Sustainable Agriculture and Natural Resource Management
Collaborative Research Support Program

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Trip Report: Nepal

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Purpose of Trip:

1. To assist and train LTRA and host-country partners in experimental set-up and design and soil sample collection protocols;
2. To brief USAID/Nepal on our work in the country.

Sites visited:

Kathmandu, Nepal;
Thumka, Nepal;
Hiklung, Nepal.

Description of activities:

On-farm CAPS research trials were designed in collaboration with Univeristy of Hawaii researchers, local farmers, and the NGO LiBird in the village of Thumka, Nepal. Nine fields were selected, owned by seven farmers. These farmers were prioritized for the household survey implemented by the socioeconomic team. Upon return to Kathmandu, we briefed USAID/Nepal on our progress.

Upon arrival in Kathmandu, I met with the Univ. of Hawaii team consisting of Ted Radovich, Susan Crow, Cathy Chan-Halbrendt, Jacqueline Halbrendt, and Cynthia Lai. Together we flew to Pokhara to procure project supplies and meet with local partners at Li-Bird (Local Initiatives for Biodiversity, Research and Development), headquarters a national NGO (www.libird.org). We toured the facilities including a basic soil test laboratory, met some of the staff, and were presented with an overview of their program.

The next day, March 21, we traveled by vehicle to Hiklung. After leaving the road, we ferried across the river by cable car (manual power), then hike about three hours up steep slopes to the village. The conditions at Hiklung are primitive: No electricity, one water tap for the village (be sure to purify the water), and wooden platforms serve as beds, if you get one at all. I make note of this so that future researchers are prepared. One must be in good physical health to access this site. Items that must be brought with you include breakfast food, sleeping pad, blanket or

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sleeping bag, mosquito coils or net, iodine tablets, warm clothes and oral rehydration salts. The latter cannot be over-emphasized, and should be procured in Kathmandu or Pokhara at a pharmacy.

Once in Hiklung, a discussion ensued regarding in which village to conduct the household surveys and on-farm trials. LiBird staff suggested that we implement our research in the nearby village of Thumka, about a 20 minute walk uphill from Hiklung. Relative to Hiklung, Thumka is even poorer, with more population pressure (32 households in village) and less water (being at a higher elevation). The village is mainly Hindu, of the Chepang ethnic group, which was considered not long ago to be one of the “untouchable” castes. After visiting Thumka, we agreed that it was indeed a logical place to work, and thereby split our team into two groups: agronomic and socioeconomic. The socioeconomic team immediately began work on the household survey, while agronomic team began by interviewing 12 farmers about current agronomic practices and walking the mountain to survey the soil types, fertilization, tillage, and other cultural practices.

Some notes on the agronomic practices of the area are warranted. The land of this region is generally divided into two groups. The khorea land is public land where there is no land tenure, although it is farmed anyway. Here, shifting cultivation is practiced to produce maize, black gram (a legume, which may be *Vigna mungo* (L.) Hepper var. *mungo*), and forage. On khorea land, urea is the main source of fertilizer, and is cultivated for about three years and then left fallow for three years. Maize is planted in April, followed two months later by broadcasting black gram. Maize is spaced about 45 cm apart using dibble sticks. In a sense, khorea land is already under conservation agriculture.

Bari land is terraced land used to produce maize, millet, vegetables (pumpkin, tomato), cowpea, and sometimes wheat. There are two types of cowpea cultivated here: commercial and local. The commercial type is produced for market and the local type is consumed locally. On bari land, farmyard manure (FYM) and ash are the main fertilizers used. Crop residues are burned to control perceived insect populations (grasshopper, termite). Maize is intercropped with pumpkin and cowpea, forming the “three sisters” intercropping system that worked so well for native peoples centuries ago. In this system, maize is planted first, and then, cowpea is broadcast after the first weeding. The main constraints for maize production were identified as water, monkeys, birds, grasshoppers, grubs, termites, stem borers, and aphids. Seed is saved annually. The rainy season is bimodal and begins in March/April and August/September. Before conversion to terraces, the land is approximately 60% slopes.

Khorea land is converted to bari land by leaving trees on the contour, forming a type of alley cropping by agroforestry practices. Therefore, the line between bari and khorea is not distinct. There is a third land classification, khet land, which represents valley bottoms, and is not part of the agroecology of these villages.

After extensive discussion among the researchers in conjunction with local farmers and LiBird, we decided on four treatments to be implemented for these on-farm trials. There are three potential cropping seasons annually. The experimental design is a randomized complete block replicated on nine fields. The treatments involve tillage (full till and strip till at 75 cm spacing) and the second rotation. The first and third rotations are the same, and are not treatments in this experiment. The third rotation is fallow. Please see Table 1 for the treatment plan.

Table 1. Treatment plan for on-farm trials in Nepal.

Treatment	Tillage	1st rotation	2nd rotation
1	Full till	Maize-pumpkin-local cowpea intercrop	Millet-commercial cowpea intercrop
2	Strip till (75 cm)	Maize-pumpkin-local cowpea intercrop	Millet-commercial cowpea intercrop
3 (Control)	Full till	Maize-pumpkin-local cowpea intercrop	Millet
4 (Control)	Full till	Maize-pumpkin-local cowpea intercrop	Commercial cowpea

We discussed repeating these experiments in another village, Khola Gaun, nearby.

Susan Crow led the installation of a weather station at Thumka. The location of the weather station was dependent on security and obstructions.

We collected samples and estimated application rates of FYM, which was applied during our visit. We also collected bulk density soil samples by duct-taping two two-inch diameter by two-inch depth brass rings, placing a piece of wood on the top, and gently tapping it into the ground with a mallet. This procedure offers several advantages over the traditional slide-hammer protocol in that: 1. It does not involve the transportation of heavy equipment, and 2. One can physically observe when the soil sample reaches the top of the cylinder, thereby avoiding sample compaction or under-filling the core. The contents of the brass rings were split, emptied into plastic zip-lock baggies, weighed, and transported back to the LiBird soils lab for drying.

I also obtained GPS information on the fields we selected for the on-farm trials. Area calculations were obtained and post-processing occurred in Blacksburg, VA. See Figures 1-3 and Table 2 for the resulting maps of the area, GIS data, and landowner information.

Back in Kathmandu, the team met with Bill Patterson and Netra Sharma for a de-briefing of our project. Bill mentioned that candidates are currently being evaluated for a new award, from which we may be able to obtain climate change data. He mentioned that we may request this information at a later date.

Suggestions and Recommendations

- A detailed sampling calendar and protocols are required by LiBird.
- I must send a copy of my soil permit to LiBird.
- I must send a the ground cover percentage procedure to U. of Hawaii researchers.
- The soils lab at LiBird is very interested in obtaining reference samples and in building their capacity and quality control.
- I must send GIS maps of the area so that researchers and LiBird staff can re-locate the selected fields of interest.
- Jacqueline Halbrendt will return to Thumka in August to assist in data collection.

Training Activities Conducted:

Program type (workshop, seminar, field day, short course, etc.)	Date	Audience	Number of Participants		Training Provider (US university, host country institution, etc.)	Training Objective
			Men	Women		
GPS data collection	Mar. 21, 2011	U of H GRA	0	1	Mulvaney/Virginia Tech	Achieve proficiency in GPS data collection
Weather station data collection	Mar. 23, 2011	LiBird staff; U of H GRA	3	1	Crow/ U. of Hawaii	Achieve proficiency in weather station data collection and download
Bulk density soil sampling protocols	March 23, 2011	LiBird staff; U of H personnel	2	2	Mulvaney/Virginia Tech	Achieve proficiency in soil bulk density data collection

List of Contacts Made:

Name	Title/Organization	Contact Info (address, phone, email)
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Jacqueline Halbrendt	GRA, Univ. of Hawaii	jhalbren@hawaii.edu
Bill Patterson, PhD	Director, General Development Office, USAID	wpatterson@usaid.gov
Netra Sharma	Program Assistant, USAID	nsharma@usaid.gov

A “wish list” of variables we’d like to measure includes:

- FYM amount and quality
- Planting area / harvest area
- Mid-season tissue samples
- SPAD meter readings
- Yield
- Cob weight and length (subsample at harvest)
- Moisture content of grain at harvest
- Biomass (subsample, dry weight)
- Pumpkin: number, weight, and size of fruit
- Feed analysis of residues (fruit and residue)
- Water content of soil (midseason and harvest)
- Water stable aggregates (at harvest each season)
- POM
- Soil C+N (total)
- Macro and micro nutrients
- pH
- CEC
- Ground cover (after planting, at least one season)
- Bulk density (at soil sampling, at harvest and before plowing)
- Texture (LiBird, at time 0)
- Incubation ? (Mineralization?) [*Mulvaney comment: I am leaning toward the Illinois Soil N Test as a simple procedure that uses air-dry and sieved soil: Khan, S.A., R.L. Mulvaney, and R.G. Hoeft. 2001. A simple soil test for detecting sites that are nonresponsive to nitrogen fertilization. Soil Sci. Soc. Am. J. 65:1751-1760. I have more info upon request.*]
- Land equivalency ratio
- N use efficiency
- Productivity
- C sequestration
- Input resource use efficiency (water, nutrients, etc.)
- Cost
- Labor by gender
- Opportunity cost

Figure 1. Overview of the Thumka, Nepal watershed.

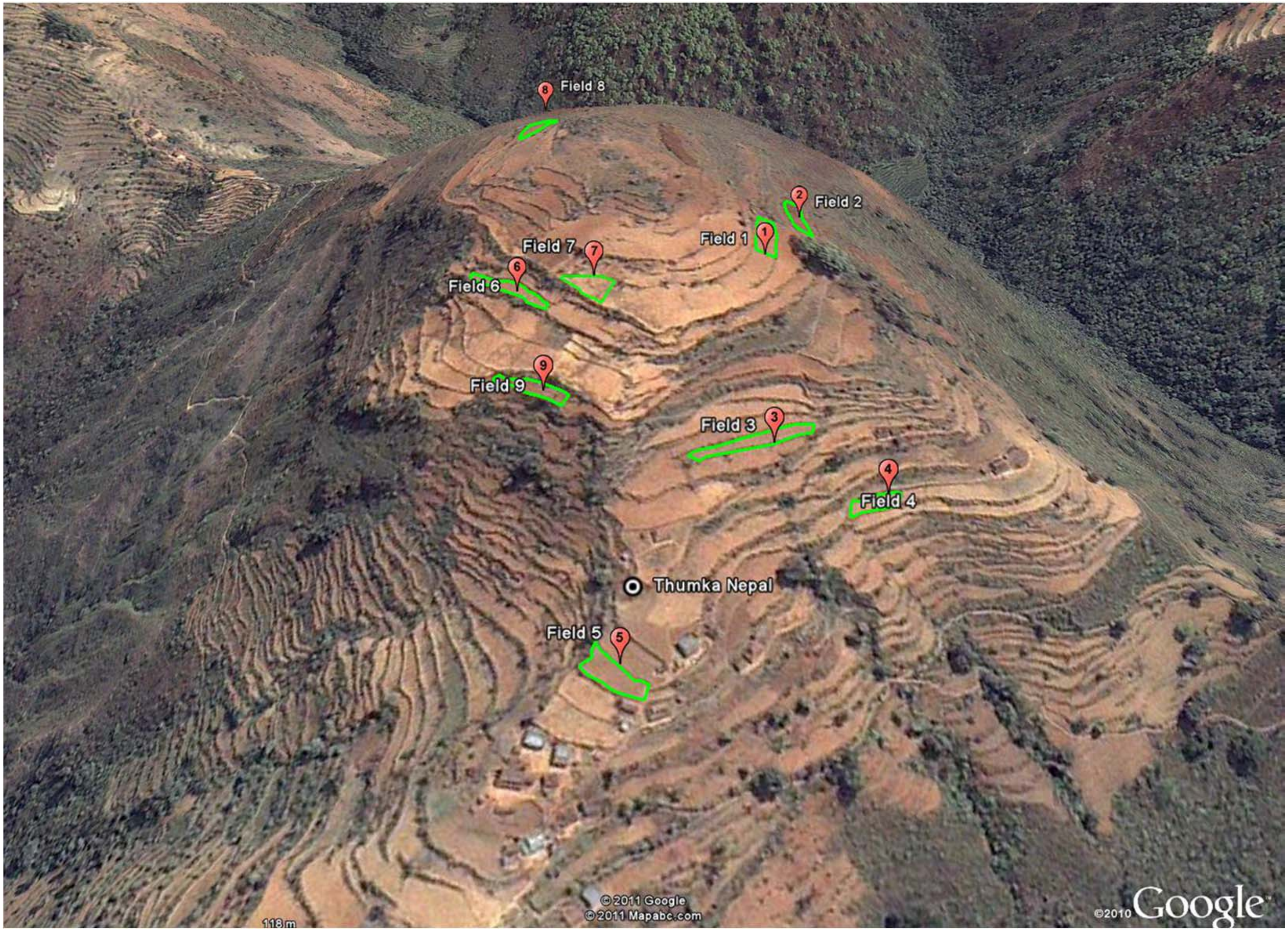

Figure 2. Three dimensional overview of the Thumka, Nepal on-farm trial locations.

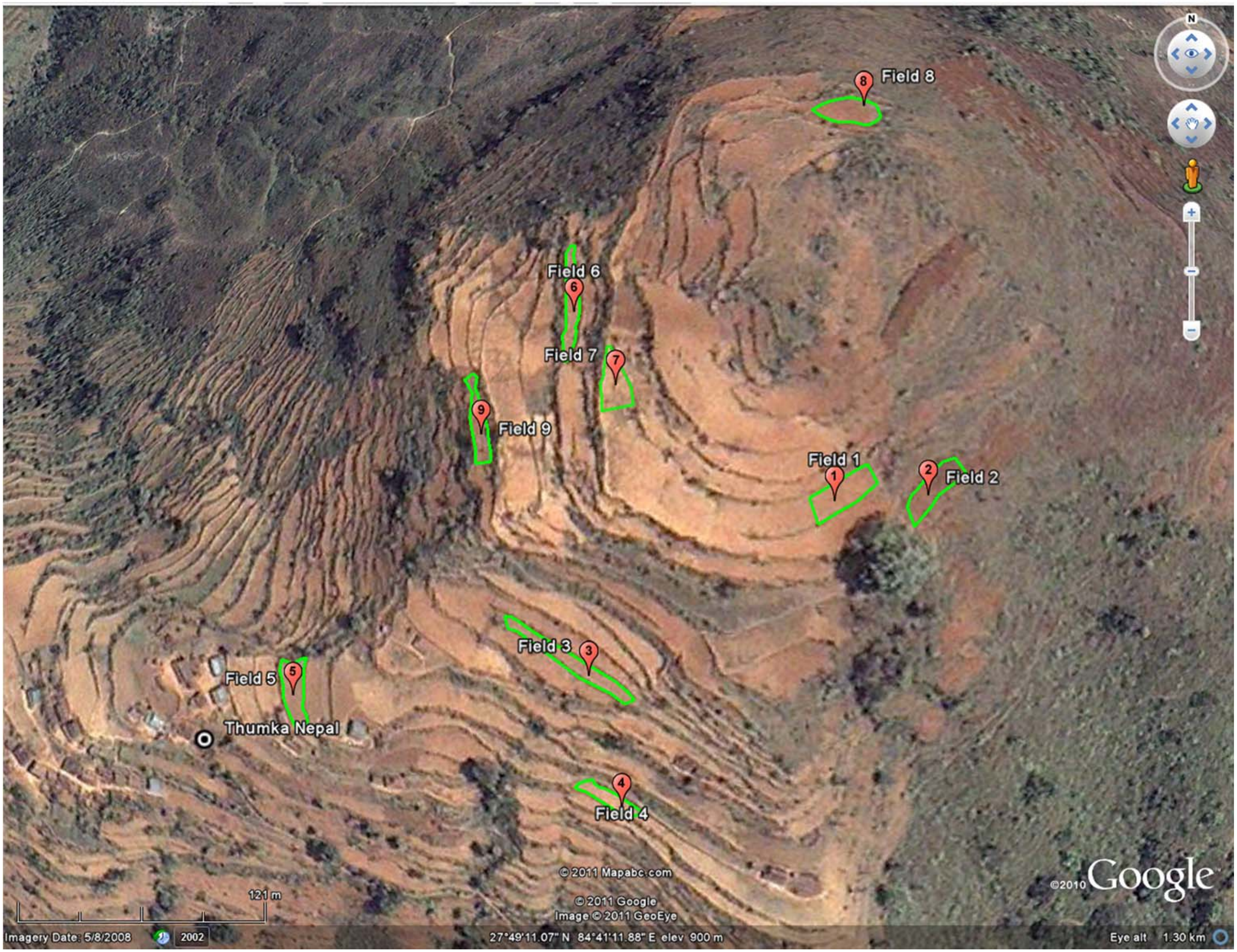

Figure 3. Detailed view of on-farm trial locations within Thumka, Nepal.

Table 2. GPS and landowner data for the on-farm CAPS trials in Thumka, Nepal.

Site	Field #	Approx. area (m^2)	Elevation (m)	N coordinates	E coordinates	Landowner
Thumka, Nepal	1	269	902	N27°49’11.4”	E84°41’14.4”	Runcha Bahadur Chepang
Thumka, Nepal	2	261	894	N27°49’11.5”	E84°41’15.6”	Chatursingh Chepang
Thumka, Nepal	3	426	874	N27°49’08.9”	E84°41’11.5”	Dil Bahadur Chepang
Thumka, Nepal	4	153	855	N27°49’13.7”	E84°41’10.7”	Surya Bahadur Chepang
Thumka, Nepal	5	208	842	N27°49’08.4”	E84°41’06.3”	Kajiman Chepang
Thumka, Nepal	6	334	896	N27°49’13.7”	E84°41’10.7”	Runcha Bahadur Chepang
Thumka, Nepal	7	264	909	N27°49’12.6”	E84°41’11.4”	Bhakta Bahadur Chepang
Thumka, Nepal	8	275	920	N27°49’16.4”	E84°41’13.8”	Kajiman Chepang
Thumka, Nepal	9	187	883	N27°49’12.4”	E84°41’09.1”	Ganga Bahadur Chepang