USDA Hurricane Mitch Recovery Program, Special Objective 1—
Damaged Rural Watersheds Rehabilitated through Strengthened Local Capacity.

SECTION I: EXECUTIVE SUMMARY

A. Program Objectives and Summary

Most of the damage wrought when Hurricane Mitch struck Central America in October 1998 and Hurricane Georges hit the Caribbean island of Hispaniola a month earlier, was water-related. Hurricane Mitch devastated much of Honduras, and parts of Nicaragua, while also damaging Guatemala and El Salvador. Hurricane Georges hit both the Dominican Republic and Haiti. The long and intense rains of the hurricanes caused massive flooding, soil erosion, landslides, and sediment deposition, as even very small rivers greatly overflowed, resulting in extensive damage to agricultural lands, roads, stream banks, and towns. Although the hurricanes were a natural disaster, their impacts may have been worsened due to deforestation, poor agricultural practices on hillsides, and poor rural road management in various watersheds. As the natural land basins through which water drains into rivers, watersheds are the same areas that are ravaged when rivers flood.

Figure 1. Initial USDA watershed rehabilitation design team in Nicaragua (at site of Casita mudflow disaster)

Not only did Hurricanes Mitch and Georges cause immediate damage, but they turned many locations into sites of continuing damage. Due to the initial damage to land, rivers, and infrastructure, even under normal storm events devastated areas gave rise to more soil erosion and excessive water runoff. Rehabilitation of damaged watersheds was essential for the recovery of the agricultural sector and to prevent further threats to life, property, and the environment.

Under Special Objective #1, "Damaged Rural Watersheds Rehabilitated through Strengthened Local Capacity," USDA focused on providing technical assistance for the recovery of damaged land and water resources by integrating agricultural, environmental, rural development concerns within the context of a watershed. Working in consultation with the respective USAID country missions and individuals from non-governmental organizations, government agencies, and local communities, USDA responded by developing and implementing a plan of technical assistance to yield accomplishments within two years. This objective for watershed rehabilitation was accomplished through four intermediate results:

- Intermediate Result 1.1: Emergency Watershed Protection Implemented for Critical Sites
- Intermediate Result 1.2: Land and Water Resources Rehabilitated in Priority Watersheds
- Intermediate Result 1.3: Local Capacity to Mitigate Future Storm Effects Strengthened
- Intermediate Result 1.4: Rural Housing Rehabilitated (Honduras only)

Among the many activities undertaken by USDA to accomplish these Intermediate Results were:

- identification and stabilization of landslides
- rehabilitation of damaged farm-to-market roads
- recovery of sediment-covered cropland
- establishment of tree nurseries to supply reforestation needs
- stabilization of hillsides
- elimination of critical watershed threats
- repair or installation of irrigation systems
- rehabilitation of hurricane-damaged rural housing
- protection of water sources and riparian areas and
- use of live barriers to promote on-farm soil and water conservation.

USDA's Foreign Agricultural Service/International Cooperation and Development (ICD) program area provided overall program design and coordination for this watershed rehabilitation effort. To achieve on-the-ground results in watershed rehabilitation, ICD implemented its program utilizing a combination of on-site technical guidance to in-country partners, grants to NGOs, and the provision of selected materials and supplies. USDA technical specialists from the Natural Resources Conservation Service, Forest Service, Agricultural Research Service, Rural Housing Service, and the Cooperative State Research, Education, and Extension Service and its land grant universities worked with local communities and local NGOs in selected hurricane-damaged watersheds to define and meet their technical needs.

USDA deployed two long-term US Direct-hire resident technical advisors (forester, soil management specialist) to Honduras and two (soil conservationist, engineer) to Nicaragua to lead implementation of the watershed rehabilitation program in those two countries where 67% of the IAA SpO 1 funding had been programmed. Both countries also had mission-specific PASAs to complement the IAA programming. Other USDA technical staff led implementation efforts in the four other countries through a series of TDYs over the period of the project.

Among the types of technical specialists USDA deployed on TDY to implement the watershed rehabilitation effort were foresters, engineers, soil conservationists, soil scientists, agronomists, hydrologists, crop scientists, and watershed specialists. These specialists, almost all Spanish speakers (or French for Haiti) assisted local people in the target watersheds to achieve real, on-the-ground improvements. Over the life of the Hurricane Mitch and Georges project, more than 150 USDA technical specialists went on short and medium term TDY assignments to give assistance in the field to the six target countries.

Intermediate Results And Activities

Result 1.1: Emergency Watershed Protection Implemented for Critical Sites

Sites where the damage to farm-to-market roads, water crossings, or stream banks was so significant that it posed a continuing threat to life or property were termed "exigencies," or critical sites. "Emergency watershed protection" consisted of repair and rehabilitation actions necessary to remove these threats, and restore or improve protection of land, water, and infrastructure in the watershed.

Without corrective action, many farmers' agricultural lands and communities were in danger from more flooding, road washouts and failures, and landslides. Various important farm-to-market roads were impassable in spots due to these exigencies. These sites were critical not only because of the needs at their particular locations, but because they influenced major parts of their watershed. Left un-repaired, they could export sediment to other areas, allow flooding of other locations, or seriously affect transit over key roads in the watershed.

USDA selected the exigencies to address based on a combination of the appropriateness of USDA technical expertise and experience for the job, the ability to complete the work with the time and resources available, interest and availability of on-the-ground partners, and the overall plan of the particular USAID country mission.

Rural farm-to-market roads, rural communities, and agricultural land were all vulnerable to more destructive flooding, more major loss of land and soil, and more damage to infrastructure because of the exigencies left by Hurricanes Mitch and Georges. As in a number of watersheds in western Nicaragua, some large-scale exigencies required detailed engineering work, leading to major construction projects for water crossings, dikes and water diversions, or installation of gabions to protect stream banks.

Other smaller scale yet still critical sites, as in rural road sites the Humuya watershed in Honduras, required installation of road drainage structures and small bridges, with a combination of heavy machinery and hand labor. In Guatemala, emergency watershed protection resulted in the stabilization of numerous landslides through the construction of retaining walls utilizing logs, rocks, and planted vegetation. Most of the work under this IR occurred in Nicaragua and Honduras, with additional efforts in Guatemala, and the Dominican Republic.

The planned impact of these activities was to repair much of the damage identified, remove some of the threats to people's lives and property resulting from the hurricane as well as from future storms, and to restore or improve the ability of farmers to transport their crops to market.

IR 1.2: Land and Water Resources Rehabilitated in Priority Watersheds

Both Hurricanes Mitch and Georges had a very visible impact on land and water resources. In Honduras, much of the soil washed away by floodwaters from agricultural lands in one part of the Choluteca River's watershed was deposited on top of agricultural land in another part. Rivers in both Honduras and Nicaragua changed course, so that farmers who once had access to water lost it, as the water now followed new paths farther away from their land. Hillside areas in Haiti and the Dominican Republic, which had already been degraded from poor agricultural practices that removed tree cover, now were in even greater need of rehabilitation and protection after the erosive effects of the hurricane's waters. Damaged stream banks in Nicaragua and Honduras, although not exigencies, still required repair to reduce their export of sediment into streams and to reduce the risk of their becoming more critical watershed threats later. The hurricanes also highlighted the need to provide protection to riparian areas, ravines, and water sources from sediment.

Figure 2. USDA soil scientist evaluating sediment deposition in Honduras at agricultural site undergoing rehabilitation

Activities were selected to rehabilitate and reclaim damaged and degraded agricultural land, to rehabilitate damaged streams by stabilizing stream banks, to protect water sources from sediment and contamination, and to stabilize hillsides. The activities had to be able to be completed within the life of the project and have the full interest and participation of local people. These activities were aimed at reducing the vulnerability of sloping agricultural land to erosion; of farms and pastures to failure due to water management problems; and of streams and rivers to sedimentation and contamination. The planned impact of these activities was to bring damaged

agricultural land back into production, to improve the condition of streams and to reduce soil erosion.

IR 1.3: Local Capacity to Mitigate Future Storm Effects Strengthened

Local capacity strengthening was a fundamental and prominent part of all activities undertaken by USDA. Whether it was reclaiming damaged agricultural land, correcting exigencies, protecting stream banks, or any of the other actions to rehabilitate damaged watersheds, all activities aimed to build human capacity in various technical areas through training workshops, on-the-job training, and partnering with local communities and NGOs. In addition to building individual human capacity at the local level, the goal was also to strengthen entire communities' capacity to withstand future storm effects through activities such as reforestation of hillsides to help keep soil in place; helping to maintain tree cover the by installing household stoves that require 50% less fuel wood; or improving local road drainage.

Activities under this IR were selected in order to foster the sustainability of the interventions. USDA's expectation was that through activities aimed at strengthening local capacity, the local community and NGO partners would continue to apply the skills and knowledge gained beyond the life of this relatively short project. Only by strengthening local capacity could watersheds be further rehabilitated and the investments made under the Hurricane reconstruction program be protected over the long-term. Activities designed to help mitigate future storm effects promoted sound practices in agricultural land management, rural road design and maintenance, stream protection, watershed mapping, and soil conservation

IR 1.4: Rural Housing Rehabilitated (Honduras only)

Housing was damaged or destroyed in all of the countries hit by Hurricanes Mitch and Georges. As part of the program for rehabilitating the upper Humuya watershed in Honduras, USDA and USAID/Honduras decided to include rural housing rehabilitation. A team of specialists from ICD and the Rural Housing Service carried out a field assessment early in the project and identified key types of support that USDA should offer, including grants and provision of earthen block machines to support Honduran adobe earthen block home construction. By partnering with the local NGO Proyecto Aldea Global, the project efforts resulted in a cost-effective and productive program of helping local people construct safer housing in rebuilding after the hurricane and left them with new construction skills and equipment to continue well beyond the life of the project. USDA also reduced the vulnerability to flooding of a new community built after the hurricane by helping GOAL, the NGO that built the community, to improve drainage on the site.

B. Funding Resources for Each Intermediate Result

USDA used the Intermediate Results as thematic program guides rather than organizational units under which funds were budgeted. Therefore, the following figures are an approximate representation of allocation by project type and level of effort.

IR 1. 1: Emergency Watershed Protection Implemented for Critical Sites
$1,674,000

IR 1.2: Land and Water Resources Rehabilitated in Priority Watersheds
$2,005,000

IR 1. 3: Local Capacity to Mitigate Future Storm Effects Strengthened
$1,247,000

IR 1.4: Rural Housing Rehabilitated (Honduras only)
$275,000

Program Management budget
$1,011,000.

Total funding of Intermediate Results plus Management Budget, under the Hurricane Mitch/Georges Reconstruction Project IAA, SpO 1 was:

Total Funding under IAA: $6.2 million.

USAID Honduras gave USDA $1 million in additional funds (not included above) to be utilized to augment work in Honduras under IR2. USDA received an additional $5.8 million from USAID Nicaragua to augment work under IRs 1,2, and 3 in that country. Some of the key accomplishments listed in this report were achieved with these additional funds.

Additional resources contributed by USDA:

Most of the USDA staff that undertook short or medium term TDY assignments utilized a variety of resources they had at their USDA offices in national forests, research stations, conservation districts, and universities throughout the country. These resources included computers and software to produce maps; engineering drawings and hydrological calculations; soil sampling equipment they borrowed for their field assignments; or consultations with other experts in their respective USDA agencies or other agencies. In addition, all of these staff spent much time at their offices working on the USDA Hurricane project, with no charge of their salary costs to the project budget. These contributions were significant, as USDA fielded approximately 150 different people, many of whom went on multiple assignments. In some instances, salaries for time on assignment in the field were donated as well, as in the case of Roy Jemison, USDA Forest Service, leader of the Haiti implementation.

C. Key Accomplishments/Practical Impacts

IR 1.1: Emergency Watershed Protection Implemented for Critical Sites

HONDURAS

- Through installation of improved drainage structures and correction of numerous soil erosion and water runoff problems, 163 road exigencies were eliminated and 43.8 kilometers of rural farm-to-market roads were rehabilitated.

- At Colonia La Pista, an emergency community built north of La Libertad for victims of Hurricane Mitch, one hundred houses were protected from excessive water runoff and flooding and soil erosion and sediment production were reduced.

NICARAGUA

- An Emergency Watershed Protection (EWP) field assessment using multi-disciplinary USDA technical teams successfully identified 88 watershed impairments caused by Hurricane Mitch at the start of the reconstruction project. This formed the basis for much of USDA's subsequent watershed repair and rehabilitation work.

- Six of the most important EWP sites requiring extensive engineering and construction expertise were successfully rehabilitated by the Nicaraguan Fund for Emergency Social Investment (FISE) with technical support from USDA engineers. These sites were:

  - Puerto Momotombo in Leon Department. Community flood protection by means of gabion dikes, stream barbs and a low water stream crossing.
  - El Hatillo in Matagalpa Department. Bridge construction and stream bank protection establishing farm-to-market link and flood protection

Figure 3. View of newly constructed El Hatillo bridge in Nicaragua

- Salale in Leon Department. Community flood protection through construction of gabion baskets and stream barbs along upper flood plain.
- Hospital La Trinidad in Esteli Department. Flood protection of a hospital severely damaged by Hurricane Mitch by construction of water division structures on the slopes above the hospital and reinforcement of drainage channel systems.
- San Juan de Limay in Esteli Department. Community flood protection through construction of gabion stream barbs and flood control structures along the outer riverbanks.
- La Quimera in Leon Department. Flood protection through improving drainage and installing stream barbs along stream banks.

- Pire River Streambank Protection Project at Santa Teresa protected 12 communities from future damage and repaired damage to the Pire River caused by Mitch. This EWP project was implemented by the Cooperative Housing Foundation.

Figure 4. USDA engineer surveying Pire River site in Nicaragua

- A severe bark beetle infestation near Jalapa that had destroyed large areas of pine forests in northern Nicaragua and risked future watershed damage was controlled by the establishment of a 13 kilometer buffer control strip. World Relief and the Nicaraguan Forest Department (INAFOR) worked together with USDA in this effort.

- Smaller bark beetle outbreaks near Santa Barbara and San Fernando were completely controlled by means of buffer control strips.

- USDA's technical assistance and leadership was instrumental to the rehabilitation

of 1388 kilometers of damaged rural roads by Nicaraguan NGOs. This contribution included technical coordination in the delivery of 10 technical trainings.

GUATEMALA

- Stabilization of 82 critical landslides by building retaining walls, revegetating landslide areas, and improving drainage for 65 hectares directly while protecting an additional 9,287 hectares in the Jones and Blanco watersheds.

DOMINICAN REPUBLIC

- A main farm-to-market road serving communities in the Rio Panzo and Rio Majagual watersheds received protection from landslides.

IR 1.2: Land and Water Resources Rehabilitated in Priority Watersheds

HONDURAS

- Seventy-eight hectares of water sources were protected by fencing selected areas of the Humuya micro-watersheds, resulting in greater protection of communities' potable water from sediment and contamination.

- Reforestation with 217,175 trees on 621 hectares of critical areas in targeted micro-watersheds of the Humuya helped stabilize slopes, establish trees on degraded lands, and reduce vulnerability to future storms.

- A total of 8 km of streams were rehabilitated by stabilizing damaged stream banks through the use of bio-engineering techniques, and planting of vegetation.

- Six sites, comprising 10.5 hectares of landslides, were stabilized through vegetative plantings.

- Planting of 56,283 lineal meters of live erosion control barriers reduced soil erosion by holding soil in place in agricultural land on slopes.

- Sources of microbial contamination to water in the Humuya from human waste were reduced by the building of 524 latrines

Figure 5. USDA Forest Service staff train community members how to test their water supply for contaminants.

- Many sources of sediment in the critical areas of the Humuya upper watershed were removed through the elimination of road exigencies.

- Significant pollution of water from coffee processing was reduced through the use of new technology in coffee de-pulping, with an estimated reduction of 646,800 liters of polluted water from three sub-watersheds.

- Technical assistance in dairy for 254 farmers in the Aguan and Choluteca watersheds had a beneficial impact on 743 ha. of dairy agricultural land, and added $714,000 in land value.

- Sugar cane lands in Choluteca area damaged by Hurricane Mitch gained $1000 a hectare or more in value after technical assistance in land leveling and soil mixing.

- Interventions of land leveling, irrigation, and technical advice to rehabilitate Choluteca's important melon growing lands directly helped 67 producers to recover.

- Irrigation and other assistance raised land value of 161 ha. damaged by Mitch by an average of $1300 per hectare, aiding vegetable farmers in the Choulteca and Aguan lower watersheds.

- Cashew farmers in the Choluteca lower watershed received assistance in soil fertility management to help boost production.

- Technical assistance in soil fertility management, land leveling, and replanting of plantain benefited 151 farmers, mainly in the Aguan lower watershed.

- Technical assistance to support the rehabilitation of oil palm, citrus, and Tilapia fish-ponds affected over 2000 hectares of Mitch-damaged land.

NICARAGUA

- USDA, USAID and the Union of Nicaraguan Agricultural Producers (UPANIC) successfully completed a small grants program aimed at repairing Mitch damage and revitalizing the rural agricultural economy. Primary accomplishments of this effort included:

  - Work at 133 sites through 29 sub-projects benefiting 12,493 households.
  - Rehabilitation of 872 hectares of farmland.
  - Planting of approximately 1,400,000 trees.
  - The adoption of improved agricultural practices by 1605 households.
  - The reforestation of 93 hectares in highly vulnerable locations in Mitch-damaged micro-watersheds.
  - The removal of 23,500 cubic meters of sediment.
  - Construction of 21 bridges (box, ford, pedestrian, and culvert types).
  - Stabilization of 4.3 kilometer of critical stream banks through bio-engineering techniques.
  - Treatment of 4.2 kilometers of gullies.

Figure 6. Planting trees to help stabilize watersheds took place in every country

- A community-based reservoir construction project undertaken with the Cooperative Housing Foundation (CHF) resulted in:

  - Construction of 403 reservoirs
  - Construction of 253 small irrigation systems
  - Training of 491 individuals in reservoir and irrigation construction

EL SALVADOR

- Construction and repair of 47,286 lineal meters of irrigation ditches along contours on sloping agricultural land reduced water runoff and increased water infiltration into the soil

- Establishment of 66,633 lineal meters of live barriers provides protection of irrigation ditches, and provides useful hillside crops too

- 1,019 lineal meters of terraces were constructed on hillside agricultural land to increase water infiltration into the ground and reduce excessive water runoff

- 484 filtration tanks were constructed to help keep water of access roads

- 42 hectares of mainly coffee cultivation of small producers were protected with small filtration ditches.

- 29 hectares of land were improved by rock barriers to soil erosion

DOMINICAN REPUBLIC

- 72 parcels covering 77.5 hectares were reforested in the Haina-Duey watershed

- Reactivation and improvement of bee honey production through assistance bee - keeper's organization in Eastern National Park in La Altagracia province.

HAITI

- 103,758 trees were planted in hurricane-damaged areas by three organizations receiving technical guidance and funding support from USDA.

- 5,521 cubic meters of rock and soil-filled barrier were constructed in gullies to stop soil erosion and sediment export

- Contour plantings of 37,550 lineal meters of shrubs, trees, and grass are aiding in soil retention on eroded agricultural lands worsened by Hurricane Georges

- Conservation structures provided protection to 74 hectares

IR 1.3: Local Capacity to Mitigate Future Storm Effects Strengthened

HONDURAS

- Participatory diagnostics, related trainings, and community organizing led by Cornell University supports rehabilitation efforts in the Humuya, and increases local capacity to protect water sources, rehabilitate roads, and manage their micro-watersheds.

Figure 7. Participatory watershed mapping ensured that local resources and community priorities guided field interventions.

- Planting of 80,178 lineal meters of live-fencing reduced the need to cut wood for fence-posts, helping to maintain tree cover in the watershed.

- Installation of 1,131 improved, fuel-efficient stoves, reduced the need for deforestation for fuel-wood, and increased the opportunity to retain protective tree cover in the watershed.

- Training in water quality monitoring improved local capacity in this technical area, and revealed high fecal coliform counts in potable water systems, highlighting the need for improved watershed management to reduce contamination.

- Partnership with Fondo Cafetero Nacional (Honduran coffee road agency) to rehabilitate roads in coffee growing areas results in repair of damage, and shows them new and better ways to maintain roads to prevent erosion and landslides due to storms.

- Road rehabilitation training, and manuals for rural road design with minimum impacts, and best management practices for rural roads, increased local capacity to build and maintain environmentally-sound farm-to-market roads.

- Training of farmers in organic farming, soil conservation, establishment of tree plantations, agroforestry, along with the training of artisans in the making of

improved stoves, resulted in both on-the-ground project accomplishments, and improved local capacity for future work in the Humuya.

NICARAGUA

- A Disaster preparedness plan was developed and training undertaken with 63 leaders from 14 communities in the target zone of CHF's Esteli watershed rehabilitation project.

- Students, teachers and parents participated in theater workshops, an innovative approach to communicating the concepts of risk mitigation and disaster preparedness for students. 625 people were trained, including 348 females, 277 males and 15 teachers.

- Watershed vulnerability reduction activities by CHF in these same communities resulted in:
  - 101 hectares reforested
  - 571 hectares protected by soil and water conservation measures

- The National Tree Seed Center was reactivated by USDA efforts resulting in tree seed collection, testing, and improved storage for the 2000 and 2001 seasons. By increasing quantity and quality of forest tree seed supplies in Nicaragua, USDA enhanced the capacity within Nicaragua to undertake future reforestation.

- Tree planting coordination efforts by USDA led to the production of an additional 329,000 seedlings thus increasing Nicaragua's vulnerability reduction efforts through reforestation

- USDA contributed road rehabilitation technical training materials that were instrumental to increasing the capacity of Nicaragua NGOs and government technicians to design and maintain quality rural roads. Materials included:

  - 100 copies of the USDA manual "Rural Roads with Minimal Impact"
  - 100 copies of the USDA's "Best Management Practices Guide for Forest Roads"
  - 500 copies of the Nicaragua "Road Rehabilitation and Maintenance Manual"

GUATEMALA

- After a wildfire, because much of the protective plant and tree cover has been burned away, watersheds are at risk of landslides and flooding during storms. To address this problem, Guatemalan technicians working with USDA Forest Service technical specialists identified critical, wildfire-prone areas in three watersheds, and targeted them for treatment to reduce the risk of wildfire.

- Forest fire prevention, fire management planning, fire detection, and combating forest fires were among the themes in a series of trainings delivered in a total of 84 training events to 357 participants.

- Fire prevention activities to reduce target watersheds' risk of wildfire resulted in construction of 26,000 lineal meters of fire lines, with 260,000 square meters of fuel breaks.

- 217 hectares were treated with prescribed burns to reduce risk of wildfire and subsequent watershed damage

- Establishment of a system of three automated forest weather stations to gather data in the target watersheds on rainfall, humidity, wind speed, has significantly increased Guatemalan authorities' ability to predict fire hazard in dry seasons, and to estimate the potential of storm events in the upper watershed to cause flooding in communities in the lower watershed.

- Baseline data collected through a characterization of the Hondo, Pasabien, and Jones river watersheds will provide an information resource for detecting changes in the watershed that may require interventions to prevent wildfire, soil erosion, and landslides.

EL SALVADOR

- Over 41,000 forest trees, and nearly 6,000 fruit trees, were planted as live barriers to protect slopes from storms and soil erosion; 7,760 lineal meters of dikes were also constructed, with strips of banana, bamboo, and yucca (Izote) for protection of these lands.

- 194 hectares of small watersheds were protected through various conservation practices, increasing their capacity to mitigate future storm effects.

- Trainings to students and technicians from 20 institutions in soil erosion control, construction of physical conservation structures benefited 393 people.

- A set of 30 projects undertaken by Peace Corps Volunteers in 28 different communities, addressed needs in reforestation, soil conservation, microwatershed protection, and other areas, reducing the vulnerability of these communities to storm effects.

DOMINICAN REPUBLIC

- Farmers and NGO technicians received training in the field at demonstration sites that proved good crop production could be gained without the destructive slash

and burn techniques that damage watersheds.

- The capacity of a plant nursery in San Juan de la Maguana province to eight times more (from 120,000 to 950,000 seedlings) to satisfy short- and long-term demand for planting stock for reforestation in Georges-affected areas.

HAITI

- Use of hand-held Global Positioning System (GPS) units combined with digital photography was promoted by USDA to improve capacity to document the exact physical location of soil conservation structures, as well as site conditions before and after treatment.

- 40 representatives from NGOs, USAID, Government of Haiti, and others involved in soil conservation and hillside agriculture activities were convened in a productive two-day workshop to discuss the effectiveness of soil conservation practices. This will be followed up by additional work after the Hurricane Reconstruction Project from USDA for USAID Haiti in determining the best soil conservation measures for Haiti.

IR 1.4: Rural Housing Rehabilitated (Honduras only)

HONDURAS

- Construction of 202 Latrine/kitchen annexes improved homes built for victims of Hurricane Mitch, and reduced household sources of stream water contamination.

- Provision of 3 mobile earthen block machines greatly supports home building for to replace destroyed, damaged, or vulnerable houses in the Humuya upper watershed.

- Expert training and consultation in earthen adobe home construction applied new techniques to improve sturdiness of the homes, reducing vulnerabilities to severe storms, and to earthquakes.

- Construction of school/storm shelter at Brisas del Campo, improves community where housing new housing was constructed.

- Development and publishing of a Spanish-English handbook on use of pressed earthen blocks for construction improves local technical capacity to produce good quality adobe houses. 300 copies were provided to Proyecto Aldea Global, the NGO implementing rural housing rehabilitation with support from USDA.

- Improvements in drainage protected 100 houses constructed for hurricane victims from flooding and other water damage.

D. Additional Measures/Recurring Costs/Other Considerations

IR 1.1: Emergency Watershed Protection Implemented for Critical Sites

Additional Measures to Protect Investments/Recurring Costs

In all work to correct exigencies, USDA staff involved local communities and relevant authorities with the understanding that they will need to maintain the culverts, roads, and other structures installed to correct those exigencies. From the beginning of the project, USDA included capacity strengthening of local engineers, local NGO staff, and local officials as an essential part of its work. USDA does not anticipate any recurring costs beyond the type the communities may have already incurred in correcting these areas. Due to superior design used in correcting these exigencies, any recurring costs should be lower because the superior design should prevent washouts, flooding, and other damage that occurred previously from faulty designs and poor management practices.

Other Activities to Consider to Mitigate Future Disasters

Beyond the exigencies USDA addressed, there are probably other sites that still need attention and treatment. The devastating effects of Hurricanes Mitch and Georges have shown that small problems left untreated can become sites of serious damage under severe storms. It would be very cost-effective for countries to undertake an assessment of critical locations at the micro-watershed level (i.e., by communities) to locate and inventory site-specific problems they could address through a program of regular maintenance. These small problems could be eliminated before any large storm turned them into serious problems.

IR 1.2: Land and Water Resources Rehabilitated in Priority Watersheds

Additional Measures to Protect Investments/Recurring Costs

There are no special measures and no special recurring costs for some land rehabilitation improvements, such as those made by leveling and mixing of sediment-covered agricultural land or planting of live barriers to stem soil erosion. Other improvements, such as new irrigation systems, will require some maintenance. Experienced farmers with pre-hurricane irrigation systems often only needed the site repaired after the hurricane. Where irrigation was a post-hurricane addition, systems were selected because of their proven success and cost-effectiveness.

In several countries, tree nurseries were established to meet reforestation needs for the project. All the partner NGOs and communities that USDA worked with were experienced with nurseries. No particular maintenance problems or recurring costs are anticipated.

Other Activities to Consider to Mitigate Future Disasters

The most important activities to consider would be those that continue to stabilize land in and along rivers and on hillsides. This can best be accomplished by establishing and maintaining forest buffers along rivers and by providing technical support to help upper watershed farmers successfully produce tree crops that have the benefit of providing protection to soil on sloping lands.

IR 1.3: Local Capacity to Mitigate Future Storm Effects Strengthened

Additional Measures to Protect Investments/Recurring Costs

None

Other Activities to Consider to Mitigate Future Disasters

Using participatory diagnostics in which local community members go into the field with technical specialists to identify problems at the micro-watershed level has proven to be an extremely effective way to organize and motivate people to take action. Fundamental to this process is the provision of concomitant technical support to correct existing and potential watershed exigencies. These diagnostics would be an effective tool for any donor wishing to foster disaster mitigation related to flooding, but technical guidance must be offered at the same time.

IR 1.4: Rural Housing Rehabilitated (Honduras only)

Additional Measures to Protect Investments/Recurring Costs

The earthen block machines donated to Proyecto Aldea Global (PAG) in Honduras to manufacture adobe blocks will need regular maintenance. PAG staff received training on the operation and maintenance of these machines, and they have been operating them successfully for almost one year.

Other Activities to Consider to Mitigate Future Disasters

All organizations undertaking home construction should pay special attention to proper drainage and seek technical advice for proper drainage design. It appeared that organizations did not always address this issue in the planning stage before they began construction. More costly modifications and improvements were then necessary later.

SECTION III: REDESIGN RECOMMENDATIONS

A. What Would Be Done Differently In A Redesigned Program

Sometime after the beginning of the project, the USDA program managers of the Special Objective 1 articulated the thrust of the project simply as "find the damage, fix the damage, prevent further damage." While that phrase had conceptual value, it would have had better operational value had it been used it to fashion the Intermediate Results as:

IR1 – Find the Damage
IR2 – Fix the Damage
IR 3 – Prevent Further Damage

Operating under these IRs might have improved the efficiency of an already successful project.

B. Constraints To Implementation And Recommendations To Avoid Them In The Future

Initial project implementation was hindered by various administrative and bureaucratic delays. Even though this was an "emergency" project with a short time-frame, the traditional human resources processes for hiring or detailing an employee for the four Central America resident positions were for "business as usual" timeframes, rather than any sort of accelerated or streamlined process for the Mitch/Georges emergency. These processes included classifying and posting announcements within USDA; medical and security clearances; and other similar processes. Emergency programs, like the Hurricanes Mitch and Georges Reconstruction Project, need to have some mandate, or authority, to move through the required procedures more expeditiously.

C. Any Other Comments Or Recommendations

In the future it would be preferable for the USAID Missions and the other US Government agencies to receive their money for implementation at the same time. Since the Missions had their money before the government agencies, they were able to move forward rapidly with implementation, including the awarding of grant agreements to the local NGOs. Had USDA had its operating funds earlier, the staff could have taken a more active role in the planning stages to assist USAID with the technical review of NGO proposals. In addition, this might have allowed USDA and the NGO community to jointly develop ways to complement one another in the planning stages rather than later.

The relatively short duration (2 years) of this type of project did not allow for a mid-term evaluation to provide some analysis of how different interventions were fairing. In the future, it would be beneficial to have a longer project life so such evaluations could be conducted.