



**Annual Report**  
**MILLENNIUM RESEARCH VILLAGES**  
The First Year: July 2004 to June 2005

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**Tropical Agriculture Program**  
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## About The Millennium Villages Project

Based at the Earth Institute at Columbia University and overseen by the United Nations Millennium Project, The Millennium Villages Project is a bottom-up approach to enabling villages in developing countries to lift themselves out of the poverty trap that afflicts more than a billion people worldwide.

The Millennium Villages Project applies all the Millennium Development Goals (MDGs) – specific targets for reducing poverty by 2015, agreed upon by all countries of the world in 2000 – as a holistic package of site-specific interventions for 12 impoverished villages in Kenya, Ethiopia, Ghana, Malawi, Mali, Nigeria, Senegal, Rwanda, Tanzania, and Uganda. These villages are carefully selected to represent each of twelve principal agroecological zones and farming systems of Africa. Villagers are working with Earth Institute scientists and development experts in agriculture, nutrition, health, education, energy, water, communications, and the environment to empower villagers to achieve all the MDGs in 10 years.

In July 2004, Sauri, Kenya was selected to be the first Millennium Research Village, with survey work beginning in January 2005. Koraro, Ethiopia was selected to be the second Millennium Research Village in January 2005, with an official site visit at the end of February. Survey activities in Koraro began in April 2005.

This document provides site descriptions, general information, and a summary of activities undertaken during the first year of the Millennium Villages Project, from July 2004 to June 2005.

## I. SAURI, KENYA

### General background

Sauri sub-location is located in the Kenya highlands, 1400-1500 meters above sea level, west of the Rift Valley and 30 km north of Lake Victoria. The equator lies just to the south of Sauri (0° 06N). The general topography is undulating with ephemeral streams, rivers and wetlands meandering through rounded hills.

**Climate:** The area is classified as the sub-humid tropics with an average temperature of 24°C, ranging from 18 to 27°C with an annual rainfall of 1800 mm. Rainfall is bimodal, divided into the long rainy season from March to June (1120 mm) and the short rainy season from September to December (710 mm). The short rains are extremely variable but highly predictable due to strong influence of the El Nino Southern Oscillation.

**Soils:** The main soils, classified as Oxisols/Nitrosols (Kandiudalfic Eutrodox) are clayey, reddish, deep, and well drained. Derived from volcanic materials, the soils were once quite fertile but are now depleted in nitrogen (N) and phosphorus (P), two of the essential nutrients for plant growth. pH borders around 5.5, though soil acidity is not a major problem for plant growth. Soil carbon

levels (1.3% C) are half that of the 'native' soils. There are some patches of wetland soils along the rivers and streams.

**Administrative/Political:** The Sauri sub-location is a conglomerate of 11 villages encompassing 5,000 people within Yala Division, Siaya District, Nyanza Province in the western region of Kenya. The sub-location covers 8 sq km. A chief (covering the location), assistant chief (sub-location) and village elders undergo interviews to be representatives of the Office of the President. A Councilor is elected through official government elections and represents the villagers at the divisional and district levels.

**Sociocultural:** 99% of the population in the sub-location are Kenyans from the Luo ethnic group. The main languages spoken in the sub-location are Dholuo, Kiswahili, and English. The Luo culture practices polygamous marriage.

**Socioeconomic:** Agriculture is the primary livelihood in the area. The land area for farming is usually less than 0.5 ha per household – insufficient to produce food for a family of 5 at current production levels. Sixty to 70% of the people in Siaya District live below the Kenyan poverty line of \$1/day. Over 20% of the children aged less than 5 years are underweight. There are three primary schools (Bar Sauri, Bar Turo, and Nyamnina) in the area.

**Agroecological Zone/Farming System:** This area is a maize-based farming system according to Dixon's classification (2001). Other crops include beans, sweet potatoes, bananas/plantains, cassava, kale, tomatoes, and onions. The bimodal rainfall and high temperature allow two crops per year, though the short rainy season is risky with 45% of the crop often failing (relative to the long rainy season).

**Health:** Malnutrition and poor health plague the community; villagers have limited access to medical care and most cannot afford to buy the few medicines that are available. A sub-district hospital borders the sub-location, with a catchment area of 96,000 people. There was no medical doctor at the sub-district hospital until January 2005, when the MVP brought one in to split his time between the hospital and the Sauri clinic. Sauri is a holoendemic area for malaria, meaning that Malaria is prevalent all year round and that the children carry a higher burden of morbidity and mortality than do the surviving adults who become partially immune. HIV statistics from surveillance data of surrounding sentinel sites indicate a prevalence in excess of 10% and perhaps as high as 30%.

**Infrastructure:** The sub-location is adjacent to a major paved road that runs between Kisumu and Busia, with the nearest major town being Kisumu, 40km from the site. There are dirt roads that access the village. To the east of the sub-location there is a functioning rail line that goes to the towns of Butere and Kisumu. The electric grid is at the southern periphery of the village, with a small part of the site having grid access. The site is within cell phone range.

## Baseline Information

Anthropometric measurements, agricultural and environmental assessments that form the baseline information were taken from August 2004 through July 2005. Household surveys and blood tests began in January 2005. This information will serve as the baseline from which the

impact of MVP interventions will be monitored and assessed in the Sauri area. The main parameters of the *Socioeconomic Baseline Census* include demography, household assets, livelihood strategies, household production/consumption and expenditures (non-durable goods), credit, and household vulnerability to risk. Additional surveys capture data on energy, transport and communication, water and sanitation, agriculture and the environment, and health and nutrition.

The bulk of the information from the household surveys is still being entered into the database. The following information is therefore incomplete and is based on the initial analysis of the dataset, measurements, satellite imagery of the area, and district or sub-district level statistics.

**Demography:** Sauri sub-location has 645 homesteads, 970 households and a total of 5,521 persons. A homestead can contain one or more households. The table below gives the breakdown into age cohorts for each village. About 10% of homesteads in the sub-location are polygamous families. Out of the 970 households, 385 (~40%) are headed by females. The average number of people in a household is 5. Poverty level for Siaya district is 64%. In Yala division it is 67%.

VILLAGE	Number of homesteads	Number of households	Age Cohort Totals per Village (in years)						Total number of persons
			<=4.5	5-12	13-17	18-49	>50	unknown	
Kosoro	46	74	46	68	47	192	59	0	412
Luero	34	65	35	83	48	133	40	0	339
Madiri	88	125	111	154	114	312	78	12	781
Nyamboga	74	113	84	114	99	235	68	2	602
Nyamninia A	103	140	111	166	134	293	95	5	804
Nyamninia B	39	64	46	81	61	119	50	1	358
Sauri A	51	78	43	76	57	189	58	0	423
Sauri B	88	128	89	122	97	240	89	2	639
Silula	33	47	53	63	40	87	29	7	279
Yala A	68	105	75	153	108	289	77	1	703
Yala B	21	31	32	29	19	77	19	5	181
<b>G. totals</b>	<b>645</b>	<b>970</b>	<b>725</b>	<b>1109</b>	<b>824</b>	<b>2166</b>	<b>662</b>	<b>35</b>	<b>5521</b>

**Figure 1:** Totals for age cohorts for the villages within the Sauri Millennium Research Village.

Data on **Income Poverty** specific to Sauri sub-location will be released later this year.

The types of livelihood strategies used in Sauri are displayed in Figure 2 on the next page. Remittances (money received from family members usually living in urban areas) rank highest followed by trading of farm produce, casual on-farm labor, and salaried employment. Note the diversity and the percentage of people involved in each one of these activities. By implication, we may conclude that an increasing amount of Sauri residents have become dependent on remittances from either their relatives or non-relatives living and working outside Sauri, but that these sources of income are complimented by mainly farm-related activities.

### Livelihood Strategies in Bar Sauri, 2004

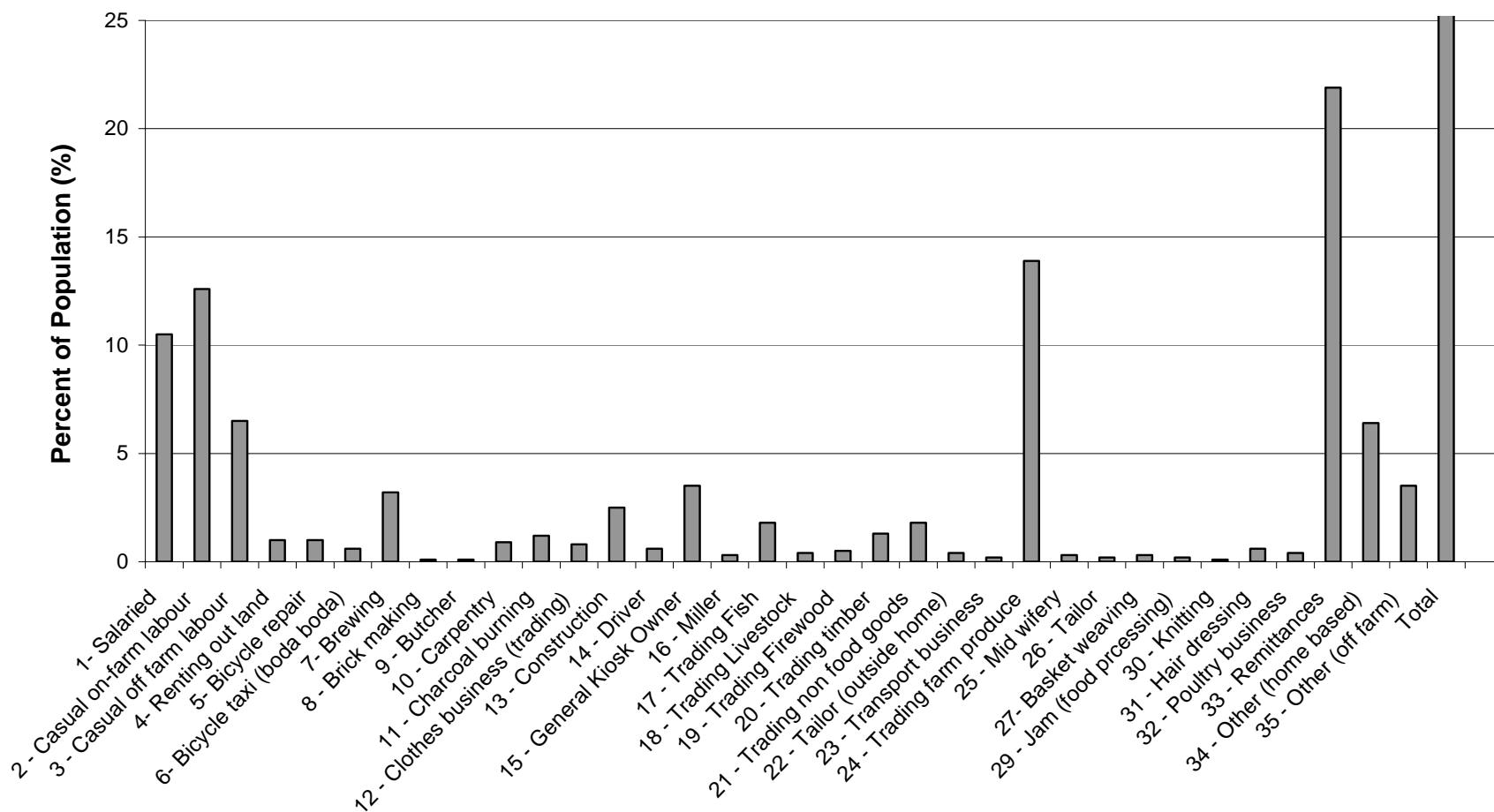


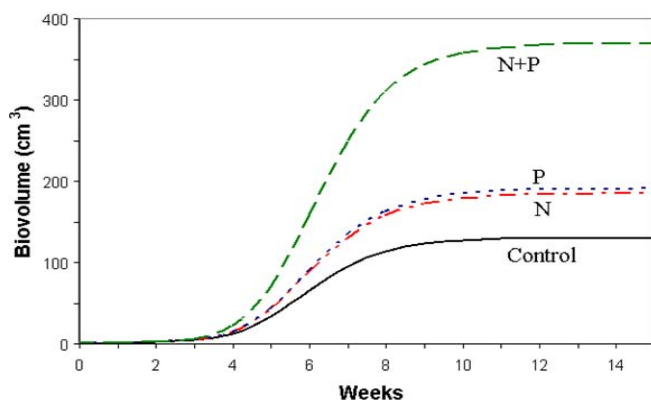
Figure 2: Livelihood strategies from 2004, as reported to surveyors in 2005.

**Land Use, Agriculture, and Environment:** A Quickbird satellite image with 60 cm resolution taken in September 2004 was used to classify the land use in the Sauri area. Results are summarized in the table below.

Land Use Classification	Class (% of area)	Sub-Class (% of area)
<b>Agricultural fields</b>	69	
Crops and natural fallow vegetation		39
Bare soil plots		30
<b>Homesteads</b> (includes hedges and small woodlots)	14	
<b>Trees in landscape</b> (outside homesteads)	14	
<b>Unclassified</b>	2	

**Figure 3:** Land use classification based on a Quickbird image from the shorter rainy season in September 2004. (L. Naukushu, D. Pillai, and F. DeClerck, unpublished)

Soil fertility in the agricultural plots was determined by limiting nutrient test plots. Two plots were located on one farm in each village. The results overwhelmingly indicate that both nitrogen (N) and phosphorus (P) are limiting to plant growth (see figure 4). The addition of potassium (K) did not have any additional impact on crop growth.



**Figure 4** indicates the biovolume of maize plants with time following the addition of different nutrients to the soil.

The area available for cropping is approximately 1/3 ha per family. To represent the pre-intervention crop yields, crop management and yields were determined on 90 farms in September 2004. Farmers applied different soil fertility strategies including Diammonium Phosphate (DAP), urea, manure, compost, leaves of tree marigold (*Tithonia diversifolia*), and combinations of these strategies. About 8% of the farmers did not apply any inputs. For the 2004 season, a total of 229 has was under maize, maize/beans cultivation. Farmers reported an average yield of 1.18 t/ha of maize (between 0.75 and 1.60 t/ha) while field plot measurements indicated average (pre-harvest) yields of 1.98 t of maize/ha. This difference in yield between that reported by farmers and that from plot measurements may be due to pest damage in the field and also to amount of green maize harvested by farmers. Using the farmers’ reported values, this translates to 82 kg of maize per person per year; a deficit of 18 – 38 kg per child and adult respectively.

**Energy Use:** An analysis of a subsample of the data from energy surveys indicates firewood use in the sub-location ranges from roughly 30-50 kg/week per household. Households, on average, spend about 200 Kenya Shillings (Ksh) per month for the three main fuels — kerosene, firewood

and charcoal. Roughly one-third of that expenditure is for each of the three fuels. Expenditures for firewood and charcoal are, on average, 2-3 times greater in the wet season, while kerosene expenditures tend to be more stable from one season to the next.

Some households (estimated to be fewer than 20 in the entire sub-location) have grid electricity at home, made possible by the electric connection at Nyamnia School.

Expenditures for transportation ranged from 70-150 KSh per month. The village has one privately owned, centrally located diesel motor, currently operating a posho (grain) mill in Sauri Center.

**Communications and Connectivity:** There are no land line telephones in the village, and although some villagers possess cell phones they are often left uncharged and used almost exclusively to receive calls (the caller is usually charged for a cell phone call). The village has near-complete coverage (with the exception of some areas by the Yala River) for both CelTel and Safaricom mobile telephone networks. A single wire phone line once served central parts of the village, but this was removed, presumably by vandals. There are no other known sources of telecommunications or computer/internet connections within the 11 villages of the sub-location.

**Health:** Blood samples were collected from 950 individuals, taken from a stratified sample to include various age, gender, and wealth categories. Samples were used for analysis of complete blood count, malaria parasites, and micronutrients. Preliminary analysis of health data and blood samples indicates the following prevalence rates:

- Malaria parasites: 43% of sampled population (37% of them children and 13% of them reproductive-age women)
- Anemia is very prevalent; e.g., >80% of children under 5 years are anemic (hemoglobin <11 gm%). Anemia is likely present in ~40% of the entire population.
- 44% reported history of recent illness prior to the blood sampling.

In addition to these Sauri specific data, district level information indicates:

- HIV: 24%
- TB: 0.7%
- Pneumonia: 4.8%
- Worms: 8.6%
- Infant (<1 year of age) mortality rate: 135/1000
- Child (under 5) mortality rate: 234/1000
- Life expectancy: male 37 years; female 43 years.

**Water Resources:** The water and sanitation survey shows that water sources in Sauri are obtained from springs (protected and unprotected), shallow wells, piped water, and rainwater harvesting. There are 33 springs in total. Twenty are protected, although 11 of these are defective. Thirteen are unprotected and exposed to multiple sources of contamination. Springs are not easily accessible to the majority, with residents walking an average of 300 meters to a water source. Some springs are surrounded by very steep slopes, a burden to reach while carrying a 20-liter container. Baseline water quality data from the various sources reveals high

fecal coliform levels. Concentration of mineral contaminants is low and within the World Health Organization guidelines.

Within the sub-location there are seven hand-dug (shallow) wells that are privately owned. Five are unusable because they lack water, have collapsed or contain poor quality water. Samples reveal high fecal coliform counts and the possibility of high concentrations of fluoride. No bore wells exist within the sub-location. A hydrogeological survey conducted by the district shows presence of aquifers at depths 35-55 m, in 50% of sampled sites.

Many homesteads have an informal rainwater harvesting (RWH) system with metal roof and gutters discharging into buckets or a metal drum. However, approximately 20% of homesteads have only grass-thatched roofs, which do not allow for RWH. The three primary schools (Bar Sauri, Bar Turo, and Nyamnina) all have RWH systems, although all have gutters in a state of disrepair with water tanks that are leaking and missing taps.

The Yala River Piped Water Supply, an extensive water system drawing water from the Yala River, was installed by the government in the late 1970s. Since then, it has rarely functioned properly or served much of the sub-location. Recently the government repaired one turbine and installed a new one at the water pumping station. In 2000, some villages within the Sauri Millennium Village put in pipes off of the main line, but again they rarely received water from the pumping station. Currently water is supplied twice a week, although this service is not always reliable. Water supply is unequally distributed over the sub-location – three entire villages and most of another do not have any piped water coverage. Only 74 homesteads (12%) and the three primary schools were mapped as having a water tap connection. High concentrations of lead in the piped supply may possibly occur through the use of lead pipes and soldering.

**Sanitation:** 38% of homesteads are without a latrine. Around 65% of homesteads with a pit latrine have a structure which is made from earthen materials (i.e., wood logs and mud floor/slab with woven leaf walls). Earthen latrines tend to be porous, allowing rainwater inflow, which increases the risk of leached waste contaminating groundwater supplies.

**Schools:** There are three primary schools within Sauri sub-location: Bar Sauri, Nyamnina and Bar Touro. There is one secondary school near the western border of Sauri called Nyamnina. One of the schools (Nyamnina) has a connection to the electricity grid, but the others have no grid, generator, or other high-wattage electricity supply.

The table below shows the schools' conditions before and as of May 2005.

SCHOOL	Number of students	Position in 2004 national exam (in the District, out of 357)	Student served schools meals before MVP	Students served school meals now	Infrastructural condition
Bar Sauri	503	7	249	503	Fair
Bar Turo	294	312	0	78	Terrible
Nyamnina	650	161	0	110	Fair

**Figure 4:** Conditions of Sauri's primary schools.

Lunches for upper classes are made of maize and beans, while for lower classes (only in Bar Sauri school) they consist only of porridge. The meals being served provide less than a third of the daily caloric needs and essentially none of the micronutrients. Beginning in May, vegetables and fruits are now included to provide sources of vitamins and minerals. Plans are currently being formed with nutritionists at Moi University for more comprehensive and nutritionally balanced meals for all the primary schools in Sauri.

## Year 1 Activities

**Baseline assessments:** Detailed household surveys, including a socioeconomic census survey of the roughly 1,000 households and subsamples of 300 households, were completed at the end of July. The surveys collected information on land use, agriculture, and environment; energy and transport; water and sanitation; and health modules (general women and children's health, men's health; nutrition; HIV-STI; and malaria). Data entry is ongoing. In addition to the surveys, baseline measurements were taken of soil nutrients and organic matter; water quality; and anthropometric measurements including blood samples for malaria parasitemia and micronutrient levels.

### **Agriculture**

For the long rainy season 2005, farmers were provided with fertilizer and improved maize hybrids. The equivalent of 100 kg N ha<sup>-1</sup> and 50 kg P ha<sup>-1</sup> were used in all plots planted with maize crop in the long rains 2005. Decisions on the size and number of plots that a farmer could put under the interventions were left to the owner of the land. The agricultural committee measured each of the plots and the agricultural extension officer advised and trained the farmers on how to apply fertilizers and the proper spacing for plants. The fertilizer and seeds were distributed through village agriculture committees established for this purpose. Upon receiving the inputs, farmers signed a contract agreeing to contribute 10% of their harvest to the school meals programs (provided a good harvest and household food security). Hybrid maize seed (Western Seed 502 and 505) was planted in the farms. A total of about 81 tons of DAP, 40 tons of urea, and 8 tons of maize seeds were issued to farmers in the 11 villages. Farmers planted their own choices of bean varieties. Beans were harvested from mid June to mid July. Data on farm production of maize and beans was monitored on a plot by plot basis by the members of the agriculture committee and project field assistants. This monitoring was overseen by the agricultural extension agent assigned to the project.

Maize was harvested in July and August 2005. The total maize production in the sub-location increased 3.5 times. Part of this increase is a result of increased maize yields, from 1.98 t/ha in 2004 to 4.9 t/ha in 2005, an increase of 2.47 times. In addition, the area planted with maize increased: In 2004, 229 has were planted with maize, maize/beans; this increased to 327 has in 2005.

In early June 2005, following the second weeding or harvest of beans, farmers were trained in the use of leguminous fallows for soil fertility replenishment. The farmers were offered three types of fertilizer trees that can be used depending on the amount of time that the tree can be left on the farm, amount of land available, and the additional wood products desired (such as firewood, stakes and poles). These are short term cover crop trees, including non-coppicing and coppicing trees. (Coppicing is the process of cutting trees down, allowing the stumps to

regenerate for a number of years and then harvesting the resulting stems.) Following the training, the agriculture committee members solicited fallow leguminous seeds requirements from the farmers and distributed seeds accordingly. The total amount of improved fallow seed distributed in all the villages was 1154 kg of seeds. Quantities of seeds were distributed to all the villages. Out of ten different species requested by farmers, the most popular ones were *Tephrosia candida*, *Gliricidia sepium*, *Crotalaria grahamiana* and *C. paulina*.

### **Health**

The Millennium Villages Project and the Sauri community constructed a new community health center, beginning with the ground-breaking on January 17, 2005. The community provided land, non-technical labor, water, bricks, and timber. The MVP provided cement, bedrock, iron sheeting, doors, windows, and hired the technical labor. The five-room facility includes a registration/nurse station; consulting/doctors room; laboratory; pharmacy; store room; toilets and an outdoor covered waiting area. The clinic is powered by a generator, pending connection to the grid by the end of the year, and has running water in three rooms, provided by a piped water system and a back-up water tank and rain water harvesting system. The health facility opened on July 14, 2005, after being registered as a rural dispensary with the Ministry of Health. The registration with the Ministry of Health will enable the clinic's longer term sustainability and allow access to some government services including medicines and perhaps personnel. The health center is staffed by a medical officer (part time), two nurses, and a laboratory technician. Over 200 patients daily were seen in the first days of operation. The clinic currently sees about 100 patients a day. The Community Health Workers assist in the registration and service of patients.

Long-lasting Insecticide Treated Bed-Nets (LLITNs) were distributed free to all households so that all full-time residents in the sub-location sleep under a net. 3,000 nets were distributed in total, a number arrived at by a prior assessment of sleeping sites per household. Prior to distribution of the nets the Community Health Workers were trained in the prevention, early diagnosis, treatment, and control of malaria (see details below under training).

### **Energy**

*Electric grid:* The government has agreed to link the clinic and Bar Sauri Primary School to the electric grid. The survey and estimates have been completed and the work order has been established. It is anticipated that the village will be connected to the grid by January 2006.

*Lanterns:* Low-wattage (5-7W) compact fluorescent lighting technology is being developed at Columbia University for implementation in Sauri and other MVP villages. The basic design involves use of a portable, rechargeable 12V battery that is carried to a school or other central charging location each morning, charged for approximately 8 hours during the day, then carried home in the evening to power a lamp that remains at the household. Depending upon the bulb employed, this lantern provides light at a level of approximately 240-320 lumens. This can cover all or most of the floor of a single room in an average or small home in the village and is sufficient for common activities such as reading or homework, ordinary household work, or other indoor activities. At full charge the battery will provide light for approximately 4-6 hours, again depending upon the bulb. This lantern design has gone through successive design phases. The first of these—the initial prototype—proved technological viability of the basic concept, but could not be recharged in the field due to a lack of suitable charging services near the sub-location. A second prototype lantern has been undergoing field testing in the village since June

2005 and has been tested, primarily by members and families of the village energy committee and students at Bar Sauri Primary School and their families. The next stage will be a limited-production run of factory produced units rather than a prototype. This production will take place in January 2006. This model includes an additional plug for a small radio, and uses a lower-wattage bulb (5W), decreasing the amount of light provided to the lower end of the lumen range given above, while extending the duration of light to the upper end of the range given above.

*Village vehicle:* The MV project purchased a Village Vehicle. The Village Vehicle is a standard-sized, two-door Nissan pickup that has been modified to carry either an average payload of things like agricultural inputs and outputs, building materials, passengers, and so on; or a single injured or ill person on a stretcher for rapid medical attention. Two main features have been added to the truck. One is a rugged frame made of metal pipe, equipped with seats, which enables the vehicle to: a) carry long, wide, or oddly-shaped goods or equipment such as pipes, sheets of metal for roofing, boards or timbers, etc., and b) two sets of folding seats which when needed, can be folded down to create space for 8-12 passengers. The second modification is the placement of a stretcher to allow transportation of sick or ill passengers to medical facilities outside of the sub-location. The vehicle will be provided to the community once they have developed by-laws for its management.

*Clinic generator:* To meet the clinic's electricity needs in anticipation of arrival of grid power in the coming months, MVP purchased a 2.8 kW (3 kW peak) diesel generator. This is now kept in a powerhouse behind the clinic and currently serves only the power needs of the clinic itself, plus small amounts of battery charging for field testing of lanterns.

*Home cooking interventions:* As part of a broad, long-term series of interventions focused on improvement of efficiency and smoke control in home cooking areas, two demonstration "upesii" (improved) cook-stoves have been installed (one in Sauri B, the other in Luero).

## **Water**

*Rainwater harvesting (RWH):* Fifteen members of the Water and Sanitation Committee participated in a tour of successful RWH programs in regional locations of Kusa, Lare, and Nakuru. The tour visited farmers who have incorporated roof- and ground-based RWH to provide water for human consumption as well as irrigation. A practical training session followed the tour where members of the committee along with other Sauri residents constructed seven model roof-based RWH systems with ferro-cement water storage tanks. Further RWH training will include the use of ground-based rain catchments with ponds for storage.

*Water quality:* Baseline water quality sampling and analysis were undertaken in July 2005. Sampling sites were selected based on topographic/hydrologic characteristics as well as the type of water sources used in the sub-location. These sites comprised: seven protected springs, five unprotected springs, two water taps, two hand-dug wells, and one RWH water tank. Baseline water quality testing reveals potential health concerns associated with high concentrations of fluoride, lead, and fecal coliform bacteria. These preliminary results signify the need for further monitoring to confirm these preliminary results and to establish the degree of severity if these parameters maintain their high levels. The continued monitoring program helps guide interventions based upon feasibility of design options to address these water quality concerns.

*Spring protection:* Members of the Water and Sanitation Committee received theoretical training on the protection of springs and spring catchments in June 2005. This training was provided by the Ministry of Water and Irrigation. The water committee has begun practical work for the protection of five unprotected springs and the repairs of nine protected springs with structural failure under the guidance of a project infrastructure facilitator.

### **Schools**

A kitchen was constructed at Bar Sauri primary school. This kitchen, in addition to providing the necessary space and conditions to cook for over 500 students, will serve as a demonstration site for clean, fuel-efficient cooking (using chimneys, etc). There is a school meals program in all three schools for all children. Five students from Bar Sauri were given scholarships to secondary school.

### **Information and Communication Technology**

Options for email and internet connectivity were examined during the first year. These included landline based connections and email through mobile phones and VSAT. Email through a cell phone and a computer was demonstrated to function at the School and the Clinic. A short term goal is to have one mobile phone in each village that is operated by one or more individuals as a small business with the ability to contact the village vehicle operator at no cost. A one-week training session on the use of computers was carried out for the school teachers in the sub-location.

### **Community Organization**

Eight sub-location committees were formed at commencement of the project in the departments of Agriculture, Health, Water & Sanitation, Energy, Environment, Business, Roads & Communication, and Education; as well as village level committees in each of these departments. There is a newly formed Sub-location Executive Committee made up of Millennium Coordinators from each village, the sub-location department chairpersons, and representatives from youth, church groups, and the disabled. A Sub-location Millennium Youth Committee was formed in June 2005.

### **Community Training**

An estimated total of 1,000 community members have received training in aspects of agriculture, health, water, energy, community organization, environment and infrastructure during year one. Committee members trained in these topics have conducted further community-wide outreach through such forums as village level demonstrations of bed net use at village barazas (meetings), and farmer to farmer training on such topics as planting and spacing, weeding and topdressing.

#### *Community Empowerment and Organization*

- Community Empowerment and Organization training was conducted with participation of 93 leaders within the committees;
- 19 Committee members including all 8 sub-location committee chairpersons have received training on writing a group constitution;

#### *Community Health*

- 35 Community Health Workers have been trained in malaria prevention, treatment, and control;

- 35 Community Health Workers were trained in mobilization and sensitization of the community for the blood sampling exercise, as well as clinic intake procedures and how to take a history, height, weight, blood pressure, etc.

#### *Agriculture and Environment*

- 31 Agriculture Committee Members have been trained in soil conservation, soil fertility improvement, *Striga* weed management, land preparation, planting and spacing of staple crops and writing Community Action Plans (CAPs);
- 641 farmers were trained in the proper application of fertilizer and plant spacing;
- 179 Community Members attended an Agricultural Field Day where they learned about using hybrid seed, inorganic fertilizer and establishment of improved fallow;
- 445 farmers were trained in improved fallow establishment;
- 4 Farmer's Field Schools have been established in the sub-location and training has started for 156 farmers;
- 44 environment committee members have participated in training on tree nursery establishment and management and 25 environment committee members attended a participatory training on problem identification and resource mapping;

#### *Safe Water*

- Spring protection and rehabilitation training has been completed with 33 water committee members and 3 representatives from the environment committee;
- 33 Water Committee members participated in a training workshop to design their Community Action Plan for water and sanitation activities in the sub-location;
- 15 water committee members participated in a three day rainwater harvesting tour in which they learned about construction of various rainwater harvesting and storage systems;
- 22 water, 11 health, 2 education, 2 environment committee members plus 2 village elders participated in a one-day Safe Water training on homestead-level water treatment and storage.

#### *Energy and Communication*

- 40 roads committee members and environment and water committee representatives have participated in training covering the components of improved roads, equipment and cost scenarios;
- 30 Energy Committee members have received training in household cook-stove installation and improved cooking practices;
- 70 Energy and Environment Committee members and community members participated in a household fuel conservation demonstration day and 25 energy committee and business committee representatives participated in a one-day training on construction of improved household cooking stoves.

### **Community Voices from Year 1 in Sauri**

At a recent community wide forum in May 2005 hosted by the Millennium Villages Project, community members were invited to give feedback and evaluation on the project's progress. Voices from the community noted that "Youth have woken up to define their future" and that the project has facilitated an "awareness that we can work together" and "we have learned that we can be independent."

## Outreach

*The Earth Clinic Project:* The earth clinic is an outreach project funded by the Earth Institute for scaling-up improved agricultural practices in 7 sub-locations in 2 districts neighboring Sauri. The Earth Clinic Project is intended to begin outreach of some of the MV activities in the surrounding villages. In Siaya district, the work of the Earth Clinic project is taking place in Nyaminia, Anyiko, Marenyo, and Jina sub-locations. In Mumias / Butere district, the sub-locations are Dudi, Doho, and Emuhaya (Emuhaya is in Vihiga district).

In Ebuhalala:

- Total population covered is about 50,000 farmers.
- Targeted farmers – 20,000 in the 2 year phase
- Current activities:
  - Planning meetings (3) Yala, Butere, Maseno
  - Developed Community action plans
  - Formed Village & Sub-locational committees
  - 14 seed production / bulking plots established
  - 140 demo plots have been established
  - Sweet potatoes, cassava and improved fallows have been established
- Plans for the short rains 2005:
  - 7 field days (1 each sub-location)
  - 7 exchange visits (1 each sub-location)
  - 7 seed orchards (1 each sub-location)

## Partners to date

- Sauri Village
- District and National Ministries
- World Agroforestry Centre – agroforestry, socioeconomic baseline
- ICRISAT – improved groundnut and sorghum varieties
- Moi University – nutrition, agriculture, water
- Egerton University – socioeconomics and impact analysis
- Tropical Institute for Community Health (TICH) - Kisumu
- CDC/KEMRI(Blood Sampling; Mosquito survey)
- FAO (Farmer Field Schools)
- Mild May International (Home-Based Care)
- CARE Kenya (PMCTC)
- UNICEF – scales and height measurement equipment; nutritional aspects

## II. KORARO, ETHIOPIA

### General background

The second Millennium Village, Koraro was selected in 2005 along with members of the Tigray regional government. The Koraro *tabia*, an administrative unit that includes three villages, covers an estimated 81.4 sq. km area and has average altitude of 1,700m. Koraro is an underdeveloped, poor, and isolated *tabia*. It is located about 16 km from a secondary dry weather road and about 54 km from the main road. The 16 km road is not usable during the rainy season.

**Climate:** The area is semiarid with only one rainy season, which usually begins on June 28<sup>th</sup> and ends on September 4<sup>th</sup> of an average year. The annual average rainfall is around 500 mm, though the *tabia* has experienced drought in most of the last 10 years. These rain shortages are characterized by late onset of rainfall, early withdrawal, or both.

**Soils:** The parent material is either sandstone or shale, with considerable limestone in the area. The area is virtually split into two major soil types: sandy (49%) and sandy-silt (51%), with the majority of the people living on the sandy-silt soils. The soils are severely degraded from erosion with no topsoil remaining in most of the area.

**Administrative/Political:** A *tabia* is the lowest administrative unit and it is composed of a cluster of up to five villages. In the case of Koraro *tabia*, it is composed of three villages (*kushets*): Koraro, Tenskua and Tala. A *kebele* is an administrative unit made up of many *kushets*. Koraro *Tabia* is administered by 15 community-selected council members and a chair of the council, who is on the government payroll. Each of the three villages in the *tabia* is also administered by council of seven members. The chair of each village serves as a member in the *tabia* council. Likewise, Koraro *Tabia* is also represented in the Woreda (district) council.

**Socioeconomic:** A total of 5,123 people reside in 1,190 households with an average family size of 4.3. More than one quarter (342) of households are headed by females. The area is extremely poor with an estimate of over 90% of the household earning less than \$1/day. Poverty in Koraro is highly associated with severe natural resource degradation and shortage of rainfall.

**Agroecological Zone/Farming System:** This area is a cool highlands farming system according to the Dixon (2001) classification scheme. The *tabia* has a total of 1,403.05 ha of agricultural land. There are two major agricultural zones in the *tabia*, which mainly depend on the soil type. These include 'Teff,' millet, Haricot bean, and sesame growing area (on sandy soil) and maize, sorghum, barley, flax growing area (on sandy-silt soil).

Livestock (cattle, sheep, and goats) form a considerable part of the agricultural livelihood in the area. There is land set aside for livestock grazing in Koraro (15 ha) and Tenskua (30 ha), while livestock are left to browse in the vast scattered forest in Tala sub-*kebele*. The *tabia* has a total of 6,739.9 ha of land that has not been used for agriculture, which is almost entirely covered by scattered, degraded vegetation. There is no protected forest in the area.

Soil erosion is rampant throughout the Koraro Millennium Village. Vegetation cover is scanty. Gully erosion is another problem of the village, coupled with surface run off and lowering of the

water table. Thus, land degradation is one of the key causes affecting agricultural production and productivity in the village.

**Health:** There is a clinic in the tabia with one nurse, two junior nurses, and four community health workers. This health station also serves two neighboring tabias Alal and Mai Gobo. Major health problems in the kebele include acute respiratory diseases, malaria, and maternal mortality from childbirth. Tala village in particular has been stricken by malaria epidemics. However, the closest hospital to the Koraro tabia is at Wukro town, 54 km away.

**Infrastructure:** The tabia is about 35 km from a RR30 rural road at Megab and about 50 km from a paved road that runs between Makele and Wukro (going further north to Adwa). The nearest major town is Makele, which is also the regional headquarters, 60 km from the site. The dirt tracks between Megab and Koraro are not all-weather and travelers must cross several streams. The nearest electric grid is in Megab which is 35 km away. As of July 2005 the site was not within cell phone range. The nearest cell phone connectivity is in Makele.

## Year 1 Activities and Plans

### **Baseline surveys and measurements**

The survey tools used in the Sauri Millennium Village in Kenya were adopted and formatted by the Center for National Health Development in Ethiopia (CNHDE) staff so that they could be easily understood and used by the fieldworkers. The formatting was also designed to facilitate data entry. The survey protocols and instruments were presented to the local IRB and were approved. Surveys started on July 15, 2005.

### **Mapping of Project Area**

Mapping of the area using GPS was among the first activities undertaken. The maps prepared include a) existing water sources; b) estimation of each farmer land holding; c) potential mosquito breeding sites; and d) housing units. The registration of individual farm holdings was the basis for the distribution of inputs to each farmer in the village.

### **Natural Resource Management and Agriculture**

The agricultural components agreed upon with the community and the Woreda Administration Office for the short term were the following: soil and water conservation; gully plugging and reforestation; fruit seedlings and vegetable seed supply; improved seed and fertilizer supply; and farmers training on new innovations.

*Watershed Rehabilitation:* In view of the severe land degradation, soil and water conservation is one of the major activities to rehabilitate soils, retain moisture, and reestablish vegetation cover. The first activity was to treat 50 has of land that contains a major gully. The following was accomplished according to plan: The 50 has of land was treated with 25,000 meters of trench bund, 46,000 meters of hillside terraces, 945 micro basins and 2,000 m<sup>3</sup> of cut off drain. The 300 meter gully was treated with a 1,790m<sup>3</sup> check dam and 480 m<sup>3</sup> of gabion (wire mesh filled with rocks). About 120 small ponds were constructed during the short planning period. All in all there are now about 360 small ponds in the village for water harvesting. Ten thousand indigenous tree seedlings are being planted in the watershed. These activities were undertaken

through technical and resource input of the project and the Woreda government. The labor was provided by the adults of Koraro for which they received cash for work from the Woreda.

*Fertilizer and improved cereal seeds:* The community in the village had little access to improved agricultural inputs that could improve their agriculture production and productivity. Therefore, the project has provided different agricultural inputs to improve the productivity and diversity of the crop production system. Eighty-five tons of diammonium phosphate (DAP) and 40 tons of urea have been distributed to 1,200 farmers. The same farmers were provided with improved cereal seeds. Early maturing varieties, which are appropriate to the agro-ecology of the village, were distributed. These include 13.5 tons of Teff (Cr-37), 6 tons of maize (Katumani variety), 1.5 tones of sorghum (Gobiye) and 230 kg of quality protein maize. The beneficiaries are 1,200 farmers for Teff, 370 farmers for maize, 230 farmers for sorghum and 40 farmers for quality protein maize. Haricot bean (200 kg) was distributed to be planted intercropped with maize.

*High value crops:* Introduction of non-traditional, high value crops would bring improved income and diet. In line with this objective, 20,870 fruit trees including orange (5,000), papaya (5,000), banana (2,000), guava (2,500), mango (1,370) and coffee (5000) seedlings are under plantation. Seventy-five kg of vegetable seed is also ready for distribution. ICRAF has sent 1,000 seedlings of mango from Kenya. The village community has delineated 0.5 has of land for a nursery. The project is making preparation for its establishment and procurement of improved seeds and seedlings.

*Conservation Tillage:* Traditionally, excessive tillage is practiced in the village. Land preparation for Teff, for example, is plowed over six times on average, thus exacerbating soil erosion. For this reason, the MVP is collaborating with Sasakawa-Global 2000 (SG 2000) to undertake a trial of minimum tillage on Teff. This is to reduce tillage and to increase soil organic matter from biological activities. Fifteen volunteer households (five of them headed by females) were identified and given training on its application by a professional from SG-2000. Herbicide was applied to kill the weeds on the plot. The farmers are expected to plow it only once to cover the seed. SG-2000 has guaranteed participating farmers an average production based on a normal season of cultivation.

Farmers' training is one of the most important components of MVP. Over 500 farmers were trained on row planting of maize and sorghum, and intercropping of maize & haricot bean. In addition the farmers received training on appropriate fertilizer use and seed rate in collaboration with SG-2000 and the Woreda Agriculture & Rural Development Office.

### **Health Services**

The health service in Koraro is inadequate. The clinic is physically accessible, though far away for some villagers; however, the clinic is poorly equipped and is only staffed with junior personnel. It cannot properly provide even primary health services such as proper laboratory diagnosis and treatment of malaria, respiratory, and other diseases. The clinic cannot assist women with complications during labor and delivery nor can it perform even minor surgery. The ability of the Koraro clinic to do emergency obstetric care and minor surgery is important because of the long distance to the nearest hospital (without a road or any transport vehicle). Patients, women in particular, are subject to high morbidity and mortality from emergency situations that cannot be attended to. The people of Koraro in general are reluctant to use the

clinic because it lacks basic diagnostics, adequate supplies of essential drugs, and effective medical interventions.

Major accomplishments in health services since the onset of the project are the following:

*Clinic building:* Upgrading the clinic, particularly providing an operating room and laboratory space, was identified as a high priority. Detailed cost estimates including new construction costs and transportation have been provided. The industrial construction materials such as corrugated iron sheets, doors, window, cement, and paint are in the process of procurement. So far, 34.3 tons of cement have been purchased and transported to the nearby town. The community in collaboration with the local government has already collected local construction materials and the clinic is under reconstruction.

*Medical equipment, drugs and other supplies:* Lists and quantities of essential drugs and other consumable supplies are being prepared based on rational use of drugs and contact has been made with a pharmaceutical company (Pharmid) in Mekelle. The quantities of drugs and supplies were estimated by assuming that the clinic will service a catchment area of about 1,000 villagers. Only drugs included in the essential drugs list have been purchased. The list will be revised regularly. Since Coartem (an Artemisinin Combinatin therapy) is not available on the market yet, the MVP health team requested that the Federal Ministry of Health provide the village with 1,000 treatment doses for the coming malaria transmission season (September to December). The MVP has already secured the drug.

*Hiring of Health Professionals:* The MVP hired a Health Officer, laboratory technician, nurse, and nurse anesthetist. The Health Officer has extensive training and experience in general surgery and emergency surgery including Cesarean sections. Moreover, he has experience in public health programs. He will be responsible for the coordination of all the health interventions, including performing surgery. An operating room (OR) nurse will be hired soon to assist in the OR. Since these health professionals have been working in different health facilities, a refresher course has been arranged for them as a team with a surgeon at Mekelle Hospital.

*Mosquito Net Distribution:* Long lasting insecticide treated mosquito nets have been purchased, imported and delivered to the site. Nets were distributed to each household in August after collecting baseline malaria survey information and evaluating the number of sleeping sites, and before the malaria transmission season began.

## **Water**

The success of the project will depend on the availability of water for irrigation and drinking. The MVP is working with the Regional Water Resources Commission and Technical Working Group to establish long-term solutions. Accordingly, senior hydro-geologists, both from Ethiopia and abroad, have visited Koraro and made a preliminary assessment. They have recommended that a detailed survey be performed and suggested the following interventions.

*Rehabilitation of existing water points:* Six out of the 10 existing water points in the village are not functional. As an immediate solution, rehabilitation of these water points is under progress. The technicians who have assessed the water points are expected to return back with their solutions. A team from Glimmer of Hope together with the Relief Society of Tigray (REST) has visited Koraro to find out how to assist in drinking water supply. REST has already repaired one

of the six hand dug-well and is expected to repair the remaining hand dug-wells. The rehabilitation of the hand dug wells is important for immediate use and short term solution. The construction of at least three boreholes is planned, as a measure to meet the long term needs of the community.

### **Transportation**

*Road Construction:* Road access is a major challenge to the project. There is no easy access to the village even during dry season. The Megab-Koraro rural road involves three different tabias for a total of 20 kilometers. The Regional Rural Road Authority has prepared detailed design and specification and estimated construction cost at USD 800,000. This budget is too large to be covered by the project. The Woreda administration has allocated 500,000 Birr (about US \$57,600) for one big bridge. Construction of the bridge is in progress and 98% of it has been completed. For the realization of the road construction, the Regional Government is expected to mobilize resources.

*Supplying a Truck to the Communities:* A truck was purchased for community use. The truck is used to transport inputs to the village and products from the village as well as for emergency health service. The transport committee is preparing rules and regulations on the management and use of the truck by the community members.

*Motorcycles and pick-up 4WD vehicles:* The terrain and area of the village make access to the community difficult. The project is purchasing 20 motorcycles and two pick-up 4WD vehicles. They will be used by various sectors to render their services in the village.

### **Energy**

There is no energy supply in the village except fuel wood and cow dung. Fuel wood is also very scarce because of severe deforestation and lack of tree planting in the community. The following interventions are in progress:

- An energy efficient stove developed by GTZ is being introduced; so far, 36 such stoves have been introduced.
- The regional Health Bureau has repaired the existing solar panel at Koraro clinic.
- A rechargeable battery operated lamp will be introduced in the village. School children will be given this lamp to get 3 to 4 hours of light to study every night.
- Diesel generator is being procured to provide back up energy to the clinic and also for charging batteries for use to operate the mobile lamps.
- 10,000 local acacia trees have been planted for use as fire wood.

### **Education**

The primary school at the village does not have water supply; students have no access to water at school. Design and specification of a reservoir to harvest water from roofs is finalized and construction will start soon. The communities are also collecting stones for the construction of additional classrooms to accommodate 7<sup>th</sup> and 8<sup>th</sup> grade students. The farmers have committed themselves to provide 10% of their farm produce to the schools for use in school feeding program.

### **Partners**

There has been wide range of collaborators in undertaking the project activities. The regional national state of Tigray has provided an overall coordination and arrangement of various visits made to the project site. The regional bureaus have been collaborating with respect to their responsibilities as follows:

- National Regional State of Tigray involved in overall coordination;
- The Bureau of Agriculture and Rural Development has provided selected variety of seeds to the project at cost and provided technical support as member of the agriculture technical advisory group;
- The Regional Water Resources Development Commission has provided technical support as member of the water technical advisory group;
- The Rural Road Authority of Tigray has prepared a detail design and specification for Megab-Koraro rural road;
- The Health Bureau have been involved:
  - In selection of professional staff for the Koraro clinic,
  - Recruiting of enumerators and other staff for the baseline survey,
  - Prepared the design of the additional rooms for the clinic and staff residence, and
  - Assigned a medical officer to the project for fifty percent of his time until the clinic becomes operational.
- The Regional Disaster Prevention and Preparedness Commission has fully cooperated at facilitating duty free privileges;
- The Hawzen Woreda administration has made extensive input to project activities. Its support includes provision of training and extension support to the beneficiary farmers, allocation of Safety Net resources for cash for work, technical support, transport services and construction of one bridge on Megab-Koraro road;
- SG-2000 has provided various inputs, trainings on improved farm practices and undertaken a trial on minimum tillage;
- The ICRAF Nairobi and Addis have provided technical support and tree planting materials;
- The Center for National Health Development in Ethiopia (CNHDE) was responsible for overseeing the implementation of the project, procurement of supplies and equipment as well as financial management.