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REPORT ON EVALUATION OF FOOD SECURITY - POVERTY ALLEVIATION IN ARID AGRICULTURE BALOCHISTAN PROJECT



Management Systems International
Corporate Offices
600 Water Street, SW
Washington, DC 20024

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FOOD SECURITY – POVERTY ALLEVIATION IN ARID AGRICULTURE BALOCHISTAN EVALUATION REPORT



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600 Water Street, SW
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**FOOD SECURITY – POVERTY ALLEVIATION IN ARID AGRICULTURE
BALOCHISTAN PROJECT**

Implemented by the Food and Agriculture Organization (FAO) of the United Nations in the province of Balochistan under a Cooperative Agreement with USAID/Pakistan

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Preface

This evaluation comprises one part of an evaluation activity that covered all eight projects in USAID/Pakistan's Economic Growth Portfolio. Some of the projects were completed, or near completion, at the time of the evaluation while others had a year or more remaining. So the activity included both mid-term and final evaluations. For ongoing projects, the evaluations will identify opportunities for improving performance. For concluding projects, the evaluations document lessons learned that can help USAID and contractors improve performance of future interventions. For some projects, the evaluations will assist with planning for project extensions.

The evaluation also preceded a design activity. Findings, conclusions, and recommendations from the evaluations will inform the design process.

Acknowledgements

The many people who gave generously of their time, knowledge, and energy made the evaluation a truly participatory exercise. Most especially, David Doolan, the FAO project manager and FAO/ICARDA personnel, Dr. Mohammad Aslam, Aijaz Hussain Awan, Dr. Hakeem Shah, and Dr. Mohammad Islam, were superlative hosts to the evaluation mission's field visit. They were informative and hospitable and devoted a tremendous amount of time to informing the evaluation team. A special thanks also to the remainder of the FAO staff, Ahmed J. Essa, Muhammad Atif Nasim, Riba Rodrigues, Rifat Rind, and Imran Khan for their invaluable assistance. The Community Development and Market Facilitators used the strong links they have established with beneficiary communities to facilitate an ambitious and rewarding field visit. The evaluation team also owes much to the many individuals who shared their time and knowledge contributing to the evaluation process. The hundreds of project beneficiaries who invited the evaluation team into their communities deserve particular thanks for their exceptional hospitality and generosity. Finally, to the office staff who supported the mission in Islamabad, Mohammad Sohail Sattar and Shunila David, thank you, we could not have done it without you.

Project Summary

The Food Security/Poverty Alleviation in Arid Agriculture Balochistan Project is a pilot phase project designed to “improve livelihoods and food security of the rural people of Balochistan by strengthening the capacity of the Balochistan applied research and technology transfer system and concerned Departments/Directorates to provide sustainable market oriented arid crop, orchard and rangeland, and livestock interventions and sustainable land and water resource strategies.”¹ Table 1 summarizes basic project details.

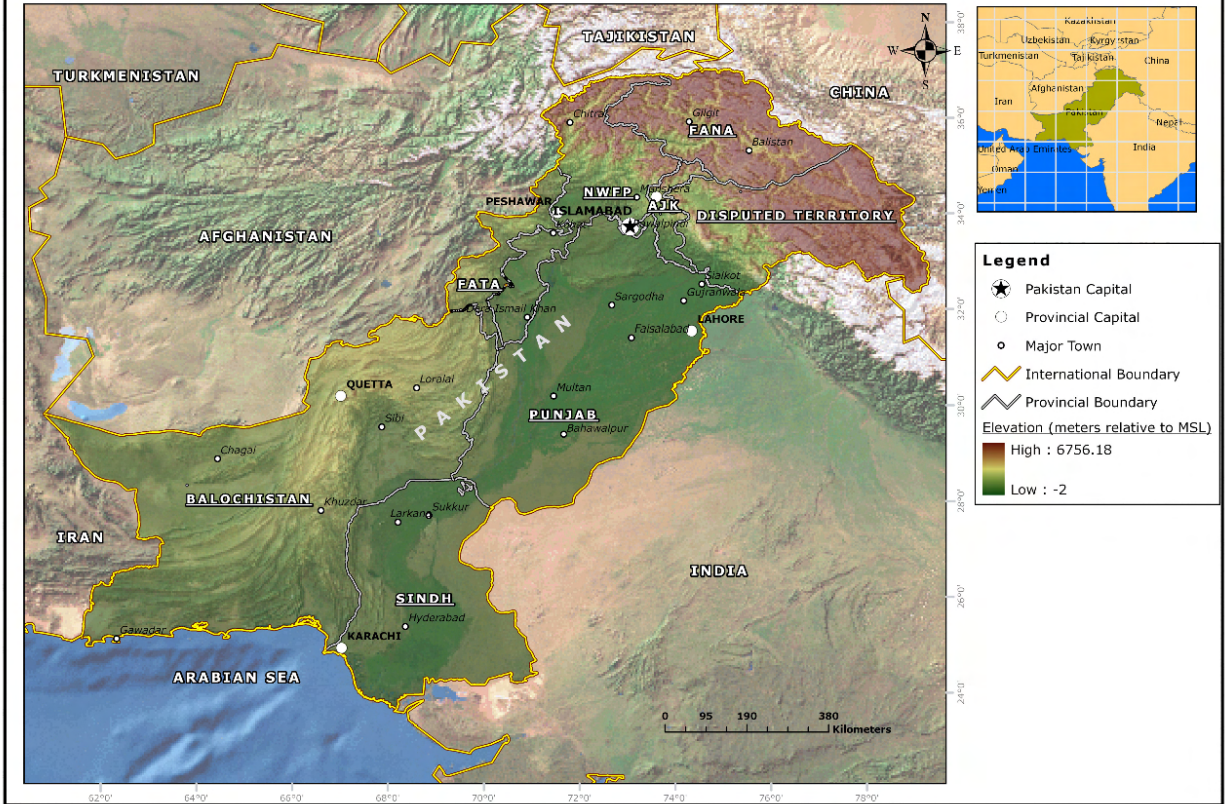
TABLE 1: PROJECT DETAILS

USAID objectives addressed	SO 6: Increased economic opportunities for the poor IR 6.3: Increased market opportunities in the rural economy
Implementing partners	Primary recipient: Food and Agriculture Organization of the United Nations (FAO) Sub-awardee: International Center for Agricultural Research in the Dry Areas (ICARDA)
Cooperative agreement	391-A-00-04-01032-00
Project dates	December, 2004 through December, 2008 (includes one-year no-cost extension)
Budget	\$5,970,398 (USAID) \$500,100 (Government of Pakistan, in-kind) <u>\$1,000,000</u> (Expected community cost share) \$7,470,498
Project location	Districts of Mastung, Loralai, & Killa Saifullah in Balochistan Province, Pakistan

The project operates out of the provincial capital, Quetta with outlying offices in the district centers of Mastung, Loralai, and Killa Saifullah. It is far removed from Islamabad, the national capital, and the poor condition of the roads and the distance make it difficult to reach other than by air. The tenuous security situation also contributes to its isolation.

¹ FAO/Government Co-Operative Programme, Project Document

Map of Pakistan



Glossary

Benefit Cost Ratio	The ratio of the present value of a stream of benefits to the present value of a stream of costs. The benefit cost ratio is a measure of the magnitude of benefit per unit of cost.
Check Dam	A dam constructed across a seasonal watercourse to slow runoff and facilitate percolation into the aquifer.
Internal Rate of Return	The rate of return (discount rate) that equates the present value of a stream of costs over time to the present value of a stream of monetary returns.
Karez	A traditional water source developed by tunneling horizontally from an underground water source till the tunnel comes out above ground downhill from the source.
Khushkaba	A water harvesting technique that uses small water diversion structures to capture water flowing off a hillside and channel it into fields surrounded by dikes where it is held as it soaks into the soil for eventual use by crops. Without the structures, most of the runoff would not be captured. Khushkaba systems are typically smaller than Sailabah systems as they capture only water running off of nearby hills rather than diverting large watercourses.
Net Present Value	The difference between the present value of a stream of benefits and the present value of a stream of costs.
Present Value	The sum of a stream of monetary values each discounted (to account for differences in the value of money over time) to a common base year.
Sailabah	A water harvesting technique that uses diversion structures to channel runoff from seasonal watercourses into fields surrounded by dikes where it is held as it soaks into the soil for eventual use by crops. Without the structures, most of the runoff would not be captured.

Acronyms

ADB	Asian Development Bank
ARI	Agricultural Research Institute
AZRC	Arid Zone Research Centre
BRSP	Balochistan Rural Support Programme
CDMF	Community Development and Market Facilitator
CO	Community Organization
EG	Economic Growth
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FATA	Federally Administered Tribal Area
GDP	Gross Domestic Product
GIS	Geographic Information System
GoB	Government of Balochistan
GoP	Government of Pakistan
HDI	Human Development Index
ICARDA	International Center for Agricultural Research in the Dry Areas
IRR	Internal Rate of Return
IRS	Integrated Research Site
IWMI	International Water Management Institute
KB	Khushhali Bank
MCO	Men's Community Organization
MINFAL	Ministry of Food, Agriculture and Livestock
MIS	Management Information System
MoU	Memorandum of Understanding
MSI	Management Systems International
NARC	National Agricultural Research Centre
NARS	National Agricultural Research System
NGO	Non-Governmental Organization
NWFP	Northwest Frontier Provinces
PARC	Pakistan Agricultural Research Council
PAT	Protected Agriculture Tunnels
PISDAC	Pakistan Initiative for Strategic Development and Competitiveness
PMP	Performance Monitoring Plan
PR	Public Relations
Rs.	Pakistan Rupees
SSI	Social Science Institute
SLSP	Strengthening Livestock Services Project
SWOG	Strategic Working Group
TTI	Technical Training Institute
UN	United Nations
UNDP	United Nations Development Programme
UNDP - ADP	United Nations Development Programme - Area Development Programme
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USG	United States Government
WB	World Bank
WCO	Women's Community Organization
WFP	World Food Programme

Executive Summary

Along Pakistan's rugged and remote western border with Afghanistan, the rural households of Balochistan Province subsist largely on agriculture (crops, goats, and sheep). Agriculture, however, is a tenuous source of livelihoods because of limited access to water coupled with a prolonged drought. Poverty is widespread in the region. In fact, as much as 35% of the rural population lives below the poverty line.



Animal health intervention, Nali Wali Zai

The Food Security/Poverty Alleviation in Arid Agriculture Balochistan Project works in three districts of Balochistan province (Mastung, Loralai, and Killa Saifullah) to enhance agricultural production by introducing improved agricultural technologies and practices. A community development component establishes and strengthens community organizations (COs) for men and women. An applied research component enhances the capacity of agricultural research

institutions to develop and disseminate productivity increasing technologies and practices focusing on crops, livestock, water use, and range management. The project's agricultural experts then introduce improved practices to COs on a cost-share basis and helps them plan and implement the interventions.

The mid-term evaluation identifies the project's strengths and weaknesses as a guide to improving current performance or the design of future interventions in agriculture.

What Has The Project Accomplished?

The project has formed 223 community organizations (comprised of 3,813 households and an estimated 30,500 individuals). Through controlled experiments and in farm practice, the research component has demonstrated substantial improvements in crop yields and livestock productivity, which have increased household incomes by an estimated 23% annually. Many of the project's activities are likely to be sustainable and, over a five-year time horizon, are conservatively estimated to generate \$19.9 million in monetary impacts as measured by the difference between incomes with the project and incomes without the project.

The monetary estimates include only a partial accounting of costs and benefits and are thus only indicative. The project has also generated benefits that are not easily quantified, such as providing drinking water to villages, organizing communities, and enhancing human capacity in community members, agricultural researchers, and project staff.

Summary of Monetary Impacts	
Present value of project costs	\$6.8 million
Present value of benefits	\$7.2 million
Net present value	\$0.3 million
Internal rate of return	5%
Benefit cost ratio	1.05
Number of direct beneficiaries	3,813 households 30,500 individuals
Annual cost per household	\$756
Average annual benefit/household	\$850
Benefit as % of average annual income	23%

The project effectively applied interventions appropriate to improving livelihoods in a region dependent on agriculture and demonstrated the efficacy of an approach applicable throughout the region. The evaluation did, however, identify opportunities to improve performance.

CONCLUSIONS	
Relevance	The approach and activities are well suited to alleviating poverty in Balochistan.
	The design process adequately represented stakeholder and beneficiary interests.
	Key stakeholders and beneficiaries are actively involved in project implementation.
	The project works directly with ultimate beneficiaries to address their needs.
Effectiveness	Project research has demonstrated the ability to meet productivity enhancement targets but its capacity is spread too thin to disseminate results widely to 223 COs.
	The project has enhanced the skills of agricultural researchers at AZRC and ARI.
Impact	The project has worked directly with 3,813 households (30,500 individuals) in a strategically important region of Pakistan generating monetary impacts for 3,200 households to date. It has indirectly influenced an additional 2,800 households (53,000 individuals).
	It is difficult to engage women and direct benefits to women are small, about \$6,000.
Efficiency	Based on conservative estimates, the project has generated benefits in excess of costs.
	The project improved incomes by an average of \$850 per year for 3,200 households at an annual per household cost of about \$756.
	The project spent 83% of its resources in Pakistan, 36% on labor, and 39% on outputs.
Sustainability	It is too early to tell whether the project's activities will ultimately be sustainable.
	Many of the COs are too immature to be sustainable without further project support.
	Sustainability of research capacity depends on circumstances beyond project control.
Replication	Project activities and approach are applicable to NWFP and FATA.
	Limited human capacity may be a barrier to substantial expansion.
Gender	The project has generated few direct monetary impacts for women (\$6,000). It has, however, generated substantial improvements in household income, which may benefit the women as members of the households.
	The project exceeded ambitious targets for engaging women as beneficiaries and staff.
	The project has empowered some WCOs and enhanced capacity of female staff.
Reporting	The project has delivered all required reports on time.
	Improved quarterly reporting formats would better serve both FAO and USAID.
	The project branded all material in accordance with guidance from USAID.
Communication and Outreach	The project effectively promoted USAID's involvement in the project to beneficiaries.
	The project has not been effective at promoting its successes to a broad audience.
	The project's communications strategy does not address USAID's desires.
Coordination	The project has not coordinated well with counterparts outside of GoP and GoB.
	High turnover in provincial government has inhibited coordination.

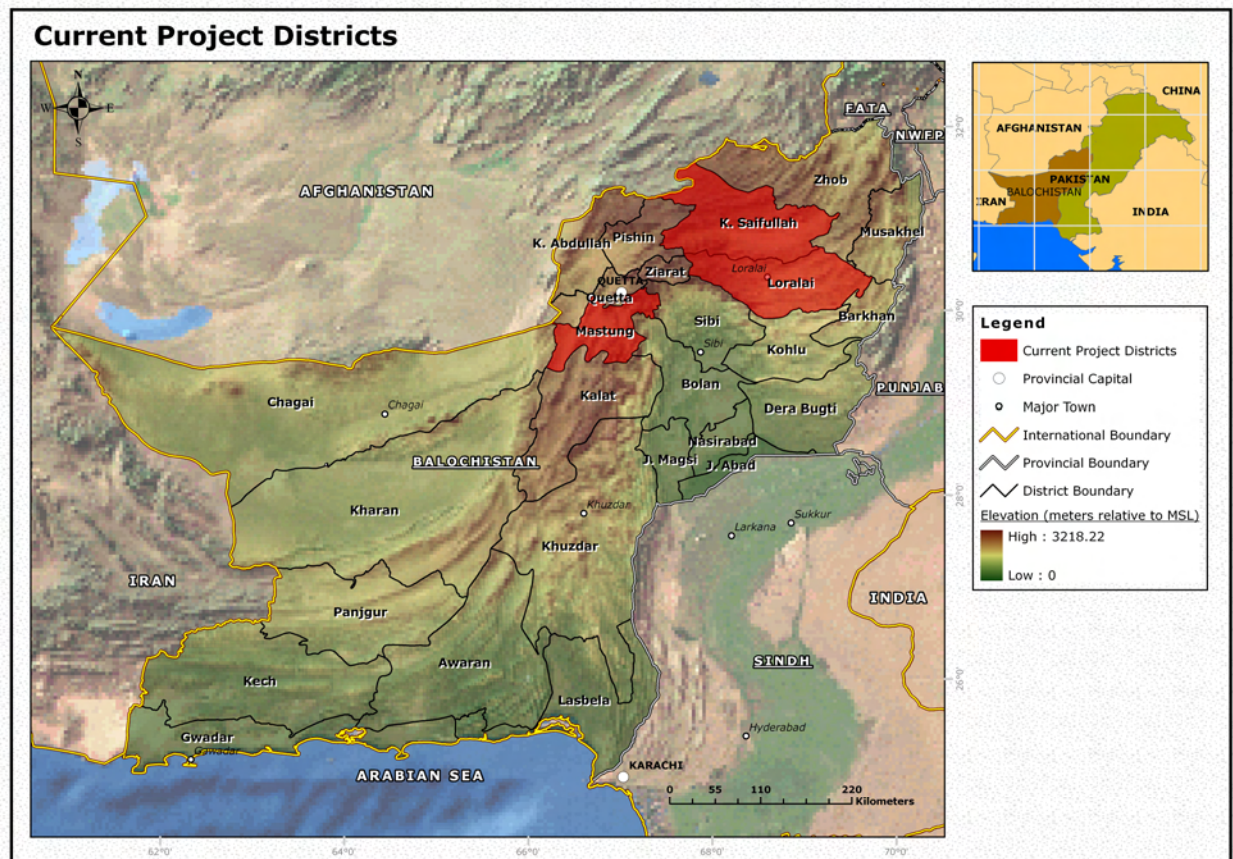
Key Recommendations

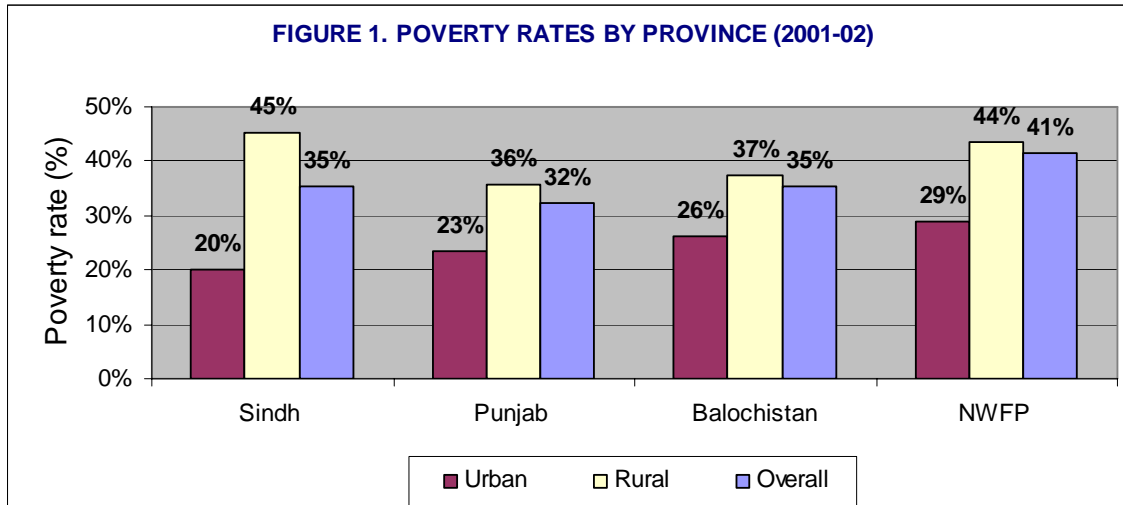
- The project established a good baseline, but it needs to substantially improve data collection procedures and analysis capacity to support meaningful impact assessment. The design of any future activity should plan for impact assessment.
- It is difficult to engage women directly in agricultural activities on a large scale. If the project desires to increase its impact on women, it should explore establishing linkages between its WCOs and other organizations with expertise in working with women.
- The project has not effectively told its very compelling story to a broad audience. It would serve the project and USAID well to plan specifically for a communications and outreach component in any future work

Introduction

Along Pakistan's remote and rugged western border with Afghanistan, the rural households of Balochistan Province eke out a largely subsistence living raising crops and livestock in an arid and harsh environment. Poverty rates are as high as 35%, schools are scarce and attendance low, many people are illiterate, and hunger and malnutrition are common. Ethnically, the population is largely Pashtun and Brahvi. The culture is strongly tribal and religiously conservative. An ongoing and persistent ten-year drought, an influx of refugees from Afghanistan, and the rise of extreme religious influences have made life even more challenging for people of the region. In this environment, the Food Security/Poverty Alleviation in Arid Agriculture Balochistan Project seeks to enhance agricultural production by introducing improved agricultural technologies and practices adapted to the local climate and culture. This will, in turn, improve the livelihoods of beneficiaries who depend heavily on agriculture.

Balochistan is the largest of Pakistan's four provinces and is located in the southwest part of the country. It covers 34.7 million hectares and accounts for 44% of the nation's land area. The diverse landscape extends from southern coastlands along the Arabian Sea through deserts, plains, and uplands to rugged northern mountains. Elevations reach to over 3,200 meters in the areas bordering Afghanistan. In spite of its size, Balochistan contains only 5% of Pakistan's population (an estimated 7.1 million people) more than three-quarters of whom live in rural areas. The project works in three northern districts: Mastung, Loralai, and Killa Saifullah near the Afghanistan border and the Northwest Frontier.





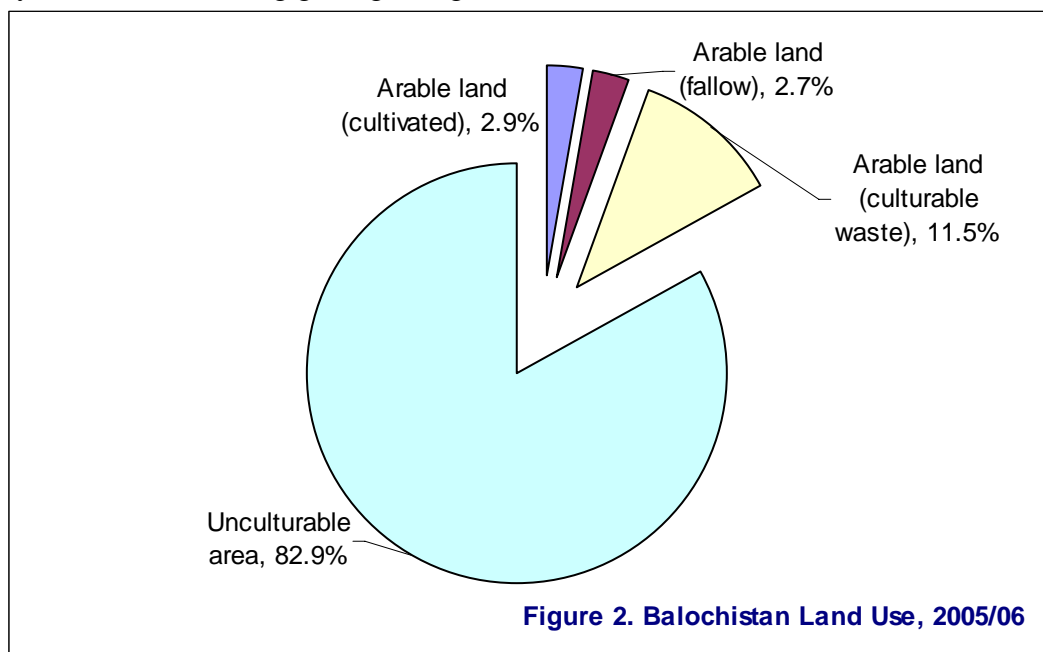
Poverty rates are high across Pakistan (Figure 1). With the exception of the NWFP, however, Balochistan’s poverty rates are generally higher than the other provinces (Cheema, 2005). Balochistan fares even worse on the Human Development Index (HDI), a broader measure of welfare. The 2002 HDI concluded that Balochistan had the lowest literacy rate, the lowest school enrollment ratio, the lowest immunization ratio, the second lowest per capita GDP (\$1,677), the lowest educational attainment index, and the lowest health index relative to the other provinces (Akmal Hussain, 2003).

Agriculture is the most important sector of Balochistan’s economy and contributes as much as 52% of GDP and employs (either full or part-time) 65% of the labor force. Balochistan’s diverse climate and topography create some unique opportunities for agriculture (e.g., horticulture), but access to water is a key constraint. Rainfall is generally very low (155mm – 350mm annually) and uncertain, particularly in the upland areas that dominate the province.

Several factors isolate Balochistan from the rest of the country: the long distance from urban centers, poor transportation infrastructure, and the tenuous security situation. These factors make it difficult for farmers to access markets for agricultural products and inputs (Vinning, 2007).

Balochistan's Agricultural Environment

The rugged landscape and lack of water render much of Balochistan's land area unsuitable for agriculture. Only about 17% is arable and a majority of that is not cultivated, primarily because of a lack of water. Even the huge unculturable area is largely unproductive with only about 30% offering good grazing for livestock.



In 2005/06, a particularly dry year, 95% of the cultivated land was irrigated with the remainder being rainfed. Yields on rainfed land are low relative to irrigated land. For example, ICARDA research trials found that the local white wheat variety produced an average of 1,300 kg per hectare on rainfed land compared to about 1,800 kg per hectare on irrigated land, a 38% greater yield (International Center for Agricultural Research in the Dry Areas (ICARDA), 2007).

Livestock is also an important component of Balochistan agriculture.² The province's rangelands may support as many as 22 million sheep and goats, although the exact number is difficult to determine because of the nomadic lifestyle of many herders. Livestock is an important source of wealth for many households in rural Balochistan. In fact, livestock accounts for as much as 36% of the value of agricultural products and contributes substantially to livelihoods.

Access to Water

Water is the key constraint to agricultural development in Balochistan. For generations, traditional karez systems have provided water for household and agricultural uses.³ Karez systems tap into naturally occurring water sources and are sustainable because they rely on the natural flow of water. Over generations, communities developed informal institutions to build,

² Statistical sources in Pakistan do not classify livestock under agriculture.

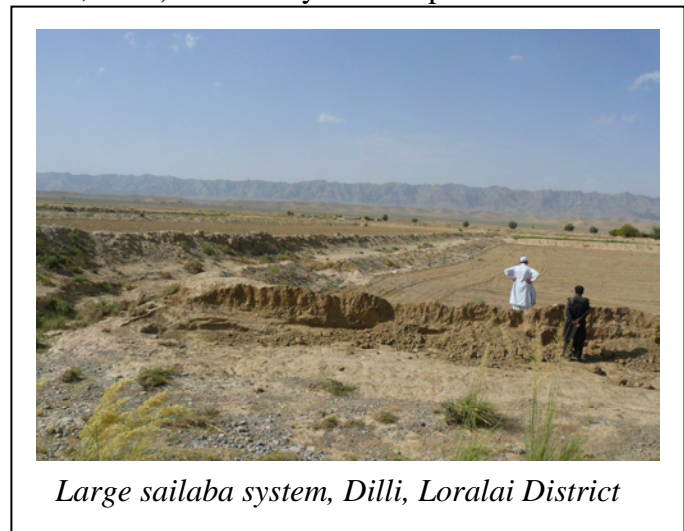
³ A karez is developed by tapping into a natural underground water source at the springline of a hill or mountain. The source is developed by excavating downward to the water and then extending a horizontal tunnel until the elevation drops enough to bring the water out to the surface (the daylight point). A karez may be developed in hard rock or in dirt (soft rock) and may extend for miles before emerging at the daylight point.

maintain, and share water from karez systems (Verheijen, 1998; Ahmad & Khan, 2007). Dramatic increases in tubewells over the past 30 years, however, have drawn down the water table and dried up many of the karez systems with disastrous consequences for the communities that depend on them.



Rainfed agriculture depends on water harvesting methods that hold water on the land long enough for it to soak into the soil where it is stored for crop use. The primary harvesting systems are sailaba and khushkaba (Ahmad & Khan, 2007). Sailaba systems depend on diversion structures (dams and weirs) to channel rainwater runoff into fields that are enclosed by dikes. A large sailaba system can deliver water to hundreds of hectares. Khushkaba systems also use dikes to hold water on fields but rely on rainwater runoff from adjacent hillsides rather than on diversion of water from riverbeds and other runoff channels.

In addition to water harvesting for storage directly in the soil, farmers use check dams to slow the flow of water during rainfall events to facilitate percolation into groundwater aquifers. Micro-catchments, small ditches cut into the contour of a slope, catch water running off a slope and hold it at plants planted in the ditch.



Drought Conditions

Currently, Balochistan is suffering from a prolonged drought that has significantly affected agriculture and livelihoods (Ahmad, 2007a). Rainfall has been below normal in seven of the past nine years and 2007 looks to be another below-average year. A survey conducted by the International Water Management Institute (IWMI) in 2001 identified a number of consequences of the drought in Balochistan as of 2001. These included a reduction in household income, greater dependence on other income sources, migration to other areas for work, and an increased burden on women to provide income and to fetch water and food from greater distances. (Akhtar & Qureshi, no date)

The survey concluded that the drought had damaged (reduced yields) on an average of 78% of farmers' rainfed lands and 38% of their irrigated lands. In the project area, the damage was greatest for rainfed wheat (important for household food security) and irrigated orchard (important for income).

In addition to crops, the survey estimated a 76% reduction in livestock numbers in Balochistan between 1997 and 2001 (Akhtar & Qureshi, no date). The loss was concentrated in sheep and goats. The average household owned 42 sheep or goats prior to the drought. Since the drought began, 16 animals had died (on average) and 16 had been sold at prices roughly half of the normal market price. Livestock are an important form of wealth and their sale at reduced prices reflects primarily the need for cash to meet other expenses. Retained animals were in poor health and not as productive (in meat and milk) as a result. All these factors affected household livelihoods. A more recent assessment of the impacts of the drought in Khuzdar Province, Balochistan (Malik, Badrunnisa, & Kazi, no date) found a reduction in livestock numbers of more than 50% due to death or forced sale, reduced crop production, and limited availability of food.

Both surveys found that the drought caused families or family members to migrate to urban areas to seek work. In 2001, the IWMI survey found that 9% of people had migrated, but the 2007 survey found a migration rate of 20%. Families viewed migration as a last resort strategy. The risks include leaving livestock assets behind and a possible loss of agricultural land if someone else took it over. Women and children, in particular, were more at risk in an urban setting. Or, if the men in the family migrated on their own, this increased the burden on women who took on full responsibility of caring for the household, livestock, and crops.

Rangelands

Balochistan's rangelands provide as much as 85%-95% of the feed for its numerous livestock. The range is controlled by the tribes and suffers from the degradation typical of common property resources. The recent drought has exacerbated the problem, reducing the yield of range forage from 60 kg per hectare to 18 kg per hectare and putting additional pressure on households (Ahmad, 2007a).

Agricultural Research and Extension

Both federal and provincial governments perform basic agricultural research in Pakistan. In Balochistan, the Arid Zone Research Center (AZRC) is a national research institute focused on arid zone research. The provincial government, largely under the Department of Agriculture and related departments, supports the Agricultural Research Institute (ARI) to conduct research on irrigated agriculture. Extension is handled at the district level through the Executive District Officers (EDOs) but also lacks sufficient support (Ahmad, 2007b)

The Development Problem and USAID's Response

Problem Statement

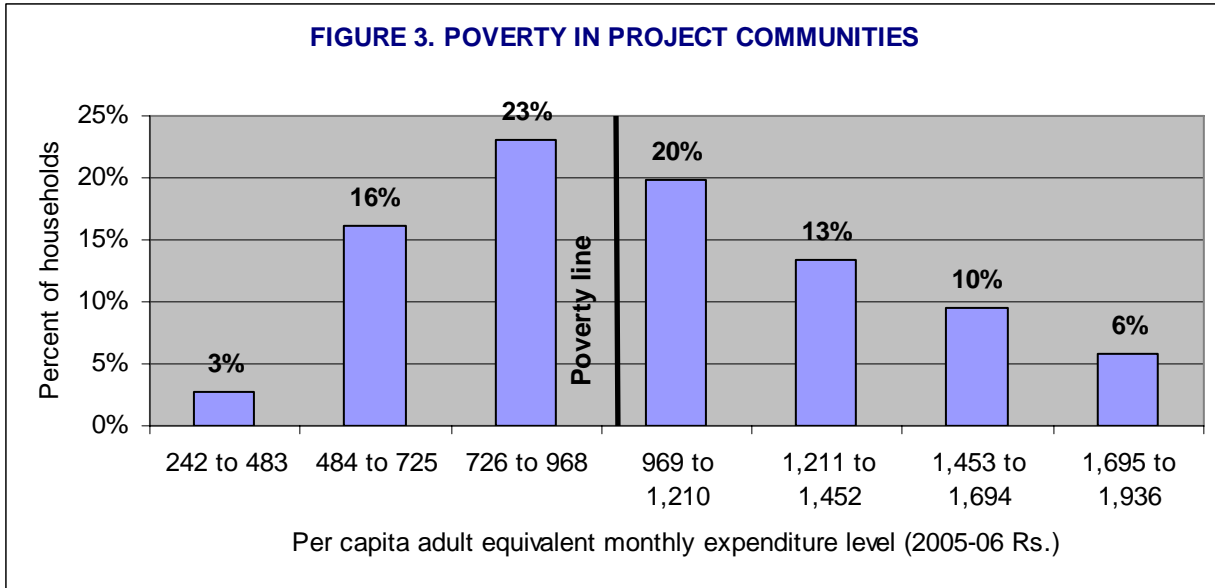
The project document states that the development objective is to “improve the livelihoods and food security of the rural people in Balochistan who have been severely affected by a prolonged drought.” Several sources of evidence suggest that food security and poverty are problems in Balochistan. For instance, the project’s baseline survey (Sharif, Shah, Farooq, Akmal, & Afzal, 2007; Farooq, Sharif, Taj, & Shah, 2007)⁴ found that wheat and milk products accounted for 73%, by weight, of a typical diet. Such a diet is deficient in the balance of nutrients required for good health.⁵ In an interview, UNICEF also confirmed that malnutrition is a severe problem in the project area. Analysis of the baseline survey data also revealed that the incidence of poverty among project communities is higher than the province-wide average of 35% or the rural average of 37%. In fact, 42% of households fall at or below the poverty line of Rs. 968 in monthly adult equivalent consumption.⁶

Figure 3 illustrates the distribution of poverty among project communities. Increments between categories are 0.25 of the poverty line. The figure shows a distribution that is heavily skewed towards poverty with 42% of households at or below the poverty line. An additional 20% of households exist within 25% of the poverty line, which makes them particularly vulnerable to fluctuations in income that could drive them into poverty.

⁴ The Social Sciences Institute (SSI) of the NARC conducted the surveys in April, 2006, about a year after project inception but prior to major interventions in the communities. The male community organization (CO) survey covered a random sample of 409 households selected from 43 communities. The female CO survey covered 104 households selected from 17 communities. As a control group, the SSI also collected data from 90 male households from communities that would not participate in the project. Follow-up surveys have not yet been conducted.

⁵ The USDA food pyramid, for instance, recommends a daily intake of about 2.5 cups of vegetables, 1 cup of grain, 1.5 cups of fruit, 3 cups of milk, and 1 ounce of meat for children. While the recommendations are not in terms of weight, they are clearly inconsistent with the diet found in the baseline survey.

⁶ The chart is based on an estimated poverty line of 680Rs./month expenditure per adult equivalent from 1998-99 (The World Bank, 2002). The older figure is then inflated by the CPI (Federal Bureau of Statistics,) to obtain the current poverty line estimate of 968 Rs./month. The adult equivalent is calculated by weighting each child in a household by 0.8 and adding to the number of adults.



The baseline survey also found that, while a majority of households' land holdings were rainfed, irrigated land generated a majority of income. Project area households also rely more on rainfed lands than the typical household in the province. About 44% of the land cultivated by project area households was rainfed, compared to only 5% in the province as a whole. Income from rainfed land, however, accounted for only five percent of agricultural income for project area households. This difference likely reflects two factors: (1) households likely consume, rather than sell, more of the production from rainfed land and (2) rainfed lands are about 28% less productive (for growing wheat) than irrigated land. Project area households also relied more on income from crops, as opposed to livestock and off-farm employment, than did other households. Table 2 summarizes relevant characteristics of the composition of income.

TABLE 2: CHARACTERISTICS OF PROJECT AREA HOUSEHOLDS

Income source	Project communities	Entire province
Cultivated land		
Irrigated (%)	56	95
Rainfed (%)	44	5
Household income	Income (Rs.)	Income (% of total)
Average household income	223,297	100.0%
Crops	120,943	54.2%
Irrigated	113,156	50.7%
Rainfed	7,787	3.5%
Livestock	29,108	13.0%
Off-farm employment	73,246	32.8%

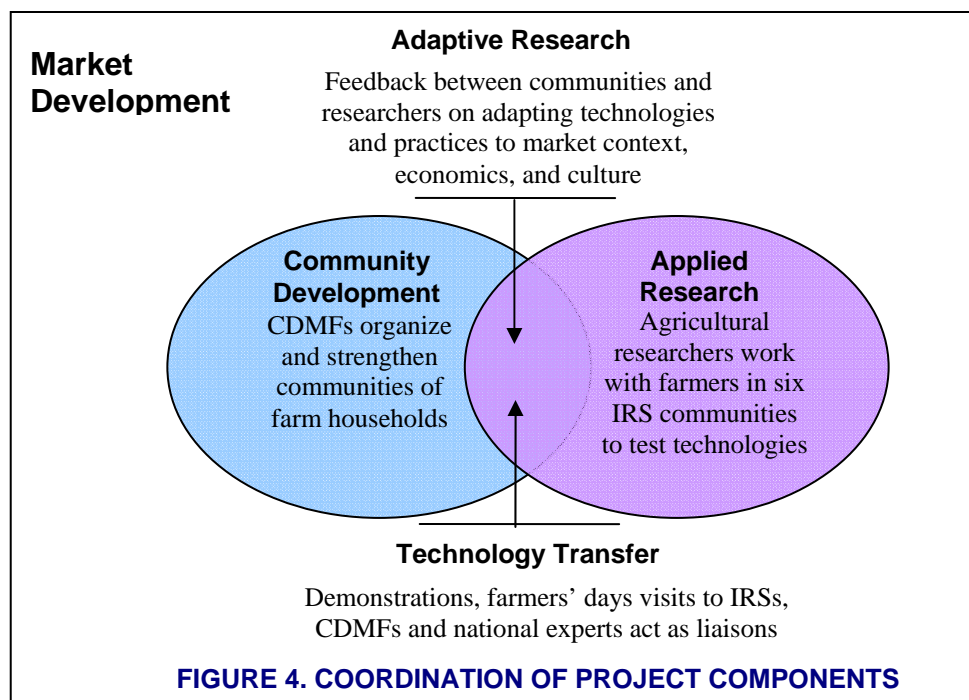
USAID’s Intervention in Response

Most Balochistan households rely on agriculture as the primary source of livelihoods. With declining growth rates of agricultural yields and persistent drought, subsistence farmers are particularly vulnerable to variability of production and reductions in livelihoods. Therefore, USAID’s interventions center around improving agricultural productivity by introducing sustainable land and water resource strategies and sustainable market-oriented arid crop/orchard, rangeland, and livestock interventions.

“Under conditions in which higher input use per acre is required to maintain yields, subsistence farmers with few resources are likely to suffer a greater than average decline in yields compared to large farmers. At the same time due to lack of savings to fall back upon, poor farmers are relatively more vulnerable to bad harvests under conditions of unstable growth” (United Nations Development Programme, 2003)

The project “strengthens the capacity of the applied research and technology transfer system and concerned Departments/Directorates to provide sustainable land and water resource strategies, sustainable market oriented arid crop/orchard, rangeland and livestock interventions.” The project works through three different components to achieve this objective: applied research, community

development, and market research (see Figure 4). Working along with agricultural research institutes, applied research adapts agricultural practices and technologies to the Balochistan environment. Community development provides the injection point for introducing improved practices and technologies to agricultural households. Market research links research and community level interventions to market information and opportunities.



- **Applied research:** Increases water use efficiency, tests and introduces new crop varieties, increases livestock productivity, and improves range productivity. Scientists from AZRC and ARI work directly with six IRS communities to conduct research trials and adaptive research. The farmers provide direct feedback on the cultural and economic feasibility of the research results. The farmers also learn about new practices and technologies from interaction with the scientists. The CDMFs and national experts (in crops, water, livestock, range, and fodder) form another link between the applied research results and the communities. They inform communities of the interventions that are available and assist the communities in designing, applying for, and implementing interventions.
- **Community development:** Establishes men's and women's community organizations in agriculturally based poor communities. The Community Development and Market Facilitators (CDMFs) train CO members to manage the organization. They also assist the organization in forming linkages to outside resources including project interventions, local government, and other organizations. The COs are the injection points for transferring knowledge from the IRSs. This transfer takes place through visits by CO members to the IRSs to view demonstrations and participate in Farmer's Days events and through interaction with national experts and CDMFs. Mature COs provide opportunities for the project, and others, to introduce interventions that will benefit community members.
- **Market research:** Interacts with the other components to identify and develop market opportunities and to communicate market information to farmers. It learns of marketing needs, opportunities, and constraints from communities. It learns what is technologically feasible from the applied research component. It may also interact with the IRS communities to test the economic, technical, and cultural feasibility of different marketing options and with markets to collect and transmit market relevant information to the project communities.

Evaluation Purpose

The evaluation activity assessed all eight of the projects that comprised the Economic Growth portfolio. The six funded through USAID/Pakistan included:

- Agriculture: Food Security/Poverty Alleviation in Arid Agriculture Balochistan
- Competitiveness: The Pakistan Initiative for Strategic Development & Competitiveness (PISDAC)
- Competitiveness: Competitiveness Support Fund (CSF)
- Microfinance: Developing Non-Bankable Territories for Financial Services
- Microfinance: Widening Harmonized Access to Micro-credit (WHAM)
- Microfinance: Enterprise Development Facility (EDF)

The activity also evaluated two projects not funded by the mission:

- Energy: South Asia Regional Initiative For Energy Cooperation And Development (SARI/E)
- Competitiveness: From Behind the Veil: Access to Contemporary Markets for Homebound Women Embroiderers in Pakistan

Because projects were at different stages, some evaluations were final and some were mid-term. The evaluation exercise had several purposes including:

- Identifying opportunities for improving performance of ongoing projects
- Extracting lessons learned that can help USAID and partners improve performance of future interventions
- Providing input to the design of the new EG portfolio

The Food Security/Poverty Alleviation in Arid Agriculture Balochistan project is just entering its fourth and final year. The evaluation is thus a mid-term evaluation with time yet to improve performance based on evaluation findings. The project is also a pilot with a plan for replication. The evaluation will provide guidance for designing a potential phase I.

USAID asked that the evaluations address ten specific questions, each with a number of sub-questions. These include six question on overarching issues, four on cross-cutting issues, and four project specific questions as documented below.

EVALUATION QUESTIONS: OVERARCHING ISSUES

1. Relevance: How well was the project focused on the needs of the beneficiaries?
 - Was the project well designed to address the needs of the beneficiaries?
 - How well was the project adjusted to address the needs of the beneficiaries?
 - To what extent did the design of the activity utilize participatory techniques?
 - Was the activity designed to meet a felt need of a specific community, target audience, or influential stakeholder?
 - Were stakeholders involved in a substantive way throughout the project life cycle?
 - Was the targeting appropriate in hindsight?
2. Effectiveness: Has the project accomplished its objectives?
 - How were the initial targets established for each activity?
 - Were the targets realistic and appropriate?
 - To what extent were the targets achieved?
 - What are the lessons learned for setting targets in future activities in accordance with the requirements of USAID's Performance Monitoring Plan (PMP)?
3. Impact: To what extent has the project benefited the people of Pakistan?
 - How has the program benefited the intended beneficiaries?
 - What were the primary and secondary positive and negative impacts of the projects?
 - How large have the impacts been or are likely to be?
 - To what extent can the impacts be attributable to the project?
 - How were the impacts distributed by region, sector and gender of the beneficiaries?
 - Were any of these benefits or losses unexpected?
4. Efficiency: How efficient has the project been in utilizing its resources to achieve results?
 - To the extent possible, what is the internal rate of return for this project, as calculated in a cost benefit analysis?
 - How cost-effective has the project been?
 - How do overhead and administrative costs for this activity compare to others across differing types of implementation mechanisms (e.g. Contract, Limited Scope Grant Agreement, Grant, Cooperative Agreement) and for the different types of implementing entities (e.g. local vs. international firms, non-profits vs. for-profits, etc)?
5. Sustainability: Are the activities and results likely to be sustained after the project is completed?
 - Were the activities designed to focus on their sustainability after project completion?
 - Were the activities implemented in a manner which focuses on their sustainability after project completion?
 - Was the initial timeframe for the activity realistic to achieve sustainable results?
 - Were any of the activities fundamentally designed and implemented in a way which creates donor dependence?
 - Is it reasonable to expect the project to achieve sustainability in the project life given internal and external factors?
6. Replication: To what extent can the activities and results of the project be replicated?
 - Were the activities designed in a manner which focuses on their replication?
 - Were the activities implemented in a manner which focuses on their replication?
 - Can the activities be replicated in other areas with similar socio-economic features?
 - Can the activities be replicated in dissimilar areas?
 - To what quantified extent can the project be replicated?

EVALUATION QUESTIONS: CROSS-CUTTING ISSUES

7. Gender: To what extent has the project benefited women?
 - To what extent has the project included women in its staff, partners, agents, etc.?
 - To what extent has the project systemically targeted women in its activities?
 - To what extent have project resources been used to benefit women?
 - How effective has the project been in reaching women?
 - What are the direct quantified benefits of the project for women?
8. Reporting: Have the prime contractors and grantees reported on time and in a useful manner?
 - Have the partners fulfilled all of their reporting requirements?
 - Were the reports useful to USAID staff?
 - Were all branding guidelines followed?
 - Were the reported results accurate and verifiable?
 - How can the reporting requirements and formats be improved?
9. Communications and Outreach: How effective has the project been in getting its story out?
 - Have the project's work plans contained communications and outreach activities?
 - Was the branding strategy clear?
 - Has the project highlighted success stories?
 - How active has the project been in communications and outreach efforts in terms of events/activities – frequency, nature, profile, content and design, branding and participation?
 - To what extent have they raised awareness of the activity among intended beneficiaries?
 - To what extent has the project followed branding guidance?
 - How can the impact of the communications and outreach component of future programming be improved?
10. Coordination: How effectively has the project coordinated with other parties?
 - How effectively has the project coordinated with the Government of Pakistan?
 - How effectively has the project coordinated with other USG projects?
 - How effectively has the project coordinated with other donors?
 - How effectively has the project coordinated with other stakeholders?
 - To what extent were synergies developed between the project and other individual USAID EG activities, other donor programs, and/or GoP initiatives?
 - What concrete steps should be taken to improve coordination and maximize synergies in future activities?

EVALUATION QUESTIONS: PROJECT SPECIFIC QUESTIONS

- In what ways has the project improved the capacity of Government research institutions?
- Have the improved agricultural practices been incorporated by the farmers and what has been the impact?
- Has the program achieved sufficient progress to be self sustaining or is continued USAID assistance required?
- Can these practices be replicated in other areas with similar socio-economic or geographic features, such as FATA?

Evaluation Methodology

The team relied on a number of methods to collect data including interviews, document review, site visits, and structured group interviews with beneficiaries. The data collected are the findings or facts of the evaluation. The evaluation team then drew conclusions from the findings based on its knowledge and experience and in consultation with other knowledgeable individuals. Finally, the team developed recommendations to address the conclusions.

This particular evaluation also employed an economic model for quantitative assessment of project impacts. This section briefly reviews specific evaluation activities. The impact and efficiency sections and Annex B contain additional detail of the development and application of the quantitative impact model.

Interviews

The evaluation team conducted structured interviews with individuals representing a range of stakeholders and others knowledgeable of the project. Key interviewees included project staff, stakeholders from the governments of Balochistan and Pakistan, and USAID personnel. Interview guides for the structured interviews followed a matrix developed by the evaluation team. Annex A contains a complete list of contacts.

Site Visits and Group Interviews with Beneficiaries

The evaluation team visited 26 project sites over 6 days with the following objectives:

- Seeing project interventions first-hand to gain an understanding of project activities
- Documenting project impacts on beneficiaries
- Learning about beneficiaries' perceptions of the project
- Learning about beneficiaries' perceptions of USAID
- Validating parameters of the quantitative impact model

The security situation and the necessity of gaining access to the communities required the team to travel with the project director, the three national experts (crops, livestock, and water), the relevant CDMFs, and the ICARDA scientist in charge of directing applied research activities at the IRSs.

Travel logistics and security considerations played a significant role in the selection of sites for field visits. Project activities cover a large geographic region with poor transportation infrastructure. In addition, many of the project communities are quite distant from even the roads that do exist. Furthermore, security arrangements required by the UN and the provincial and district governments as well as ongoing conflicts that overlapped some project areas further constrained the evaluation team's access to communities. The evaluation team worked with project staff to identify a set of 26 (out of approximately 212) project communities that were accessible during a 6-day field trip. Selected COs included a representative mix of mature and new COs, men's and women's COs, and project interventions. The field itinerary also included three of the six IRSs.

During the field visits, the two local evaluation team members concentrated primarily on conducting the structured group interviews with beneficiaries. The ex-pat team member met with some COs, but focused primarily on observing interventions and discussing the interventions with project staff and community members. All team members took extensive notes on each site visit. For details, see the following table.

TABLE 3: FIELD ACTIVITIES

FIELD ACTIVITY	DISTRICTS			
	MASTUNG	LORALAI	KILLA SAIFULLAH	ALL DISTRICTS
Communities visited	8	11	7	26
Group interviews with women's CO	3	0	6	9
Group interviews with men's CO	6	7	3	16
Observation of intervention	3	10	6	19
Crop interventions	6	6	3	15
Water interventions	8	9	4	21
Livestock interventions	6	5	4	15
Field visits with scientists	2	2	1	5
Interviews with project staff and CDMFs	--	--	--	20
Interviews with local government officials	2	0	1	3

Document Review

The evaluation team also reviewed all available project documents and other relevant material. Annex A contains a list of the primary project documents reviewed during the evaluation. The bibliography at the end of the report documents other literature cited in the evaluation.

Impact Assessment

An assessment of the project's monetary impacts is an important component of the evaluation. The team derived estimates of project impacts from a quantitative impact model that estimated the aggregate effects of project interventions on household incomes. The model combined data on adoption rates of different interventions, research results on crop and livestock productivity increases, market prices of agricultural products, and estimated production costs to estimate the net monetary impact of the project's interventions. The evaluation team used the site visits to validate and adjust the parameters of the model. The team erred on the side of conservatism when selecting model parameters. The "Impacts" section of this report contains estimates from the model. Annex B describes the model and its assumptions in detail.

Findings on Overarching Questions

Relevance

Evaluation question: How well was the project focused on the needs of the beneficiaries?

Conclusions

- The project approach and activities are well suited to the problem of poverty alleviation in Balochistan. A number of experienced donor agencies (i.e., World Bank, UNDP, IWRM) conclude that the project focus on agriculture, research, and extension are relevant to rural poverty alleviation in Pakistan.
- The speed of the design process precluded a fully participatory approach. Nevertheless, the process engaged most of the important stakeholders. Although the process did not explicitly engage beneficiaries or women, other stakeholders with extensive experience working with community development and agriculture in Balochistan appear to have adequately represented those interests.
- The project's speed of design, scope, and geographic focus appear to reflect USAID's interest in establishing a visible presence quickly among rural people in a strategically important region of Pakistan.
- Key stakeholders and beneficiaries have remained actively involved in project implementation.
- The project is designed to work directly with ultimate beneficiaries. It helps them identify needs and adapts interventions to address those needs. Beneficiaries are thus directly involved in identifying, designing, and implementing interventions.

Findings – Project Design

Many households in rural Balochistan are poor and depend largely on agriculture for their livelihoods. The project aims to improve livelihoods and food security by enhancing the productivity of arid agriculture. The focus on livelihood improvement through increased agricultural productivity is well placed. The World Bank recently concluded that “agricultural growth is a necessary, but not sufficient, condition for rapid reduction of rural poverty in Pakistan” (The World Bank, 2007b) and that “...promoting agriculture is imperative for meeting the Millennium Development Goal of halving poverty and hunger by 2015 and continuing to reduce poverty and hunger for several decades thereafter” (The World Bank, 2007a).

Each of the 25 COs that participated in group interviews expressed appreciation for the project's efforts. Those that had experienced interventions believed the project was addressing real needs (i.e., income enhancement), although success in meeting those needs varied by community and intervention. An interview participant expressed his views of the mechanisms by which the project had affected his community as follows:

“New technologies have been introduced. We need more projects for training, awareness of farmers. We thank FAO/USAID for their funding. We want new technologies, new methods for farmers. With a small amount of money, we have benefited so much.”
(Community member from Murtat Kallan, Loralai District)

The project's activities are consistent with the recommendations of a number of recent studies of poverty alleviation and economic growth in Pakistan.

- The United Nations Development Programme (Akmal Hussain, 2003) stated that “the current ineffectiveness of agriculture research and poor diffusion amongst farmers is a cause for concern.” It identified low irrigation efficiencies and ineffective agricultural research and extension as key causes of the declining growth rate of agricultural productivity. The study also stated that “...breeding of more vigorous seed varieties adapted to local environmental conditions and their diffusion amongst farmers through an effective research and extension programme is necessary.”
- The World Bank (The World Bank, 2007b) identified investments in agricultural technology, increased public-private partnerships in research and extension, diversification into higher value crops, improved water delivery, better water management, greater efficiency of water use at the farm level, enhanced capacity of agricultural research at the provincial level, improved seed certification and quality control, and social mobilization among the components of a comprehensive rural growth and poverty reduction strategy. The study also concluded that district level agricultural extension activities lack adequate capacity and funding.
- The International Water Management Institute (Ahmad, Hussain, Qureshi, Majeed, & Saleem, 2004) recommended that drought relief efforts in Balochistan should focus on rehabilitation of traditional irrigation systems such as karezes on an emergency basis where farmers need both technical and financial help, education in water conservation strategies both at household and field level, and introduction of innovative rainwater harvesting techniques to store more rainwater.

Several key stakeholders concurred that current extension services do not meet the needs of most farmers. These stakeholders included the project director, the Member (Social Sciences) PARC, and the Deputy Secretary (Development), Department of Agriculture & Cooperatives, Balochistan. They cited poor support, lack of training, and a focus on input supply to primarily larger farmers as causes. The evaluation team heard of one district livestock extension agent who was not given transportation to perform his job. The team also observed a district veterinary hospital where vaccines were stored at ambient temperatures, severely degrading their effectiveness, because the hospital did not have a functioning refrigerator.

The project was designed very quickly, a process in keeping with USAID's desire to “...look for and undertake initiatives that it can implement immediately with a minimum of planning and discussion.”⁷ Nevertheless, the design process did involve a number of key stakeholders. These stakeholders met in Quetta in February, 2004 to design the project out of a concept paper developed by the FAO at USAID's request. Participating stakeholders included representatives from:

- USAID
- FAO
- The Government of Pakistan represented by
 - Ministry of Food, Agriculture, and Livestock (MINFAL)
 - Arid Zone Research Center (AZRC)

⁷ USAID Interim Strategic Plan for 2003-2007

- The Government of Balochistan represented by
 - Department of Planning & Development
 - Department of Agriculture
 - Department of Livestock and Poultry
 - Department of Irrigation & Power
 - Agricultural Research Institute (ARI)

During the initial four-month planning phase of the project, the project director sought additional input from these stakeholders and from line department staff, administrative officials, and Nazims in the project districts. The project reflects the interests of a number of these stakeholders. The speed of the design, the focus on interacting with a large number of communities, and the choice of target beneficiaries address USAID’s interest in “...[being] seen, in action, in the rural areas and among Pakistan’s poor and forgotten communities fast if the people are going to support their Government’s decision to join us in the war on terrorism.” The choice of districts in which to work (the Pashtun and Brahvi Districts of Mastung, Loralai, and Killa Saifullah) is also consistent with USAID interests in working in strategically important areas. The two individuals closest to the design process, a former USAID employee and the FAO country representative, believed this may have been USAID’s main interest in the project.

Both federal and provincial government entities strongly support the project. A key provincial stakeholder, the Deputy Secretary (Development), Department of Agriculture and Cooperatives, Balochistan, believed that the project was doing a much better job of addressing the real needs of the people of Balochistan than any other current project. Representatives of the following ministries and departments spoke highly of the project and its contribution to their work.

- Ministry of Food, Agriculture, and Livestock (MINFAL)
- Arid Zone Research Center (AZRC)
- Agricultural Research Institute (ARI)
- Pakistan Agricultural Research Council (PARC)
- National Agricultural Research Center (NARC)
- Government of Balochistan departments of
 - Livestock & Dairy Development
 - Planning & Development
 - Agriculture
 - Agriculture & Cooperatives

Findings – Project Implementation

The project works directly with the ultimate beneficiaries. Communities and individuals decide whether they wish to participate or not. Participating communities assess their needs relative to what the project offers, determine which interventions are most valuable to them, work directly with project staff to design and implement the intervention, and pay for half the cost of the intervention, often in terms of providing labor. The project tailors interventions to the specific needs, circumstances, and resources of each community. Beneficiaries implement the interventions by sowing, tending, and harvesting crops; vaccinating or feeding livestock; and managing water.

The project's focus on adaptive research also involves COs in aspects of designing and adapting interventions. The project director defines adaptive research as the process of defining needs; identifying a technological solution; determining whether the technological solution is economically feasible, culturally appropriate, and efficacious (and adapting otherwise); and ensuring that the intervention is sustainable. Two examples include:

- An improved wheat variety appeared well adapted to the local environment but farmers found it unacceptable for making bread.
- Seed cleaning machines and protected agriculture tunnels (PAT), and adapting them to ensure that communities could manage the technologies, that the cost of the technology was recoverable (i.e., that markets existed for the products that covered production costs using the tunnels), and that the equipment could be repaired and maintained locally.

Key stakeholders remain actively involved in project implementation. The project is housed with AZRC and ARI in Quetta and project staff interacts frequently with their counterparts in these research institutions. The project director and the national experts meet regularly with GoB personnel to coordinate project activities in the field. The Secretary Agriculture Balochistan serves as the provincial focal point for coordinating project activities with government initiatives and other projects.

Additionally, a steering committee of key USAID, GoP, and GoB stakeholders meets annually to review project accomplishments and approve the budget and workplan for the coming year. Entities represented on the steering committee include:

- A high-level representative (i.e., Additional Secretary, Deputy Secretary) of the Ministry of Food, Agriculture, and Livestock (MINFAL) as the chair.
- National Agricultural Research Center (NARC)
- Pakistan Agricultural Research Council (PARC)
- Government of Pakistan (represented by various departments within MINFAL)
- Government of Balochistan (departments of Agriculture, Livestock & Dairy Development, Planning & Development)
- USAID
- International Center for Agricultural Research in the Dry Areas (ICARDA)
- FAO

Effectiveness

Evaluation question: Has the project accomplished its objectives?

Conclusions

- In applied research and on farms, the project met or exceeded the technical targets of improving cereal crop and livestock production by 10% and on-farm water use efficiency by 40%.
- The project increased average household income by 23%, average household cereal yield by 35%, and average livestock yield (for the 12,075 animals treated) by 21%.
- The project is likely to meet its targets for establishing COs. It has been slow in doing so, however, and many are too immature to have implemented interventions. For that reason, and because the project lacks the human capacity to manage so many communities, the project is unlikely to meet its targets for implementing interventions. The result is that project benefits are unevenly distributed over COs. For example, the project has not yet implemented interventions in 38 (16%) of the COs.
- The project actively engaged scientists from AZRC and ARI in applied research and enhanced their research skills and capacity. By extension, this has enhanced the capacity of the research institutions in Balochistan.
- Three of five key indicators of project objectives are not well stated.

Findings

With a year until completion, it is early to assess the project's ultimate effectiveness. The evaluation thus focuses primarily on whether the project appears on track to meet targets and accomplish objectives. None of the key people involved in project design are now available in Pakistan, so it is difficult to determine how targets were selected. The current project director, who was not engaged in design, believes the target of establishing 250 community organizations may reflect USAID's desire to affect the lives of as many people as possible.

The project document specifies five high-level performance indicators: two related to the project goal and three related to objectives. The three objective-oriented indicators are not well designed or measurable. The project exceeded its targets for the goal-oriented indicators by increasing average household income and livestock and cereal yields by more than 10%.

Project interventions increased average household income by 23%. The baseline survey found an average household income of Rs. 223,297 among project communities. The Impacts chapter of this report calculates an average increase in income attributable to project interventions of Rs. 51,000, which represents a 23% increase.

Introduction of improved wheat varieties increased average wheat yields by 35%. The project's impact on average wheat yields is the difference between average yields with the improved varieties distributed by the project and what average yields would have been if only the original local variety had been available. The land base over which average yields were calculated is the estimated average area planted to rainfed and irrigated wheat per household (from the baseline survey) multiplied by the number of participating households in each year of the project. The analysis subtracts the area planted to improved varieties in each year (data from

project records) from the land base in that year to determine the area remaining in local varieties. Field trials conducted by ICARDA provided data on average yields for local and improved varieties under rainfed and irrigated conditions. Table 4 summarizes the derivation of estimated changes in average wheat yields.

Project interventions in animal feeding and health care increased average weight gain by an estimated 21% for the 12,075 animals treated (International Center for Agricultural Research in the Dry Areas (ICARDA), 2007). The project's indicator for animal weight gain states that it will "Increase average baseline CO household per capita livestock production by 10%." If this means an average over all of the estimated 79,500⁸ animals owned by project households, then average weight gain is 3.2%.

TABLE 4: DERIVATION OF CHANGE IN AVERAGE WHEAT YIELD

	Rainfed			Irrigated			Totals
	2005	2006	2007	2005	2006	2007	
Participation information							
Average area per household (ha) ^a	0.99	0.99	0.99	2.44	2.44	2.44	
Participating households (#)	1,515	2,004	3,069	1,515	2,004	3,069	
Without project yields							
Total area planted (ha)	1,506	1,992	3,051	3,693	4,885	7,481	22,609
Yield - local variety (kg/ha) ^b	1,300	1,300	1,300	1,800	1,800	1,800	
Production (tonnes)	1,958	2,590	3,967	6,647	8,793	13,465	37,420
Average yield (kg/ha)	1,300	1,300	1,300	1,800	1,800	1,800	1,655
With project yields							
Area in improved varieties (ha)	869	1,992	2,985	0	4,276	4,297	14,419
Area in local varieties (ha)	637	0	0	3,693	609	3,184	8,123
Yield - improved variety (kg/ha)	1,800	1,800	1,800	3,000	3,000	3,000	
Production (tonnes)	2,393	3,586	5,373	6,647	13,924	18,622	50,545
Average yield (kg/ha) ^b	1,588	1,800	1,800	1,800	2,850	2,489	2,242
Change in average yield (%)	22%	38%	38%	0%	58%	38%	35%

a. Average area planted to rainfed and irrigated wheat by project households as estimated from the baseline survey.
b. Obtained from ICARDA field research trials.

⁸ The baseline survey found that the average household in the project area owned 20.62 adult goats and sheep.

TABLE 5: SUMMARY OF EFFECTIVENESS RELATIVE TO KEY PERFORMANCE INDICATORS

GOAL/OBJECTIVES	PERFORMANCE INDICATOR	PROGRESS
<u>Goal-oriented</u> Goal: To reduce poverty and household food insecurity of the rural people of Balochistan	Increasing average baseline CO household incomes by 10% at project end. (10% is the target in the project document. Subsequent reports set the target at 15% but there is no record of an official change)	The baseline survey estimated average CO household income at Rs. 223,297. Project has increased average CO household income by Rs. 51,000 (23%).
	Increase average baseline CO household per capita cereal and livestock production by 10% at project end. (This represents two indicators: one for cereal yields and one for livestock yields)	Average CO household per capita cereal yield from baseline survey is 1,655 kg/ha Project increased average CO wheat yield by 35%. Project increased average CO livestock production by 21% over the 12,075 animals treated. ⁹
<u>Objective-oriented</u> Objective: Strengthen the capacity of the Balochistan applied research and technology transfer system and GoB Departments/ Directorates to provide sustainable market oriented arid crop, orchard, rangeland and livestock interventions and sustainable land and water resource strategies	Strengthen applied-research capacity at AZRC and ARI	Enhanced the capacity of 11 scientists through training and applied research experience.
	Strengthen technology transfer system with involvement of GoB line department/directorates	The evaluation team collected no evidence to address this indicator.
	Promote sustainable land and water policies and strategies	Established or strengthened four community water user groups/associations.

Table 5 summarizes the project goal and objectives, the relevant indicators, and progress in meeting targets. The two goal-oriented indicators relate directly to the project goals of improving food security and reducing poverty. These indicators have specific quantifiable targets, readily measurable, and relevant measures of the project goals. On the other hand, the three objective-oriented indicators are not well designed. These indicators have no specific targets and are restatements of project objectives. These estimates rely heavily on reported research results and the assumption that farmers can replicate research results in a farm environment. The evaluation team used its visits with 26 participating communities to validate the research results.¹⁰

Table 6 summarizes evidence of the project’s effectiveness in meeting technical research targets and in transferring those results to the farm. The second column summarizes results from the project’s research efforts on the IRSs.¹¹ The third column presents evidence gathered during site visits.

⁹ Calculated over the estimated 79,500 animals owned by participating households, average weight gain was 3.2% but this is a misleading measure of the project’s impact on livestock.

¹⁰ Observations from field visits reflect the responses of community members to questions about the impact of the project on crop and livestock yields. They are not based on actual measurements of yields or a poll of community members. The sole purpose was to determine whether farmers were obtaining results generally consistent with research findings.

¹¹ The evidence was gathered from the 2006 Annual Report of the project’s ICARDA-led applied research component and interviews with and presentations by scientists.

TABLE 6: EFFECTIVENESS OF INTERVENTIONS IN CROPS, LIVESTOCK, AND WATER MANAGEMENT

RESEARCH COMPONENT	APPLIED RESEARCH RESULTS FROM PUBLISHED REPORTS AND PRESENTATIONS	FARM LEVEL RESULTS FROM SITE VISITS
CROP INTERVENTIONS		
Wheat ^a	Average 67% increase in grain yield relative to local variety on improved rainfed land Average 67% increase in grain yield relative to local variety on irrigated land	Farmers at 11 of 15 sites where improved wheat seed had been distributed reported 50% to 100% greater yields from the improved variety relative to the local variety. At two sites in Mastung, the improved variety did not perform well because of drought. Results at the other two sites are not known.
Barley	Average 78% increase in grain yield relative to local variety on improved rainfed land Average 50% increase in grain yield relative to local variety on irrigated land	The evaluation team did not visit a site where barley seed had been distributed.
Lentil	Average 40% increase in grain yield relative to local variety on improved rainfed land Average 70% increase in grain yield relative to local variety on irrigated land	The evaluation team did not have an opportunity to ask about lentil.
LIVESTOCK INTERVENTIONS		
Animal health treatment	Diagnosis and treatment reduced incidence of disease and parasites and increased average net animal value by 12% (Rs. 6,578 to Rs. 7,346)	Community members from seven of nine communities where the intervention had been applied reported reduced mortality, increased weight gain (8-10 kg more), and improved milk production. The evaluation team did not collect specific information from the other two communities.
Animal feeding	Improved feeding regime increased average weight by 29% and average net animal value by Rs. 475	Community members in eight of ten communities where the intervention had been applied reported reduced mortality (particularly during the recent drought), increased weight gain, and increased market value (Rs. 2,000). ¹² The evaluation team did not collect specific information from the other two communities.
WATER INTERVENTIONS		
Reduce conveyance loss	Lined and piped watercourses reduced water loss by 30% to 100%	The one visited site where intervention was applied was irrigating more land from saved water.
Increase on-farm water use efficiency	More efficient irrigation scheduling increased economic returns to wheat by 23% to 49%.	The evaluation team did not observe any irrigation scheduling interventions.
Land leveling & dikes	The research has not addressed this issue specifically.	Seven of nine visited sites where intervention had been applied reported increased yields (50% was only quantitative measure) and incomes.
<p>a. Local wheat is very well adapted to Balochistan's arid agriculture. In high rainfall years, however, its susceptibility to yellow rust substantially reduces yields. The crops research seeks a variety that will perform well in a wide variety of situations. Few of the promising varieties from the research are yet ready for wider distribution however. Many of the farm level results for wheat refer to the Bakhar variety, an irrigated variety imported from Punjab to address a seed shortage early in the project. The variety has performed very well relative to the local variety except under extreme drought (i.e., Mastung).</p>		

¹² The research results in the second column reflect average net gains in animal value. Values reported by communities reflect changes in gross market value. Comparable changes in gross values from the research range from Rs. 504 to Rs. 1,338 although they were estimated in a different year (and market) than the observations from communities.

The team interviewed 15 people about the project's impact on the research capacity of AZRC and ARI. Interviewees included provincial and national agricultural scientists, government officials, institute managers, and the scientists themselves. All believed that the training and the experience of conducting applied research on the IRSs had

improved the research skills and capacities of the 11 scientists directly involved. Some of the scientists and all of the managers stated that overseas training¹³ was a valuable experience both for enhancing research capacity and building confidence and maturity. In presentations by the scientists and discussions in the field, the team observed a good grasp of research methods and statistical procedures and above average presentation skills.

"FAO came in 2005, and did good work. They did land leveling, gave seed, and livestock training. But there was no rain that year, but at end of 2006/7 we had good production due to rains. But again we had loses due to floods, when we lost wheat, and bunds were broken. They gave almond trees, pistachio and gave training."

(Community organization member in Mehr Ali Zai, Mastung District)



Community organization in Humaya

Several particularly knowledgeable and senior interviewees believed the project could have done more to enhance research skills and capacity by providing more opportunities for scientists to work side-by-side with foreign researchers. These interviewees included an agricultural researcher and manager, the Member (Social Sciences) of PARC, ICARDA's national professional officer, and a project coordinator. These individuals drew on their own experience working closely with mentors. They reported

that close working relationships with senior scientists motivated them and formed lasting connections to other individuals in their professions. These individuals claimed many of the most effective agricultural scientists in Pakistan today received their training abroad and were mentored by other scientists.

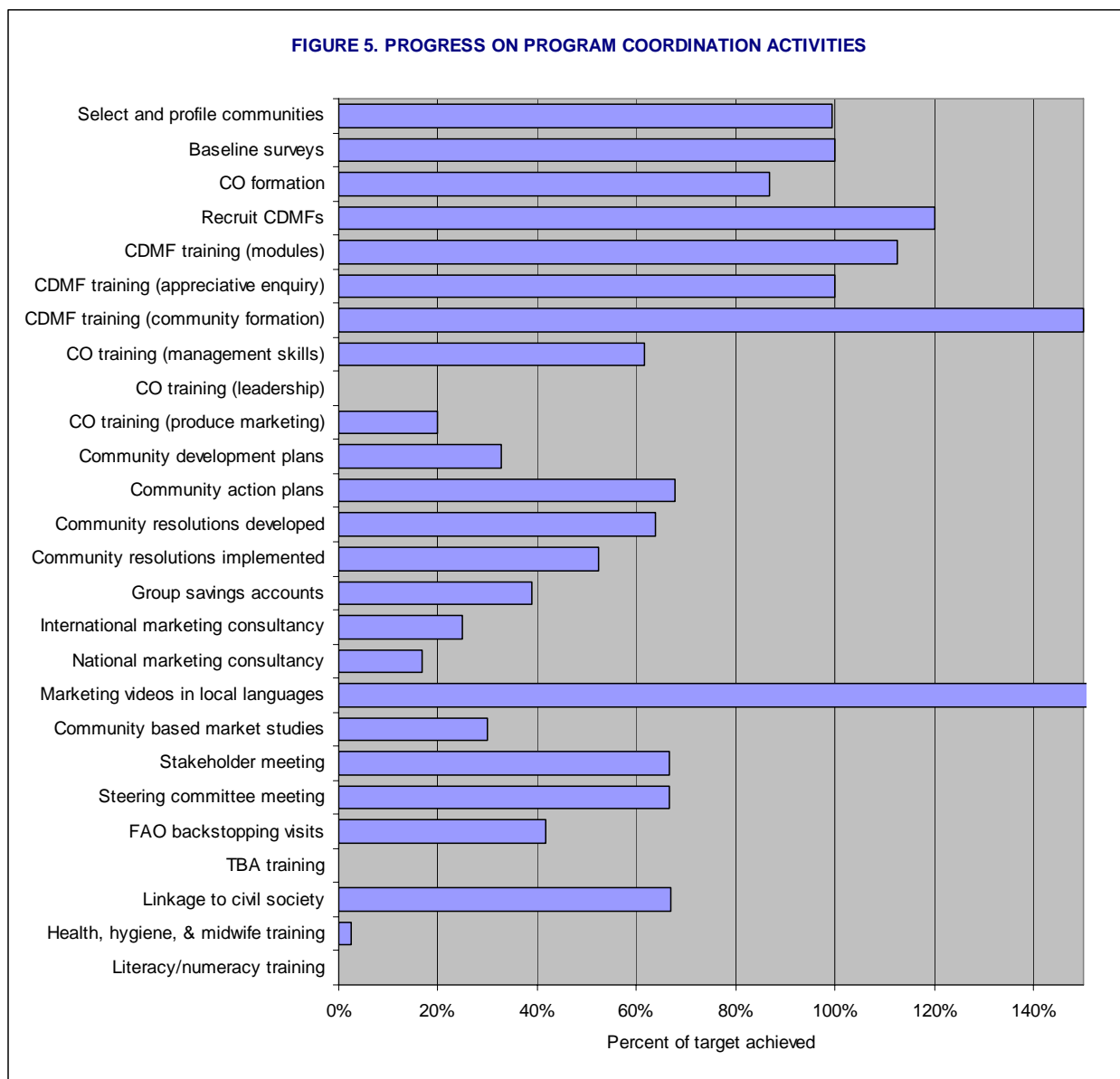
Although not included as a question in the interview guide, two communities specifically emphasized the difference between the FAO project and other assistance projects in Balochistan. One said that when the CDMFs visited they were there to help, not just to drink tea. Another interviewee had visited a number of community organizations and viewed the effort communities devoted to the project as an indicator of the project's perceived value.

In addition to the five primary performance indicators, project reports track approximately 135 output indicators. Most are typical indicators that simply count activities or outputs. Some, however, are ambiguous, unquantifiable, and ultimately unrealistic. For example, the objective of "improving water-use efficiency by 40% and cereal yield stability by 30%" does

¹³ The project has sent 11 AZRC scientists (well above the eight specified in the workplan) for overseas training, brought five scientists (short of the 12 specified in the workplan) in to work with AZRC scientists in Quetta, and engaged 11 AZRC and ARI scientists directly in applied research activities.

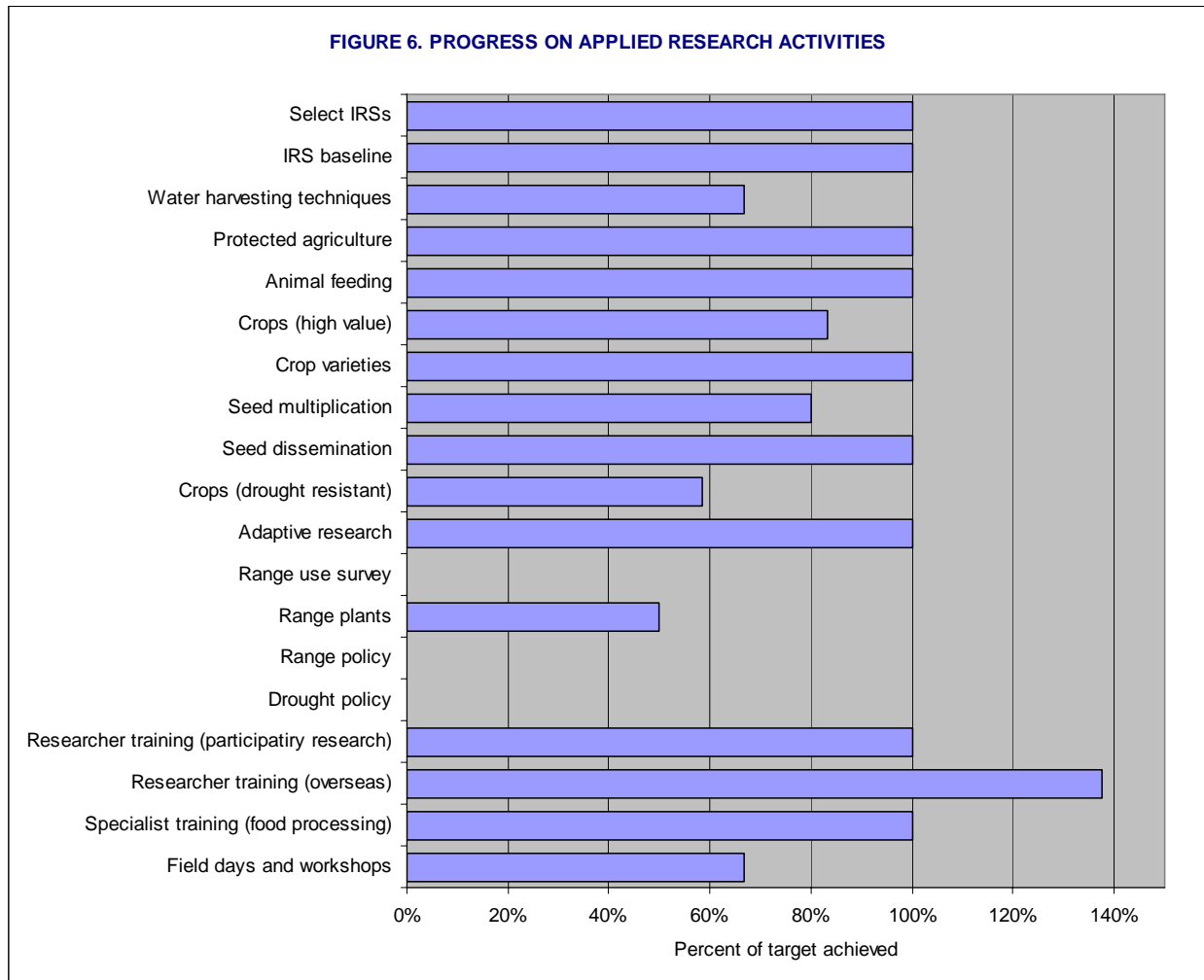
not define whether the objective applies to demonstrating a research result or achieving the improvement as an average over all households.

The project has abandoned some activities (e.g. GIS, drip irrigation) because they were not suited to the project context. This is in line with the outlined objective of “[taking] corrective action ... during the life of [the] project if necessary.” Figures 5 through 9 illustrate progress towards meeting output targets in the broad areas of program coordination, applied research, water management, range and livestock management, and crop enhancement as reported in September, 2007 quarterly report.



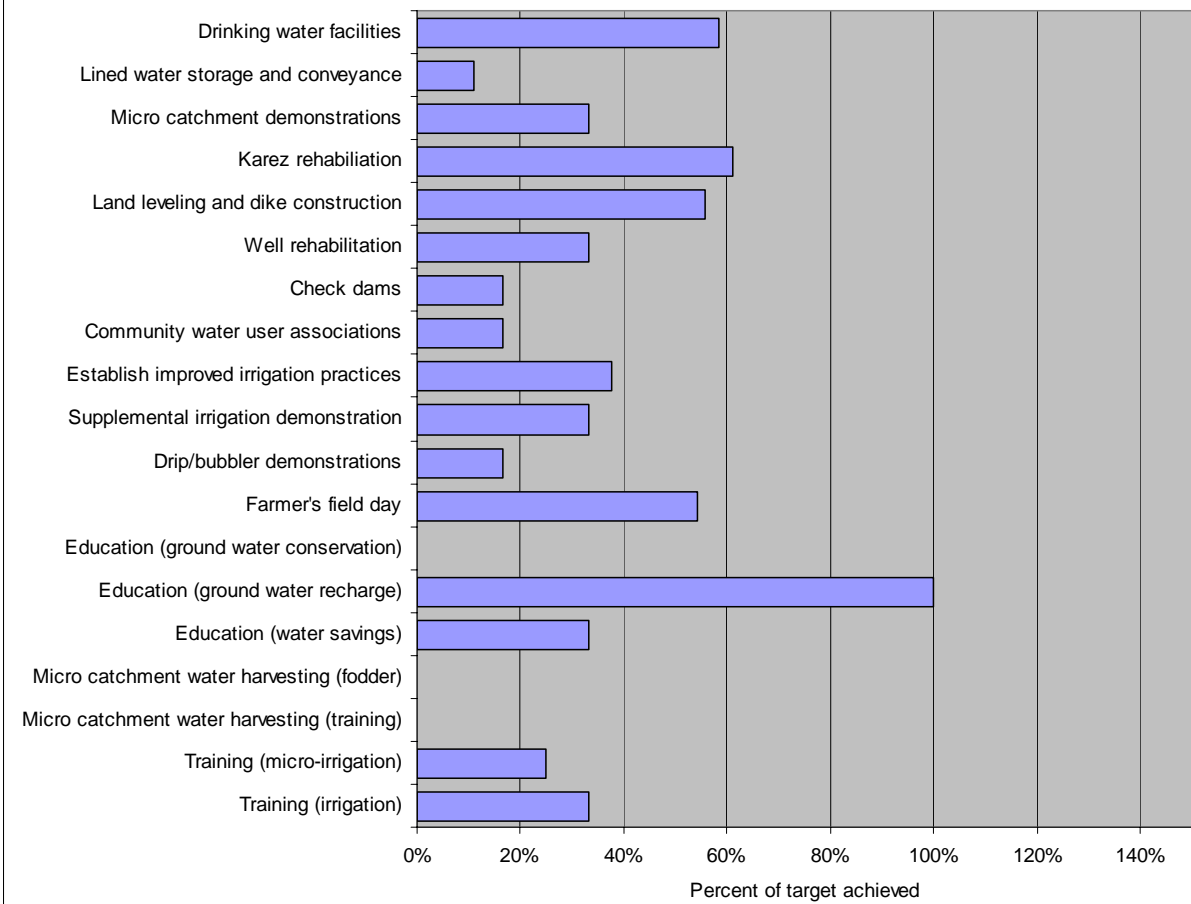
The project has done very well meeting its targets for identifying, profiling, and establishing COs and recruiting and training CDMFs. The project has not made as much progress in CO training beyond the initial training in management skills. The project is also behind schedule to meet targets related to CO development (i.e., development plans, action plans, resolutions developed and implemented, and group savings accounts). This is consistent with

many COs being relatively new and the time it takes to gain trust and begin work. Much of the marketing work appears behind schedule, but the marketing consultants have just begun work as planned and the activity is just now getting underway. The project has effectively dropped the three activities (range use, range policy, drought policy) near the bottom of the figure.

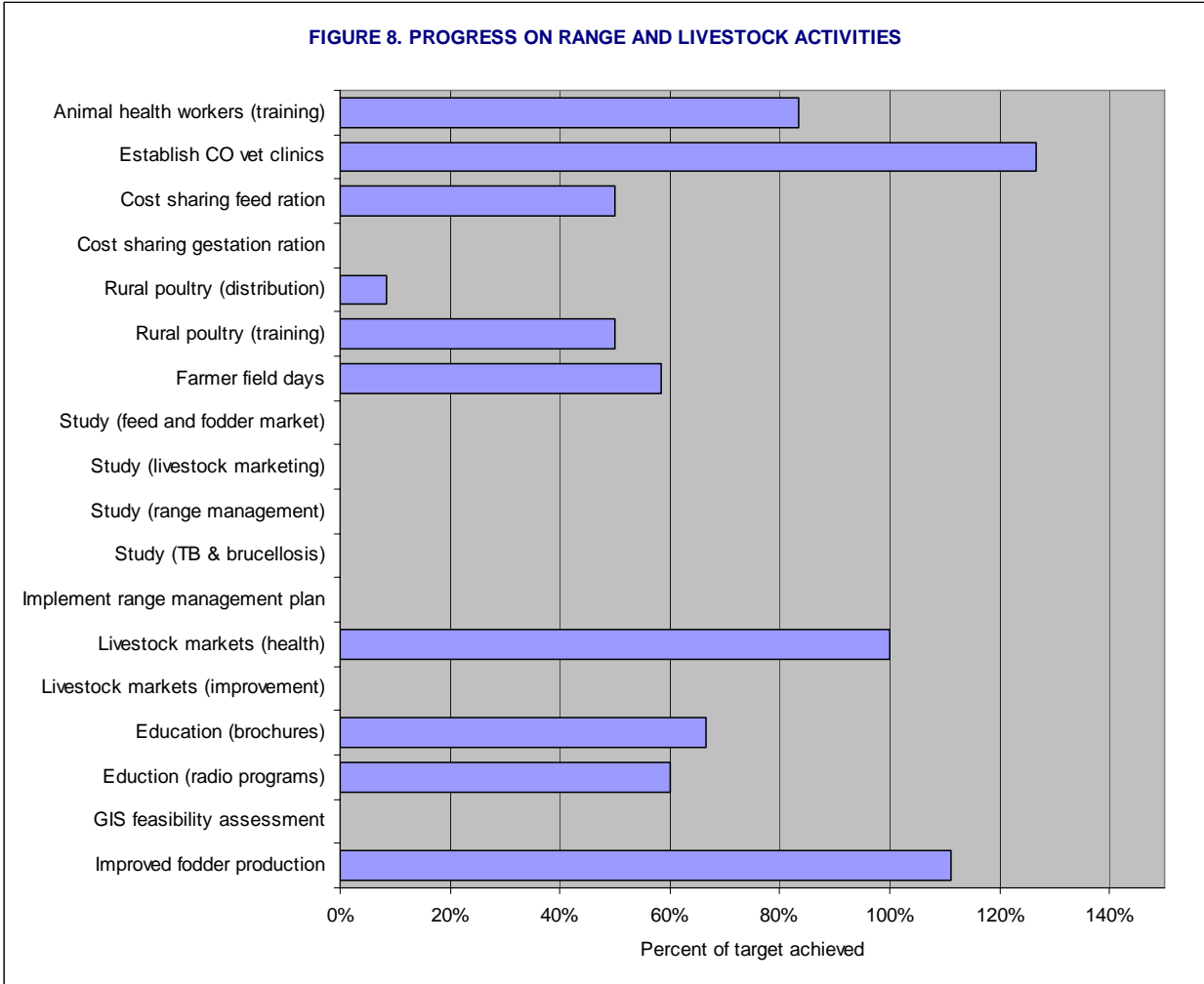


Applied research activities are on track for meeting targets with a few notable exceptions. In particular, the project has made little progress on policy-oriented activities (range, and drought) and little progress on range activities in general.

FIGURE 7. PROGRESS ON WATER MANAGEMENT ACTIVITIES

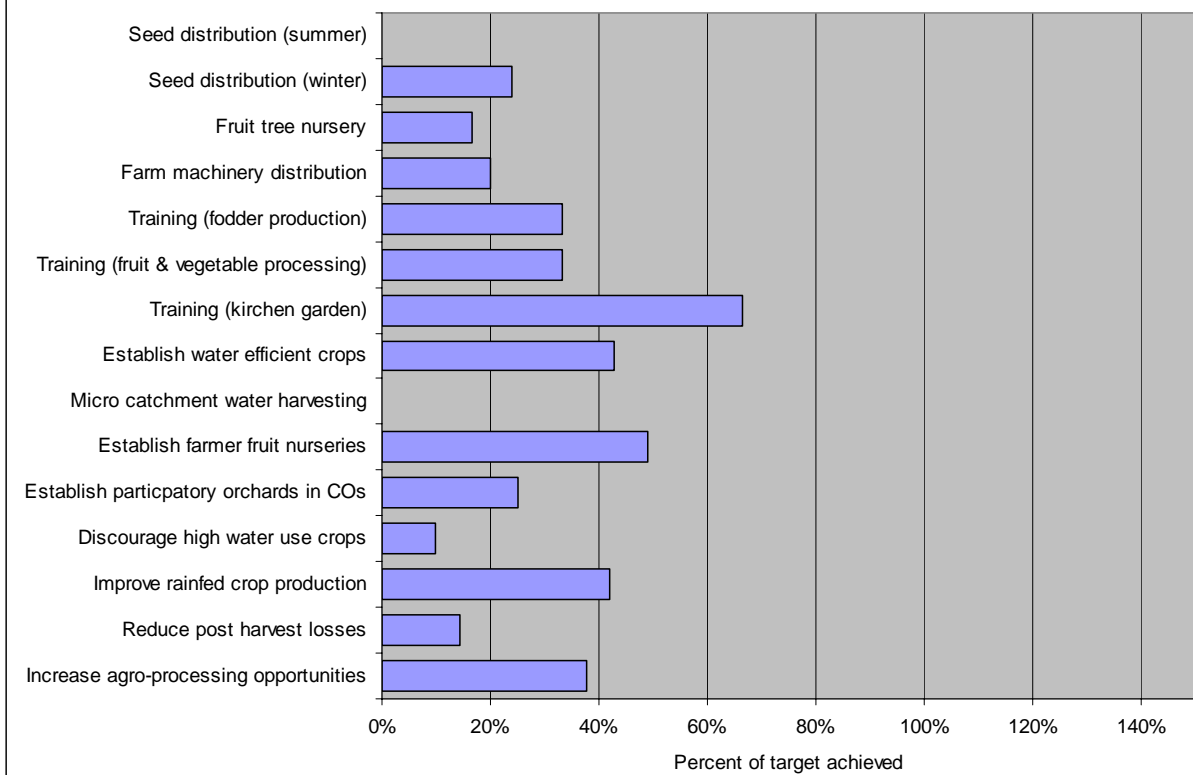


Targets for water management interventions appear to have been generally unrealistic. Interventions (i.e., drinking water, lined tanks, karez rehabilitation, well rehabilitation, and check dams) are dependent on requests from COs. Project designers may have overestimated demand. However, the project also appears to be behind schedule in many of the other water management activities as well, particularly micro-catchment water harvesting.



Progress on livestock activities has been spotty. The project is generally on track to meet targets in health related activities, education/communications and outreach activities, and fodder production. It seems unlikely to reach many of the other targets and has been particularly weak in producing studies.

FIGURE 9. PROGRESS ON CROP ENHANCEMENT ACTIVITIES



The project appears behind schedule to meet many of its crop activities. Although benefits from seed distribution have been substantial (see “Impacts” chapter) the project will likely not meet its target. The target specifies the number of communities in which seed is distributed and, as of the end of the third quarter of 2007, the project had distributed seed in only 26% of COs (60). Thus the substantial benefits of seed distribution are concentrated in a relatively small number of communities.

The bottom eight categories in Figure 9 represent aggregates of several activities each, and the figures are not entirely representative of the activity as a whole. For example, in “Establishing farmer fruit nurseries,” the project has done well in design and training activities but has not identified any interested communities. In “Establishing participatory orchards,” the project again has done well in training but has not made much progress in sourcing plants or establishing orchards. In “Increase agro-processing opportunities,” the project has almost met targets in training for food processing and kitchen gardens but has not made much progress in moving beyond training.

Three interviewees who were most qualified to address project effectiveness (two project managers and a project coordinator) believe the project likely engaged many more communities than necessary for a pilot project. This resulted in the project spreading resources too thinly. Because it has taken longer than expected to establish 223 COs, 38 are not yet mature enough to begin implementing interventions. This dilutes the project’s impact on individual communities. On the other hand, the large number of COs means the project has engaged many individuals. This addresses USAID’s interest in having a broad and visible impact.

The link between the applied research and community development components has not evolved quite as planned largely because both components have taken longer than expected. Applied agricultural research takes time and research results are just now available to disseminate to communities. Also, developing sufficient trust with community organizations takes time, especially to introduce complex and risky interventions. For these reasons, most interventions have focused on disseminating knowledge of existing techniques and practices, distributing existing seed varieties, and addressing capital constraints.¹⁴ The project director believed it was important that the first few interventions in a community be low risk with high payoffs. In addition, security concerns in the region affected the project's progress, and caused the premature departure of key project staff, two national experts and the project director. The current project director arrived in July, 2006, over a year and a half after the project began.

¹⁴ In an environment with high poverty rates and limited access to credit, capital constraints are also relevant barriers to livelihood improvement. The Khushhali Bank proposal, for example, cites one negative impact on livelihoods in Balochistan as the “breakdown in many areas of the traditional kareze system of water channeling for agricultural production and now finding affordable skilled persons to repair them.”

Impact

Evaluation question: To what extent has the project benefited the people of Pakistan?

CONCLUSIONS

- The project has affected, directly or indirectly, an estimated 6,629 households (53,000 individuals). The project has worked directly with 3,813 households (an estimated 30,500 individuals). An additional 2,816 households (22,500 individuals) who live in project communities but have not joined the COs have benefited indirectly. Beneficiaries are in the largely Pashtun and Brahvi districts of Mastung, Loralai, and Killa Saifullah in the politically strategically important region of Pakistan along the Afghanistan border.
- Project interventions have increased average (as measured across all participating households) annual household income by an estimated 23%. Monetary benefits, however, accrue largely to the 83% of participating households that are members of the COs where interventions have been applied.
- Monetary impacts attributable to the project to date (one year before the project ends) total an estimated \$6.9 million in direct monetary benefits, \$0.2 million in secondary monetary impacts, and \$0.5 million in durable capital improvements.
- It has proven difficult to engage women directly in agriculturally-oriented

Findings

The project benefits individuals in a number of ways. Some benefits are readily quantifiable in monetary terms and others are not easily monetized. When interventions produce a product with market value, the team can easily measure those interventions in monetary terms. The value of these interventions is the change in net income associated with the increase in production attributable to the intervention. These benefits translate directly to increased household incomes. Many project activities are less easily quantified in monetary terms. Table 7 summarizes the primary monetary and non-monetary benefits of the project.

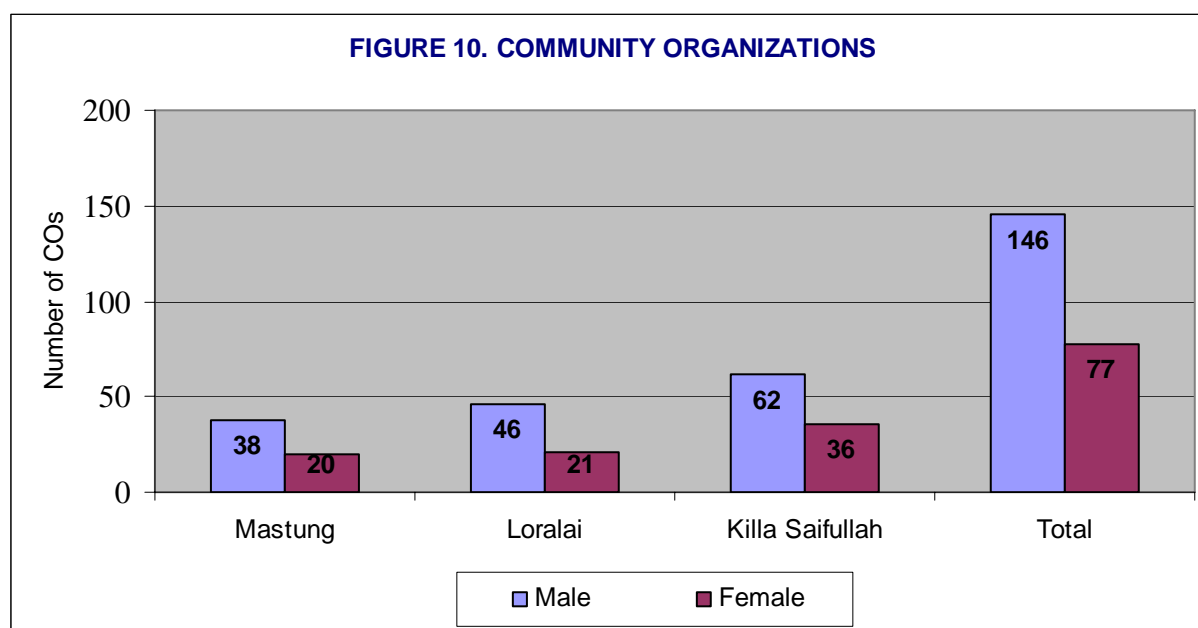
The project has affected, directly and indirectly, an estimated 6,629 households (53,000 individuals). The ultimate beneficiaries of the project are the CO members and their families. As of September, 2007 the project had established 223 COs containing 3,813 households and approximately 30,500 individuals.¹⁵ In addition, the project generates indirect benefits for households in, or near, participating villages but who have chosen not to join the CO. These households will nonetheless come into contact with participating households and be exposed to demonstrations of interventions in the field.¹⁶ There are an estimated 2,816 indirect beneficiary households containing an estimated 22,500 individuals. Figures 10 and 11 illustrate the distribution of COs and beneficiary households by district, gender, and type of beneficiary.

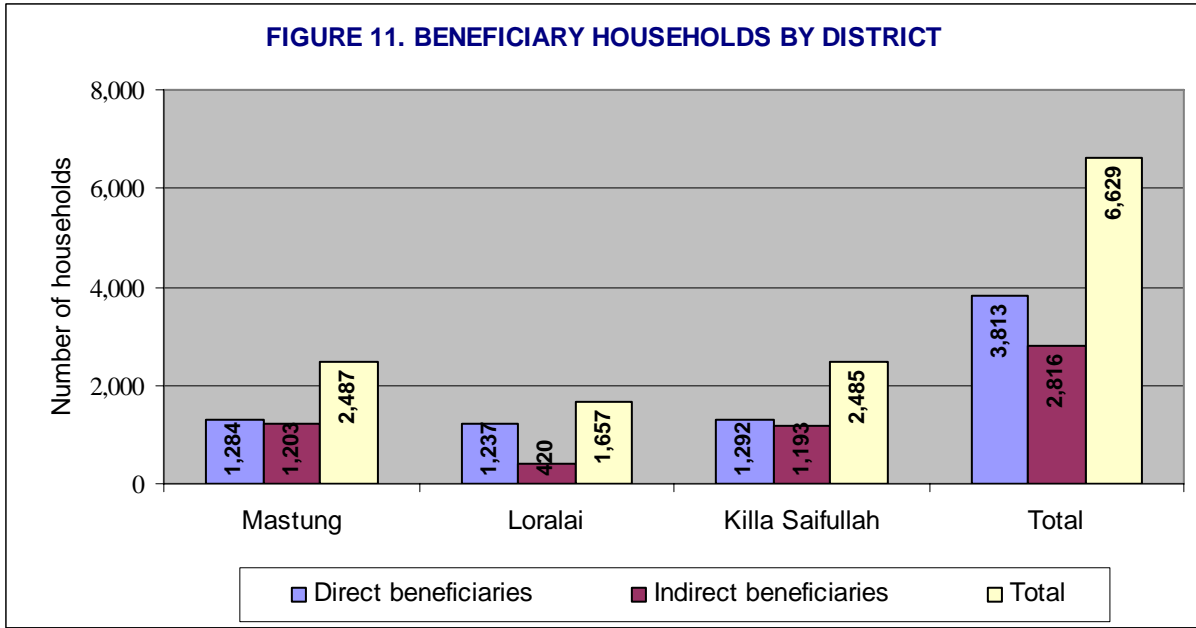
¹⁵ The number of individuals is estimated from number of households by multiplying households by the average family size of eight persons per family.

¹⁶ For example, a non-participating household in a village where the project installs a drinking water source will benefit from the intervention. Similarly, a non-participating household in a village where the project distributes improved wheat varieties may purchase some of the saved seed from a neighbor in the following year.

TABLE 7: PRIMARY MONETARY AND NON-MONETARY BENEFITS OF THE PROJECT

MONETARY BENEFITS (IMPACTS ON INCOME)	NON-MONETARY BENEFITS
<p>Value of increased agricultural incomes from:</p> <ul style="list-style-type: none"> • Increased yields of improved varieties of wheat & barley • Distribution of cumin & alfalfa seed • Production of high-value orchard crops (almond) adapted to arid agriculture • Multiplication of improved wheat & barley seed for sale to other farmers • Value of distributed poultry and products • Increased animal weight gain due to improved feeding practices. • Reduced animal mortality, increased lambing percentage, and increased animal value resulting from improved health care. • Increased crop production on newly leveled and diked rainfed land • Increased crop production from additional water made available by reducing water transmission losses (lined storage tanks, lined or piped irrigation channels), rehabilitating water sources (karez, tubewell), and improved water harvesting structures. 	<ul style="list-style-type: none"> • Social benefits of community organizations. • Benefits of empowerment of women through women’s community organizations. • Benefits of improved access to household water sources. • Benefits of training in agro-processing, animal health, kitchen gardens, poultry raising, nursery management, range management, sheep fattening, and health and hygiene. To some extent these benefits are captured in the benefits of the activities they support but training can also generate non-monetary benefits by building skills and confidence. • Benefits of improved human capacity through training. • Benefits of applied research. This is partially captured by the benefits of new technologies and practices developed. The real benefit of information, however, is the value of a mistake not made and that is difficult to capture in this context. • Benefits of check dams that increase water infiltration into the deep aquifer. • Benefits of fruit, nut, and olive plantations that are not yet mature enough to be producing.





Current Monetary Benefits

The impact assessment model estimates the impact on household incomes associated with the project's interventions. The model considers only those interventions that generate measurable improvements in agricultural productivity. It uses market (farm gate) prices and estimated production costs to translate increased productivity into net impact on household income. The analyses are very conservative. For example, estimated impacts on household income are net of production costs, even though the beneficiary families perform much of the labor. The analysis treats production costs as secondary benefits because expenditures on equipment, labor, and other inputs circulate within the local economy. Secondary benefits are not included in estimates of project impact. Similarly, the model assumes that beneficiaries grow wheat with additional land or water made available by the project, even though field visits found some communities growing much higher value crops (tomato) on improved land when water was available.¹⁷

The impact model considers only benefits that are attributable to project interventions. The model defines the monetary benefit attributable to an intervention as the difference in household income between the situation with the intervention and what the situation *would have been without the intervention*. Because interventions increase agricultural production, income for both scenarios is the net value of agricultural production. Table 8 illustrates some of the scenarios used for estimating intervention impacts. Annex B describes the details and assumptions of the impact assessment model.

¹⁷ Ownership of the land will determine the incidence of capital value benefits. The baseline survey estimated that over 60% of project area households owned their land.

TABLE 8: ILLUSTRATIVE EXAMPLES OF COMPARATIVE IMPACT SCENARIOS

INTERVENTION	SCENARIOS	
	WITH INTERVENTION	COUNTERFACTUAL
Improved seed varieties	Net value of agricultural production based on yield of improved variety	Net value of agricultural production based on yield of original variety
Increased access to water (e.g., karez rehabilitation, lined storage or conveyance)	Net value of agricultural production with improved access (greater yield due to better irrigation or increased irrigated land area)	Net value of agricultural production with original water availability
Animal feeding, health	Net value of animals with improved feed or health care	Net value of animals under original practice
Improved water harvesting (e.g., land leveling and dikes)	Net value of agricultural production with improved water harvesting structures	Net value of agricultural production under original practice

Note: Values of agricultural production under both scenarios are based on research trials conducted by ICARDA scientists and on market prices either from statistical sources or the project baseline survey.

Tables 9 and 10 summarize the monetary benefits attributable to interventions in crops, water, and livestock, respectively. Table 9 shows total benefits (nominal benefits from inception to the end of 2007) for each project component and type of benefit. Table 10 shows direct benefits (excluding capital value increases and indirect benefits) by year for each project component. The remainder of the analysis considers only direct benefits.

TABLE 9: PROJECT BENEFITS BY COMPONENT

Project component	Direct impact on household incomes (1,000 Rs.)	Secondary impacts (1,000 Rs.)	Capital value increase (1,000 Rs.)	Total values (1,000 Rs.)
Crops	378,825	7,949	0	386,774
Water	26,168	3,080	30,480	59,717
Livestock	7,414	2,300	0	9,715
Total values (1,000 Rs.)	412,397	13,328	30,480	456,206
Total values (1,000 \$)	6,873	222	508	7,603

a. Incidence of capital value increase depends on ownership of land. The baseline survey estimated that over 60% of project area households own the land they farm.

TABLE 10: DIRECT BENEFITS BY PROJECT YEAR

Project component	Direct impact on household incomes (1,000 Rs.)	Secondary impacts (1,000 Rs.)	Capital value increase (1,000 Rs.)	Total values (1,000 Rs.)
Crops	378,825	7,949	0	386,774
Water	26,168	3,080	30,480	59,717
Livestock	7,414	2,300	0	9,715
Total values (1,000 Rs.)	412,397	13,328	30,480	456,206
Total values (1,000 \$)	6,873	222	508	7,603

a. Incidence of capital value increase depends on ownership of land. The baseline survey estimated that over 60% of project area households own the land they farm.

The project has generated an estimated \$6.9 million in direct monetary benefits to date (December, 2007). Direct benefits account for 90% percent of total monetary benefits. Secondary benefits account for 3% and increased capital value of land for 7%. Of the project components, crop interventions produced 92 percent of the direct benefits, water interventions produced 6%, and livestock interventions 2%.

The project has increased average household income by Rs. 51,000, a 23% increase from the Rs. 223,297 level established by the baseline survey.



In the community of Humaya in Killa Saifullah District, the project leveled 40 acres of land on which 20 families had been growing rainfed wheat with very low yields. They reported receiving 100 kg per acre per year generating a gross value of about Rs. 1,800 per acre. Once the land was leveled, the community installed shallow tubewells and began to irrigate the newly leveled land.

At the time of the evaluation team's visit, one of the 20 farmers was harvesting tomatoes from his two-acre share of the leveled land. He expected to sell the crop for Rs. 150,000 and could grow two such crops per year. He worked the land with his family and hired no labor. Therefore, much of the estimated Rs. 300,000 per year would be income to his family. This represents a substantial increase relative to the pre-project average annual family income of Rs. 223,297.

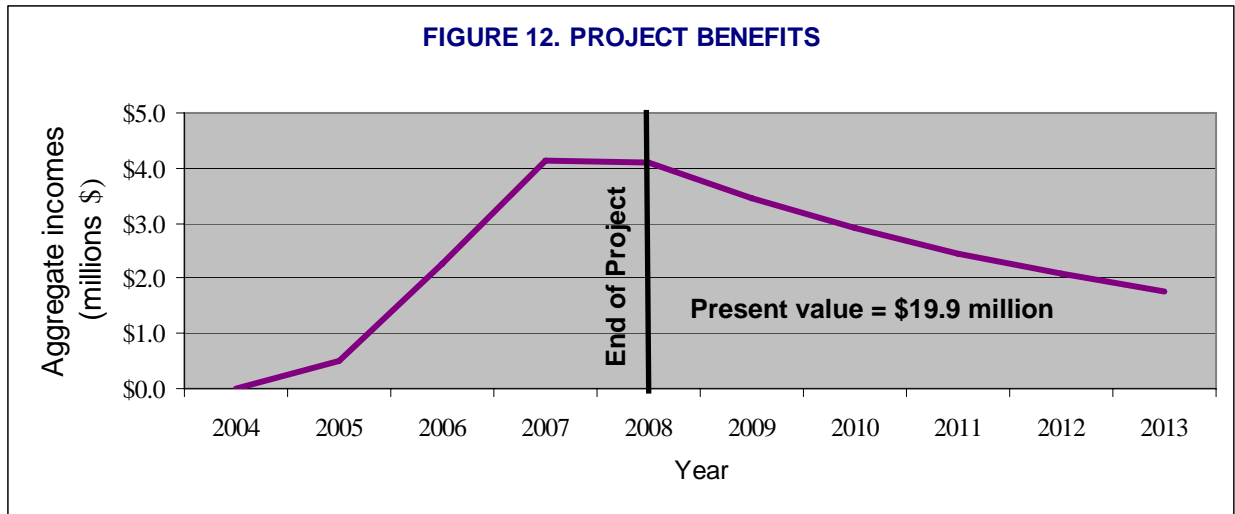
Total (Projected) Monetary Benefits

Over a nine-year time horizon (extending to five years beyond project completion) the activities generate monetary benefits with an estimated present value of \$19.9 million. The present value adjustment accounts for differences in the value of money over time. The analysis states projected benefits in present value terms to facilitate calculation of efficiency measures in the following chapter. Annex B contains additional detail on present value calculations.

Some of the project activities are likely sustainable and will continue to positively affect beneficiaries beyond the end of the project. To more completely account for all project benefits, the analysis projects benefits for five years beyond the end of the project (i.e., through 2013). The analysis makes the following assumptions about the sustainability of benefits.

- Water interventions are investments in durable infrastructure (e.g., karez rehabilitations, leveled land and dikes, water diversion structures, storage tanks) that will continue to generate benefits with little deterioration over a five-year time frame. The analysis assumes that water benefits will remain constant at their 2007 levels through 2013.
- Livestock benefits (i.e., animal fattening, veterinary treatment, rural poultry) will likely decay after the project is complete. Rural poultry distribution is likely to cease altogether unless the incubator projects are implemented. Farmers have a financial incentive to continue animal fattening and veterinary activities but sustainability will depend on how well the project has established these practices in communities and on the availability of inputs (i.e., feed rations and medications). These practices are likely to decline over time without continued project support. The analysis assumes they decay at a rate of 50% per year from their 2007 levels.
- Improved crop seeds lose their purity over time, and therefore yields begin to decline. Also, sustainability of the activity will depend on a supply of seed. The project has built some capacity for seed multiplication and cleaning that should enhance the prospects for sustainability of improved seed varieties. Nevertheless, benefits from improved seed varieties are likely to decline over time without continued project support. The analysis assumes that the benefits from improved wheat varieties will continue beyond the end of the project, but will decay at a rate of 20% per year from their level in 2007.

Because there is substantial uncertainty about the rates at which livestock benefits decay, the analysis also calculates projected benefits for alternative decay factor values. Figure 12 illustrates the calculation of project benefits under an assumption of a 50% decay rate of livestock benefits. The present value of the area under the line represents the benefit of the project in terms of increased beneficiary incomes. Normally, such a graph would show a lower line representing benefits without the project. In that case, the present value of the difference between the two lines would represent the impact of the project. In this case, however, the analysis directly estimated benefits net of without project income.



The graph illustrates a fairly pessimistic scenario. The largest project benefit (crops) decays by 20% annually. This assumes that farmers will not be able to obtain fresh supplies of seed and that the village seed enterprises are not successful in maintaining seed quality. Different assumptions about future seed viability generate estimates of the present value of monetary benefits ranging from \$25 million (with no decay in viability) to \$18.5 million (with a 30% annual decay rate in yields). Table 11 in the following chapter contains more detail.

Non-Monetary Benefits

Group interviews with beneficiary communities provided the majority of the evidence of non-monetary project impacts. This qualitative evidence does not provide any quantitative evidence of the benefits' frequency.

During the structured interviews with community members, the team did not ask specifically about training in agricultural practices. Of the 25 structured interviews with communities, only 3 interviewees spoke specifically about the benefits of training in agricultural practices. Most likely training does affect income, but it is difficult to quantify the impact. The following quote illustrates some of the perceived benefits of agricultural training.

“Horticulture training has also created awareness among the farmers concerning improvement of farm practices. This includes (a) improved practices in cultivation of vegetables (b) appropriate use of fertilizer – organic and chemical, and (c) pruning of branches. (*Observations of group interview facilitator in Khazima, Killa Saifullah District*)

Community members also reported a number of other benefits associated with the project and with the formation of COs. The following observations and case studies from group interviews with beneficiaries illustrate additional non-monetary benefits. These are isolated observations that illustrate the types of benefits communities experienced. The team has no evidence of how many communities may have experienced these types of benefits.

“CO benefits include being able to work together, having a common understanding of each other’s problems, and knowing when another household was in trouble and needing

help. Households don't talk about their problems – men just don't and women are confined and don't socialize. Community is better able to understand and solve the small problems. Also better able to approach other organizations for assistance.” (*Summary of interview facilitator's observations from group interview at Shah Karez, Loralai District*)

“The women got together and identified the need for a center, and the CDMF helped them set it up. People volunteered to give a room for a literacy center and one for an embroidery center.” (*Observations from group interview with beneficiaries, Ghousabad, Mastung District*)

“The other benefits of the project as anticipated by few of the community members include (i) affordability of private schooling for children due to increased incomes (ii) opening up of retail shops to generate further income (iii) creation of employment opportunities in the village which will reduce the number of community members going to other areas for labour, and (iv) reinvestment in horticulture. (*Summary of observations by group interview facilitator in Khazina, Killa Saifullah District*)

“Now community is more educated, there is greater awareness. Trainings helped. Now people get together and talk.” (*Group interview participant from Murtat Kallan, Loralai District*)



Improving Access to Water in Mahol Baloch Khan

The small community of Mahol Baloch Khan was once surrounded by lush orchards. The drought, coupled with load shedding that idled pumps tapping the deep aquifer, decimated the orchards in the past decade and only a few dead trees remain.

Now the community ekes out a subsistence livelihood growing dryland wheat. Prior to the intervention of the FAO/USAID project, its only source of water was a well four kilometers from the

village. A family member, usually young boys because women could not travel that far from home, would go twice daily to get water, a task that took about six hours. Sometimes the trip would be in vain if electricity cuts prevented the pump from working.

The project installed a pipe to bring water from the well to the community and will soon build a proper storage tank to replace the katcha pond. It now takes only minutes for most households to obtain water. Boys who no longer have to collect water are now working or going to school.

Access to water has revived the community. During the drought, many families left for urban areas. Now that water is more readily available, many are fixing up abandoned houses in preparation to return.

Case Study of a Farmer

Aminullah is a farmer of village Jadid Allozai, district Killah Saifullah. He owns 50 acres of land and cultivates multiple crops including wheat, tomato, chilies, and carrots. He is married and has four children. Under the FAO project, Aminullah was selected for the training as the community health worker for livestock. Very enthusiastic about the project, he said he gained important learning opportunities. As a livestock health worker, he learned about vaccinating ruminants and castration of animals for fattening. Because of this, other villagers consult him about animal health.



Also, learning about producing carrot seeds enabled him to save money. In addition, Aminullah and other farmers use the CO to discuss and resolve issues of mutual interest. He said, “Previously, I used to waste my spare time by doing nothing but now the project has organized us and has provided us the opportunity to discuss our issues and problems...we feel more as a community after the establishment of community organization in our village.”

Aminullah said the project gave him social exposure. Visits from national and international personnel prompted him to learn more about the world, and therefore he bought a television set. Now, he discusses politics and current affairs with his fellow farmers. In addition, he decided to learn English to communicate effectively with village visitors. He enrolled his children in school and wants them to be better educated. In his words: *“This project has given me the opportunity to increase my income as well as awareness to focus on improving the life of my family.”*

Efficiency

Evaluation question: How efficient has the project been in utilizing its resources to achieve results?

CONCLUSIONS

- Efficiency is a relative concept. Furthermore, measures of efficiency based purely on comparison of monetary measures are partial because they do not capture all project benefits. Nevertheless, using conservative benefit estimates, the project has generated monetary benefits in excess of costs (benefit cost ratio of 1.05) and generated a positive rate of return (IRR of 5%).
- From a cost effectiveness perspective, the project has directly affected the livelihoods of about 3,200 households (total CO members minus households that have not yet experienced monetary impacts) at a per household cost of about \$756 per year.
- In terms of other measures of efficiency, the project has spent about 83% of its resources in Pakistan, about 36% on labor, and about 39% directly on outputs.

Findings

There are a number of possible measures of project efficiency. They have in common a comparison of costs to some measure of output. When outputs are measured in monetary terms, the comparison is usually between the present value of costs and the present value of benefits. The present value adjustment accounts for the fact that benefits and cost that occur at different points in time are not comparable because the value of money changes over time. The adjustment reduces values at different points in time to a common denominator that can be summed to obtain the present value of benefits or costs. Annex B contains a detailed description of the derivation of the benefit cost ratio.

Table 11 documents project costs and benefits and presents three common measures of economic efficiency: net present value (NPV), the benefit cost ratio, and the internal rate of return (IRR). Benefits and costs are discounted at a rate of 10% to 2007.

- **Net Present Value (NPV)**

The project's net present value is the difference between the present value of benefits and the present value of costs. A positive value indicates that a project has returned benefits in excess of costs. Since the measure is independent of the size of a project's budget, however, it provides no evidence of the return on the project investment. For example, the returns implied by a NPV of \$1 million are very different for a \$5 million project than for a \$20 million project.

- **Benefit Cost Ratio**

The benefit cost ratio is the present value of benefits divided by the present value of costs. A benefit cost ratio of one implies that a project returned one dollar for each dollar expended. A benefit cost ratio provides a rough measure of economic returns because it represents the proportional return on investment. For example, a benefit cost ratio of 1.5 implies that project benefits are 150% of costs.

- **Internal Rate of Return (IRR)**

The IRR is the rate of return on a stream of costs that equates the present value of costs with the present value of benefits. It thus represents the potential financial return on the investment. The IRR, however, provides no information on the distribution of benefits.

TABLE 11: PROJECT COSTS AND BENEFITS

Year	Project costs		Project benefits	
	Nominal	Present value	Nominal	Present value
2004	\$118,403	\$157,594	\$0	\$0
2005	\$2,142,934	\$2,592,950	\$492,000	\$595,000
2006	\$1,861,667	\$2,047,834	\$2,259,000	\$2,485,000
2007	\$2,054,731	\$2,054,731	\$4,123,000	\$4,123,000
2008	\$1,368,643	\$1,244,221	\$4,085,000	\$3,714,000
2009	\$0	\$0	\$3,437,000	\$2,840,000
2010	\$0	\$0	\$2,898,000	\$2,177,000
2011	\$0	\$0	\$2,450,000	\$1,674,000
2012	\$0	\$0	\$2,078,000	\$1,290,000
2013	\$0	\$0	\$1,767,000	\$998,000
Totals (2004-07)		\$6,853,109		\$7,202,000
Totals (2004-13)		\$8,097,330		\$19,895,000
Efficiency Measures				
		Current		Projected
Net Present Value		\$349,297		\$11,798,000
Benefit Cost Ratio		1.05		2.46
Internal Rate of Return		5%		25%

By these measures of efficiency, based only on monetary impacts, the project has returned benefits in excess of costs (1.05 times costs) and earned a 5% rate of return on investment. When benefits are projected out to the year 2013, the project performs better because it continues to generate benefits with no additional cost. Benefits exceed costs by \$11.8 million and the rate of return on the investment rises to 25%.

The project is complex with many components. Unfortunately, the accounting was not detailed enough to determine benefit cost ratios for each component. Two estimates of benefit cost ratios from rainwater harvesting projects, however, suggest that the benefit cost ratios generated by the project are in line with other arid agricultural development projects. An analysis of rainwater harvesting structures in India produced benefit cost ratios of 0.41 to 1.33 (Goel,

2005) and a similar study in Tanzania produced ratios of 1.0 to 1.6 with IRRs of 0.31 to 0.57 over a ten-year time horizon¹⁸ (Senkondo, Msongi, Xavery, Lazaro, & Hatibu, 2004).

The cost benefit analysis includes only a subset of all possible costs and benefits. In particular, the analysis includes only those costs and benefits readily quantifiable in monetary terms. In terms of costs, the analysis includes financial costs but excludes costs external to the project such as social or environmental costs.¹⁹ In terms of benefits, the analysis includes only the direct benefits described in the “Impacts” chapter and not secondary benefits, increases in capital value, or non-monetary benefits.

The benefit cost ratio is not particularly sensitive to the decay rate assumed for livestock benefits because these benefits account for only a small portion of total benefits. However, the benefit cost ratio is sensitive to assumptions about how crop yields decline over time. Table 12 illustrates the impact of different assumptions about crop yield decline on the benefit cost ratio.

TABLE 12: SENSITIVITY OF BENEFIT COST RATIO TO DECAY IN CROP YIELDS

Annual rate of decay (%)	PV of costs (million \$)	PV of benefits (million \$)	Benefit cost ratio
0%	\$8.10	\$25.00	3.09
10%	\$8.10	\$21.90	2.7
20%	\$8.10	\$19.90	2.46
30%	\$8.10	\$18.50	2.28

Table 13 summarizes selected measures of project performance to date to facilitate comparison across projects on a number of dimensions.

¹⁸ The longer time horizon would inflate the IRR measure relative to the five-year time horizon of the current analysis.

¹⁹ This particular project does not generate many environmental costs. As an example of such a cost, however, consider an agricultural development project that converts a wetland to farmland. A full accounting of costs would include the lost environmental or ecosystem benefits associated with the wetland. The project, however, does not bear these costs so they are not often included in a cost benefit analysis. Cost benefit analyses often treat external social costs in a similar manner.

TABLE 13: SUMMARY OF EFFICIENCY MEASURES AS OF DECEMBER 2007

MEASURE	VALUE
Present value of project costs	\$6.8 million
Present value of benefits	\$7.2 million
Net present value	\$0.3 million
Internal rate of return	5%
Benefit cost ratio	1.05
Annual cost per beneficiary household	\$756
Number of direct beneficiaries	3,813 households and 30,500 individuals
Average annual benefit/beneficiary	\$850 per household
Benefit as % of average annual income	23%

Comparison of expenditures across projects can provide some measure of the relative efficiency of a project. In particular, a project that spends a greater percentage of its budget on actual project outputs than another spends its resources more efficiently in terms of producing outputs. Figure 13 summarizes the breakdown of project costs across six categories. The figure shows costs against the entire project budget that includes both a GoP contribution and community cost share contributions. Two categories (i.e., local labor and outputs and activities) accounted for 56% of project expenditures. Remaining expenses were about evenly split between ex-pat labor outside of Pakistan, ex-pat labor in Pakistan, other direct costs outside Pakistan, and other direct costs inside Pakistan. The other evaluation reports contain similar figures for purposes of comparison.

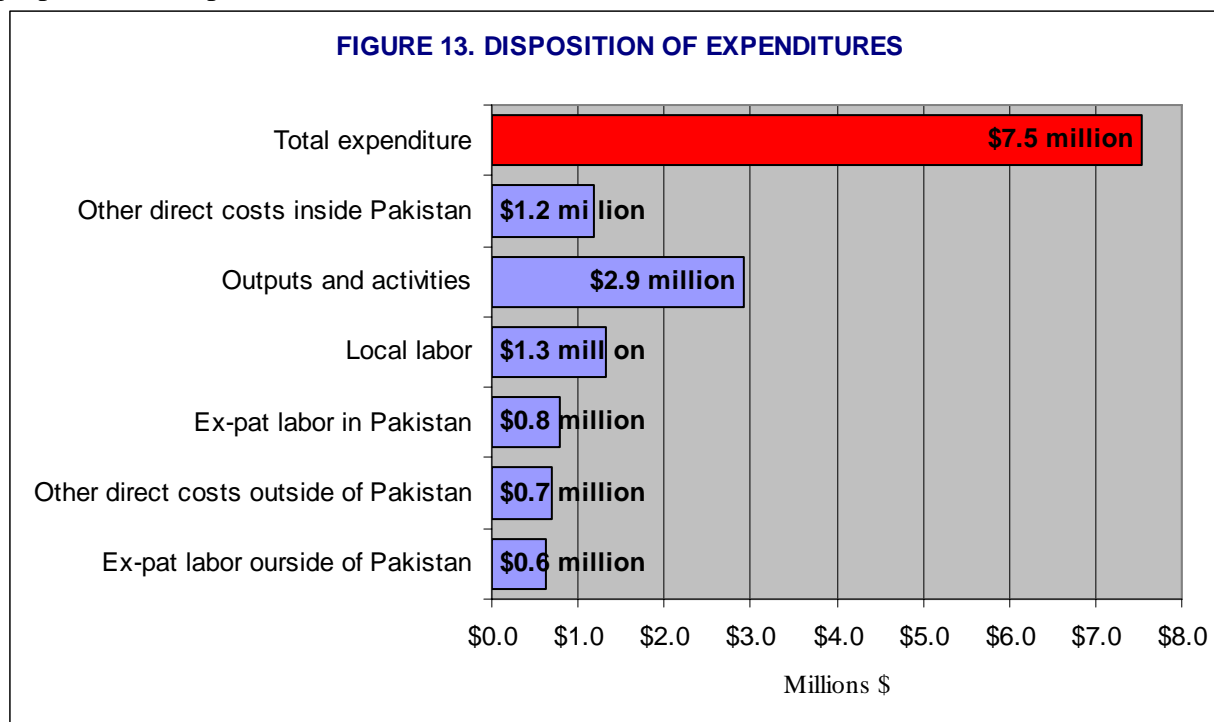
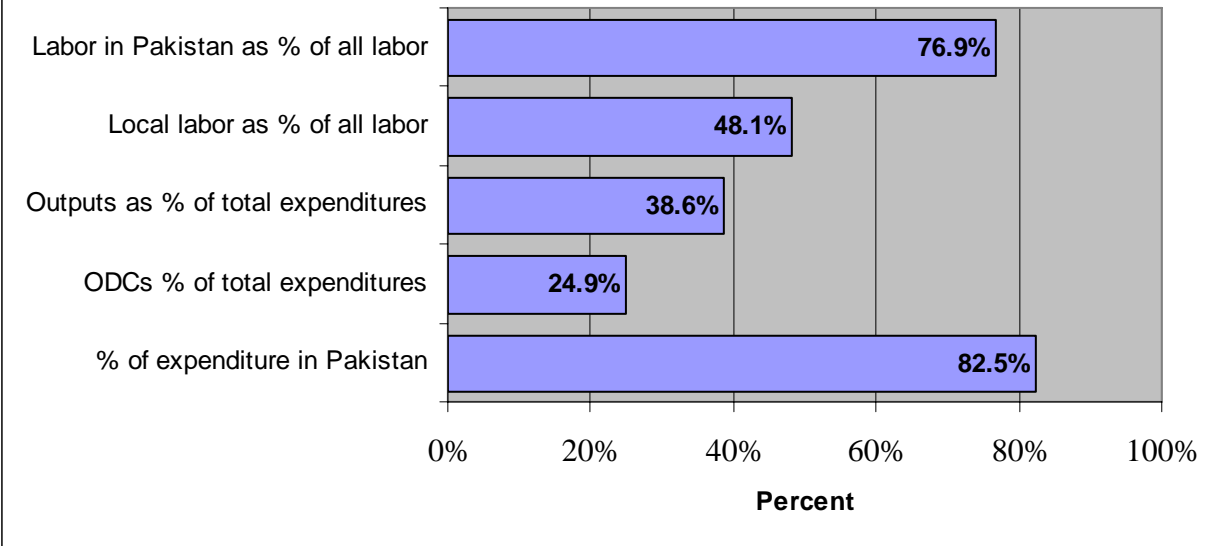


Figure 14 summarizes some standard cost ratios for comparison with other projects.

FIGURE 14. SELECTED EXPENDITURE RATIOS



The project incurred more than 80% of expenditures in Pakistan. Most of the labor expenditure occurred in Pakistan but a little more than half went to expatriate labor. The project spent well over one-third of its budget directly on outputs and activities. To the extent that other direct costs reflect administrative expenses, the project spent one-quarter of its budget on administration.

Sustainability

Evaluation question: Are the activities and results likely to be sustained after the project is completed?

CONCLUSIONS

- It is too early to tell whether the project's activities will ultimately be sustainable. The project's focus on embedding knowledge in individuals and communities; establishing linkages to the private sector; and adapting research to the technological, economic, and cultural context of Balochistan should improve the prospects for sustainability.
- Many of the COs are likely too new and immature to be sustainable without further project support.
- The project's training and hands-on experience has enhanced the research capacity of some individual scientists in AZRC and ARI. Circumstances largely beyond the control of the project (e.g. government support, education, improvements in the security situation) will likely affect whether the enhanced capacity of the scientists will translate to long-term increased capacity in the institutions themselves.

Findings

In the context of a mid-term evaluation, it is not possible to say whether the project is sustainable or not. Instead, the team investigated the conditions necessary for sustainability and whether the project is effectively addressing those issues. There are two dimensions to sustainability. The first is the issue of whether the project's on-farm interventions (i.e., crop enhancement, water management, livestock management) will continue to generate benefits for communities beyond the end of the project. The second is whether the project's institutional interventions (i.e., establishing community organizations and enhancing research and extension capacity) have created COs that will continue their functions without the project and effectively institutionalized enhanced research and extension capacity in the agricultural research institutions. This section first reviews the sustainability of on-farm interventions and then turns its attention to the sustainability of institutional interventions.

The project staff described strategies designed to foster the sustainability of on-farm interventions. These include:

- **Embedding knowledge and building human capacity**
The project embeds skills and knowledge in communities by training community members in improved agricultural practices, basic animal health diagnosis and treatment, and CO management skills.
- **Creating linkages to the private sector and harnessing private markets**
For example, the project proved the efficacy of improved animal feed rations in increasing weight gain and lambing success. The ration was not readily available locally; however, because of the demand created by the project, some local feed stores now carry it and a feed supplier has opened a branch in Pishin District. In another example, the project is testing portable seed cleaning machines on the IRSs and is establishing them as

the basis for private seed enterprises within the communities. A locally available supply of high quality seed is critical to sustainability of the crop interventions.

- **Adapting interventions to the cultural, economic, and technological context**
For example, one of the wheat varieties that performed well in trials was not accepted by communities because bread made from the grain was less palatable than that made from other varieties. Similarly, the project's seed cleaning machines are not fully sustainable until parts, maintenance, and repair are available locally. This also applies to drip irrigation, protected agriculture tunnels, and egg incubators. In all of these cases, the project is working to develop locally sustainable technologies.
- **Providing durable infrastructure**
The project's investments in improving communities' durable infrastructure are producing sustainable improvements. Rehabilitated karez systems (20 communities), lined water tanks (7 communities), piped water conveyance (13 communities), flood protection/diversion structures (2 communities), and improved water harvesting structures (41 communities) will continue to function well beyond the project itself.
- **Requiring community contributions**
Communities must contribute 50% of the cost of interventions. This requirement fosters ownership and enhances prospects for sustainability.

Prospects for sustainability vary across the project's activities. Because water interventions are durable infrastructure, benefits from these interventions are largely sustainable and will suffer little deterioration within a ten-year time horizon. The sustainability of benefits associated with crop and livestock activities, however, depends largely on whether individuals and communities choose to continue the activities and whether inputs (i.e., seed, feed, medications) are available. Some activities are more likely sustainable because the project demonstrated the economic efficacy of the practices, established market-based mechanisms for input supply (e.g., community-based seed cleaning enterprises), and embedded skills in the communities (e.g., trained community animal health workers). Ultimately, though, the evaluation team cannot determine whether these interventions will be sustainable or not.

If on-farm interventions are sustainable, they will generate the end-of-project level of benefit beyond the end of the project. Sustainable institutional interventions, on the other hand, will drive continued growth in benefits as researchers continue to explore improved products and practices and COs seek to improve their lives outside the bounds of the project. All interviewees (6) who spoke to the issue of institutional sustainability mentioned, in some context, that long-term sustainability depends on one or both of the following:

- (1) Developing community organizations for whom the rationale for existence transcends the specific interests of the project
- (2) Institutionalizing project objectives in government to ensure long-term institutional support for agricultural research and extension.

It is difficult to judge the sustainability of COs while they are engaged in the project. During field visits, the evaluation team observed COs all along a spectrum of potential sustainability. For instance, two particularly mature COs (Ghousabad and Mehr Ali Zai) had demonstrated that they were sustainable. They had both been organized by other projects prior to the FAO project, so they were more mature than most COs interviewed. In both cases, the organizations had survived gaps between projects and had sought and obtained assistance (electricity, gas, schools, literacy centers, and street repair) from other sources. Three other COs

(Humaya, Sheik Umar, and Kuchi) were very new and had not yet participated in project interventions. The team member who facilitated the group interview noted that they had little to say about potential benefits of COs and that they lacked the confidence of members of more mature COs. The facilitator thought it unlikely that these COs had the skills to be sustainable at their current stage of development.

Six interviewees suggested that the sustainability of the research and extension components of the project depended largely on factors beyond the project's control. (These interviewees included senior staff at PARC; project managers; a senior project coordinator and policy analyst; and the Deputy Secretary (Development), Department of Agriculture and Cooperatives, Balochistan.) They spoke of two primary barriers to enhancing agricultural research and extension capacity in Balochistan: the province's isolation and the lack of government support for research. Because Balochistan is so isolated, scientists and administrators prefer not to be posted there. Administrators recounted the difficulty of attracting and retaining talented, upwardly mobile people in Balochistan. Within government, poor salaries and limited physical support for agricultural research limit the appeal to talented people. A recent reorganization of salary and incentive structures in agricultural research may address this barrier (Ahmad, 2007b).

The team interviewed a senior scientist who works for the IWMI housed within the AZRC. He believed the project has potential to address some of these barriers, at least in the area of promoting multidisciplinary applied research (Ahmad, 2007a). He states that:

“AZRC-ICARDA-FAO project has already started working on Programme approach, where integrated research sites have been established and the multidisciplinary team is involved in strategic research in operating systems. The experience is rewarding, where scientists started learning the issues of Sailaba and Khushkaba systems and issues faced by the farming community.”

“AZRC management and research team with the support of ICARDA have made a major breakthrough under this project and research experiences in the real-life situation can be used to re-organize AZRC research in an integrated and inter-disciplinary fashion.”

None of these interviewees believed the project could become fully sustainable in a four-year timeframe. Time is critical in building sustainable COs because of the time required to gain the communities' trust for productive engagement and knowledge transfer. The following quotes illustrate some of the challenges in gaining community trust.

“In 2005, Dr. Islam came from ICARDA with FAO people and explained the benefits of what they were doing. Initially we were suspicious as no one has helped us ever before. Initially we had 11 members, and now have 25, out of 45 households in the village.”
(*Focus Group participant in Lal Baig*)

“It is difficult to change the mentality of farmers. Earlier, they resisted new varieties, now they adopt it and apply it. Now they are on route to development.” (*President of Community Organization in Murtat Kallan*)

The project's crop expert described another example. He proposed using an herbicide to control a particularly destructive invasive weed. The landowner believed it was a US plot to poison his land and would not allow it. He did eventually allow the crop expert to spray weeds on unused land at the edge of the field. Several weeks later the weeds appeared dead. The farmer, however, was still suspicious and believed they would be back in the next season. When they did not reappear, he said it would be back in the next. A year and a half later, the farmer finally seems to trust the project's motives.

Agricultural research also takes a long time. The crop variety research is just now beginning to generate useable results. This is particularly true given the vagaries of the weather, the persistent drought, and the seasonal cycle of agriculture, which limits the rate at which field trials can be conducted.

Replication

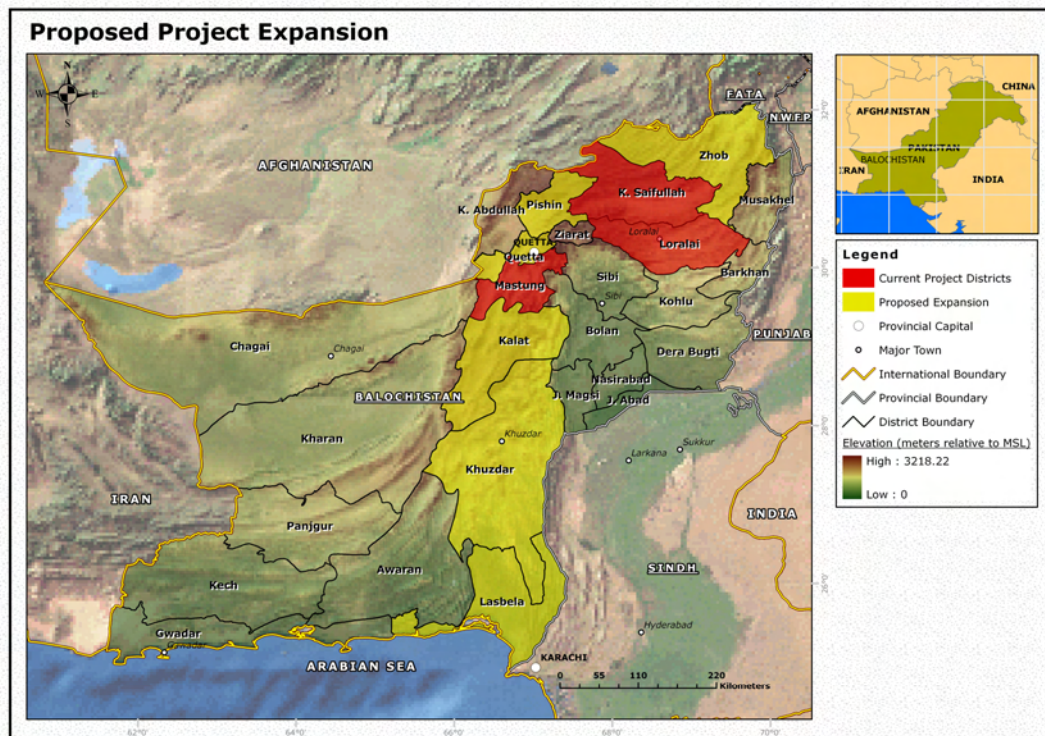
Evaluation question: To what extent can the activities and results of the project be replicated?

CONCLUSIONS

- The project includes plans for replication. Its activities and specific research results are directly applicable to regions with similar cultural and agro-ecological characteristics. These include the NWFP, FATA, and adjacent regions of Afghanistan.
- The project has demonstrated that it can develop improved agricultural technologies and practices and disseminate them to communities in the cultural environment of Balochistan. There is reason to expect that, given sufficient time and resources, the project can replicate the approach in similar regions.
- Limited human capacity in the form of the local experts in water, range, livestock, and crop management may be a barrier to substantial expansion.

Findings

The project document contains a clear plan for replication based on lessons learned during the pilot phase. If funding is available, implementing partners are eager to replicate the project. During interviews, representatives of the GoP and GoB strongly supported extension and replication of the project. These two entities have officially endorsed that proposal in the steering committee and in personal interviews with representatives. Specific plans propose replication in three more districts in Balochistan (Zhub, Khuzdar, and Lasbella) and the steering committee endorsed a proposal to expand it to an additional three districts (Quetta, Pishin, and Kalat). The map illustrates potential areas for replication.



According to the project director, replication will require additional technical experts to evaluate, design, and implement interventions at the community level. Replication would also require additional CDMFs to work directly with COs. The project director, and others, however, cited a key constraint in the shortage of qualified technical agricultural experts willing to work in Balochistan. In his experience, however, many good candidates are qualified for the CDMF positions.

While the project's activities and approach are directly applicable to the FATA, the tenuous security makes it particularly difficult for foreign personnel to work directly in the field. The local CDMFs and technical experts already perform most of the direct work with communities, but a foreign project director would likely have to play a smaller role in monitoring project activities in the field.

The project director believes that Peshawer may be a promising place in which to replicate the project. Peshawer has a premier agricultural university to provide a pool of agricultural researchers.²⁰ Peshawer would also provide the substantial and nearby market for agricultural commodities that is missing in much of Balochistan.

²⁰ An association with an agricultural university could also have the added benefit of contributing substantially to human capacity building. If the project engaged promising students it could build their capacity through interaction with experts (both national and international) and exposure to practical agricultural research. Professional interaction with inspired and knowledgeable experts in a real-world research environment can be an important motivating factor in the training of promising students and researchers.

Findings on Cross-Cutting Questions

Gender

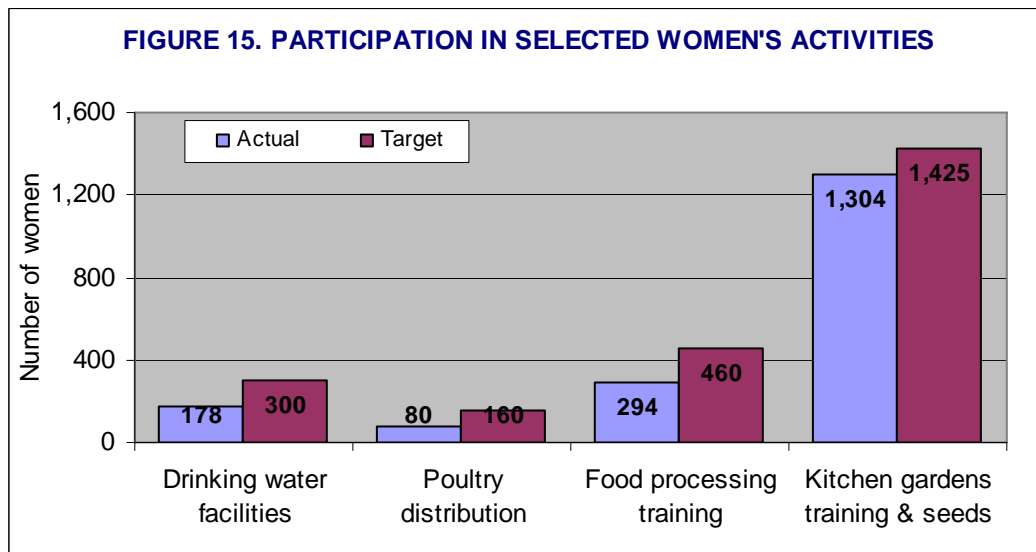
Evaluation question: To what extent has the project benefited women?

CONCLUSIONS

- The project has generated few direct measurable monetary impacts for women (\$6,000). It has, however, generated substantial improvements in household income, which may benefit women as members of the households.
- Given the difficulty in engaging women directly in agricultural activities in Balochistan, the project set ambitious targets for women's involvement (as participants/beneficiaries, and as employees) and has met or exceeded those targets.
- Limited evidence suggests that the project is empowering some WCOs.

Findings

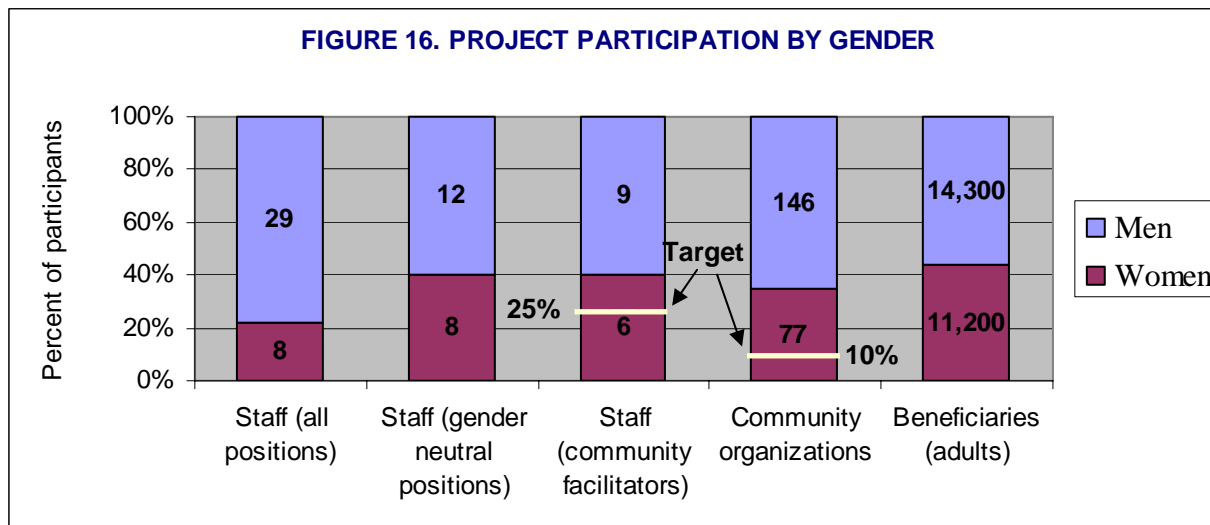
Opportunities to engage women directly in agricultural activities are limited, particularly in the conservative culture of Balochistan. The baseline survey found that women play a very limited role in cropping activities and a somewhat larger role in livestock (Sharif et al., 2007). Women's roles in livestock are confined largely to activities that take place at the home (i.e., stall feeding, watering, milking, animal health care, shed cleaning, and making dung cakes). In one community, women reported making lassi, yoghurt, butter, ghee, and other dairy products in the home year-round. Poultry and egg production was one of the few activities in which women maintained exclusive control over income. Figure 15 summarizes participation in selected activities designed specifically to engage and benefit women. The marketing component, which is just getting underway, is developing additional activities specifically for women (Vinning, 2007).



Seven drinking water facilities (affecting 178 households) particularly affect women. Because women are responsible for collecting water for household use, they directly benefit from

drinking water projects that locate a water source closer to the home. The baseline survey estimated that ten percent of project area households live more than a kilometer from their source of drinking water. In the project communities, this represents over 300 households and 2,400 individuals not counting indirect beneficiaries.²¹ The aggregate impact from drinking water interventions is thus potentially quite large.

The project document also established targets for forming women’s community organizations (10% of all COs) and hiring female CDMFs (25%). With 77 women’s COs (35% of the total) and 6 female CDMFs (40% of the total), the project has exceeded both targets. Figure 16 summarizes some of the project’s engagement of women.



The project employs 29 full-time staff, 8 of whom are women. Given the realities of the culture, women can’t be effective in positions of drivers or technical experts, which are nine of the available positions. So, women fill 8 of the 20 positions (40%) available to them. The project also employs three consultants, one of whom is a Pakistani woman.

Six of the eight full-time female employees are CDMFs who work in the district offices and directly with communities. All are young women with positions of responsibility who are living and working relatively independent of family supervision. They have all received training in community development, agriculture, and marketing. The project director has noticed marked improvement in their skills and believes the capacity building of the CDMFs is an important impact of the project. A USAID staff person who visited the project was also very impressed with the professional development of the CDMFs, and the female CDMFs in particular.

The role of WCOs in empowering women is a potentially large, but difficult to quantify, benefit of the project. The following comments from interviews with WCO members illustrate the challenges and successes of empowering women.

“Muslim Bagh Tehsil is less conservative, girls are educated, and are even allowed to work. In Killa Saifullah, it is much more difficult, as women even hide from their men.

²¹ Indirect beneficiaries are households that are not part of a community organization but benefit from the intervention because they are in the same, or a nearby, community. Indirect benefits are especially relevant for water interventions because all households in the village will use a new water source.

So making COs is something very new.” (*Female community organization member, Umar Karez, Killa Saifullah District*)

“At first the women were even shy to talk to me, and did not want to go to each others’ houses to meet. Now they even go to other villages and already they have Rs. 2,000 savings in 5-6 months. The teacher, who is also the president, now also went to the bank to open the account. This is a big achievement! (*Female Community Development and Market Facilitator discussing the women’s community organization at Khazima, Mastung District*)

Because interaction with women in agricultural activities is limited, the project has branched out beyond traditional agricultural interventions to assist some WCOs. The project helped establish a sewing center and a women’s community center in at least one CO, provided literacy training, and assisted at least one WCO in finding markets for embroidery. The following quote describes the project’s activities with women in one community.

“The women got together and identified the need for a center, and the CDMF helped them set it up. People volunteered to give a room for a literacy center and one for an embroidery center.” (*Structured interview participant from Ghousabad, Mastung District*)

Recognizing that women have fewer resources than men, the project requires only a 25% cost share from WCOs as opposed to a 50% share from men’s community organizations (MCOs).

The project director’s back to office report from a field visit in November, 2006 documents an unintended benefit of the seed cleaning enterprise. He wrote that “a major unforeseen benefit has been the reduction in tedious labor for women and children who traditionally hand picked over all seed prior to sowing in an attempt to remove small, broken and diseased grains.”

Reporting

Evaluation question: Have the prime contractors and grantees reported on time and in a useful manner?

CONCLUSIONS

- The project has delivered all required reports on time.
- The quarterly reports, which represent USAID's primary instrument for monitoring the project, do not meet USAID's information needs. The reports are too long and detailed for a very limited USAID EG staff (one US direct hire and one FSN) to read carefully. The quarterly reports also pose a substantial, and unplanned, burden on project resources. Resolving reporting requirements could better serve both parties.
- Project staff made a good-faith effort to comply with branding requirements in reporting. The project has branded all but its first quarterly report. The project staff responded promptly and appropriately to USAID guidance on branding.

Findings

According to both the project director and USAID personnel, the project has delivered all the required reports on time. Except for the first quarterly report, all reviewed reports contained the USAID brand and seal, though not always the correct version. The project's administrative officer in charge of reporting said that USAID did not inform project personnel of branding requirements at the beginning of the project. Consequently, project staff branded reports but not with the correct seal, branding, or colors. After USAID invited the project's administrative officer to Islamabad for a branding workshop in late 2006, all reports since early 2007 are branded appropriately.

The project document that defines the agreement between USAID and the FAO does not require quarterly reports. Nevertheless, the project provides quarterly reports, although the project staff experiences this as an unanticipated burden. The project director estimates that reporting requirements, of which the quarterly report is a substantial component, consume about 25% of his administrative staff's time. Data on communities and interventions are a key input to reports. The project has developed a management information system (MIS) to track activities, but data on interventions is not fed into the MIS in a timely manner. The project staff had to make a substantial effort to update MIS data on interventions to support the evaluation.

At least recently, reports have not been particularly useful to USAID as a management tool. The project director and USAID staff both recounted that USAID found the initial quarterly reports to be too technical. USAID suggested a narrative style that focused more on impacts. Project staff revised the report format, but USAID personnel still find the reports to be too long and complex to be useful for project management given the limited staff time available. From a management perspective, the individual at USAID who reviewed the reports desired a concise (6-8 page) report that employed tables and graphics to summarize project outputs, impact, contribution to USAID objectives, innovations, and problems encountered or lessons learned. No further dialogue has taken place between USAID and FAO to find a suitable reporting format.

Communications and Outreach

Evaluation question: How effective has the project been in getting its story out?

CONCLUSIONS

- The project effectively promoted USAID’s involvement in the project. Most of the project communications give credit to USAID. Publicly distributed material contains the USAID logo. Most importantly, all 25 COs that participated in group interviews knew of USAID’s involvement in the project, even though they did not always know what USAID was.
- The project design did not incorporate a true public relations component. Consequently, the project has not been particularly effective at promoting its successes to a broad audience. The project’s isolation, however, makes effective promotion particularly important if it is to get its story out to policy makers and the general public.
- The project’s communications strategy does not address USAID’s desire for documenting success stories and framing project impacts in a human context. In fact, USAID has written the only success stories about the project.

Findings

The project’s communications and public awareness activities have focused almost exclusively on the project’s needs to disseminate educational messages and publicize project-oriented activities. The 2005 and 2006 workplans describe public awareness activities that include radio and television talk shows, press releases, pamphlets, brochures, workshops, seminars, and demonstration projects. Advancing the project’s educational or publicity objectives was the stated rationale for all these activities. The first mention of a broader communication strategy appears in the 2007 workplan that mentions documenting and publicizing success stories, but only in the context of its “[critical importance] to replication of successful interventions” and not for the purpose of promoting the project or USAID. In fact, USAID has written the only success stories about the project. The following table lists specific communications and outreach activities to date. All address the project’s need to educate or communicate about its activities.

ACTIVITY	NUMBER
Marketing videos	2
Water efficiency awareness campaigns	2
Brochures, leaflets, posters produced	4
Radio programs	30
Newspaper notices/articles	14

The project has promoted USAID in a positive light to more than 3,800 households and 30,000 individuals directly. Each of the 25 COs interviewed by the evaluation team knew of USAID’s involvement in the project, although they did not always know what USAID meant. Each of the COs also expressed appreciation for the project’s efforts to improve their livelihoods. The team collected no direct evidence that the project has changed perceptions of the United

States among participants. A CDMF reported that there is anti-American sentiment in the region and that some communities, and individuals within participating communities, have refused to work with the project because of its association with the United States.

The project has placed the USAID brand on its activities and promotional material to the extent appropriate in the Balochistan environment. While nobody intimately familiar with the details of the project's beginning is readily available for interviews now, the project director and USAID personnel believe that the project was exempt from strict adherence to some branding guidelines because of the political environment in which it works. In particular, the project does not display the USAID brand at participating communities. The project allegedly brands a limited number of infrastructure interventions in the field. The evaluation team, however, observed no branding in the 26 sites it visited.

While the project maintains a low profile with respect to USAID branding in the field, the project does consistently brand its publications, presentations, posters, and public events. The only exceptions noted during field visits and document review were two presentations given at district field offices. These presentations contained the USAID logo without the "From the American People" logo.

Coordination

Evaluation question: How effectively has the project coordinated with other parties?

CONCLUSIONS

- The project maintains close contact with national and provincial government counterparts. There is little evidence, however, that the project coordinates with GoB or GoP programs and initiatives.
- Effective coordination with government officials in Balochistan has been difficult because of the high turnover rate in government positions. The high rate of turnover inhibits coordination to the extent that interests and priorities change and it takes time to re-establish working relationships.
- There is no evident coordination between the project activities and other US Government projects or with USAID's other Economic Growth projects. The team found evidence of only limited coordination with other donor organizations and NGOs active in Balochistan.

Findings

The project maintains close relationships with key representatives of the Governments of Pakistan and Balochistan. Key representatives from both governments interact with the project as members of the steering committee and as advisors. Additionally, representatives of both governments participated in project design. The project director meets periodically with the Secretary Agriculture Balochistan to discuss the project. He also maintains periodic contact with government partners in Islamabad. In ten trips to Islamabad during 2006 and 2007, he met three times with representatives from MINFAL and once with representatives from PARC.

In spite of maintaining contact with key government partners, the team found little evidence of direct coordination between the project and GoB or GoP initiatives or programs, other donor programs, or other USAID/EG projects. In the project's first year, the project director explored opportunities for collaboration with other projects and programs. Few of these efforts, however, led to actual collaboration. The project established agreements with the Strengthening Livestock Services Project (funded by the EU) and with the UNDP/ADP. The latter agreement was not to work in the same communities. Organizers feared that the UNDP/ADP's lower cost-sharing requirements for some overlapping activities would confuse COs. Other examples of attempts at coordination include:

- The project met with Khushhali Bank in Quetta to explore coordination in helping COs establish savings accounts. No collaboration has yet occurred.
- The project director recently met with Marilee Kane of the USAID earthquake program to develop synergies between their marketing initiatives and share experiences on gender-specific activities. No collaboration has yet occurred.
- The project director met with Mr. Warren Weinstein of PISDAC to explore opportunities for collaboration between the project and PISDAC activities in horticulture. No collaboration has yet occurred.

- The FAO presence in Balochistan also helped facilitate a rapid and more effective FAO response to the recent floods.

Frequent turnover in government positions inhibits the project's ability to coordinate with government, especially at the provincial level. Interests and priorities change, and then the project needs time to reestablish working relationships. For example, during the past three years, three different individuals have held the office of Secretary Agriculture Balochistan. The project director is now in the process of establishing a working relationship with the new Secretary, but the process has taken several months so far (by the date of final editing of this report, that Secretary too had moved on). The previous Secretary was very engaged in the project and very interested in exploring opportunities for coordination and synergies. As the Secretary Agriculture Balochistan, he was the provincial focal point for the project and had a particular interest in coordinating the project with other government and donor activities. In an interview, he spoke of the importance of coordination and its potential to leverage project successes. The project director is uncertain whether the new secretary will continue to engage with the project so closely.

Summary of Conclusions

Project-Specific Questions and Conclusions

- In what ways has the project improved the capacity of Government research institutions?
See conclusions on effectiveness.
- Have the improved agricultural practices been incorporated by the farmers and what has been the impact?

Farmers have incorporated improved agricultural technologies and practices as a result of the project. Each project intervention represents an instance of a community adopting improved agricultural practices. Tables B2 through B4 in Annex B summarize the number of interventions to date. In the crops component, however, the improved practices were not those developed by the applied research component because testing of a few promising varieties is just now concluding and it will take time to multiply the seeds. Some farmers were initially suspicious of suggested interventions but many have adopted the improved practices after seeing successful demonstrations. The interventions have almost always increased agricultural productivity, which improves incomes and food security for beneficiaries. The evaluation team learned of a few instances where the interventions did not benefit farmers (e.g., Bakhar wheat that did not produce well in unusually dry conditions in two COs in Mastung District and two cases where dikes were destroyed by unprecedented flooding).

- Has the program achieved sufficient progress to be self sustaining or is continued USAID assistance required?
See conclusions on sustainability.
- Can these practices be replicated in other areas (such as FATA) with similar socio-economic or geographic features?
See conclusions on replication.

Conclusions by Evaluation Question

Relevance

- The project approach and activities are well suited to the problem of poverty alleviation in Balochistan. A number of experienced donor agencies (i.e., World Bank, UNDP, IWRM) conclude that the project focus on agriculture, research, and extension are relevant to rural poverty alleviation in Pakistan.
- The speed of the design process precluded a fully participatory approach. Nevertheless, the process engaged most important stakeholders. Although the process did not explicitly engage beneficiaries or women, other stakeholders with extensive experience working with community development and agriculture in Balochistan appear to have adequately represented those interests.

- The project's speed of design, scope, and geographic focus appear to reflect USAID's interest in establishing a visible presence quickly among rural people in a strategically important region of Pakistan.
- Key stakeholders and beneficiaries have remained actively involved in project implementation.
- The project is designed to work directly with ultimate beneficiaries. It helps them identify needs and adapts interventions to address those needs. Beneficiaries are thus directly involved in identifying, designing, and implementing interventions.

Effectiveness

- In applied research and on farms, the project has met or exceeded the technical targets of improving cereal crop and livestock production by 10% and on-farm water use efficiency by 40%.
- The project has increased average household income by 23%, average household cereal yield by 35%, and average livestock yield (for the 12,075 animals treated) by 21%.
- The project is likely to meet its targets for establishing COs. It has been slow in doing so, however, and many are too immature to have implemented interventions. For that reason, and because the project lacks the human capacity to manage so many communities, it is unlikely to meet its targets for implementing interventions. The result is that project benefits are unevenly distributed over COs. For example, the project has not yet implemented interventions in 38 (16%) of the COs.
- The project has actively engaged scientists from AZRC and ARI in applied research and enhanced their research skills and capacity. By extension, this has enhanced the capacity of the research institutions in Balochistan.
- Three of five key indicators of project objectives are not well stated.

Impact

- The project has affected, directly and indirectly, an estimated 6,629 households (53,000 individuals). The project has worked directly with 3,813 households (an estimated 30,500 individuals). An additional 2,816 households (22,500 individuals) who live in project communities but have not joined the COs have benefited indirectly. Beneficiaries are in the largely Pashtun and Brahvi districts of Mastung, Loralai, and Killa Saifullah in the politically strategically important region of Pakistan along the Afghanistan border.
- Project interventions have increased average (as measured across all participating households) annual household income by an estimated 23%. Monetary benefits, however, accrue largely to the 83% of participating households that are members of the COs where interventions have been applied.
- Monetary impacts attributable to the project to date (one year before the project ends) total an estimated \$6.9 million in direct monetary benefits, \$0.2 million in secondary monetary impacts, and \$0.5 million in durable capital improvements.
- It has proven difficult to engage women directly in agriculturally-oriented interventions and direct economic benefits to women have been very limited: an estimated \$6,000.

Efficiency

- Efficiency is a relative concept. Furthermore, measures of efficiency based purely on comparison of monetary measures are partial because they do not capture all project

benefits. Nevertheless, using conservative benefit estimates, the project has generated monetary benefits in excess of costs (benefit cost ratio of 1.5) and generated a positive rate of return (IRR of 5%).

- From a cost effectiveness perspective, the project has directly affected the livelihoods of about 3,200 households (total CO members minus households that have not yet experienced monetary impacts) at a per household cost of about \$756 per year.
- In terms of other measures of efficiency, the project has spent about 83% of its resources in Pakistan, about 36% on labor, and about 39% directly on outputs.

Sustainability

- It is too early to tell whether the project's activities will ultimately be sustainable. The project's focus on embedding knowledge in individuals and communities; establishing linkages to the private sector; and adapting research to the technological, economic, and cultural context of Balochistan should improve the prospects for sustainability.
- Many of the COs are likely too new and immature to be sustainable without further project support.
- The project's training and hands-on experience has enhanced the research capacity of some individual scientists in AZRC and ARI. Circumstances largely beyond the control of the project (e.g, government support, education, improvements in the security situation) will likely affect whether the enhanced capacity of the scientists will translate to long-term increased capacity in the institutions themselves.

Replication

- The project includes plans for replication. Its activities and specific research results are directly applicable to regions with similar cultural and agro-ecological characteristics. These include the NWFP, FATA, and adjacent regions of Afghanistan.
- The project has demonstrated that it can develop improved agricultural technologies and practices and disseminate them to communities in the cultural environment of Balochistan. There is no reason to expect that, given sufficient time and resources, it can't replicate the approach in similar regions.
- Limited human capacity in the form of the local experts in water, range, livestock, and crop management may be a barrier to substantial expansion.

Gender

- The project has generated few direct monetary impacts for women (\$6,000). It has, however, generated substantial improvements in household income, which may benefit women as members of the households.
- Given the difficulty in engaging women directly in agricultural activities in Balochistan, the project set ambitious targets for women's involvement (as participants/beneficiaries, and as employees) and has met or exceeded those targets.
- Limited evidence suggests that the project is empowering some WCOs.

Reporting

- The project has delivered all required reports on time.
- The quarterly reports, which represent USAID's primary instrument for monitoring the project, do not meet USAID's information needs. The reports are too long and detailed

for a very limited USAID EG staff (one US direct hire and one FSN) to read carefully. The quarterly reports also pose a substantial, and unplanned, burden on project resources. Resolving reporting requirements could better serve both parties.

- Project staff made a good-faith effort to comply with branding requirements in reporting. In spite of limited initial guidance from USAID, the project has branded all but its first quarterly report. The project staff responded promptly and appropriately to USAID guidance on branding.

Communications and Outreach

- The project effectively promoted USAID's involvement in the project. Most of the project communications give credit to USAID. Publicly distributed material contains the USAID logo. Most importantly, all 25 COs that participated in group interviews knew of USAID's involvement in the project, even though they did not always know what USAID meant.
- The project design did not incorporate a true communications and outreach component. Consequently, the project has not been particularly effective at promoting its successes to a broad audience. The project's isolation, however, makes effective promotion particularly important if it is to get its story out to policy makers and the general public.
- The project's communications strategy does not address USAID's desire for documenting success stories and framing project impacts in a human context. In fact, USAID has written the only success stories about the project.

Coordination

- The project maintains close contact with national and provincial government counterparts. There is little evidence, however, that the project coordinates with GoB or GoP programs and initiatives.
- Effective coordination with government officials in Balochistan has been difficult because of the high turnover rate in government positions. The high rate of turnover inhibits coordination to the extent that interests and priorities change and it takes time to re-establish working relationships.
- There is no evident coordination between the project activities and other US Government projects or with USAID's other Economic Growth projects. The team found evidence of only limited coordination with other donor organizations and NGOs active in Balochistan.

Recommendations

Relevance

Include beneficiaries in design of any follow-up project.

Potential beneficiaries were not included in the design of the pilot project. Now, however, the project can use the established relationships with COs in the pilot phase and involve beneficiaries in the design of any follow-up project. For example, the project could request that the CDMFs engage the communities in a structured evaluation of the pilot phase (what has worked and what has not), a formal assessment and prioritization of needs (not necessarily restricted to agriculture), and an appraisal of the efficacy and relevance of existing and potential interventions.

Effectiveness

Increase emphasis on irrigated agriculture.

In spite of its focus on arid agriculture, an estimated \$135,446 of \$216,981 (62%) of current water intervention benefits and \$2.7 million of \$3.7 million (74%) of current crop benefits came from interventions in irrigated agriculture. Although arid agriculture is important to project community households (more so than for other households), it has relatively little impact on household livelihoods because it is so much less productive than irrigated land. A focus on improving the productivity of irrigated agriculture and improving water use efficiency may be the most appropriate way to affect livelihoods.

Assess research capacity.

A key objective of the project is to enhance the research capacity of AZRC and ARI. It is difficult to assess changes in human capacity. A periodic survey of agricultural scientists (including a baseline) would have greatly enhanced the ability to assess impacts. If the project continues beyond the pilot with the same objectives, it should develop and apply an instrument to assess research capacity.

Establish a new baseline for any new phase.

If the project is extended beyond the pilot it should conduct another baseline survey. The survey should be specifically designed to assess project impacts in terms of the objectives of the new project. An update of the existing baseline survey, expanded into regions where the follow-up would be implemented, could serve the dual purpose of identifying the impacts of the current project and establishing the baseline for a follow-up.

Set more realistic targets.

If the project is extended beyond the pilot, designers should pay careful attention to setting realistic targets. The current project is likely to miss many of its targets for interventions. There are two possible reasons: (1) it took longer than expected for the project to establish COs and for the applied research component to ready improved technologies and practices for application and (2) the project may not have had the human capacity to work with so many COs in designing and implementing interventions. Targets in a follow-up project need to recognize and account for these constraints.

Narrow the scope of any future project.

As a pilot, the current project included many activities that have subsequently been dropped, either implicitly or explicitly. If the project is extended beyond the pilot, designers should pay careful attention to what worked in the pilot and what did not and narrow the scope of project activities to those that best match its expertise and where it can have the greatest impact.

Design better indicators.

Many key indicators in the current project were poorly designed. If the project is extended beyond the pilot phase, designers should pay more attention to designing good indicators. Good indicators should be *direct* measures of the result; *objective* and unambiguous; *adequate* in number and scope to measure the result; *quantitative*, when possible; *disaggregated*, when appropriate; *practical* in terms of data collection, and based on *reliable* data.

Impact

Expand the scope of benefits.

The project's monetary impacts accrued to only a portion of the participating communities. The timing of establishing COs and guiding them through the process required to implement an intervention may have contributed to the uneven distribution of benefits. While some unevenness in the distribution of benefits is unavoidable, in its remaining year, the project should focus on expanding the scope of benefits. If the project is extended beyond the pilot, it should pay attention to distributing benefits as broadly as possible.

Design data collection activities to support impact analysis.

Better tracking of interventions to validate impacts would greatly improve the accuracy of impact estimates. The impact model used in this evaluation required many assumptions about how interventions actually affected communities. Routine and systematic monitoring of interventions would have substantially improved the reliability of the impact model and generated better information about how interventions affect agricultural production – information that could contribute to improving future interventions.

Develop an impact model and ensure that the MIS contains the data necessary to implement the model.

The impact model developed for the evaluation, while only partial, is nevertheless very informative about the relative value of interventions. A similar model could contribute substantially to formative evaluation of the project in its remaining year and, more importantly, to any extension of the project beyond the pilot phase. To realize this potential, the project's MIS will need to be developed to support the data requirements of the impact model and the timeliness of data collection and entry will need to be improved.

Sustainability

Establish COs more quickly.

If the project is extended beyond the pilot phase, it should set targets for establishing COs that it can achieve early in the project. It accomplishes little to establish COs late in the

project with insufficient time remaining to either implement interventions or to bring the COs to a point where they will be sustainable beyond the end of the project.

Replication

Address constraints to replication.

Two of the main constraints to replication appear to be additional human capacity in the form of local experts in crops, water, and livestock and the potential difficulties of expanding into less secure areas. The project's plans for replication should explicitly address these issues. Can it ensure adequate human capacity to support replication? What adjustments to the process will be necessary to expand into less secure environments?

Gender

Track extra-project activities of WCOs.

The project has assisted WCOs in activities not envisioned in the project document (e.g., literacy centers, embroidery). To the extent that the project engages in these extra-project activities, it should formally document the activities in the project MIS to facilitate reporting.

Exploit linkages to other projects or organizations to benefit women.

Opportunities to benefit women directly through agriculturally-oriented interventions are limited. The project may be able to enhance its impact on women by leveraging the relationship already developed with WCOs. to introduce other projects or activities with expertise in addressing needs expressed by women. For example, some WCOs expressed an interest in embroidery. The project might explore developing a link to the USAID-funded "Behind the Veil" women's embroidery project to benefit from that project's capacity and expertise. Many such opportunities are likely to exist and CDMFs would have to actively pursue linkages to other projects, programs, and initiatives of the public, private, and non-profit sectors that might enhance the project's capacity to empower women.

Reporting

Establish a quarterly report format that better meets the needs of USAID.

The current quarterly report does not meet USAID information needs and imposes a large burden on project staff. The project director should work with USAID to improve the report format to better serve both parties.

Develop the project's MIS and establish and enforce procedures for maintaining it.

The project's MIS appears well designed to serve administrative needs. If enhanced and maintained, the MIS could contribute substantially to reporting and impact assessment. The project should evaluate the existing MIS to ensure that it includes the information necessary for reporting and implement procedures for timely entry of data.

Communications and Outreach

Place greater emphasis on communications and outreach.

The project has not been effective in promoting its successes. Balochistan's geographic isolation, however, makes a communications and outreach component critical to project recognition. The project should develop an effective communications and outreach capability if it desires broader recognition for its accomplishments.

Increase awareness of USAID.

The project has done well in promoting USAID as the source of project funding. Some communities, although they were aware of USAID involvement, did not know what USAID was. A visible and beneficial presence in the region is a key element of USAID's strategy. Within the constraints of the local political environment, the project should ensure that beneficiaries know the funding comes from the American people. The project could contribute to assessing progress in this area by including measures of beneficiaries' perceptions of the US in baseline and follow-up surveys.

Coordination

Exploit the relationships the project has built to introduce other types of interventions.

The project has not coordinated particularly well with other projects, programs, and initiatives. There is substantial potential in such coordination, however, and the project could make a greater effort to develop and leverage such connections. For example, the project has developed working relationships with a large number of communities in a strategically important region of Pakistan. These COs provide an opportunity to introduce other, non-agricultural, interventions that address issues of importance to USAID (e.g., women's empowerment, health, or education). Interaction of other projects or activities with the COs puts the FAO's hard work and success at risk. Project staff may, understandably, wish to keep close control of such interactions. Synergies will also have to be carefully managed so they don't compromise the ongoing work of the FAO project.

Lessons Learned

Align Project Objectives And USAID Objectives

USAID's desire for a broad and visible presence in the region may have contributed to an overly ambitious project that will ultimately not achieve many of its objectives for applying interventions. USAID must align various objectives in a project design to avoid compromising project performance.

Design For Impact Assessment

The project's extensive baseline (including both treatment and control groups) contributed substantially to the ability to estimate community level project impacts. If USAID desires impact assessment of its projects, it will be well served to require this level of attention to the data requirements of impact assessment of all its projects.

Coordinate Timing Of Project Activities

In this case, the initial project documents contained no timeline for establishing COs in the context of other activities. Established COs are a necessary condition for implementing project interventions. For any project, designers need to identify potential bottlenecks and schedule activities appropriately to achieve objectives.

Review Proposals For Well-Designed Indicators

The project contained several poorly designed indicators. Poorly designed indicators do not contribute to good project management. Evaluation of project proposals should include assessment of the quality of proposed indicators.

Use A Community Development Approach

The community development approach employed by the project has been an effective way to introduce improved agricultural practices and technologies to communities. Although this approach takes time to establish a relationship and trust, it has developed an effective platform for applying community-level interventions.

Next Steps

The recommendations cover issues at two different levels. Some relate to management and programmatic issues internal to USAID. Others are specific to project activities and the interaction between USAID and the project. The project has a year to go yet and there is ample opportunity to implement the project specific recommendations. The two types of issues require slightly different approaches. A possible course of action for methodically processing the evaluation results for improved performance is:

ACTIVITY	TIMEFRAME	RESPONSIBLE PERSON/OFFICE
Assign a person to review the recommendations of all eight evaluations and separate the recommendations into: (1) those that need to be handled internally within USAID, (2) those that need to be handled internally within EG, and (3) those that are project specific.	Immediately	USAID/EG
RECOMMENDATIONS INTERNAL TO USAID/EG		
Convene a meeting within USAID to review the recommendations that need to be handled internally within USAID. Use the meeting to: <ul style="list-style-type: none"> • Decide which recommendations to address and which to ignore. • Discuss how to address the recommendations deemed important. • Identify an individual or office responsible for implementing each recommendation. • Establish a timeframe for implementation. • Determine a process for tracking progress on implementation of each recommendation. 	Third priority after initial meeting	USAID/EG
Reconvene every six months (in whatever groups are appropriate) to review progress on implementation.	Six month intervals	USAID/EG
Convene a meeting within EG to review the recommendations that need to be handled within EG. Follow the procedures outlines above.	Second priority after initial meeting	USAID/EG
Reconvene every six months (in whatever groups are appropriate) to review progress on implementation.	Six month intervals	USAID/EG
RECOMMENDATIONS SPECIFIC TO THE PROJECT		
Convene a meeting between USAID, the Food Security/Poverty Alleviation in Arid Agriculture Balochistan Project director, and the FAO country representative to determine how to address the project specific recommendations. In the meeting: <ul style="list-style-type: none"> • Decide which recommendations to address and which to ignore. Consider which can contribute to project performance in the project's remaining year. • Determine how to implement the recommendations deemed important to address. • Establish a timeframe for implementation. • Define a process for tracking progress on implementation. 	First priority after initial meeting	EG FAO
Reconvene every month (in whatever groups are appropriate) to review progress on implementation.	One month intervals	EG FAO

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Annex A - Evaluation Activity Details

Contact List

Date Met	Last Name	First Name	Organization	Title	Address	Phone	Email
08/07, and other dates	Bhandara	Aazar	USAID	CTO/ Activity Manager		0321-512-2255 (M)	Abhandara@usa.gov
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9/11/07	Ali	Sayed Mohammed	Food and Agriculture Organization of the United Nations (FAO)	Assistant Representative	NARC Premises, Park Road, Chak Shahzad, P.O. Box 1476, Islamabad, Pakistan	92-51-925-5452	Mohammed. Ali@fao.org
9/11/07	Khalid	Naeem	National Agriculture Research Center (NARC)	Project director, Avian flu	National Reference Lab for Poultry Diseases (NRLPD), ASI, National Agriculture Research Centre, Park Road, Islamabad-45500	+51-9255029 0333-5177282 (M)	naeem22@isb.comsats.net.pk
9/11/07	Saleem Khan Jhagra	Mohammad	Ministry of Food and Livestock (MINFAL)	Additional Secretary		051-9202103	
9/12/07	Majid	Abdul	International Center for Agricultural Research in the Dry Areas (ICARDA)	Country Representative	ICARDA Country Office, National Agriculture Research Center, Park Road, Islamabad	92-51-9255178/9	karda@comsats.net.pk
9/12/07	Sharif	Muhammad	Social Sciences Institute, National Agricultural Research Centre (NARC)	Chief Scientific Officer/ Director	Park Road, Islamabad	92-51-9255052 0333-5742529 (M)	msharifcso_ssd@yahoo.com
9/18/07	Changezi	Qayyum Nazar	Planning & Development Department, Government of Balochistan	Additional Chief Secretary		081-9201052	

Date Met	Last Name	First Name	Organization	Title	Address	Phone	Email
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9/18/07	Baloch	Lafarullah	Livestock & Dairy Development Department, Government of Balochistan	Secretary		081-920-2243 0300-381-0013 (M)	
9/18/07	Durrani	Zulfigar	Planning & Development Department, Government of Balochistan	Chief of Section, Foreign Aid/PRSP		081-920-2723 0301-373-1725 (M)	
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Many	Awan	Aijaz Hussain	National Water Resource Management Expert	FAO		081-2000446 0300-8383913 (M)	
Many	Shah	Dr. Hakeem	National Crops Enhancement Expert	FAO		081-2000446 0300-8383912 (M)	
9/29/07	Islam	Dr. Mohammad	ICARDA	National Expert Research Component		081-2855010 0333-7805308 (M)	
9/20/07	Rasheed	Asif	FAO	Community Development & Marketing Facilitator (CDMF)	FAO, District Office Mastung	0843-895782	asif rasheed @fao.org.pk
9/21/07	Kasi	Mr. M. Azam	Livestock & Dairy Dev: Department, Government of Balochistan	Director General, Livestock & Dairy Development Department		081-9202564	
9/21/07	Riaz	Dr. Mohammad	Agriculture Department, Government of Balochistan	Director General, Agriculture Research		081-9211196	

Date Met	Last Name	First Name	Organization	Title	Address	Phone	Email
9/29/07	Khan	Mr. Hafeezullah	Agriculture Department, Government of Balochistan	Director Marketing Research			
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10/2/07	Gul	Agha Ahmed	University of Balochistan, Quetta	Vice Chancellor (Brigadier)		081-9211240	
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10/26/07	Ahmad	Anjum	The World Bank	Senior Private Sector Development Specialist	20-A, Shahrah-e-Jamhuriat, Ramna-5, (G-5/1), P.O. Box 1025, Islamabad	227-9641/6	aahmad2@worldbank.org

Date Met	Last Name	First Name	Organization	Title	Address	Phone	Email
9/29/07	Marri	Mr. Ghulam Mohuddin	Planning & Development Department, Government of Balochistan	Chief economist			
11/9/07	Awan	Javaid Iqbal	Ministry of Health	Joint Secretary Health, Former Secretary Agriculture Balochistan			
11/8/07	Vinning	Grant	FAO (consultant)	Marketing consultant			
11/12/07	Zia	Umm e	FAO (consultant)	Marketing consultant			
10/29/07	Qazi	Mr. Babar Raza	Pakistan Agriculture Research Council (PARC)	Director, AZRC	Brewery Road, P. O. Box 63, Quetta, Pakistan	92-81-853620	ahburiro@yahoo.com

Field Visits

Schedule of Focus Groups and Site Visits			
	Community	Date of visit	Activities
Mastung District	Ghousabad	Sept. 20, 2007	Site visit (crop & irrigation) Focus group w/ men Focus group w/ women
	Kandawa	Sept. 20, 2007	Focus group w/ women
	Khadi Karez	Sept. 20, 2007	Site visit (karez rehabilitation)
	Siddiqabad (IRS)	Sept. 20, 2007	Site visit (IRS research, water, crops, range, PAT) Focus group w/ men Focus group w/ women
	Faizabad	Sept. 21, 2007	Focus group w/ men
	Sohrabzai	Sept. 21, 2007	Focus group w/ men
	Killi Ghousabad	Sept. 21, 2007	Focus group w/ men
	Mehr Ali Zai	Sept. 21, 2007	Focus group w/ men
Killa Saifullah District	Shaik Umar Karez	Sept. 22, 2007	Site visit (karez rehabilitation) Focus group w/ women (3 COs)
	Khazina Karez	Sept. 22, 2007	Site visit (karez rehabilitation) Focus group w/ men Focus group w/ women
	Jadid Allozai (IRS)	Sept 23, 2007	Site visit (IRS research, seed cleaning, livestock, PAT)
	Shinki Karez	Sept. 23, 2007	Focus group w/ men
	Humaya	Sept 23, 2007	Site visit (land leveling, orchard) Focus group w/ men Focus group w/ women (2 COs)
	Chinalli	Sept. 23, 2007	Site visit (karez rehabilitation)
Loralai District	Kach Ahmaqzai	Sept. 23, 2007	Site visit (land leveling)
	Mahol Baloch Khan	Sept. 24, 2007	Site visit (drinking water)
	Shah Karez	Sept. 24, 2007	Site visit (water diversion)
	New Vialla	Sept. 24, 2007	Site visit (water storage)
	Dilli	Sept. 24, 2007	Site visit (water diversion, land leveling & dikes)
	Murtat Killian	Sept. 24, 2007	Site visit (orchard) Focus group w/ men
	Lal Baig (IRS)	Sept. 25, 2007	Site visit (IRS research, seed cleaning, orchard, livestock, weed control) Focus group w/ men
	Katoi Farm	Sept. 25, 2007	Site visit (orchard, nursery)
	Sirka Chin	Sept. 25, 2007	Site visit (weed control)
	Kuchi	Sept 25, 2007	Site visit (land leveling & dikes) Focus group w/ men (2 COs)
	Palri	Sept. 25, 2007	Focus group w/ men

Interview Guide

Community Development and Market Facilitators

1. How have stakeholders, and women in particular, been involved in project implementation?
2. What specific needs does the project address and for whom?
3. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
4. In practice, to what extent has the project has improved the efficiency of agricultural water use in participating communities?
5. In practice, to what extent has the project has improved range and livestock management in participating communities?
6. In practice, to what extent has the project has improved agricultural yields in participating communities?
7. In practice, to what extent has the project has supported women in participating communities?
8. Has the project increased incomes of participating households?
9. Has the project increased food security for participating households?
10. Has the project contributed in a positive way to the quality of life of the community?
11. Are there other impacts associated with the project?
12. How likely is it that the CO's will continue to function after the project is over?
13. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
14. How effective has the project been in highlighting success stories?
15. To what extent has the project influenced public perception regarding USAID or America?
16. How can the impact of communications and outreach be improved?
17. How effective has the project been in targeting women in their respective projects?
18. Is the project effectively empowering communities? Examples.
19. Is the process for engaging communities effective?
20. Has project staff gained the trust of communities?
21. Do communities believe their views are valued?

Interview Guide Donor Agencies

1. Does the project address a real need of communities and is the approach appropriate?
2. In practice, to what extent do you think the project has supported women in participating communities?
3. How could the project's impact on women be improved?
4. Has the project increased incomes of participating households?
5. Has the project increased food security for participating households?
6. Are there other impacts associated with the project?
7. Have the activities been implemented in a manner that focuses on sustainability?
8. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
9. To what extent have PR activities influenced public perception about USAID and America?
10. How can the impact of the communications and outreach be improved?
11. How effectively has the project coordinated with other donors and the Government of Pakistan?
12. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
13. What concrete steps should be taken to improve coordination and maximize synergies between future activities?

Interview Guide
Beneficiary Community Organizations

1. How has the community been involved in the project?
2. How were women involved in the project?
3. How has the project improved the efficiency of agricultural water use in the community?
 - a. Probe here to see how farmers used additional water. Did they plant more land or just use the water on the land they were already farming?
4. How has the project improved range and livestock management in the community?
 - a. Probe for details. What types of livestock and range management activities have been applied in the community? What have been the effects of those activities in detail?
5. How has the project improved agricultural yields in the community?
 - a. Probe for details. What types of crop production activities have been applied in the community? What have been the effects of those activities in detail?
6. How has the project supported women in the community? Explain.
7. Does your household have a greater income because of the project? How did the project increase your income?
8. Does your household have a greater quantity, quality, or diversity of food because of the project? How did the project increase food security?
9. Has the project affected your household or community in any other ways? Probe for responses. Probe for quantifiable and non-quantifiable benefits or impacts.
10. Add some questions about the impacts, if any, of having a community organization. I'd like to know if having the organization has allowed the community to accomplish anything that it could not have accomplished otherwise. Has it "empowered" the community in any way?

Research Guide
Document Review

1. Is there a design document and does it contain a clear logical framework (i.e., link between activities and impacts with respect to a defined problem)?
2. Are the reported results accurate and verifiable?
3. What are the program costs?
4. Did project design and implementation focus on replication?
5. Have the partners fulfilled their reporting requirements?
6. Have all branding guidelines been followed?
7. How effective has the project been in highlighting success stories?

Interview Guide District Stakeholders

1. To what extent were stakeholders involved in design of the project?
2. How were women stakeholders involved in the project design?
3. To what extent have stakeholders been involved in project implementation?
4. Were women stakeholders involved in implementation?
5. What specific need was the project designed to address and for whom?
6. Was the audience for whom the project was designed involved in a substantive way throughout the project life cycle?
7. Has the project increased incomes of participating households?
8. Has the project increased food security for participating households?
9. Are there other impacts associated with the project? (quantified)
10. What are the other non-monetary, quantifiable benefits of the project?
11. Are there other project benefits that are not quantifiable?
12. What is the prospect for sustainability of the project? What are barriers and challenges to sustainability?
13. What is the likely trajectory of change in incomes attributable to project activities over the next 5, 10, 15, 20 years? Consider both new technology, rates of adoption, and increased market access.
14. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
15. To what extent has the project influenced public perception of USAID and America?
16. How can the future communications and outreach activities be improved?
17. How effectively has the project coordinated with other donors and the Government of Pakistan? With you?
18. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
19. What could be done to improve coordination and maximize synergies between future activities?
20. What has been the effectiveness of each activity in targeting women?
21. To what extent has the project improved research capacity of AZRC and ARI?
22. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
23. In practice, to what extent do you think the project has improved the efficiency of agricultural water use in participating communities?
24. In practice, to what extent do you think the project has improved range and livestock management in participating communities?
25. In practice, to what extent do you think the project has improved agricultural yields in participating communities?
26. In practice, to what extent do you think the project has supported women in participating communities?
27. Were indicators appropriate and targets realistic?

Interview Guide Implementation Partners

1. To what extent were stakeholders involved in design of the project?
2. How were women stakeholders involved in the project design?
3. To what extent have stakeholders been involved in project implementation?
4. Were women stakeholders involved in implementation?
5. What specific needs was the project designed to address and for whom?
6. Was the audience for whom the project was designed involved in a substantive way throughout the project life cycle?
7. Were indicators appropriate and targets realistic?
8. Have the activities been implemented in a manner that focuses on sustainability?
9. What is the likely trajectory of change in incomes attributable to project activities over the next 5, 10, 15, 20 years? Consider both new technology, rates of adoption, and increased market access.
10. What is the likely trajectory of change in productivity (food security) attributable to project activities over the next 5, 10, 15, 20 years? Consider both new technology, rates of adoption, and increased market access.
11. Did project design and implementation focus on replication?
12. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
13. In practice, to what extent do you think the project has supported women in participating communities?
14. Has USAID provided appropriate oversight for each activity?
15. Has USAID provided clear and consistent guidance to implementing partners?
16. To what extent has the guidance been followed by the implementing partner?
17. How can management techniques be improved given the reality of limited human resources and frequent staff turnover?
18. To what extent have PR activities raised awareness of the activity and influenced public perception?
19. How can the impact of the PR component of future programming be improved?
20. How effectively has the project coordinated with other donors and the Government of Pakistan?
21. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
22. What concrete steps should be taken to improve coordination and maximize synergies between future activities?
23. What has been the effectiveness of each activity in targeting women in their respective projects?

Interview Guide
AZRC & ARI

1. To what extent has the project improved research capacity of AZRC and ARI?
2. Is any enhanced capacity sustainable? What are barriers to, or conditions necessary for, sustainability?
3. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
4. In practice, to what extent do you think the project has improved the efficiency of agricultural water use in participating communities?
5. In practice, to what extent do you think the project has improved range and livestock management in participating communities?
6. In practice, to what extent do you think the project has improved agricultural yields in participating communities?

Interview Guide Key Informants

1. To what extent has the project improved research capacity of AZRC and ARI?
2. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
3. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
4. In practice, to what extent do you think the project has improved the efficiency of agricultural water use in participating communities?
5. In practice, to what extent do you think the project has improved range and livestock management in participating communities?
6. In practice, to what extent do you think the project has improved agricultural yields in participating communities?
7. What are the other non-monetary, quantifiable benefits of the project?
8. Are there other project benefits that are not quantifiable?
9. Are there other impacts associated with the project? (quantified)
10. Have the activities been implemented in a manner that focuses on sustainability?
11. What are likely barriers to, or conditions for, sustainability?
12. What is the likely trajectory of change in incomes attributable to project activities over the next 5, 10, 15, 20 years? Consider both new technology, rates of adoption, and increased market access.
13. What is the likely trajectory of change in productivity (food security) attributable to project activities over the next 5, 10, 15, 20 years? Consider both new technology, rates of adoption, and increased market access.
14. Did project design and implementation focus on replication?
15. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
16. To what extent has the project influenced public perception of USAID and America?
17. How can future communications and outreach be improved?
18. How effectively has the project coordinated with other donors and the Government of Pakistan?
19. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
20. What concrete steps should be taken to improve coordination and maximize synergies between future activities?
21. What has been the effectiveness of each activity in targeting women in their respective projects?

Interview Guide Provincial Stakeholders

1. To what extent were stakeholders involved in design of the project?
2. How were women stakeholders involved in the project design?
3. To what extent have stakeholders been involved in project implementation?
4. Were women stakeholders involved in implementation?
5. What specific needs was the project designed to address and for whom?
6. Was the audience for whom the project was designed involved in a substantive way throughout the project life cycle?
7. Were indicators appropriate and targets realistic?
8. To what extent has the project improved research capacity of AZRC and ARI?
9. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
10. In practice, to what extent do you think the project has improved the efficiency of agricultural water use in participating communities?
11. In practice, to what extent do you think the project has improved range and livestock management in participating communities?
12. In practice, to what extent do you think the project has improved agricultural yields in participating communities?
13. In practice, to what extent do you think the project has supported women in participating communities?
14. Has the project increased incomes of participating households?
15. Has the project increased food security for participating households?
16. Are there other impacts associated with the project? (quantified)
17. Have the activities been implemented in a manner that focuses on sustainability?
18. Did project design and implementation focus on replication?
19. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
20. To what extent has the project influenced public perception of USAID or America?
21. How can future communications and outreach be improved?
22. How effectively has the project coordinated with other donors and the Government of Pakistan?
23. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
24. What concrete steps should be taken to improve coordination and maximize synergies between future activities?
25. What has been the effectiveness of each activity in targeting women in their respective projects?

Interview Guide

Project Staff (as appropriate to role)

1. To what extent were stakeholders involved in design of the project?
2. How were women stakeholders involved in the project design?
3. How were women stakeholders involved in the project design?
4. To what extent have stakeholders been involved in project implementation?
5. Were women stakeholders involved in implementation?
6. What specific need was the project designed to address and for whom?
7. Was the audience for whom the project was designed involved in a substantive way throughout the project life cycle?
8. Were indicators appropriate and targets realistic?
9. To what extent has the project improved research capacity of AZRC and ARI?
10. To what extent has the project improved the transfer of agricultural technologies and practices from research institutions to farmers?
11. In practice, to what extent do you think the project has improved the efficiency of agricultural water use in participating communities?
12. In practice, to what extent do you think the project has improved range and livestock management in participating communities?
13. In practice, to what extent do you think the project has improved agricultural yields in participating communities?
14. In practice, to what extent do you think the project has supported women in participating communities?
15. What are the other non-monetary, quantifiable benefits of the project?
16. Are there other project benefits that are not quantifiable?
17. Has the project increased incomes of participating households?
18. Has the project increased food security for participating households?
19. Are there other impacts associated with the project? (quantified)
20. Have the activities been implemented in a manner that focuses on sustainability?
21. Did project design and implementation focus on replication?
22. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
23. Has the project been, or is it planned to be, replicated elsewhere?
24. Has USAID provided appropriate oversight for each activity?
25. Has USAID provided clear and consistent guidance to implementing partners?
26. To what extent has the guidance been followed by the implementing partner?
27. How can management techniques be improved given the reality of limited human resources and frequent staff turnover?
28. Have the partners fulfilled their reporting requirements?
29. How effective has the project been in highlighting success stories?
30. How effective were the project's communications and outreach events/activities in terms of frequency, profile, content & design, branding & participation?
31. To what extent has the project influenced public perception of USAID and America?
32. How can future communications and outreach be improved?
33. How effectively has the project coordinated with other donors and the Government of Pakistan?
34. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
35. What concrete steps should be taken to improve coordination and maximize synergies between future activities?
36. What has been the effectiveness of each activity in targeting women in their respective projects?

Interview Guide
USAID (as appropriate to role)

1. To what extent were stakeholders involved in design of the project?
2. How were women stakeholders involved in the project design?
3. To what extent have stakeholders been involved in project implementation?
4. Were women stakeholders involved in implementation?
5. What specific need was the project designed to address and for whom?
6. Was the audience for whom the project was designed involved in a substantive way throughout the project life cycle?
7. In practice, to what extent do you think the project has supported women in participating communities?
8. Were indicators appropriate and targets realistic?
9. Did project design and implementation focus on replication?
10. Can the activities be replicated in other areas with similar socio-economic and agricultural features?
11. Has USAID provided appropriate oversight for each activity?
12. Has USAID provided clear and consistent guidance to implementing partners?
13. To what extent has the guidance been followed by the implementing partner?
14. How can management techniques be improved given the reality of limited human resources and frequent staff turnover?
15. Have the partners fulfilled their reporting requirements?
16. Have the reports been in a format that is useful to USAID staff?
17. Have all branding guidelines been followed?
18. How effective were the project's communications and outreach events/activities in terms of frequency, profile, content & design, branding & participation?
19. To what extent have PR activities raised awareness of the activity and influenced public perception?
20. How can the impact of the PR component of future programming be improved?
21. How effectively has the project coordinated with other donors and the Government of Pakistan?
22. Have synergies been maximized between individual USAID EG activities, other donor programs and/or GoP initiatives?
23. What concrete steps should be taken to improve coordination and maximize synergies between future activities?

PROJECT DOCUMENTS REVIEWED

- Project Document
- 11 quarterly reports from Jan./March, 2005 to July/September, 2007
- Project workplans for 2005, 2006, and 2007
- Minutes of Steering Committee meetings for 2005, 2006, and 2007
- 5 biannual progress reports from April, 2005 to May, 2007
- Baseline survey reports (male and female)
- A Practical Guide to Community Development Process
- Site Facilitators Training Workshop Report, March, 2006
- Women Role in Crop-Livestock Production and Food Processing: Results from Rapid Rural Appraisal, April, 2006
- Socioeconomic and Livelihood Characterization, and Baseline Information of Integrated Research Sites in Balochistan, ICARDA
- Monitoring Report on Sample Survey of Community Organization based Cost sharing Crop Production Activities carried out through FAO/USAID project during year 2005, June, 2006
- Marketing: Observations, issues and recommendation arising from a field visit July – August 2007, Grant Vinning, marketing consultant
- Verification and Assessment Report of Locally Procured Seed of Wheat, Barley and Luceren distributed in the programme Community Organization Organizations on Cost sharing bases by FAO/USAID project during the Rabi Season of 2005 in Loralai District, August, 2006. Mr. Aijaz Hussain, Dr. Hakeem Shah
- Report of the Consultative meeting with District Line Department Officers, 8 February 2005
- Report of World Water Day activities, 22 March 2005 (by Bolan Area Water Partnership)
- Report of Water Awareness Campaign Meeting, Killa Saifullah 13 March 2005 (by Bolan Area Water Partnership)
- Report of Water Awareness Campaign Meeting, Loralai, 14 March 2005 (by Bolan Area Water Partnership)
- Report of Water Awareness Campaign Meeting, Mastung, 3 April 2005 (by Bolan Area Water Partnership)
- Report of World Water Day activities, 22 March 2005 (by Bolan Area Water Partnership)
- Report on Seminar on animal production and health, 24 November 2006-05-19
- Report on range management practices in Balochistan, 1 Dec. 2005 to 28 February 2006 (by short-term consultant)
- Monitoring Report on Sample survey of Community Organization based Cost sharing Crop Production Activities carried out through FAO/ USAID project during year 2005. Dr. Hakeem Shah, National consultant FAO. June 2006.
- Stakeholders Meeting - ICARDA Annual Work planning Meeting Report – 12-13 July 2006. July 2006.
- Verification and Assessment Report of Locally Procured Seed of Wheat, Barley and Luceren distributed in the programme Community Organization Organizations on Cost

PROJECT DOCUMENTS REVIEWED

sharing bases by FAO/USAID project during the Rabi Season of 2005 in Loralai District. Dr. Hakeem Shah and Mr. Aijaz Hussain, National Experts. September 2006.

- Interim Progress Report BRSP, covering period February to July 2006. October 2006.
- Third Quarterly report to USAID Pakistan covering the period July to September 2006. October 2006.
- Back to office report on Initiation of Village Based Seed Enterprise (VBSE) initiation in Balochistan, Under the Food Security/Poverty Alleviation in Arid Agriculture in Balochistan project. Abdoul Aziz Niane, M. Azeem Khan, Islam Mohamed and Mohamad Saleem, ICARDA. October 2006
- Progress Report of the ICARDA operated research sub component of the Food Security/Poverty Alleviation in Arid Agriculture Balochistan Pilot Project Phase for the period 1 January – 30 June 2006. October 2006
- Community Development in Practice – Group Capacity Building Practical Exercises (8 Modules)
- Baseline survey NARC, February 2007 (male and female communities)
- Backstopping Mission Report - David Hitchcock – December 2006
- Draft - Traditional Range Management Practices Balochistan.
- Backstopping Mission Report - David Hitchcock – March 2006

Annex B: Impact Assessment and Cost Benefit Analysis

Impact Assessment

The impact of a project intervention is the difference between household income with the intervention and what it would have been without the intervention. Since most of the project's interventions focus on increasing agricultural production (either crops or livestock), the impact is the difference between value of agricultural production with the intervention and what it would have been without the intervention. Calculating the impact of an intervention thus requires knowledge of the size of the intervention, the mechanism by which the intervention affects agricultural yields, pre and post intervention yields, and market prices for commodities. Furthermore, the relevant measure of impacts should be net of production costs. Therefore, calculating the impact of an intervention also requires knowledge of pre and post intervention production costs. Project research reports, the baseline survey, secondary data sources, and the project's MIS provided these data. This annex describes in detail the derivation of values associated with each intervention.

Many of the water and crop interventions increase the area of cultivated land, improve water availability, or introduce more productive crop varieties. In these cases, the value of the intervention depends on area planted and yields of different varieties of particular crops (wheat, barley, lentil, maize) under various conditions (basic rainfed, improved rainfed, and irrigated). Table B1 summarizes ICARDA research data on crop yields that supports the impact estimates for wheat, barley, and lentil. The ICARDA 2006 annual report (International Center for Agricultural Research in the Dry Areas (ICARDA), 2007) contains the research results for interventions in livestock feeding and veterinary services. The remainder of this annex describes calculation of the impacts of each intervention based on the research results.

Table B1 . Crop Yields and Prices Used for Impact Assessment Model

	Yields (kg/ha)									Farmgate price (Rs/kg)
	Basic rainfed			Improved rainfed			Irrigated			
	Min	Max	Average	Min	Max	Average	Min	Max	Average	
Wheat										
Local white										
Grain	1,000	1,900	1,300	1,200	1,900	1,500	1,200	1,900	1,800	15.00
TDM	5,000	9,500	6,000	6,000	10,000	7,500	7,500	10,000	8,500	
Straw	4,000	7,600	4,700	4,800	8,100	6,000	6,300	8,100	6,700	3.00
Improved variety										
Grain	1,600	3,300	1,800	2,000	3,500	2,500	3,000	4,000	3,000	15.00
TDM	4,500	9,000	5,500	6,500	15,000	6,500	8,000	9,500	8,000	
Straw	2,900	5,700	3,700	4,500	11,500	4,000	5,000	5,500	5,000	3.00
Barley										
Unimproved										
Grain	800	1,700	1,200	1,200	1,900	1,400	1,500	2,000	1,600	13.00
TDM	4,000	9,000	5,500	6,000	8,000	7,000	7,500	9,500	7,500	
Straw	3,200	7,300	4,300	4,800	6,100	5,600	6,000	7,500	5,900	3.00
Improved (sonober 96)										
Grain	1,500	3,000	2,000	2,000	3,200	2,500	2,000	3,600	2,400	13.00
TDM	4,500	9,500	5,000	6,000	9,500	6,500	7,500	10,000	7,500	
Straw	3,000	6,500	3,000	4,000	6,300	4,000	5,500	6,400	5,100	3.00
Lentil										
Unimproved										
Grain	250	500	450	250	500	500	400	600	500	35.00
TDM	1,500	4,000	1,500	1,500	4,500	1,800	2,000	4,500	2,500	
Straw	1,250	3,500	1,050	1,250	4,000	1,300	1,600	3,900	2,000	
Improved (sonober 96)										
Grain	400	850	600	700	900	700	800	1,000	850	35.00
TDM	1,500	4,000	2,000	2,500	4,500	2,800	3,000	5,000	3,500	
Straw	1,100	3,150	1,400	1,800	3,600	2,100	2,200	4,000	2,650	

Water Interventions

Land leveling and dikes, flood protection/diversion structures

Leveling land and dikes and flood diversion structures harvest rainwater, increase the water available to crops, and increase yields. In some cases, the interventions create new arable land or bring land back into production that has not been used because dikes or structures failed. As a conservative estimate, however, the impact model assumes that the land was previously farmed and that the intervention improved yields by improving the land from basic to improved rainfed land. It also conservatively assumes that wheat is grown on the improved land even though field visits observed higher value crops (lentil) being grown on improved rainfed land. The following table summarizes calculation of the value of the intervention.

Impact of Land Leveling and Dikes and Flood Prevention/Diversion Structures

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	basic rainfed wheat	1,300 kg grain @ Rs. 15/kg + 4,700 kg straw @ Rs. 3/kg = Rs. 33,600	7,263	26,337
Post intervention	improved rainfed wheat	1,500 kg grain @ Rs. 15/kg + 6,000 kg straw @ Rs. 3/kg = Rs. 40,500	7,263	33,237
Impact of intervention (Rs./ha)				6,900

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Lined storage tanks, lined/piped irrigation canals, tubewell rehabilitation, karez rehabilitation

These interventions reduce water loss or make more water available thus making it possible to irrigate more land or increase production on land already irrigated. In either case, increased water translates directly to increased agricultural production. The model estimates monetary benefits as the value of improved wheat varieties that could be grown on land irrigated by the additional water. This is conservative as irrigated land is often used to grow higher value crops. For instance, the team observed tomato, cauliflower, and fruit being grown on land irrigated from improved water sources. Estimates of the land area affected by the interventions are based on the project's monitoring of its interventions. The following table summarizes calculation of the value of the intervention. The production cost is an indirect benefit as much of the cost is household labor or other labor or inputs purchased in the local economy.

Impact of Lined Storage Tanks, Lined/Piped Irrigation Canals,
Tubewell Rehabilitation, and Karez Rehabilitation

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	land not cultivated	Rs. 0	0	0
Post intervention	improved rainfed wheat	1,800 kg grain @ Rs. 15/kg + 6,700 kg straw @ Rs. 3/kg = Rs. 47,100	7,263	33,237
Impact of intervention (Rs./ha)				39,839

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Crop Interventions

Many of the values associated with crop interventions are based on ICARDA research results as summarized in the following tables.

Improved Wheat Seed Distribution (Irrigated)

The economic value of improved wheat seed for irrigated land is the value of the yield difference between local wheat and improved wheat under irrigated conditions. The following table summarizes calculation of the value of the intervention.

Impact of Improved Wheat Seed Distribution (Irrigated)

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	irrigated local wheat	1,800 kg grain @ Rs. 15/kg + 6,700 kg straw @ Rs. 3/kg = Rs. 47,100	7,263	39,837
Post intervention	irrigated improved wheat	3,000 kg grain @ Rs. 15/kg + 5,000 kg straw @ Rs. 3/kg = Rs. 60,000	7,263	52,737
Impact of intervention (Rs./ha)				12,900

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Improved Wheat Seed Distribution (Rainfed)

The economic value of improved wheat seed for rainfed land is the value of the yield difference between local wheat and improved wheat under improved rainfed conditions. The following table summarizes calculation of the value of the intervention.

Impact of Improved Wheat Seed Distribution (Rainfed)				
	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	improved rainfed local wheat	1,500 kg grain @ Rs. 15/kg + 6,000 kg straw @ Rs. 3/kg = Rs. 40,500	7,263	33,237
Post intervention	improved rainfed improved wheat	2,500 kg grain @ Rs. 15/kg + 4,000 kg straw @ Rs. 3/kg = Rs. 49,500	7,263	42,237
Impact of intervention (Rs./ha)				9,000

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Improved Barley Seed Distribution

The economic value of improved barley seed is estimated as the value of the yield difference between local barley and improved barley under improved rainfed conditions. The following table summarizes calculation of the value of the intervention.

Impact of Improved Barley Seed Distribution				
	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	improved rainfed local barley	1,400 kg grain @ Rs. 13/kg + 5,600 kg straw @ Rs. 3/kg = Rs. 35,000	7,263	27,737
Post intervention	improved rainfed improved barley	2,500 kg grain @ Rs. 13/kg + 4,000 kg straw @ Rs. 3/kg = Rs. 44,500	7,263	37,237
Impact of intervention (Rs./ha)				9,500

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Cumin and Alfalfa Seed Distribution

The project provided cumin seed when it was not locally available. It provided alfalfa seed at the market price with a 50% cost share requirement. The project's crops expert believes that many of the areas planted to cumin would have been left fallow if the seed had not been available so there was no opportunity cost (other than production costs) to producing cumin in these years on the

land sown to the crops. For alfalfa, the project's cost share arrangement reduced farmers' seed cost by half and probably resulted in twice as much area planted to alfalfa. Alfalfa seed distribution impacts are thus the net value of production multiplied by half the area planted. The following tables summarize calculation of the value of the interventions.

Impact of Cumin Seed Distribution

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	fallow land	0	0	0
Post intervention	cumin	180 kg @ Rs. 69.58/kg = Rs. 12,524	10,449	2,075
Impact of intervention (Rs./ha)				2,075

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Impact of Alfalfa Seed Distribution (Irrigated)

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	½ of area planted to alfalfa and ½ fallow	44,480 kg @ Rs. 1/kg = Rs 44,480 for area planted to alfalfa and Rs. 0 for fallow land	23,837 for cultivate land, 0 for fallow land	20,643 for cultivate land, 0 for fallow land
Post intervention	alfalfa	44,480 kg @ Rs. 1/kg = Rs 44,480	23,837	20,643
Impact of intervention (Rs./ha)				20,643

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Demonstration and Cost Share Orchards

The project planted demonstration and cost share almond orchards on land that would otherwise have been fallow. The following table summarizes calculation of the value of the interventions.

Impact of Demonstration and Crop Share Orchards

	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	fallow land	0	0	0
Post intervention	Orchard	1,200 kg @ Rs. 70/kg = Rs 84,000	35,393	48,607
Impact of intervention (Rs./ha)				48,607

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Improved Crop Seed Production

The project provided seed for farmers to multiply improved seed varieties on irrigated land on which they would otherwise have grown wheat for food. Values are based on the premium value of improved wheat seed cleaned and sold for seed. The following table summarizes calculation of the value of the intervention.

Impact of Improved Crop Seed Production				
	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	irrigated improved wheat	3,000 kg grain @ Rs. 15/kg + 5,000 kg straw @ Rs. 3/kg = Rs. 60,000	7,263	52,737
Post intervention	irrigated improved wheat	3,000 kg grain @ Rs. 23/kg + 5,000 kg straw @ Rs. 3/kg * .90 to account for 10% loss in cleaning = Rs. 75,600	9,353	66,247
Impact of intervention (Rs./ha)				13,510

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Improved Lentil Seed Distribution

The project distributed improved lentil seed that farmers planted in place of the local variety. Calculation of the value of the intervention assumes that lentil is planted on improved rainfed land. The following table summarizes calculation of the value of the intervention.

Impact of Improved Lentil Seed Distribution				
	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	improved rainfed improved lentil	500 kg @ Rs. 35/kg = Rs. 17,500	11,928	5,572
Post intervention	improved rainfed improved lentil	700 kg @ Rs. 35/kg = Rs. 24,500	11,928	12,572
Impact of intervention (Rs./ha)				7,000

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Improved Maize Seed Distribution

The project distributed improved maize seed that farmers planted when the local variety was not available. Calculation of the value of the intervention assumes the land would have remained fallow if the seed was not supplied. Improved maize seed was planted under irrigated conditions

where it has a yield of about two tonnes per hectare of grain and one tonne of straw. The following table summarizes calculation of the value of the intervention.

Impact of Improved Maize Seed Distribution				
	Basis for valuation	Value of production (Rs./ha) ^a	Production costs (Rs./ha)	Net value of production (Rs./ha)
Pre intervention	land left fallow	0	0	0
Post intervention	irrigated improved maize	2,000 kg grain @ Rs. 6/kg + 1,000 kg straw @ Rs. 2/kg = Rs. 14,000	12,663	1,337
Impact of intervention (Rs./ha)				1,337

a. Yield estimates based on ICARDA research. Market values from baseline survey, market data, and knowledge of national crops expert.

Livestock Interventions

Rural Poultry Distribution

The impact model assumes that eggs are the primary source of value from rural poultry. The project brief calculates that a flock of 20 chickens will produce an average of Rs. 350 in eggs each month on average. The annual value of egg production per bird is thus Rs. 210. To be conservative, the analysis does not include the residual value of the bird for meat.

Sheep Fattening Cost Share

The project demonstrated the efficacy of feed supplements to fatten animals for a specific high value market. The ICARDA research tracked six sets of lambs/kids, four treatment and two control groups. It kept track of production costs and value of animal products. The following table summarizes research results and calculation of the value of the intervention.

Impact of Sheep Fattening Cost Share				
	Basis for valuation	Value of production (Rs./animal) ^a	Production costs (Rs./animal)	Net value of production (Rs./animal)
Pre intervention	Grazing	Average income from animal = Rs. 2,674 (meat, wool, dung)	2,431	243
Post intervention	Grazing plus Shukrana feed @ 500 g/day	Average income from animal = Rs. 3,442 (meat, wool, dung)	2,906	536
Impact of intervention (Rs./ha)			475	293

a. Yield estimates based on ICARDA research and analysis (International Center for Agricultural Research in the Dry Areas (ICARDA), 2007).

Veterinary Treatment

Veterinary treatment reduced the incidence of disease, increased weight gain, improved lambing percentage, and increase the value of an animal's skin and wool. ICARDA research tracked three groups of lambs/kids (one control and two treatment groups) and monitored production costs and the value of animal products. The following table summarizes research results and calculation of the value of the intervention.

Impact of Veterinary Treatment				
	Basis for valuation	Value of production (Rs./animal) ^a	Production costs (Rs./animal)	Net value of production (Rs./animal)
Pre intervention	Farmer practice	Average increase in animal value = Rs. 1,640 (meat, lambs, wool, skin)	61	1,579
Post intervention	Veterinary treatment	Average income from animal = Rs. 2,422 (meat, lambs, wool, skin)	78	2,344
Impact of intervention (Rs./ha)		782	17	765

a. Yield estimates based on ICARDA research and analysis (International Center for Agricultural Research in the Dry Areas (ICARDA), 2007).

Capital Value Increases

Land with water available for irrigation is more valuable than land without water. The capital value increase component of benefits reflects the value added to land because of interventions that increase the quantity of water available. Capital value increases accrue to the owner of the land. The baseline survey found that about 60% of project area households own the land they farm. The benefits reported in the evaluation do not include increases in the capital value of land.

Benefit Estimates

Tables B2 through B4 illustrate the calculation of benefits as of December, 2007. Each table shows the specific interventions, the size of the intervention to date, the value of agricultural production per unit of intervention, the number of households and individuals benefiting from the interventions, and the impact of the interventions on incomes (aggregate and per household). The water interventions include an additional column to reflect increased land values resulting from improvements in water harvesting infrastructure or increased access to irrigation water. Benefit estimates are nominal (undiscounted) and aggregated over the three-years of project activity. The tables serve primarily to illustrate the approach and to document the data used for impact assessment. They do not contain the detail of the estimates presented in the report nor do they present discounted

values.

Table E2. Monetary Impacts of Water Interventions (January, 2005 through September, 2008)

Intervention	Beneficiaries				Benefits					
	Units ^a	Size	Capital multiplier (Rs.) ^b	Net value of production (Rs./unit) ^c	Households	Individuals ^d	Capital value (1,000 Rs.)	Aggregate income (1,000 Rs.)	Average household income (1,000 Rs.) ^e	Secondary impacts (1,000 Rs.) ^f
Land leveling & dikes	hectares	664	24,000	6,900	1,488	11,904	15,936	8,956	6	0
Lined storage tanks	hectares	10	66,000	39,837	453	3,624	660	518	1	94
Irrigation canals (lined/piped)	hectares	71	66,000	39,837	759	6,072	4,686	5,338	7	973
Tubewell rehabilitation	hectares	10	66,000	39,837	105	840	660	1,036	10	189
Karez improvement	hectares	113	66,000	39,837	1,033	8,264	7,458	9,999	10	1,823
Flood protection/diversion	hectares	45	24,000	6,900	130	1,040	1,080	311	2	0
Total values (1,000 Rs.)							30,480	26,158		3,080
Total values (1,000 \$) ^g							508	436		51

a. Reflects new area that can be irrigated with additional water made available from lined storage tanks, irrigation canals (lined/piped), tubewell rehabilitation, karez improvement, and flood diversion interventions.

b. Reflects increased value of land due to improvements or availability of water.

c. Net value of additional production based on research results and validated through field visits. Valued at farm gate price. Value of production estimates assume that wheat is planted on newly available land. The evaluation team observed instances during site visits of additional water or leveled land being used for much higher value crops such as tomato (Humaya) or cauliflower (New Vialla). See Annex B for details.

d. Households multiplied by average household size (eight from most recent census).

e. Average annual household income in participating communities before the project was Rs. 223,297.

f. Difference between gross value of production and net value of production. Production costs include to labor (either household locally hired) and inputs (many locally purchased) and thus represent secondary economic impacts to the local economy. The implied multiplier for such impacts is 1, a conservative number.

g. Based on exchange rate of Rs. 60=\$1.

Table B3. Monetary Impacts of Crop Interventions (January, 2005 through September, 2008)

Intervention	Beneficiaries				Benefits			
	Units ^a	Size	Net value of production (Rs./unit) ^b	Households	Individuals ^c	Aggregate income (1,000 Rs.)	Average household income (1,000 Rs.) ^d	Secondary impacts (1,000 Rs.) ^e
Improved wheat seed, irrigated	hectares	10,204	12,900	1,852	14,816	175,755	95	0
Improved wheat seed, rainfed	hectares	13,999	9,000	2,105	16,840	187,426	89	0
Improved barley seed	hectares	1	9,500	1	8	10	10	0
Curmin seed	hectares	706	2,075	550	4,400	1,465	3	7,377
Alfalfa seed	hectares	0	20,643	418	3,344	0	0	0
Demonstration orchards	hectares	2	0	2	16	0	0	0
Cost share orchards	hectares	53	0	81	648	0	0	0
Improved crop seed production	hectares	13	13,510	13	104	176	14	27
Lentil seed distribution	number	1,991	7,000	385	3,080	13,937	36	0
Maize seed distribution	number	43	1,337	128	1,024	57	0	545
Total values (1,000 Rs.)						378,825	246	7,949
Total values (1,000 \$) ^f						6,314	4	132

a. Reflects area planted to a crop.

b. Value of yield increase over traditional varieties.

c. Households multiplied by average household size (eight from most recent census).

d. Average annual household income in participating communities before the project was Rs. 223,297.

e. Difference between gross value of production and net value of production. Production costs include to labor (either household locally hired) and inputs (many locally purchased) and thus represent secondary economic impacts to the local economy. The implied multiplier for such impacts is 1, a conservative number.

f. Based on exchange rate of Rs. 60=\$1.

Table B4. Monetary Impacts of Livestock Interventions (January, 2005 through September, 2008)

Intervention	Beneficiaries				Benefits			
	Units ^a	Size	Net value of production (Rs./unit)	Households	Individuals ^b	Aggregate income (1,000 Rs.)	Average household income (1,000 Rs.)	Secondary impacts (1,000 Rs.) ^c
Rural poultry production	birds	1,600	210	80	640	336	4	0
Sheep fattening cost share	animals	4,574	293	944	7,552	1,340	1	2,173
Veterinary treatment	animals	7,501	765	525	4,200	5,738	11	128
Total values (1,000 Rs.)						7,414	17	2,300
Total values (1,000 \$) ^e						124	0	38

a. Reflects number of animal treated or distributed.

b. Households multiplied by average household size (eight from most recent census).

c. Average annual household income in participating communities before the project was Rs. 223,297.

d. Difference between gross value of production and net value of production. Production costs include to labor (either household locally hired) and inputs (many locally purchased) and thus represent secondary economic impacts to the local economy. The implied multiplier for such impacts is 1, a conservative number.

e. Based on exchange rate of Rs. 60=\$1.

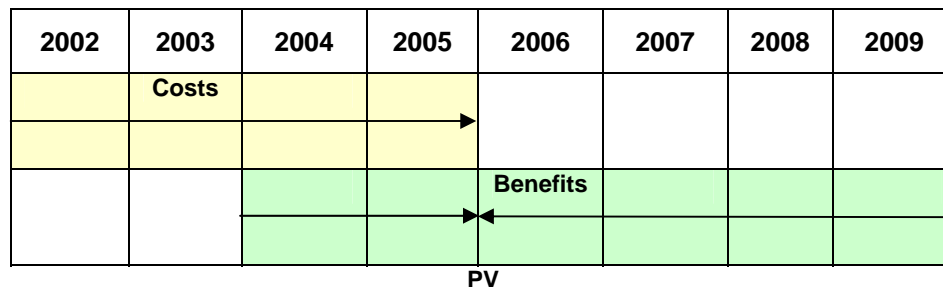
Cost Benefit Analysis

Cost benefit analysis compares project costs with project benefits as a measure of efficiency. Common types of comparisons include the benefit cost ratio (present value of benefits divided by present value of cost), net present value (present value of benefits minus present value of costs), or internal rate of return (rate of return that equates present value of costs with present value of benefits). Because costs and benefits do not often occur at the same time, however, the comparison is not straightforward. Two issues arise: comparing costs and benefits that occur at different points in time, and projecting future benefits.

Since monetary values are not constant over time it is not appropriate to compare a cost in one year with a benefit in another. Instead, a discount rate must be applied to adjust costs and benefits occurring through time to a common time period. The discount rate may reflect inflation or the opportunity cost of investing money in a project. Also, since some benefits may occur in the future, a complete cost benefit analysis may require estimating future benefits.

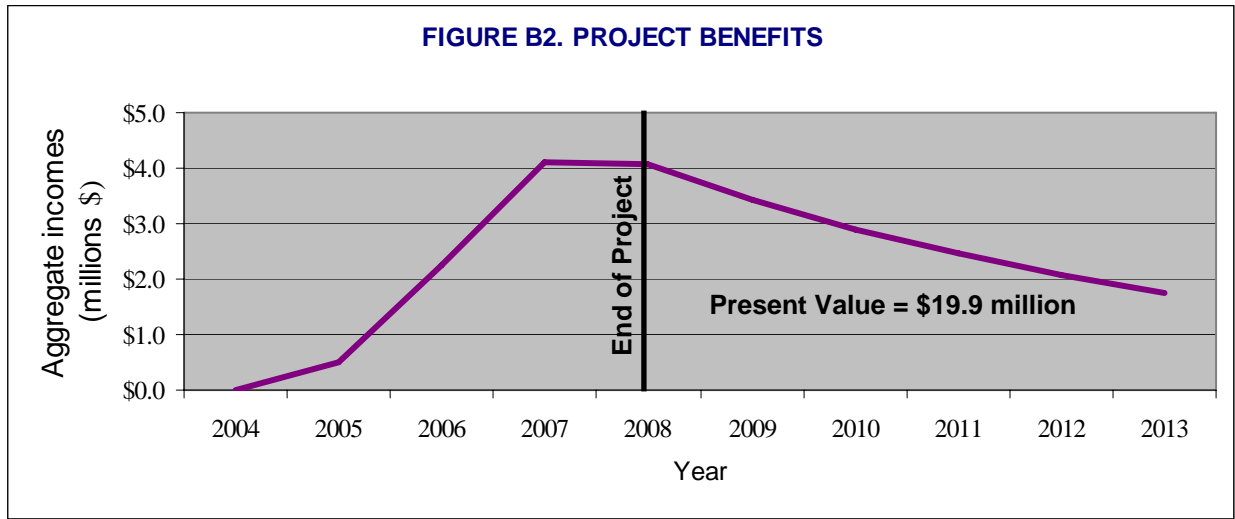
Figure B1 illustrates the issues involved in calculating the project’s net present value (or benefit cost ratio). Consider a project that begins in 2002 and runs till 2005. It begins generating benefits in 2004 and continues to produce benefits until 2009. The present value (PV) of costs at the end of 2005 (an arbitrary date chosen to coincide with the end of the project) is the sum of annual costs with each year’s costs inflated by an appropriate rate to 2005 values. Similarly the present value of benefits is the sum of actual benefits in 2004 and 2005 inflated to 2005 values plus the sum of projected benefits in 2006 through 2009 discounted to 2005 values.

Figure B1. Illustration of Present Value



The cost benefit analysis contained in this report calculates present value of costs and benefits as of 2007. At applies a 10% discount rate to calculate the present value of costs. The analysis includes actual benefits through the end of the project and estimated benefits for five years beyond the end of the project, i.e., 2013.

Figure B2 illustrates the concept of benefit cost analysis for the scenario with a 20% annual deterioration in crop yields and 50% annual deterioration of livestock benefits. Typically this type of graph would show a “with project” line that represented benefits in each year with the project and a “without project” line that represented aggregate household incomes if the project had not taken place. The present value of the area between the two lines is the impact of the project. In this case, the single line in the graph already subtracts “without project” incomes. Subtracting the present value of project costs from this value yields the net present value of the project. Dividing the present value of benefits by the present value of costs yields the benefit cost ratio.



The remainder of this section describes considerations in estimation of future benefits that produced the projections of benefits beyond the end of the project.

Water Interventions

Water interventions (e.g., karez rehabilitations, land leveling and dikes, lined storage tanks and irrigation channels) represent durable infrastructure. They will typically last without significant deterioration well beyond the five-year time horizon used for the cost benefit analysis. Furthermore, the interventions in each year benefit a new group of households while the beneficiaries of the previous year continue to enjoy benefits. Therefore, the benefit in any year is the sum of benefits to that year's beneficiaries plus the (annually occurring) benefits from previous year's beneficiaries. The projection of benefits from water interventions assumes that benefits continue, with no deterioration from 2008 levels, for the five-year time horizon of the analysis.

Crop and Livestock Interventions

Crop and livestock interventions are less durable than water interventions. The continuation of the benefits without the project depend on whether farmers wish to continue the practices they have learned and whether they have access to the necessary inputs (e.g., seed, medication). The project aims to make these interventions sustainable. Farmers are growing improved wheat varieties for seed and the project has begun to establish seed cleaning enterprises within communities that will contribute to seed availability. It has trained animal health workers to treat animals. It has also demonstrated the economic efficacy of animal fattening and some evidence suggests that the feed ration is becoming available in some local markets.

Crop benefits, like benefits from water, are cumulative over time. Once the project distributes seed from an improved variety, farmers save the seed and plant it again in the following year. It is thus reasonable to assume that the area planted to an improved variety in a given year will be planted to that variety in subsequent years if the variety is successful. The analysis assumes that area planted to improved crop varieties is cumulative. However, because

yields of new varieties decline over time, the analysis reduces yields from these new varieties by 20% annually.

Thus, for crop and livestock benefits, the analysis applies an annual decay rate to account for declining rates of use. For crops it is a 20% decay rate on yield. For livestock it is a decay rate on adoption or use.