farmer communicates to consumer in town about available produce and the consumer will travel to the farm and pay the famer and transport the produce using their own means of transport which amply reduces burden of over-paying by the village farmer.

3.5 AGRICULTURAL PRODUCTIVE SITES

Agriculture is primary source of active employment for the rural majority. The primary purpose of agriculture is the sustenance of food security per a household. Each family has an average of one hectare of productive agricultural land occupied with food crops. Both farmers and households produce wide varieties of food crops with cassava and maize as staple foods. Other crops produced by farmers in Yambio County include groundnuts, rice, sweet potatoes, vegetables, bananas, pineapples. Cash crops such as coffee, sugar cane, orange, mangoes, palm and teak trees are also grown.

In Yambio County, there are groups of organized farmers who form active farmers cooperatives, they usually receive basic training in crop technology and carry out group cultivations. Those groups have both success stories and challenges to share with the public. Challenges such as limited market, poor yields, inadequate storage facilities, poor form of preservation of surplus produce and lack of startup capital are categorized among major setbacks faced by farmers.

One key success is the improved yields due to supply of improved seeds by USAID funded FARM project and also adaptive simple technologies which are sustainable locally. Organized group farmers also benefit from micro-loans schemes aimed to boost agriculture. Capitalizing on the best practice of those organized group of farmers will assist in formation of a strategic dynamic cross-cutting group with tested mechanism to empower them take lead in roads maintenance in other to boost agriculture and widen the market opportunities as anticipated incentive.

Characteristics of the Farmers Groups in Yambio County

- They are formally organized bodies comprised of at least five members with chairperson and secretary
- They have farm land secured under the customary land tenure system and are well measured and demarcated, although they are not legally registered, they are customarily binding
- They receive basic training in crop technology, field management and financial management and farm records management
- They receive payable loans with the amount agreeable as well as the interval for reimbursement
- They cultivate land ranging in size from five hectare to ten hectares
- They are market-led group whose basic objective is to generate income
- They are mostly located in rural areas

3.6 POTENTIAL AGRICULTURAL SITES

The term Potential Agricultural Sites refers to the huge track of empty land not put into a rightful agriculture usage at present. During the land inventory exercise in Yambio County, a total of 44 potential sites in all the six payams of Yambio County have been identified. Most of the identified sites extend towards the feeder roads, hence ranking it as best for engaging into roads maintenance concurrently with agriculture. Even though the customary land tenure system and traditional authority have a direct influence on any form of land use, as a custodian of land rights, it's important to consider consultations and awareness on the form of land use for commercialized agricultural purposes. According to the observations gathered during the field work, areas with relatively maintained sections of feeder roads have shown high interest in various land usage, conclusively, those potential agricultural sites would be successfully developed into active agricultural field once the feeder roads leading to those locations have been improved.

Figure 5 Pineapple farm in Makpara One Yambio County

3.7 LAND TENURE

Despite the enactment of the South Sudan Land Act in 2009, land tenure still widely remains under the customary land tenure system. The land act categorizes land into three types – Public land, Private land and Community land. Activities and all other form of usage of the land under those three land title deeds are to be checked by legal standards. Currently in Yambio County, land is administered under the customary tenure system and if a land is to be transformed into modern use, such as for construction of boreholes, schools, roads and agriculture, community leadership will have be consulted to generate consensus and guarantee success for the sustenance of a project.

The community leaders in this case act both as custodians of the land and as experts locally experienced in history of land within the community. Identification or formulation of community based organizations and tapping rightful procedures of land acquisition for purpose of projects reduces land conflicts and promote peaceful implementation of developmental projects.

3.8 THE LOCAL GOVERNMENT STRUCTURES IN YAMBIO COUNTY

South Sudan has adopted a governance system of decentralization. Under this system, the role of each layer of government is clearly defined. The state powers are decentralized from national government onto state government and finally to the local government. These powers mandate the state and local government to execute defined responsibilities on behalf of the central government. These can be political, social, civic, legal or economic responsibilities.

Figure 6 Community Water Point in Kidi Village constructed on community land in Yambio County

The three layers of governments currently in full force in RSS include the national government, which is the overall policies and rules formulator and is the custodian of national affairs of the country. National government institutions include national ministries, Parastatals and national commissions. The second layer of government is the state government. It comprises state legislative assembly, state ministries, law enforcing agents, commissions and other state agents. The last layer is the local government which comprises a county, payam and Boma directly a lower level of government administrative jurisdiction. The county is headed by a Commissioner who is an appointee of an elected state governor and his/her key role is to bridge the administrative linkage between the community, citizens or electorates with the state government. The county is constituted of a number of departments, which also have direct administrative links with the traditional authorities, with paramount chief at the top of the traditional authority at county level and chiefs and sub chiefs at Payams and Bomas respectively. At the lowest echelon of the local government structure, interface of governance exists. For example, a Payam is run by a Payam administrative officer who is directly under supervision of the County, on the other hand under traditional authority arrangement, Payam is run by a Payam Chief who is supervised by the paramount chief, the same at level of Boma where there is Boma administrator and Boma sub-chief. Those highly technical local government officials work as mobilisers, organizers of community, mediators and law enforcement agents through use of traditional legal instruments like payam and Boma Courts.

Cooperation with each layer of these local structures is paramount for successful implementation of community linked projects such as FTRP, where continuous direct involvement of the community in project activities will ensure high degree of trust, create local consensus and in response, will produce broader commitment and build stronger team and cohesion at all stages of the project cycle.

3.9 RURAL DEVELOPMENT

It has been estimated that nearly 84 percent of the population of Yambio County is rural bound meaning that they live in rural parts of Yambio County. The rural population in Yambio County's outer Payams are mainly characterized by the traditional values, African extended families, rudimentary technologies and a deep dependence on a small scale subsistence farming as a major single handed basic livelihood endowment. In the rural setting, the female population plays an active role in areas like child rearing, farming, household management, peace initiatives and implicit rural entrepreneurship (mostly arts and crafts).

Many contributions of women are not consistently recorded, but evidence of daily life can attest to the fact that women have also stepped in to champion and assume a new role of leadership in the society, largely due to democracy. Women still however remain behind in terms of education, empowerment and ability to make decisions in development projects. Women are a major engine of agricultural development in payams of Yambio County. Implicit rural development could only be realized or attained to a

comparative level only if roads conditions are improved in order to effectively and efficiently allow for consistent delivery of civic services to the rural population including safety and security sectors.

A number of investors and companies are carrying out teak logging in Payams of Yambio County. However the role of those investors towards rural development is highly contested. Many of them use the old extractive approach model for investment in rural areas, meaning that they fail to create integrated rural development. For effective rural development to take place, special attention is required to create market led agriculture and a sound base for transformation of agriculture from a mere subsistence into a modern professional and industrial standard – one with the stability to create jobs as a process of development, specifically in the retailing, food stores and agro-factory industries.

Figure 7 Timber extraction work ongoing in James Diko

With improved roads, bridges, installation of telecommunications networks in rural areas, farmers can not only share information but be aware about dynamic trends in the urban markets, which can improve their analytical abilities and improve decision-making on sales of produce and purchase of agricultural implements. The best approach for transformative rural development is through a constructive dialogue among the stakeholders – sustainable rural development cannot happen instantaneously, but requires the cooperation and involvement of local people who are knowledgeable about best priorities, values, aspirations and expectations of their own people. Community involvement is a solid parameter for a sustainable rural development.

3.10 IMPACTS OF POOR FEEDER ROADS ON THE RURAL POPULATION

Based on field work findings, the following are the key impacts of poor feeder road networks:

- Some Payams, Boma and villages are completely cut-off from County. For example, it is not possible to travel from Nyaka to Yambio through Ukuo- Rimenze. This is because some section of this feeder road is already covered by vegetation and forest.
- Farm or agricultural produce from productive Bomas, such as Birisi and Nasoro Bomas located in Gangura Payam, are completely cut-off from the Yambio main market. This causes most of their produce to rot and creates loss, which is a main reason why farmers from affected Bomas are not willing to produce more.
- The County headquarter administration, NGOs and other stakeholders find it very difficult to reach some Payams. For example in Nandegere, Payam citizens are not able to receive regular services, which is attributed to the current poor state of the feeder road connect the Payam to Yambio County headquarter
- The travel time interval and the transportation fare keeps increasing, and this is majorly attributed to the poor state of the feeder roads. For example, to travel from Yambio to Nandegere by motor-cycle, a fare chargeable per a passenger amounts to 250 SSP. As a result, many people, especially farmers, are not able to take their produce into the market easily, neither can traders travel from Yambio to Nandegere in large numbers.
- Many cases of deaths in the outer Payams of Yambio County are connected directly to the state of poor feeder roads networks. For example, in some cases patients who suffers from treatable diseases

die on the way to or in villages, simply because it is very expensive to motor-cycle and it often takes longer for a patient to reach hospital in Yambio.

Figure 8 Section of feeder road encroached by bush and locally made wooden bridge in Namama

4.0 KEY TERMINOLOGIES AND THEIR DEFINITIONS

Administrator: Payam Executive officer who is head of Payam local government and reports to the Commissioner through County Executive Director

Agriculture: Growing of crops and practice of animal husbandry and poultry for both domestic consumption and commercial purposes

Boma: The lowest level of local government after the Payam and is run by Boma Administrator

Commissioner: Head of a County, in charge of local government at both County, Payam and Boma and is the appointee of an elected State Governor

Community: Group of persons who belong to specific territorial area, who share common attributes like culture, values, believes and norms

Chiefs: Traditional leaders who are the head of people under traditional leadership arrangement in the decentralized system of governance

County: The highest umbrella of a local government which is comprised of Payams and Bomas

Demography: Human population living in specific geographical areas for a reasonably extended period of time

Payam: Second highest local government level after the County and is formed out of several Bomas

Rural development: Holistically integrated growth of rural area economically, socially, politically, physically and spiritually

Traditional Land tenure system: Traditional arrangement under which land rights are acquired by the citizens

Local government: Government structures at County, Payam and Boma levels

Data: Unprocessed information gathered from field

Data Management: Methods through which useful processed data is stored for safety and references

Informant: Person or group of persons who provide valid information on specific subject for purpose of decision making to addressing specific challenges falling under the subject

4.1 COMPOSITION OF THE TEAM

Figure 9 Feeder roads inventory team in CLA office Yambio

The team mainly comprises three FTRP staff, a GIS consultant and four members of the technical team drawn from SMPI and CLA. The four-member team has good background knowledge on important areas such as agricultural extension, the feeder roads network in Yambio County, community mobilization, public speaking, conflict mitigation, mediation and resolution, public relations and community security management.

The eight-member team who participated was further divided into four groups -- each group comprised two members in order to strategize operations. The first group was assigned to roads, bridges and culverts conditions assessment. The second group carried out tracking and mapping of roads, settlements, markets and agriculture potential areas. The third ground focused on agricultural extension and identification of potential agriculture areas. The fourth group performed community outreach tasks like public briefing, interviews, opinion gathering, facilitate consensus building and informing the payams, Bomas authorities.

4.2 SUPPORT TEAM AND SUPPORT TEAM OVERSIGHT

The formation and the selection of the four member team came as a result of recommendation from the office of Yambio County Commissioner who doubled as a chairperson of CLA on February 22, 2015. The selection of the team, an important part of this exercise, was successfully completed. This was followed by a short training and a briefing of the team planned, designed and implemented by Tetra Tech.

Figure 10 Group of informants with inventory team in Nyaka

4.3 ROLE OF INFORMANTS

An informant is a person, group of people, or institution who provides the feeder roads inventory team with correct data regarding road use, impacts of state of poor road conditions on the citizens, level of services available, previous community roads maintenance program initiatives and impact of the failing roads on agriculture and marketing. The data gathered from the respondent plays an important role in analyzing the current and future needs of roads for the specific community, taking into consideration several elements like expansion, increase in traffic, establishment of more new markets, community based organizations and rapid changes in land uses.

4.4 DATA COLLECTION METHODS

During this exercise of feeder roads inventory in Yambio County, methods involved for collection of data from the field and communities include interviews, observations, documentary review, tacking, mapping, coordinates and photograph taking.

5.0 FINDINGS

5.1 TOTAL DISTANCE OF FEEDER ROADS TRACKED AND ASSESSED

During the inventory of feeder roads in Yambio County, a total of 392 kilometers of feeder roads were tracked. However, this does not reflect in totality all the feeder roads networks in Yambio County. All existing and completely damaged bridges and culverts on these feeder roads were assessed and indicated on the track. Some sections of the feeder roads, such as the road which connect James Diko to Gangura, could not be tracked because of a collapsed bridge on Huu River. Importantly, all data gathered during inventory of feeder roads can be useful for future road maintenance planning, designing, costing and implementation.

5.2 CHARACTERISTICS OF THE FEEDER ROADS IN YAMBIO COUNTY

Figure 11 Sue Bridge on a way to Nadiangere Payam

- About 75-80 percent of feeder roads tracked during the inventory exercise are not being maintained over extended period of time.
- Feeder roads have potholes, others are filled with water and mud
- Bush encroachment is a common phenomenon on the feeder roads. Fallen braches and tree stems cover some roads
- Most bridges and culverts on feeder roads are either too old or damaged. Some are repaired by local community by use of local materials like flat timbers
- Main roadways in some section of feeder roads is narrowed to width of two meters
- Other sections of feeder roads are closed completely. For example James Diko-Gangura via Huu river

5.3 LONGEST FEEDER ROADS AND ITS IMPACT ON THE POPULATION

The two longest feeder roads according to the findings of the team are Nandiangere (165 kilometers) and Rimenze- Nangume- James Diko- Huu-Nangume-Makaragbudu- Ukua- Nyaka-Bangasu (90 kilometers). The immediate negative impacts of these feeder roads on the population are that farmers are cut–off from the town markets. This has resulted in a limited scale of sales of agro-produce by rural farmers. Also acquiring necessary good and services is a challenge. Sometimes service providers such as NGOs and the government cannot reach affected populations, which widens the service delivery gap. Intervention to improve these roads will greatly contribute towards improved access to services and market.

5.4 CHARACTERISTICS OF RURAL AGRICULTURE

Although Yambio County has potential in agriculture in terms of abundant arable farm land, soil fertility and reliable rain, the sector is undergoing scores of critical challenges and opportunities. Key characteristics of rural agriculture in Yambio are listed below:

- The majority of farmers practice subsistence farming for family consumption only. Farmers have however shown improvement in terms of farm expansion. If the roads are improved, famers can shift from subsistence farming to commercialized and mechanized farming.
- The majority of farmers mainly use rudimentary hand tools like hoes, machetes for ploughing and bush clearance. This reduces the farmer productivity index. The state of modern technology is still low.

Figure 12 Cassava farm and cassava roots in Mobongo Nadiangere Payam

- Many farmers are moving away from the traditional culture of mono-cropping and adapting to mixed farming. This help farmers to produce wide varieties of high quality, which brings a good price at the market.
- Women constitute about 50 percent of agricultural manpower. For instance, five out of ten women are engaged directly in agriculture, except for the sick and elderly. Because of low rates of enrollment in schools, girls in rural areas experience earlier marriages and as a result, the majority of them become fully employed in agriculture for both income and family sustenance.
- Farmers who underwent crop technology training are more knowledgeable in cropping as compared with those who did not attain trainings. There is evidence of demonstration farms, either established by community based organizations or NGOs. The major focus of such training is to provide skills to the farmer, to earn more income as a result of improved yield.
- The majority of farmers have field/farm land located in different places. For example a farmer can plough next to the feeder roads in order to transport the harvested crop to store or market. Meanwhile, another field is located farther from home or road which is mainly kept as a green storage for domesticated consumptions.
- The major crops that are grown by natural farmers include peanuts, millet, maize, rice, bananas, sorghum, simsim, pineapples and vegetables.

Figure 13 Some of commonly used means of transportation in Payams, Bomas and villages

5.5 COMPLEMENTARY ECONOMIC ACTIVITIES AND TECHNOLOGIES

To complement crop production in Yambio County, poultry, goat rearing, fishing, honey gathering, palm oil processing and teak forestry logging is being carried out. The state of technology in rural parts of Yambio County is limited with fewer grinding-mills used for grinding maize and other cearoles spies and show-machines that are used to fell teak trees. In terms of transportation, the intermediate means of transport (IMT) like motor-cycles and bicycles are dependable means especially among the local communities. Communication technology special mobile operation network coverage is limited to Payams nearer to Yambio town. The network is either accessed through sharing signals from antennas that have been erected inside Yambio County or through expansion of new network in populated payams. For example MTN, one of mobile networks operating in South Sudan, has erected one tower in Ri-Rangu Payam center, to help the citizens to interact or communicate with each other through use of mobile phones. Mobile operators and other private sector companies operating in Yambio County can be

potential stakeholders in feeder roads projects, as their companies' expansion and profitability majorly depends on roads. The greatest challenge at moment is the lack of a clearer framework of engagement of potential roads stakeholders in the county.

5.6 ATTEMPT ON MECHANIZATION OF AGRICULTURE

Figure 14 Granted Tractor in Bangasu Payam Yambio County

In the year 2009 and 2010, there were attempts by the government of South Sudan to mechanize agriculture in Western Equatoria. As a result, each Payam in Yambio County received a tractor to boost agriculture through implementing mechanized farming. This project has failed to successfully yield the intended result. All the tractors are granted at the moment. The challenges that have compounded this project included lack of defined institutional framework to manage the tractors, lack of technical person(s) to use the tractors and lack of general logistical provisions, like fuel, lubricants and spare parts. The failures from this project can translate good lesson to FTRP to set parameters of both the institutional and personnel capacity building program and also to create logistical support to accompany tractors and other roads maintenance machines to be used by the county in this pilot project.

5.7 CHARACTERISTIC OF RURAL DEMOGRAPHY

Figure 15 Primary school in Namama

The settlement pattern in Outer Payams in Yambio County is basically traditional in nature. People experience scattered type of settlement in general. Factors which are responsible for attracting human settlement include availability of land for both settlement and agriculture, sources of water for domesticated uses, existence of feeder roads for movement, sources of civil amenities such as schools, health care. The settlement is highly concentrated in Payam and Boma centers and this pattern tends to change overly whereby population demises, households become farther sparsely and scattered. The rural inhabitants usually form mono-societies in which the powers of decision making and authority are derived from the traditional authority and chieftaincies. One implicit important factor is that major settlements occur along the feeder roads network. This settlement can play constructive role to FTRP if tapped into organizational framework whereby community base groups will be formed trained and deployed into identified section of road for maintenance within a given distances.

Characteristic of land tenure system in Yambio County

The Payams in Yambio County conforms to the customary land tenure system. Land rights are allocated to individuals, groups or organizations through authorization of chieftaincy with the consent of the County Commissioner who double as a chairperson of County Land Authority. Land disputes are always resolved systematically through public hearing including council of seating elders who are knowledgeable about historical origin of the land ownership. Following the enactment of Western Equatoria land management

bill 2013 into law by state legislative assembly, it is believed it would improve various types of land uses in the state including Yambio County. For a successful execution of a community base project like FTRP, community involvement is very crucial in addressing acquisitions of land for agriculture purpose and other uses like roads diversion, realignment and other public utility installation.

6.0 DISCUSSION OF MAIN FINDINGS

Long stretches of Feeder Roads have not been maintained for an extended period of time:

Figure 16 Unmaintained section of feeder road in Birisi

During the conduct of the feeder roads inventory in Yambio County, data and technical observation revealed that most feeder roads tracked have not been maintained for the extended period of time. Those roads are characterized by potholes, bush encroachment, damaged bridges and culverts also other parts are completely cut off. This has limited the usage of the roads to pedestals, bicycles and motorcycles only. The current state of feeder roads negatively impacts the local communities socially, economically and politically, and limits their cultural participation and the delivery of services. The currently maintained feeder roads in Yambio County includes Nabiapai (34.8 km) feeder road and Sakure (8.4km) a project funded by USAID implemented by CBOs and supervised by UNOPS. The maintained sections of feeder roads in Yambio County makes about 11-12 percent.

Figure 17 Figure Settlement along Nabiapai road Gangura Payam

There is existence of settlements along feeder roads:

A huge human population and settlement exists along feeder roads. This may perhaps be because of constructive reasons such as access to basic services and security. Settlements are administered by chieftaincies under arrangement of traditional authority. Most settlers are agriculturalists, as such the strategic positioning of the settlement along the feeder roads' central is to get access to markets with agricultural produce or in small business units established just by the road sides. Indoor sales are preferred by many rural people especially the women.

Some of Agricultural productive areas are cut-off by roads network:

During this exercise, it has also been observed that major agricultural belts are cut off from the feeder roads network. Also the respondents from badly affected areas like Nyaka, Birisi, Nadiagere etc., testified that if the roads are reopened in future farmers willingly can utilize those abundant productive agricultural land for crop production. With rehabilitation of feeder roads in Yambio County, farmers are likely to increase their agricultural outputs. Surplus production will enhance and promote a sustainable agro-

Figure 18 Organic Bananas produce by elderly farmer in James Diko, areas affected by poor network of roads

business, agricultural entrepreneurship and economic growth as a catalyst for a sustainable rural development.

Farmers have excess stock of harvested food items in villages:

Practically speaking, based on the observations obtained, the majority of rural farmers have harvested food crops ready to be sold but because of the poor roads, those farmers are not able to reach the town markets with their produce. Some farmers while being interviewed said that each year they experience what is called "gross-loss" resulting from the over stock or over production (difference between what a farmer produces and total out puts he/she sold) . When a farmer fails to sell produce in time, loss can occur. In some locations the situation is made worse by lack of proper storage facilities. Rural farmer support for the road project is paramount because it's those roads that can link them to the market faster and easier.

Women farmers can become central beneficiaries given the impressive magnitude of participation of rural women in Yambio County in agricultural production.

Figure 19 Stock of Groundnuts packed for sale Mobongo Naidiangere

Social services units and Markets are established along feeder roads:

Along each feeder road, at least one well-constructed or under-tree-class primary school is found. Also along each feeder road there is a borehole that supplies citizens with safe clean drinking water. In the same way, in segment of each feeder road there is at least one small business or trade center in which citizens get supplies of necessity goods, services and utilities. These small business centers also act as meeting-points where town traders who supply rural markets with goods carry out transactions. Improvement of feeder roads in Yambio County will boost business between rural and urban traders specially agro-business and trade.

Farmers groups are active in some Payams of Yambio County:

Both small scale and medium scale group of farmer cooperatives exists in some Payams of Yambio County. Their origins are a result of the local initiative of farmers themselves or of external support from NGOs. It is believed that farmers who are organized in groups stand a better chance of winning support from donors, negotiating good land deals and bargaining prices of agricultural outputs more effectively. From observation made, it was evidently clear that farmers who are performing through groups are more effective, efficient, reliable and cooperative than individual farmers. These farmer groups receive support from a number of sources such as World Bank, African Development Bank, USAID-FARM Project and government agents and ministries. The support includes technical capacity building training, supply of improved (hybrid) seeds, construction of storage facilities and macro-loan schemes. The opportunity here is that the existing framework for farmer groups can be utilized with a streamlined strategy that can create stronger partnerships between farmers and FTRP.

6.1 BUILDING BLOCKS OF CONSENSUS

The consensus building with community and other relevant stakeholders is an important and integral part of implementation of FTRP. This can be achieved through activities such as stakeholder engagement, development of a joint action plan with line ministries and concerned authorities, consultations, meetings, and public awareness among communities and traditional authorities as focal point for local stakeholders. The line ministries, other relevant authorities and traditional authorities command power to influence and win popular local support towards any relevant program. It is during the consensus development process in which issues such as roles of line ministries, community, contractual relationships, project mandates, duration and implementations modality may have to be defined, determined and formalized to avoid role ambiguity and minimize mismanagement of the project resources. Additionally, during the introduction of consensus building, legal status and the governing framework of a project must be adopted, reviewed and established through tapping best practices from similar previous activities to avoid sets of implications associated with project at later stages.

Figure 20 Organic Bananas produce by elderly farmer in James Diko, areas affected by poor network of roads

6.2 WAYS TO LINK FARMERS WITH MARKETS

The primary form of linkage between a village farmer and the town market is the nearby feeder roads. For many years ago farmers or entire communities have not realized their important role in a participatory approach to maintaining feeder roads. The reaction of the community in any attempt to involve them to participate in feeder roads work has always been that "the government can do it", which excludes the community and undermines important democratic principles for involvement, participation and empowerment. This requires an immediate "paradigm shift" from an observer role into an active role in roads maintenance, known as an "all of us approach" to the feeder road works.

While this might appear simple or easy, it is a big tasks which requires the reliability, determination and commitment of all stakeholders. One important fact is that the community is endowed with many resources which can be tapped and directed towards road works. For example community organized groups, labor/people, marram, aggregates, sand and many others all are found within the community as primary resources. For a participatory approach to succeed in Yambio County, identification, mobilization and organization of these resources needs to be well planned with a visional predictability garnered towards comprehensive outcomes. Research has shown that objectively organized groups, projects and programs achieve excellence as compared with ill-organized ones. It is imperative here that organized farmer groups are the primary target, because farmers earn more income by sale of agriculture produce in relatively fair price in town market. Improved feeder roads will enable a farmer or group of farmers to directly access the market conveniently and cheaply.

6.3 BUILDING OF STRUCTURAL FRAMEWORK AND WORKING BLOCKS

Increased efforts to engage the enlarged stakeholders of roads range from NGOs, State and Local Government, Faith Base Organization, Community Based Organization and the private sector and traditional authority can yield positive result towards elevating poor road conditions. These relevant stakeholders can form several important layers for roads maintenance needs. As it is the case under best practices, there is intention to review the existing structures and at the same time create coordinative

organograms that adjusts and lean towards engagement protocols of an inclusive body of all road users. This can be achieved through a strategic road plan which includes the formulation of roads work groups in each of the above mentioned categories of institutions. This approach can advocate for collective responsibility in which every institution can contribute towards road maintenance, thereby creating a plan of action which is more inclusive.

7.0 IMPLICATIONS FOR FTRP

There are four potential areas for FTRP interventions in feeder roads improvement in Yambio County:

Conduct of massive public education

USAID through its funded project FTRP has an opportunity to work with other bodies of stakeholders to provide public education in Yambio County related to roads usage, collective roads maintenance responsibility, general management of feeder roads, roads assessment and reporting mechanism. Such awareness promotion needs to utilize various forms of social media, using electronic, print, audio and visional digital collections. The information to deliver to public should focus on attracting attention to the roads and defining the existing resources that the public is empowered with, which if tapped and channeled appropriately can have significant input on roads maintenance. It also should state factual details on how each group of stakeholders (farmers, traders, industrialists, NGOs, FBOs, CBO, citizens and all layers of echelon in the state government) can uniquely contribute to road works. Through awareness promotion efforts, the citizens can be made aware of their important role in roads management and a shift from the perceived dogmatic tendencies among citizens where road management is mainly associated with the government agents can be encouraged.

Provide technical assistance

Technical assistance which embodies longer term positive effect is required with all its associated reliable costs. Training of the community based organization/contractors on the basics of road maintenance is a primarily important facet of a longer term success story for FTRP. Establishment of a field-base demonstration site, whereby the community members are shown practical aspect of the roads maintenance, is highly desired. Other area of technical assistance are also crucial to the development of the state institutions like SMPI, CLA, and Payam administration. Provision of basic support, continuous coordination and exchange of skills and knowledge through organizing short technical courses has to be embraced. Once those institutions have been empowered, they can be able to demonstrate full institutional capacity and the ability to carry out feeder road works in Payams of Yambio County under the pilot project.

Provide roads machinery

As it is in the case for any pilot projects, FTRP has started with institutions whose mechanical and machinery gaps can be observed from a far distance. This means that FTRP has to invest in some form of complete sets of road machinery with needed spare parts to begin using mix technologies approaches during the practical execution of project programs. Clear and a sound precautionary guidelines on usage of machinery must be established to prevent mismanagement of the machineries. Such measures, such as the evaluation of qualities which qualify a group of farmers to access road maintenance tractor from the authorities, will prevent cost overruns. The institution which is responsible for managing the equipment also requires training in equipment management, procurement, logistics and contracts development.

Maintain the poor sections of selected feeder roads

FTRP has to establish a mechanism through which it can provide a plan of action, build work links/groups, supply roads hand tools, and carry out practical roads maintenance work. This can act as a demonstration for training of local road groups which are to be formed under FTRP. The roads, once improved, will

assist both in terms of movement of people/citizens and in the movement of agriculture outputs to the town markets.

7.1 MAGNITUDE OF POSSIBLE INTERVENTION

In a summary, FTRP could maintain feeder roads in Yambio County through the following strategies:

- Engaging the citizens through constructive dialogue and massive public education program in Yambio County to gain public support towards the project
- Conduct maintenance for a selected section of feeder road as field work demonstration
- Provide technical assistance and institutional capacity development to key institutions (SMPI and CLA)
- Assist SMPI and CLA to develop bylaws on proper usage of the rehabilitated feeder roads
- Provide machinery and equipment for the pilot project in Yambio County

The final decision on potential intervention depends on the recommendations from the USAID South Sudan program in Juba.

7.2 PROMOTION OF AGRICULTURE WITH FEEDER ROADS MAINTENANCE

During the inventory exercise, evidence obtained indicated that many cultivated farms and potential agriculture areas exist in the same areas as the feeder roads. This strategic location of farms and potential agricultural areas can currently be used as a source of information for further insight studies and robust plans in collaboration with those farming organizations in outer Payams and Bomas of Yambio County. The analysis from the findings to be obtained from the study will be useful to illustrate, determine and give a clear road map and plan of action for a formation of roads working groups within those farm organizations in particular and in the community at large. The intended benefit to the farmers includes the use of road maintenance tractors for ploughing agriculture land.

The one dominant complaint obtained from farmers in all outer Payams during the feeder roads inventory exercise in Yambio County is lack of access to town markets with agricultural outputs produced by farmers in Yambio County.

8.0 CHALLENGES AND LESSONS LEARNED

8.1 DATA COLLECTION

Major challenge encountered during the data collection although not regular was difficulties in accessing satellite signals while tracking and taking coordinates of bridges and culverts. The worse experience was encountered during Rimenze –Napere feeder road tracking on March 17th, 2015. Second issue concerns with informants, in some villages it was hard to get adults in house. Children whom we got were not able to give elaborate information on the social-economic impact of the road on income of the household or family. During the inventory also institutions like Payam and Boma administration, Police, Prison, trade unions, schools and Churches have responded far much better than household setting. For similar exercise in future, needs for approaches like community meetings requires to be broaden to prepare ground for capturing a wider relevant views from different road users that range from pedestals, cyclists, motor cycle riders and light vehicles users and also people from different occupations like farmers, traders, teachers, church leaders, community leaders and women and youths union.

8.2 POOR CONDITIONS OF ROADS

The team experienced difficulties associated with poor road conditions. This ranged from categories of road conditions like the presence of potholes filled with water and mud to bush encroachment and fallen trees and branches which made roads impassable. The team was quick to volunteer in several occasion

and removed the fallen trees to allow the vehicles to pass. This was experienced during tracking of Rimenze-James Diko, Yambio-Birisi, Remenza-Napere, and feeder roads (See figure). This affected the team negatively in terms of effectiveness.

8.3 DIFFICULTIES IN FINDING MATURE ADULT INFORMANTS

This solely concerns itself with conduct of interviews with informants in Payams, Bomas and villages. During process of conducting perception interviews, informants were picked at random. In some villages, it was hard to find an adult person in a household, as a result children whom we met were not able to give elaborate information about the social-economic impact of the poor state feeder road on income, health and growth of family or community. Institutions like Payam, Boma authority, Police, Prison, trade unions, schools and Churches responded far better than families or households. For similar exercises in future, more moderate approaches like community meetings needs to be strongly emphasized so that a wider views from different road users like pedestals, bicycle, motor cycle riders and public and private vehicles' users plus people from different occupations like farmers, traders, teachers, church leaders, community leaders are involved in process of generating useful or desired information to the project.

Figure 21 Inventory team members removing off fallen tree from roadway in James Diko

8.4 RECOMMENDATIONS

Centralized on the findings obtained during the 2015 Yambio County feeder roads inventory, the team have exhibited technical skills based on the findings in the field and in line with feeder road conditions and usefulness, settlements patterns, agriculture productivity and potential agriculture areas plus dynamic forms of land uses and complementary social- economic activities. Below is a list indicating recommended suggestions for the stakeholders:

Table 1 Recommendations for Stakeholders

NAME OF PAYAM	DISTANCE (KM)	ESTIMATED POPULATION	JUSTIFICATIONS/INDICATORS
Nadiangere	165	4158	• The road will be impassable during rainy season • Big settlement along the feeder road • Agricultural Productive Payam • Major supplier of food, fish, honey to Yambio • Potential agriculture land stretches along the road • At the main time transport fare is SSP 250 too high for rural people • Important security road • Security is relatively calm along the road • Link people to town markets and services

James Diko-Nyaka		All Bangasu 14646	• High population • Connects up four Boma centers • High settlement along the road • Agricultural productive with potential agriculture land to be utilized • Relative Peace and security calm • Connect rural population to town markets and services • Security roads connects to border of DRC
Backiwiri-Nasoro-Birisi		All Gangura 16504	• High rural population and settlement along the road • Connects three Boma centers to Nabiapai road • Agricultural productive with potential agricultural land • There is good security and relative peace in the area • Connect rural population to town markets and services • Security road connects to border of DRC • Diverse economic services available
Zamba-Senda-Ndvuro	------ ----		Important feeder road for security, agriculture, connection to various centers, markets, services, security is calm and there is peace
Saura-Ri-Rangu -Yubu		11068	• Big population in Payam and settlement along the feeder road • Agricultural Productive Payam • Host a large farm for prisons in Yubu • security is calm and there is peace • Authorities and People are more cooperative • Link people to town markets and services
Gabat-Namgbimo		--	• Agricultural Productive belt • Potential agriculture land stretches along road • Short cross to Namgbimo center • Link people to town markets and services
Yobongo-Nakpare		--	• Settlement along the feeder road and inside the villages • Agricultural Productive belt • Potential agriculture land • Security is relatively calm • Link people to town markets and services

APPENDIX

Table 2 Tracked Feeder Roads Network and Distances

S/NO	ROAD COVERAGE	DAMAGE INDEX	DISTANCE (KM)
01	Saura- Nambia- Zambasenda-Nadiangere-Mobongo- Ibba	DI-3	165 Km
02	Rimenze- Nangume- James Diko- Huu and Nangume-Makaragbudu- Ukua- Nyaka- Bangasu	DI-3	90 KM
03	Backiwiri- Bawarie, Birisi-Gangura	DI-3	27 Km
04	Zambasenda- Ndovuro- Bazungua	DI-3	11 KM
05	Nambia- Ri- Rungu- Yobu River	DI-2	17 KM
06	Ri-Rungu- Nangbangaru	DI-3	03 KM
07	Ri- Rungu- Yabongo	DI-3	07 KM
08	Gabat- Naangbimo	DI-3	07 KM
09	Yabongo- Makpara- Ndovuro	DI-3	11 KM
10	Ri- Rungu- Zambasenda	DI-3	05 KM
11	Yambio- Sakundo to Nzaro	DI-3	07 KM
12	Yambio- Nayure	DI-3	04 KM
13	Bodo- Ri-Nazero	DI-3	05 Km
14	Rimenza- Napere	DI-3	07 KM
15	Burezigbo- Gbefe	DI-3	14 KM
16	Bazungu (Bawaa)- Makpara	DI-3	05 KM
17	Namama (Nambia)- Saura	DI-3	07 KM
	TOTAL DISTANCES IN KILOMETERS		**392 KMS**

Table 3 Yambio County Populations, Source: South Sudan Centre For Census (2010)

PAYAMS OF YAMBIO COUNTY	TOTAL POPULATION	MALES	FEMALES	HOUSE HOLDS (HHS)
Bangasu Payam	14646	7340	7306	2256
Gangura Payam	16504	8247	8257	3034
Ri-Rangu Payam	11068	5702	5366	2043
Nadiangere Payam	4158	2227	1931	977
Yambio Town Payam	105881	54815	51066	17838
Total	**152257**	**78331**	**73926**	**26148**

Table 4 Important feeder roads in Yambio County

Feeder Road Section	Yambio - Nabiapai	Yambio - Birisi	Birisi - Gangura	Yambio - Sakure	Baguga -	Saura - LiRangu	LiRangu - Yubu	LiRangu - Yabongo	Saura - Nadiangere	Nadiangere - River Ibba	Yabong - Momboi
Road Name	Nabiapai Road										
Distance (km)	34	22	13	12	9	22	13	10	168	66	34
Population											
Population density/ sq. km	17	17	17	17	17	17	17	17	17	17	17
IDPs Returnees	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No
Socio-economic activities											
Trading centers, markets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Farming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fishing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Organized groups	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Non Timber forest Pdts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Centers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Schools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customs	Yes	No	Yes	Yes	No	No	No	No	No	No	No
Rd Maintenance Service											
Existing roads work	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No
Approaches	UNOPS - USAID labor based	UNOPS, USAID, AAH labor based	?	UNOPS	No	USAID LBG labor based	No	No	No	No	No
Motor workshops	Yes	Yes	No	No	No	No	No	No	No	No	No
Equipment in use	Tractors/ hand tools	Tractors/ hand tools	Hand tools	Tractors/ hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools
Technical Observations											
Connection from Trunk Road	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Potholes (no number estimates)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Culverts	19	1	1	0	0	3	0	1	3	1	3
Trenches, gulleys (no number estimates)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trees (no number estimates)	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bridges	3	1	1	2	2	1	0	2	4	7	2
Road Condition	D1	**D2**	D2	D2	D2	D2	D2	D2	D3	D2	D2
Year of Maintenance	2013-2014	2014	1998	2013-214	2010	2009	1980	1980	1978	1975	1980

Feeder Road Section	Ndavura -	Naangbimo -	Bawo - Bakiwiri	Burezgbo -	James Diko -	Ukuo -	Bangasu - Nyaka	Nyaka - Ukuo	Bodo - Makperega	Bazungua - Bawa	Nayure -	Saura - Bazungua	Ri Menze -
Road Name													
Distance (km)	18	16	12	20	26	19	36	11	12	8	16	22	18
Population													
Population density/ sq. km	17	17	17	17	17	17	17	17	17	17	17	17	17
IDPs Returnees	Yes	Yes	No	No	Yes	No	No	Yes	Yes	Yes	Yes	No	
Socio-economic activities													
Trading centers, markets	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Farming	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fishing	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Organized groups	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Non Timber forest Pdts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Health Centers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Schools	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Customs	No	No	No	No	No	No	No	No	No	No	No	No	Yes
Rd Maintenance Service													
Existing roads work	No	No	No	No	Yes	No	No	No	No	No	No	No	No
Approaches	No	No	No	No	No	No	No	No	No	No	No	No	No
Motor workshops	No	No	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Equipment in use	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools	Hand tools
Technical Observations													
Connection from Trunk Road	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Potholes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Culverts	1	0	0	0	2	1	0	0	0	No	0	3	0
Trenches, gulleys	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Trees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bridges	0	0	0	0	2	2	4	1	0	0	2	4	1
Road Condition	D2	D2	D3	D2	D2	D2	D2	D2	D2	D2	D2	D3	D3
Year of Maintenance	1980	2013	Before 1956	Before 1956	1970s	1970s	!970s	1970s	TBD	TBD	TBD	TBD	TBD

Table 5 Yambio County Feeder Roads Assessment and Mapping

SR NO	*ROAD NAME /STRUCTURE*	*LENGTH (KM)/ DIMENSION*	*COORDINATES*	*REMARKS*
A	YAMBIO-NABIAPAI	34.5		DAMAGE INDEX #1
1	ASANZA BRIDGE	3.45X2.5	N:04.54644 E: 028.40447	
2	UZE BRIDGE	5.5X5.4	N:04.50881 E:028.43684	
3	NAMBIRA BRIDGE	4.4X4.3	N:04.44416 E: 028.47453	
4	CULVERT #1	0.9	N:04. 38631 E:028.49051	
5	CULVERT #2	0.9	N:04. 43904 E:028.49906	
6	CULVERT #3	0.9	N:04. 43717 E:028.50052	
7	CULVERT #4	0.9	N:04. 43015 E:028.51063	
8	CULVERT #5	0.9	N:04. 42997 E:028.51154	
9	CULVERT #6	0.9	N:04. 42653 E:028.52978	
10	CULVERT #7	0.9	N:04. 40795 E:028.53282	
11	CULVERT #8	0.9	N:04. 40225 E:028.53628	
12	CULVERT #9	0.9	N:04. 39621 E:028.54761	
13	CULVERT #10	0.9	N:04. 39427 E:028.55135	
14	CULVERT #11	0.9	N:04. 39330 E:028.55329	
15	CULVERT #12	0.9	N:04. 39032 E:028.55577	
16	CULVERT #13	0.9	N:04. 38631 E:028.56083	
17	CULVERT #14	0.9	N:04. 38643 E:028.56191	
18	CULVERT #15	0.9	N:04. 38561 E:028.56994	
19	CULVERT #16	0.9	N:04. 38351 E:028.57594	
20	CULVERT #17	0.9	N:04. 38631 E:028.58545	
B	YAMBIO-BIRISI			DAMAGE INDEX #2
1	UZE BRIDGE	8.4X3.3	N:04.53960 E:028.39529	
2	CULVERT #1	0.9	N:04.53920 E:028.39460	

Table 5 continued

C	YAMBIO-SAKURE			DAMAGE INDEX#1
	CULVERT #1	0.6	N:04.577708 E:028.xxxxx	
D	BAGUGA-NZARA			DAMAGE INDEX #3
	ZAMBANDO CULVERT	0.6	N:04.58036 E:028.34262	
E	SAURA-LIRANGU			DAMAGE INDEX #2
1	YABONGO BRIDGE	7.6X5.6	N:04.65743 E:028.35404	
2	NAMBIA CULVERT	0.9	N:04.66966 E:028.36774	
3	MAKPANTURU BOX CULVERT	6.5X5	N:04.69766 E:028.36651	
4	NAPISI CULVERT	0.9	N:04.72267 E:028.36249	
5	MAKPANTURU #2 BOX CULVERT	6.8X4.6	N:04.69792 E:028.33025	
6	YABONGO BRIDGE NZARA RD	5.6X3.4	N:04.68647 E:028.31637	
F	YABONGO-MAMBAI			DAMAGE INDEX #3
1	YABONGO BRIDGE		N:04.60438 E:028.40270	
2	MAKPARA BRIDGE	8.5X4.55	N:04.62033 E:028.40322	
3	YABONGO #2 BRIDGE		N:04.62880 E:028.38030	
4	NDAVURO CULVERT		N:04.66214 E:028.xxxxx	
g	YAMBIO-NADIAGERE			DAMAGE INDEX #3
1	SUE BRIDGE #1	29.8x4.5	N:05.02078 E:028.41150	
2	SUE BRIDGE #2	8.2x4.5	N:05.02125 E:028.41124	
3	BANANGBA CULVERT (Proposed)		N:05.13390 E:028.42772	
4	MAKPAKARU CULVERT (Proposed)		N:05.22556 E:028.42953	
5	NANGBANGURU CULVERT (Proposed)		N:05.44025 E:028.35154	
6	MBONGO BRIDGE #1	6.4x3.5	N:05.57474 E:028.43394	
7	MBONGO BRIDGE #2	5.0x3.5	N:05.57519 E:028.43422	
8	MENZE BRIDGE #1	7.2x4	N:05.60010 E:028.45528	
9	MENZE BRIDGE #2	4.5x4	N:05.60024 E:028.45539	
10	MENZE BRIDGE #3	13x4	N:05.60074 E:028.45578	
11	NANGONDI BRIDGE	4.7x4	N:05.62411 E:028.46531	
12	MABONGO CULVERT (Proposed)		N:05.63788 E:028.XXXXX	
13	IBBA RIVER BRIDGE (Proposed)	33.5x5	N:05.78301 E:028.48023	

Table 5 continued

H	JAMES DIKO			DAMAGE INDEX #3
1	NANGUME CULVERT	0.6	N:04.62310 E:028.66245	
2	WIRIBAADI BRIDGE		N:04.58268 E:028.62265	
3	HUU BRIDGE	7x3	N:04.53854 E:028.58870	
4	HUU CULVERT #1	0.6	N:04.53863 E:028.58891	
5	HUU CULVERT #2	0.6	N:04.53846 E:028.58857	
I	UKUO			DAMAGE INDEX #3
1	MADIKAMBO BRIDGE	5.6X3.0	N:04.62207 E:028.67528	
2	CULVERT #1	0.6	N:04.62229 E:028.67602	
3	NAMAMA CULVERT	0.6	N:04.58627 E:028.71959	
4	BRIDGE		N:04.xxxxx E:028.xxxxx	
J	BANGASU-NYAKA			DAMAGE INDEX #3
	STREAM #1 BRIDGE	4.5x3	N:04.69169 E:028.82712	
	STREAM #2 BRIDGE	6x3	N:04.66341 E:028.84409	
	STREAM #3 BRIDGE	5.4x3	N:04.63014 E:028.86823	
	STREAM #4 BRIDGE	5.4x3	N:04.57933 E:028.87255	
K	LIRANGU-BADAGBU			DAMAGE INDEX #2
	YUSU BRIDGE #1	10.5x3.5	N:04. 75957 E:028.28993	
	YUSU BRIDGE #2	9.8x3.5	N:04. 75949 E:028.28955	

Figure 22 Map showing feeder roads, agriculture potential areas, markets and bridges

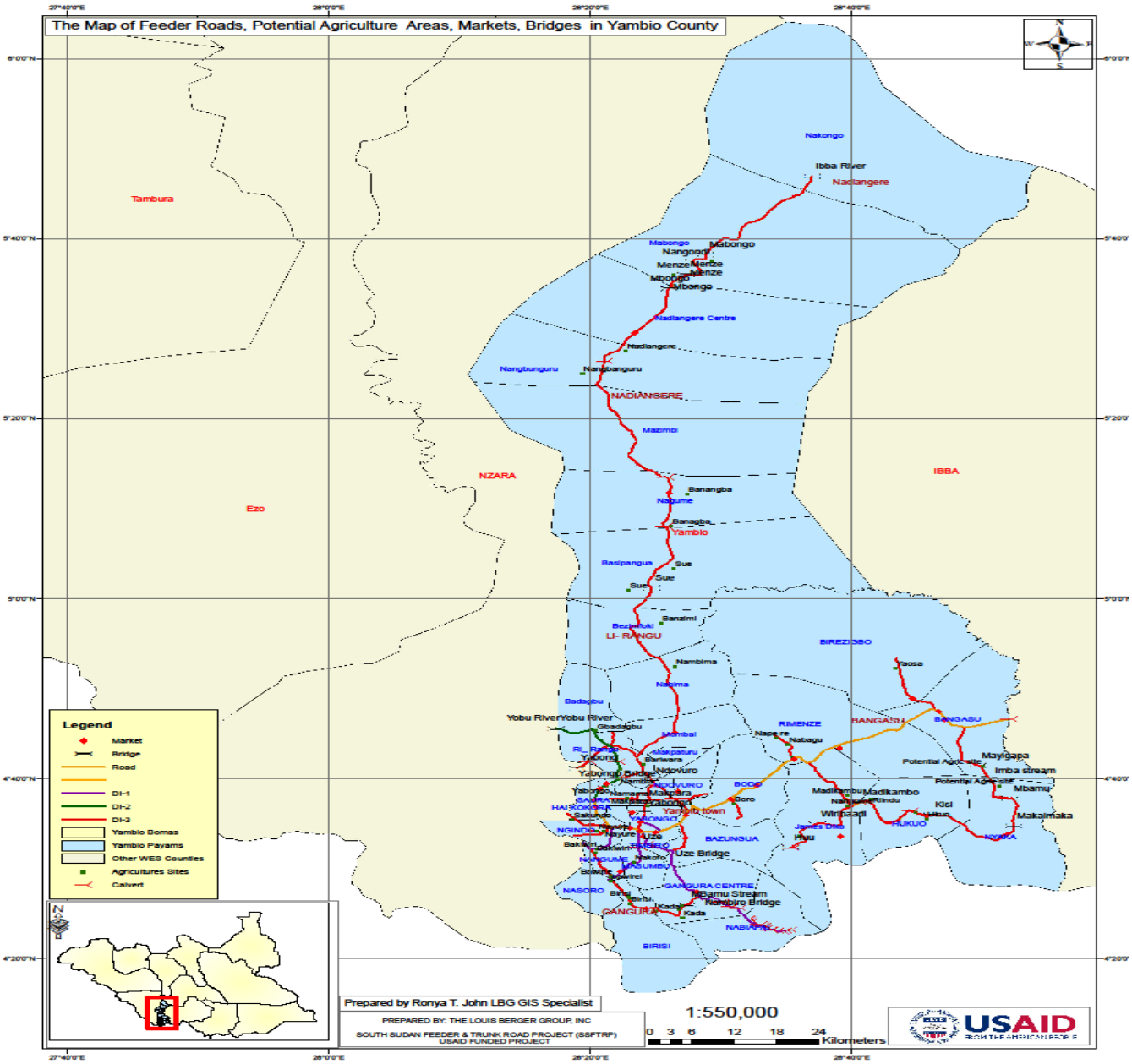


Figure 23 Map showing Payams in Yambio County

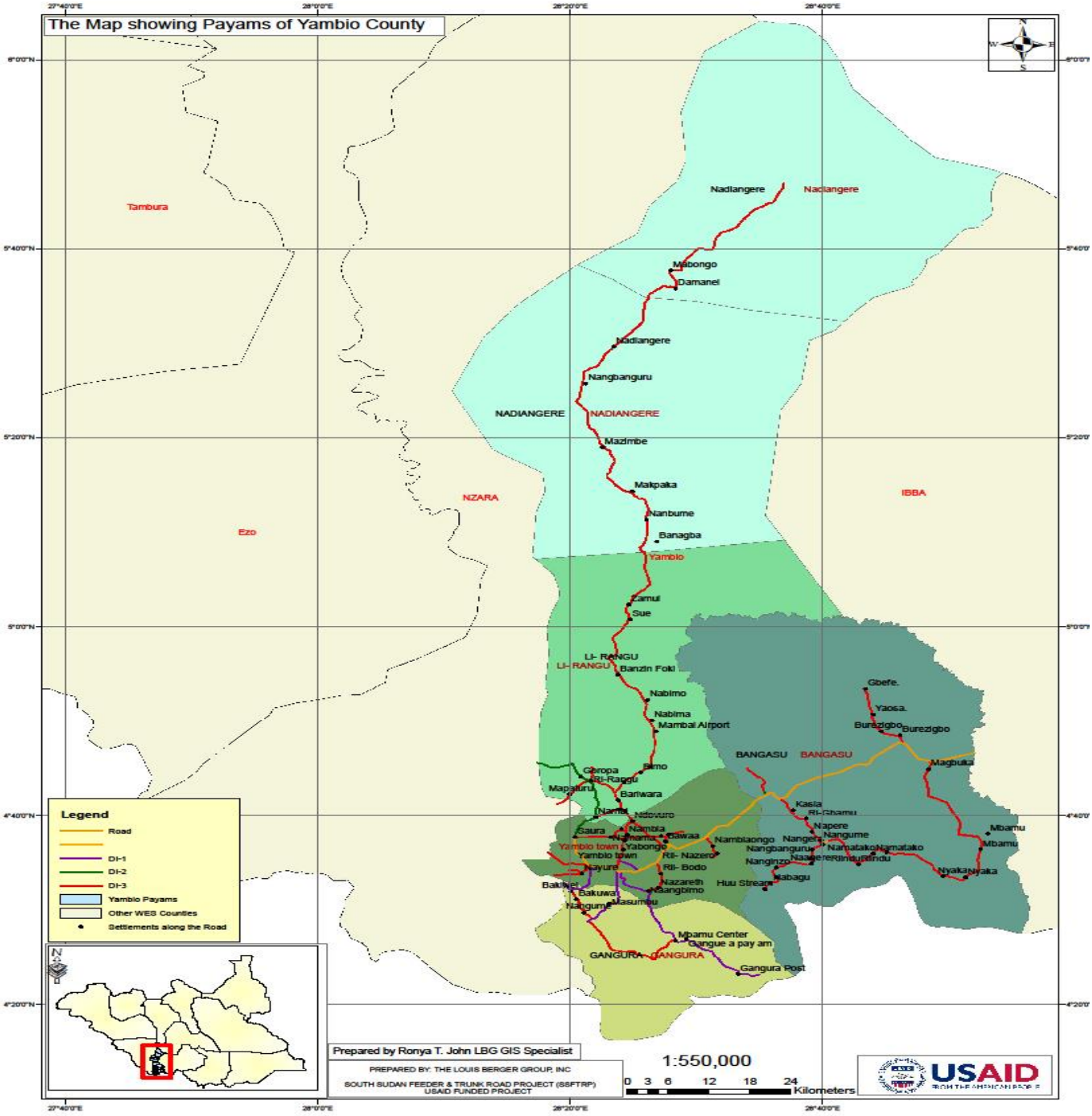


Figure 24 Map showing bridges and culverts on the mapped feeder roads in Yambio County

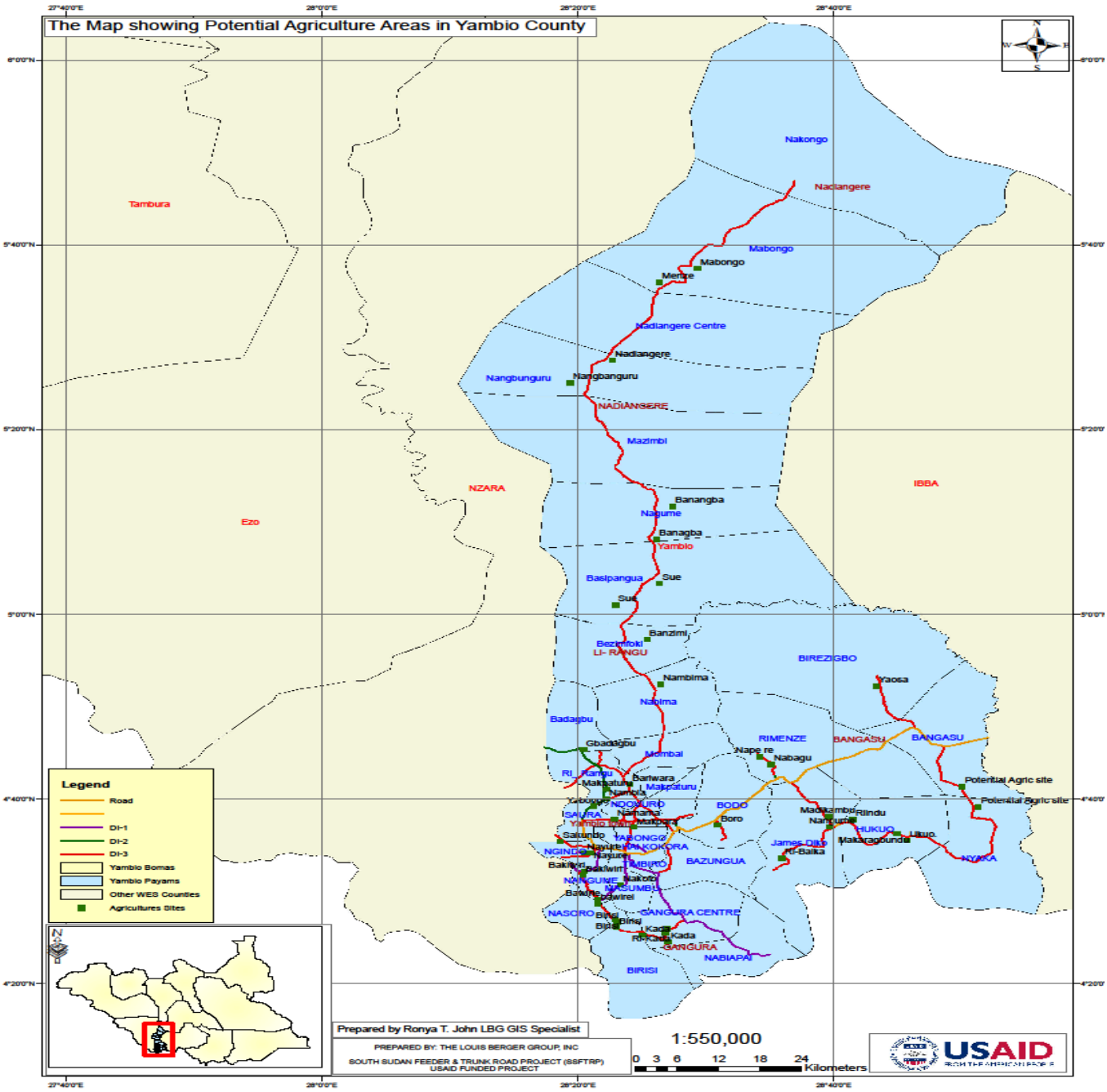


Figure 25 Map showing potential agricultural sites

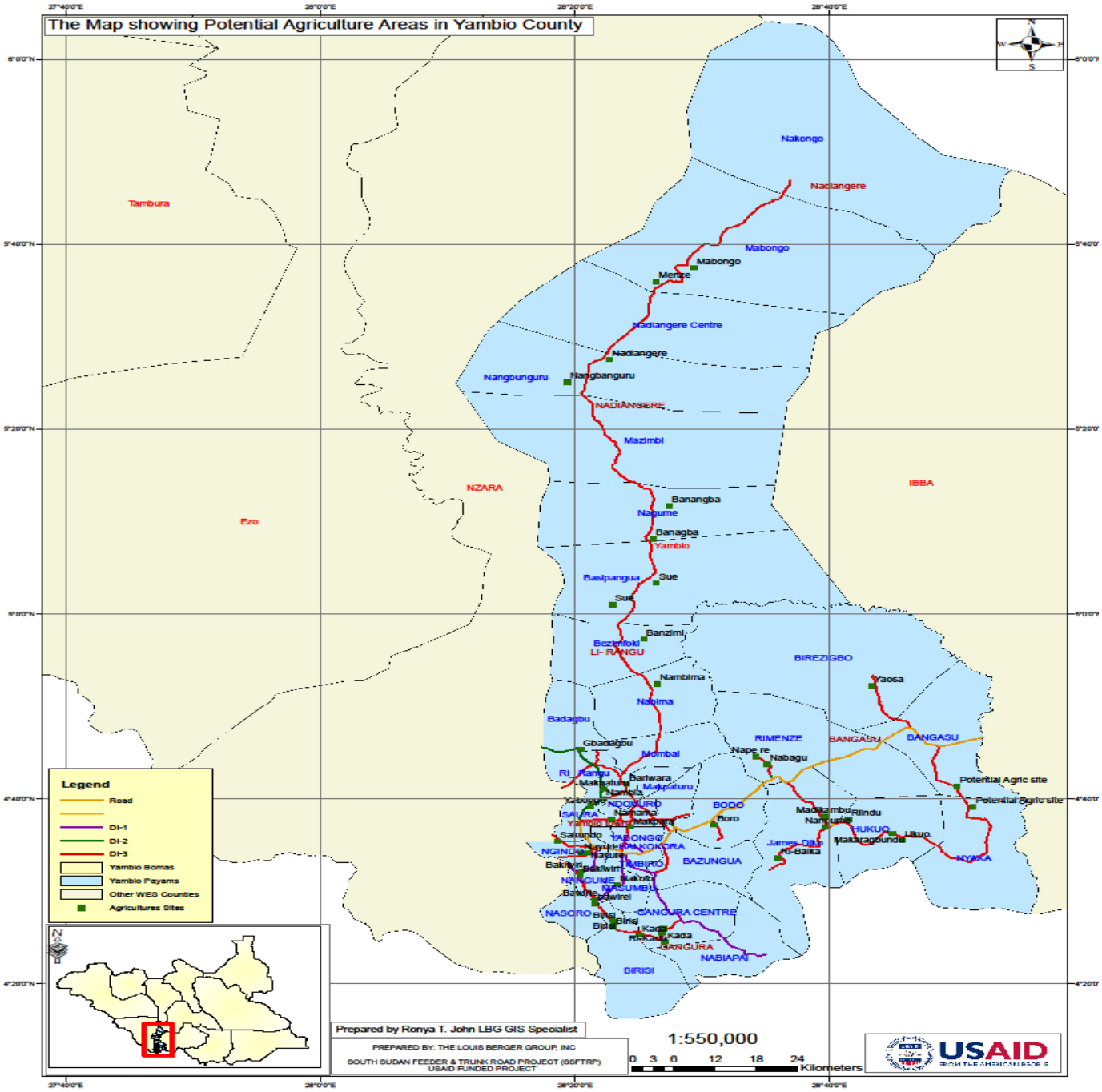
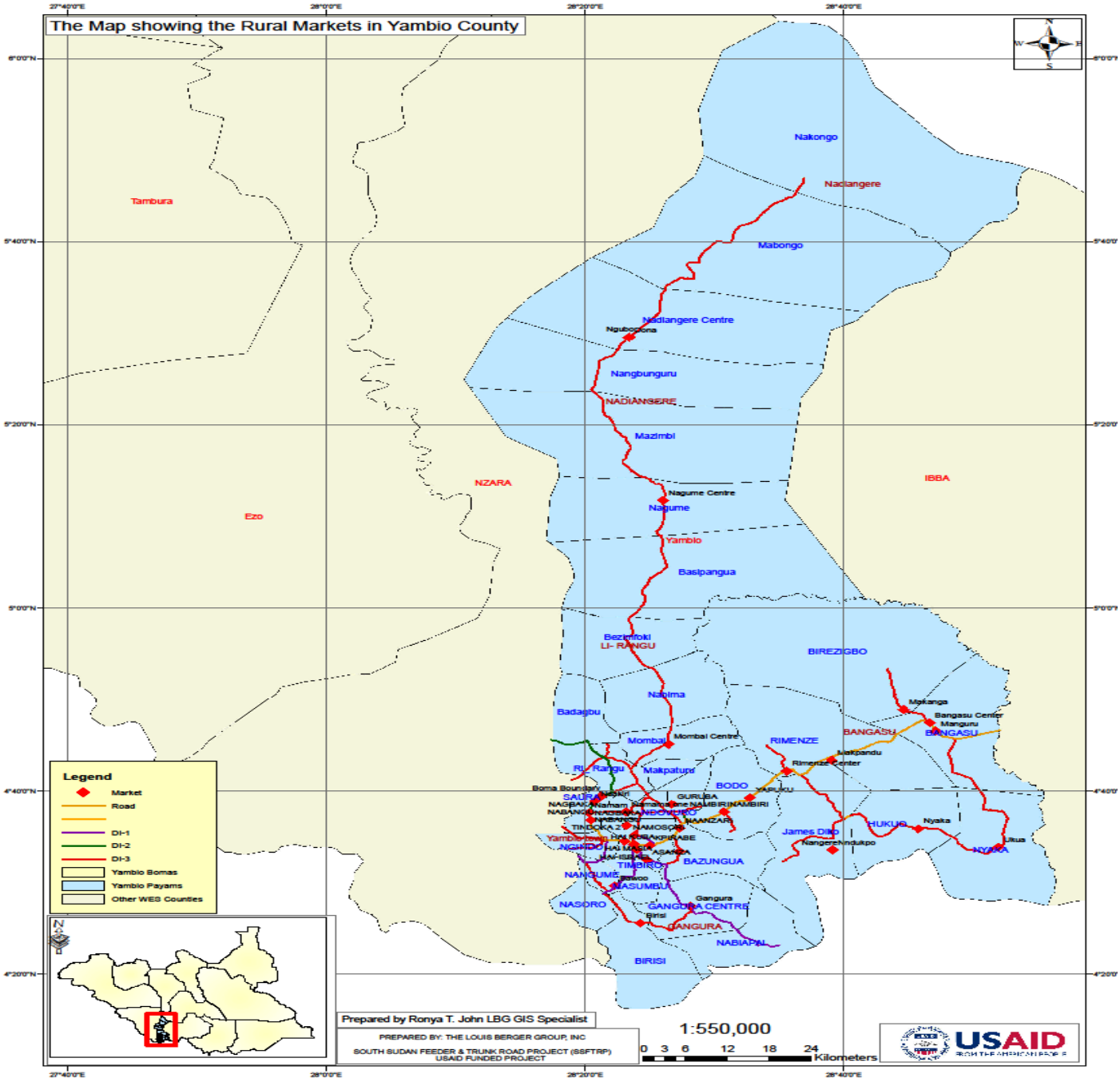


Figure 26 Map showing settlement and main rural markets in Yambio County



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