September 22, 2004

To: Goro Uehara, P.I.
Bowen, Richard
Chan-Halbrandt, Catherine
du Toit, Andre
Fleming, Kent
Friday, J.B.
McArthur, Harold
Minerbi, Luciano
Powley, John
Rodrigues, Angela, USAID
Tsuji, Gordon
Yost, Russell

From: Richard Ogoshi
Systems Agronomist

Re: Trip report, IRRI and Timor-Leste, August 17 to September 4, 2004

Objectives

- Teach MAFF staff and farmers principles and practices of making compost,
- Teach MAFF staff and farmers weather station set up and maintenance, and significance of weather and climate data,
- Assist generation of plans for the 2004-2005 corn and rice demonstration trials with MAFF staff and participating farmers,
- Teach MAFF and UH staff use of Global Positioning System (GPS) and demonstrate the connection with Geographic Information System (GIS),
- Assist in production of training video on nitrogen management in rice and documentation of land use trials,
- Learn Integrated Crop Management, Leaf Color Chart, post-harvest practices for rice, rice variety program cooperation between IRRI and MAFF, hybrid rice variety program implementation.

Accomplishments

The compost making workshop was held at the MAFF office in Baucau on August 23, 2004. Nine MAFF staff from Dili and Baucau, and seven farmers participated (see Appendix A for list of participants). The training covered principles of compost production including aeration, moisture, carbon:nitrogen ratio of raw material, heat conservation, and time. The practical portion of the workshop had participants collect raw material, mix it in appropriate proportions, add water, and build the heap. Participants felt the workshop was helpful because the material for composting is easily obtained and compost minimizes their dependence on inorganic fertilizer.

The climate workshop was held at the Baucau MAFF office on August 24, 2004. The same participants from the compost making workshop attended this one (see Appendix A for list of participants). Participants learned the placement and set up of the weather station, how the sensors work, procedure to download data from the station into a computer, and the use of long-term climate averages derived from the Portuguese data. Andre du Toit presented the results of the daily weather data collected to date from Seical, Fatumaca, Bubu Ana Cala, and Uaitobonu, and a seasonal forecast program that he developed.

Plans for the upcoming corn and rice demonstration trials were formed at a meeting with MAFF, farmer, UNTL, and UH representatives at the MAFF Baucau office on September 2, 2004 (see Appendix B for list of participants). The locations, plot sizes, and treatments were agreed upon. The corn trials are located at Bubu Ana Cala, Fatumaca, Buburaga, and Gariuai. The treatments include a fertilizer rate experiment (N, P, K) for three corn varieties (Arjuna, Bisi-2, Suwan 5), and an unreplicated compost application. The paddy rice demonstration locations are Uaitobonu and Seical (Martinho, Duarte, and Joao farms) and dryland rice demonstrations at Bubu Ana Cala and Buburaga. The treatments include a fertilizer rate experiment (N, P, K). The paddy rice demonstration trial includes an unreplicated Integrated Crop Management (see definition of Integrated Crop Mangagement in Appendix D. Dr. V. Balasubramanian) treatment at Uaitobonu.

The Graph making and Global Positioning System (GPS)/Geographic Information System (GIS) workshop was held on September 3, 2004, at a house next to the du Toit home in Baucau. Andre du Toit taught the section on making graphs in Excel. The GPS section concentrated on basics of GPS such as obtaining strong satellite signal, determining the coordinates and elevation of a location, locating a point on a landscape, finding the area of a field plot, measuring the distance between two points on a landscape. The GIS section was a demonstration of downloading point data from the GPS into the computer and displaying the points in an ArcView theme, and displaying multiple themes. All participants agreed that the small number of workshop participants greatly helped their learning. The participant:computer ratio was about 2:1. They also asked that these three topics be continued in future workshops.

Assistance was given to Keith Bing and Andre du Toit who recorded video shots that document the land use trials from August 25 to 31, 2004. The land use trials are located at 11 sites, but only 10 were visited (see figure 1). Observations on the land use trials are in the next section.

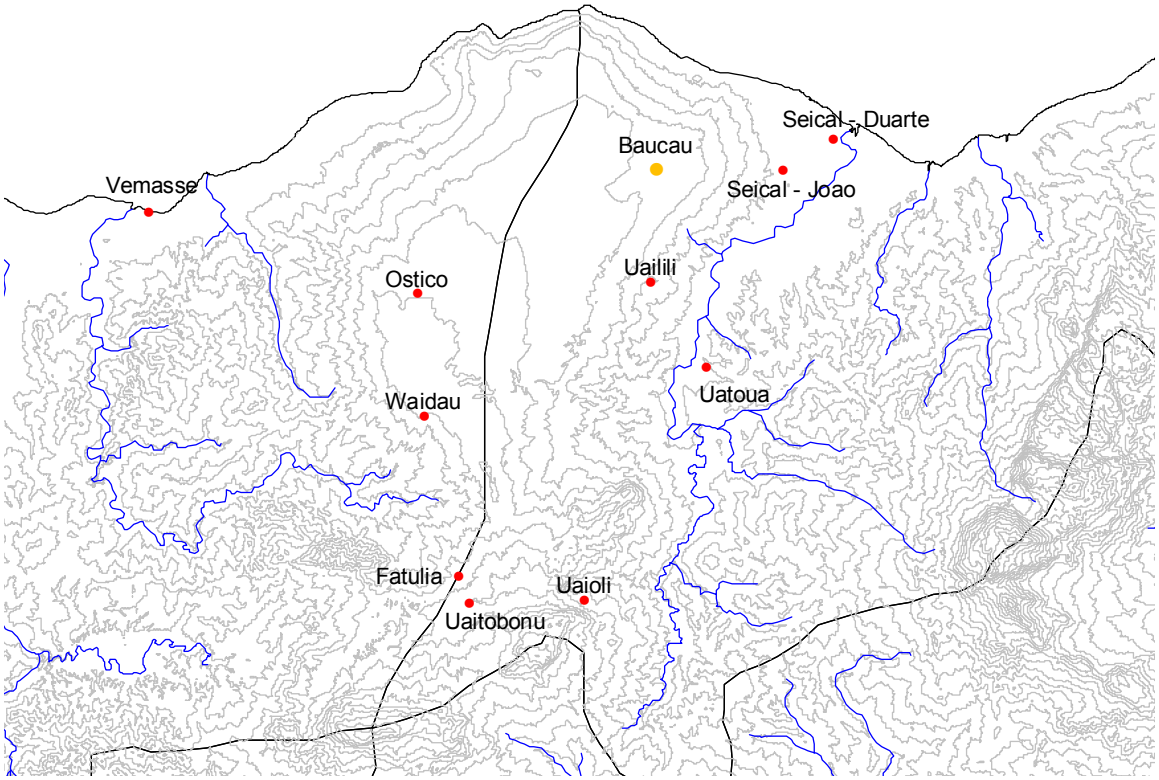

Figure 1. Locations of 10 Land Use Trials in Baucau District, Timor Leste. Black lines are watershed boundaries, blue lines are rivers, gray lines are 100 m elevation contours.

Assistance was given to Keith Bing on September 1, 2004, who recorded video to produce a training module on the use of the Leaf Color Chart (LCC) for nitrogen management in rice production. The LCC determines the timing of nitrogen fertilizer application based on the rice leaf color. The LCC will be tested in the upcoming demonstration trials in January, 2005. Dr. V. Balasubramanian at IRRI developed the LCC for rice production.

The visit to IRRI on August 18 to 20, 2004, included meetings with Drs. Ronald Cantrell (Director General), Edwin Javier (Germplasm coordinator), Martin Gummert (post-harvest engineer), Ish Kumar (rice breeder), and V. Balasubramanian. (rice agronomist). See appendix D for details of meetings.

Observations/Meetings

The land use trials are running well. The first question Andre du Toit posed to the farmers, “What would you do to generate income?”, shifted the trials from a paternalistic approach to one that utilizes the experience that farmers have acquired. The results are that the farmers are highly motivated, put large amounts of labor into the scheme, and are very proud of their work. Ten of the 11 sites were visited (figure 1).

1) Vemasse. This farmer group chose to raise brackish water fish in ponds to generate new income. The project assisted in starting the fish ponds with $1140 to rent a back-hoe to dig the ponds, and purchase fingerlings and feed.

Before the start of this new enterprise, this group raised fish in bamboo cages submerged in the ocean from May to October, and fished the ocean from November to January. There is no ocean fishing activity from February to April due to high waves. The pond-raised fish production started in April and ends in October when ocean fishing starts. Production cycle from stocking the pond to harvest lasts three months.

During the harvest period, the ponds produce 10 to 12 buckets (approximately 20 gallon each) of fish per day which sells for $67 per bucket. The fish are sold to restaurants in Vemasse and Dili.

A Korean fishing company offered this group a contract to purchase 20,000 fingerlings per month at $1 per fingerling. The company would use this for bait to catch tuna offshore. Currently, the group's production capacity is only 8,000 fingerlings per month, but hope to raise the level in the near future.

2) Fatulia. There are two farmer groups at this site. One group is composed of teachers at the local school and the other group is made of students at the school. Both groups chose to grow vegetables to generate income. The groups produce tomato, red bean, cabbage, and other leafy vegetables. These vegetables are sold to the local market in Venilale. They generated about $500 to date and use the income to pay school fees for their children. Production continues.

The project provided $983.50 to the groups to purchase material for fencing, irrigation and transportation, fertilizer, and seed.

3) Uaitobonu. The group at this site chose to produce vegetables including onion, garlic, chili, and leafy vegetables. The produce is sold to buyers who in turn sell it in the local market and Dili. These vegetable buyers find the quality of the vegetables very desirable. Vegetables grown in Uaitobonu are completely sold in one to two hours compared to vegetables from other areas that can take a full day to sell.

Gross revenue to date is well over $2000. The revenue was used to pay school fees for all children in the farmer group.

The project supplied $999 to this group to purchase material for a fence and irrigation system, and purchase seed.

4) Ostico. The group chose to raise chicken to generate new income. The chickens are sold to a restaurant in Vemasse at $2.00 per chicken. The group earns about $0.50 profit per chicken. In a previous report (dated June 25, 2004), the group had sold 40 chicken that generated $80 gross revenue and a profit of $20.00. In the second week of August, 2004, the group sold 50 chickens that made $100 gross revenue and a profit of $25.00.

The project provided $520 to this group to purchase chicks and feed.

5) Uailili. This group chose to raise freshwater fish to generate income. The members of this group constructed four fish ponds out of palm tree trunks and mud on the

foot slopes of the Baucau plateau. The ponds were stocked and the group is currently rearing the fish.

The project provided $439 to the group to purchase fingerlings and feed.

6) Uaioli. This group chose to raise fish, chicken, and pigs to generate new income. The farmers built three fishponds out of mud, a chicken coop above one fishpond, and a stand alone pigpen. The chicken coop above the fishpond allows the chicken manure to fall into the pond and enrich the pond with nutrients to grow algae that the fish feed on. The ponds were stocked with 60 fish purchased from a fish farm in Ossu for $45 on August 28, 2004. The farmer group is currently rearing the fish, chicken, and piglets.

The project provided the funds to purchase the stock fish.

7) Uatoua. This group chose to raise pigs to generate income. The farmers built pens out of available material such as lumber made out of coconut tree, fencing material from bamboo, and roofing material from palm leaves. Ten pigs were purchased at $50 each. Feed was purchased at $0.40 per pig per day. The pigs will be sold at $100 each. The group plans to breed the pigs to continue production.

The project provided $2000 for the purchase of the pigs and feed.

8) Waidau. This is the newest group in the land use trials and they chose to raise pigs to generate new income. The farmers built four pigpens out of the available material on hand. They plan to purchase five pigs at $30 each, and sell at $250 to $300 each. They will breed the pigs to continue production.

The project provided $500 to purchase the pigs and feed.

9) Seical. Duarte leads a fishing group that catches and sells fish worth about $10 a day.

10) Seical. Joao leads a vegetable group in Seical. The group purchased seed with support from the project. The tomato are currently at fruit set stage and will be sold in markets in Baucau and Dili.

Figure 2. Fishpond at Vemasse (left) and vegetable plot at Uaitobonu (right)

Figure 3. Clockwise from top left: Chicken enclosure at Ostico; Fishponds at Uailili; Pigpen at Waidau; Tomato on stakes at Seical; Fisherman in Seical group; Chicken coop over fishponds at Uaioli.

Senhor Simplicio (warehouse manager, Fatumaca) requests a grain moisture meter. He suspects that farmers are soaking the rice grain in water before selling to Fatumaca. A moisture meter would help determine whether this is true. According to Dr. Gummert at IRRI, rewetting rice grain is the largest factor that lowers grain quality. Rewetting the grain creates micro-fissures that crack during milling. Usually rewetting can occur naturally when rain falls on the drying grain. If Senhor Simpliceu's suspicion is correct, discouraging farmers from rewetting their grain, by using a moisture meter to determine the grain water content before buying, could help raise overall grain quality.

Claudino Nabais, MAFF, reported that a former plant breeder during the Indonesian time is interested in establishing a consulting business using the Soil Test Kit to diagnose farmer's soils.

Recommendations

The land use trials are producing good results. The farmers seem happy and they are indeed generating new income. There are one or two farmers that may not generate income that has a large impact on their household, but that is a small minority. The current staff is stretched thin covering all the trials. More staff will be needed in the near future.

IRRI is a great resource for rice producers. Our project has offers from researchers at IRRI to bring pertinent technology that they developed to Timor-Leste (see Appendix D). I recommend that we accept their offer especially regarding the Integrated Crop Management (including the Leaf Color Chart), grain moisture meter, milling chart, and send MAFF and/or UH staff members to the 11-day rice training course in Los Banos. The rice training course covers all steps in rice production from land preparation to milling.

Appendix A. Participant list for compost production workshop August 23, 2004, and climate workshop, August 24, 2004, Baucau District, TL.

Name	Affiliation
Abilio Hornati	MAFF, Baucau
Antonio Lopes	MAFF, Baucau
Alexio Gusmao	MAFF, Baucau
Francisco Gama	MAFF, Dili
Raimundo Mau	MAFF, Dili
Claudino Nabais	MAFF, Dili
Duarte Correia	Farmer, Seical
Martinho Pereira	Farmer, Seical
Manuel Castro Pereira	Youth leader, Fatulia
Daniel Pereira	Fatulia
Constancio de Rego	Village Chief, Fatulia
Luciano Pereira	MAFF, Baucau
Joao Antonio de Rego	Fatulia

Simplicio Sormento	Warehouse manager, Fatumaca
Pascoal Belo	MAFF, Baucau
Agostinho Guterres	MAFF, Baucau
Fernando Sousa	UH, Dili
Francisco Soares	UH, Dili

Appendix B. List of participants in the rice and corn demonstration trial planning, Baucau District, September 2, 2004.

Name	Affiliation
Duarte Correia	Farmer, Seical
Agostinho Guterres	MAFF, Baucau
Joao Correia	Farmer, Seical
Martinho Pereira	Farmer, Seical
Acacio da Costa G.	UNTL

Appendix B. (continued)

Name	Affiliation
Manuel Jose F.	Farmer, Buburaga
Robert Williams	UNTL
Simplicio Sormento	Warehouse manager, Fatumaca
Izaquel Ximenes	Farmer, Fatulia
Joao Antonio Rego	Fatulia
Atonio do Rego Rangel	Fatulia
Daniel Pereira	Uaitobonu
Virgilio de S. Ribeiro	Fatulia
Manuel de Castro Pereira	Fatulia
Constancio Jose de Rego	Village Chief, Fatulia
Pascoal Belo	MAFF, Baucau
Candido Ximenes	Grupo Cooperative
Francisco Gama	MAFF, Dili
Antonio Lopes	MAFF, Baucau
Abilio Ornati	MAFF, Dili
Luciano Pereira	MAFF, Baucau

Appendix C. List of participants in Graphing, GPS, GIS workshop, Baucau District, September 3, 2004.

Name	Affiliation
Antonio Lopes	MAFF, Baucau
Pascoal Belo	MAFF, Baucau
Luciano Pereira	MAFF, Baucau
Agostinho Guterres	MAFF, Baucau
Francisco Gama	MAFF, Dili
Fernando Sousa	UH, Dili
Francisco Soares	UH, Dili
Nina Amaral	UH, Dili

Appendix D. Notes on meetings with IRRI scientists.

Dr. Ronald Cantrell (Director General, IRRI). Informed Dr. Cantrell of project objectives and method, and objectives of my visit: 1) learn LCC for possible use in Timor Leste, and 2) learn factors in producing high quality rice. He mentioned that Seeds of Life provided $45,000 to support IRRI's work in Timor Leste, mainly for germplasm.

Dr. Edwin Javier (Senior Scientist, INGER Coordinator, IRRI). Informed Dr. Javier of project objectives and methods. He is IRRI's liaison for Seeds of Life program in Timor Leste. IRRI's collaboration with Seeds of Life stared in late 2000. IRRI/Seeds of Life identified "best bet" lines of rice for Timor Leste. The term "best bet" is used because he doesn't have complete confidence in the data from the yield trials conducted in Timor Leste. He is developing a proposal that will train farmers to produce seed and is looking for sites to pilot the effort. I mentioned that if the proposal goes through, we would be interested in collaborating with him.

Dr. Martin Gummert (Agricultural Engineering Unit, IRRI). Informed Dr. Gummert of project objectives and methods. Dr. Gummert originally came to IRRI to work on seed driers. He found that adoption of the technology he developed was low. He feels that the technology driven transfer is insufficient to solve farmers problems. He switched to a systems approach where he starts with the market demand and works backward through the post-harvest chain to find constraints that prevent the traits in demand. He offers simple interventions to resolve the constraints. Some of the technologies he is working on: 1) laser leveling in rice paddies because level fields produce more uniformly maturing rice that in turn produces more uniformity in grain moisture and size for better milling, 2) cheap (<$100) electric seed drier that has only been adopted by farmers in Vietnam (Mekong Delta region) possibly because they have no alternatives to drying on roads or pavement because transportation is predominantly on the river, 3) storage units (plastic bags that store 50 to 30,000 kg rice) that are hermetically sealed. His data shows the seal lowers oxygen that kills the insects and actually prolongs seed viability (contrary to popular belief). He is willing to send us 50 kg size plastic bags to test in Timor Leste. To seal 55 gallon drums with small mouth, adding caulk or grease to the threads in the cover may be enough to produce a hermetic seal, 4) cheap grain moisture meter ($15 per unit) for grain drying process. The moisture meter reads from 12 to 16% to identify when the rice is ready to mill. He is willing to give us the plans so that someone in Timor can manufacture the meters or he can sell us the meters. Specific questions posed to Dr. Gummert: Question: What is the major cause of poor rice quality in developing countries? Answer: Rewetting of grain. Once the grains reach maturity on the rice head, the grain needs to be harvested and threshed in a timely manner (less than 4 days between harvest and threshing). If the grain is left on the head in the field, rain or dew can rewet the grain which causes micro-fissuring which leads to breakage during milling. Question: How is brown rice produced? Answer: the milling is stopped after dehulling, but there are problems. Brown rice is an acquired taste so children will need to be taught to eat brown rice, adults do not eat brown rice. The bran contains a high amount of fatty acids which

can turn rancid and shortens the shelf life of the rice. Question: What are the common milling problems in developing countries? Answer: Precleaning and adjustment of huller. The huller requires frequent swapping of the rollers to even their wear. Frequent changing of the screens of the huller. Adjusting the huller to match the variety/moisture content of the grain to prevent breakage. This is an art. He is currently working on finding a relationship between the temperature of the grain coming out of the polisher and the mill settings to make the adjustments a science rather than an art. He will use an infra-red thermometer to track the grain temperature. This work may be completed next year. Question: Is there a cheap seed grader? Answer: Seedburo makes a metal plate with pockets. The grain is placed at one end of the plate and gently shaken to pass the grain over the pockets. The pockets catch the broken grain and allow the whole grains to pass over the plate. This separates the brokens from the whole grain which are then weighed and % brokens calculated. It does not separate the brokens into classes. Dr. Gummert gave a milling chart to determine an endpoint to rice polishing similar to the leaf color chart. Over-polishing is a common problem. Dr. Gummert made an offer for any other help the project may need.

Dr. Ish Kumar (International Research Fellow, Plant Breeding, Genetics, and Biochemistry). Informed Dr. Kumar of project objectives and methods. Dr. Kumar developed rice hybrids in India and IRRI. He claims that his hybrids have 15 to 30% greater yield (translates to 1 to 2 tons per ha more) than the best locally adapted varieties in India, Indonesia, and the Philippines. He noted that China now plants 50% of its rice area to hybrids (15 million ha). He has several commercially available hybrids that he developed: Intani 1 and Intani 2 (produced and sold by the Bisi company in Indonesia), Hybrindo 1 and Hybrindo 2 (developed in India, likely adapted to Timor Leste), and Rokan and Maro (IRRI hybrids). The cost of hybrid seed is about $2 per kg. He is very interested in starting a hybrid seed production program in Timor Leste. He offered his personal help in doing this. He noted that IRRI produces a manual for hybrid seed production. The target audience is plant breeders in other countries. The average seed production for hybrids is 2 tons/ha. He also offered to send hybrid seed for demonstration trials. I told him that I would present the data to MAFF, but leave it up to them to decide whether they would grow hybrid rice. He also offered to show MAFF the commercial production paddies planted with hybrid varieties. The sight of heavy heads is impressive.

Dr. V. Balasubramanian (Agronomist, Training Center – IPMO). Informed Dr. Balasubramanian of project objectives and methods.

Dr. Balasubramanian was involved with validating the System of Rice Intensification (SRI) that was developed in Madagascar. His validation work showed that SRI does increase rice yield, but farmers did not adopt the method because it was too labor intensive and too strange looking. He has adapted some of the SRI practices into a more practical method he calls Integrated Crop Management (ICM).

ICM has four components: 1) modified mat nursery, 2) precise square planting, 3) weeding/soil stirring, 4) nutrient management, 5) intermittent irrigation until panicle initiation. Intermittent irrigation is not as critical as the other practices.

A modified mat nursery increases the vigor of the transplanted seedlings. The modified mat nursery keeps roots relatively intact on transplanting and is relatively young

(four leaf stage, approximately 15 days after planting, before tiller appears at 5th leaf stage) and vigorous. The modified mat nursery starts with seed preparation. Seeds are soaked in water for 24 h, then drained, and covered with a sack for 24 h. At the end of the period the seeds should have sprouted. The sprouted seeds are planted into a nursery at 100 g seed per m^2, this translates into 10 kg seed per ha transplanted seedlings. The seed are sown at 0.5 cm depth in 1 square meter blocks. The blocks are constructed on a raised bed in a dry paddy. The bed is covered with banana leaves. A soil media made of 7 to 8 buckets soil, 1 to 2 buckets well decomposed manure, and ½ bucket rice hulls (fresh or charred) is placed in 1 square meter blocks constructed of banana sheaths or 5 x 5 cm lumber. The block is filled with media less 0.5 cm, and the sprouts sown on the media at 100 g seed per square meter. A 0.5 cm layer is added to cover the seed. The block is covered with banana leaves or rice straw for three days to reduce evaporation. The blocks are sprinkled with water twice a day. After 5 days, the paddy may be flooded. If the seedlings are yellow, a 0.5% urea solution may be sprinkled on day 9. At day 14, the paddy should be drained. On day 15, the mats are transported to the paddy, soil shaken loose, and transplanted at 1 seedling per hill. If the seedlings are at the 5th leaf stage, it is too late to transplant.

The plant spacing is 20 x 20 cm to 25 x 25 cm. The precise placement of the hills makes mechanical weeding possible along both axes and provides adequate spacing for uniform tillering which helps uniformity of maturation.

Soil stirring and weeding are accomplished in the same step with a mechanical hand-push weeder. The weeder has teeth on rollers with a diameter of about 15 cm. The rollers are pushed between the rows and the teeth plow down the weeds and prune the rice roots. The root pruning stimulates root growth deeper into the soil. This step alone can increase rice yields by 600 kg/ha.

Nutrient management is site specific to attain yield goals at the least amount of added nutrients. The Leaf Color Chart determines when to apply nitrogen fertilizer based on the color of the leaf. Urea is applied at 50 kg/ha during wet season, or 75 kg/ha during dry season, when needed. Phosphorus, potassium, zinc, and other nutrients are applied at recommended doses or from analysis of minus-one experiment plots. Minus-one plots are fertilized with all necessary nutrients except for one to see whether the soil can supply that nutrient.

Dr. Balasubramanian conducts an 11-day rice training course at IRRI in September and March every year. During this course, participants learn and practice field preparation, planting, N management, harvesting, drying, milling, and storage for rice production. He suggests that someone from the project or MAFF attend the course. The cost is about $700 for the course and lodging.

Dr. Balasubramanian is available mid- to late-January 2005 to visit Timor Leste to conduct further training or consultation with MAFF and other interested groups.