MOUNTAIN TERRACES PROJECT, ICARDA/AREA, YEMEN

Improving Natural Resources Management and Food Security for Rural Households in the Mountains of Yemen

Research Report

Rural Livelihood Assessment in the Mountain Areas of Yemen

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1. Introduction

Poverty is considered by several scientists and researchers as results of a set of natural and human factors, domestic policies and external factors that come together to create an environment conducive to the occurrence and spread of poverty and the increase in its severity.

The Mountain Terraces Project (MTP) in Yemen has the aim of poverty reduction by improving rural livelihoods and increasing the chances of maintaining mountain terrace land. The overall objective of the research project is to development of decision-support tools, which could allow policy makers to understand farmers' investment behavior and analyze the policy and institutional options that could assist in reversing terrace degradation, with a view to improving natural resource management, food security and income levels of rural households in the highlands of Yemen.

The farming systems dominated in the Mountain Terraces in Yemen is "Highland Mixed Farming System". This system is the most important in the NENA Region (FAO, 2001) in terms of population. There are two subsystems; one dominated by rainfed cereal and legumes plus tree crops on terraces, while the second is based on livestock on communally managed lands. Poverty is extensive, as markets are often distant, infrastructure is poorly developed and the degradation of natural resources is a serious problem.

The project attempts to use community-based integrated natural resources management research approach, which involves the use of participatory research methods in problem identification and technology development, generation of direct benefits to farmers in a short time horizon and linking with development.

2. The Study area

2.1 Location
Three study MTP sites were selected for this project to represent the prevailing agro-ecologies and farming systems and the Yemeni Mountain Terrace area. The selected research sites area:
- Al –Qimmeh micro-watershed, Northern Highlands, Kohlan Affar District, Hajja Province.
- Al-Naqilain micro-watershed, Middle Mountains, west of Ibb.
- Wadi Yasqum, Yehr, Yafa' District, Southern Uplands, Lahaj.

The micro-watershed sites were selected jointly by ICARDA scientists and research teams based on the criteria developed to select specific micro-watersheds and the communities within them. These included:
- Occurrence of both well-maintained and degraded terraced land;
- Presence of cooperative farmers, living in large communities;
- Well-defined watershed, not less than 500 households and area extent of 2-4 km2;
- The area must have a potential for agriculture;
- Accessibility by researchers should not be inhibitive;
- Availability of secondary data such as maps.

2.2 Services and markets

2.2.1 Services
At Al –Qimmeh watershed, children attend the elementary school in AlQimmah from AlQimmah, and Beit Alwali. Al-Ubal school also serves children from Beit AlFarawe. Bani Bram has its own school, and children from Faraa go to Beit Jumaa elementary school, outside the watershed. There are intermediate schools in AlQimmah, and Kohlan, which also has a municipality office. Kohlan is seven to eleven kilometres from the villages. Initial indications are that about half of all households send a boy to primary school, and one in ten households send a girl. Only boys are reported to have completed secondary school. Socially girls are kept at home after completing primary education. Girls are required for all agricultural and household work. Almost all villages have been supplied electricity within the past few years. An agricultural extension office based in Kohlan is intended to serve the entire district. However, it is limited by lack of facilities, training and supervision. Extension agents have modest qualifications and little on the job training.

Most villages at Al-Naqilain watershed have a primary school, but only three villages have a secondary school. Girls are less likely to have time to go to school, as they must fetch water, take livestock to rangeland and do various domestic tasks. Their families may not be able to afford the necessary pens, books, clothes and registration. They may also leave secondary school early to get married.

2.2.2 Markets
Trade opportunities at the local level are strongly affected by weak infrastructure, absence of processing, storage and marketing facilities, transport and market taxes, and trade distortions created by imports of subsidized low cost agricultural products.

Other factors such as standards in market chains could affect small producers (DFID, 2003).

There is a daily market at Al-Qqimma village included about 51 shops for groceries, gas cylinder, flour mill, and general shops. Few shops in the village are used to store agricultural products during the season. There is a daily market at Imran town(on the way) for all goods and provisions and Saturday is the market day whereupon sellers of different goods and items gather on both the main roadside. Every Monday Kuhlan village has a market where sellers from different villages gather to sell their products and buy their requirements; and also at Wadi Sheres village there is a market every Sunday specialized for buying and selling livestock.

Market for Al-Naqilain watershed is located at Nagd Alahmar on the highway from where the gravel road starts to the watershed. This is a daily market for the watershed but Saturdays are the market day whereupon sellers from all the vicinity collect with their products. The roadsides are occupied with vegetable, fruit, spice, qat, fodder, and chicken sellers. There are 47 shops at Nagd Alahmar include restaurants, butcher, storage shops for agricultural products and provisions, communication/telephone shops, groceries, vegetable sellers, gas cylinder shop, qat shops.

2.3 Climate, agricultural production systems, and land use

The climate of Yemen is controlled by air circulation associated with the large-scale pressure systems of the Sahara and Arabian Desert to the north and the Inidian Ocean to the south. As a result, the early part of the rainy season of April to September is controlled by the former system, while the latter brings larger volumes of heavy rain from July. In winter, from November to February, north-easterly winds from the high pressure systems over the desert bring very dry settled weather with little cloud, high radiation and large diurnal range of temperature. In early summer, between March and May, south-westerly winds resulting from the weakening of this high pressure zone bring some rain, followed by heavier rain in mid-summer between July and September associated with the northward movement of the inter-tropical convergence zone.

The nearest meterological station at Al-Naqilain watershed is at Ibb, 14 km from the study site. Average annual rainfall in Ibb (1982-1990) is 881 mm. The mean temperature varies from 15-20ºc, maximum temperatures of 26-29ºc are reached in April-October, with lows of 5-6ºc during November –January. The average potential evaporation is 3.1-3.5 mm/day during the dry in cold season, and 4.7-4.8 mm/day during April-July. However, Ibb is at 1900 m.a.s.l, 200 m lower than the lowest part of the study site, which is cooler than Ibb, and farmers estimate the average annual rainfall to be around 650 mm.

There are many ecological zones in Yemen, and there is a large variation in the average annual rainfall among these zones. Researchers have not yet identified the main agricultural production systems in Yemen. However, Mazid (1999) preliminarily identified seven agricultural production systems in Yemen; based on average annual rainfall altitude above sea level, terrace use, and irrigation availability; as follows:
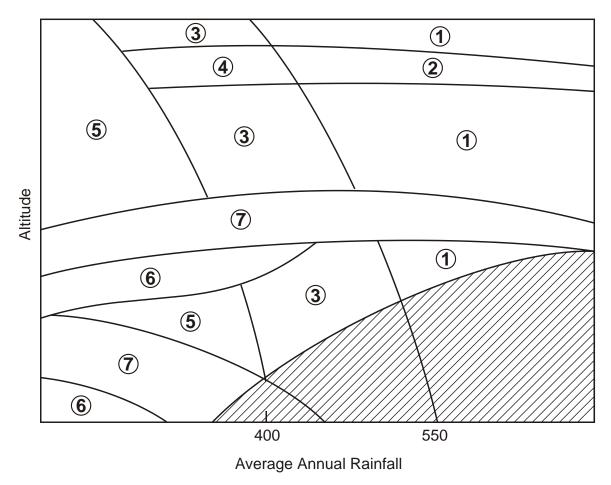
1. High rainfall agriculture production system (> 550 mm).

2. High rainfall agriculture production system on terraces (> 550 mm).
3. Rainfed agriculture production system (400·550 mm).
4. Rainfed agriculture production system on terraces (400·550 mm).
5. Dry rainfed agriculture production system (< 400mm).
6. Irrigated agriculture production system based on spate floods.
7. Irrigated agriculture production system based on wells.

These systems according to average annual rainfall and altitude are shown in Figure1.

Generally, land use in the study areas can be categorized as follows: residential areas; rainfed annual crops (sorghum, barley, wheat, lentil); rainfed perennial crops (qat); mixed annual rainfed and perennial crops (sorghum and qat); irrigated cropland; rangeland; and cemetery (a specially allocated plot of cultivated land).

Figure 1. Agricultural production systems in Yemen.

2.4 Policies affecting land use and terraces maintenance

In Yemen, the welfare of the people and good land management were inseparable for many centuries, as most agricultural land consisted of mountain terraces that farmers built themselves. But, recent dramatic socioeconomic changes have affected the Yemeni people's livelihoods and the ways they care for their land.

According to a study (ICARDA, 2003) conducted by ICARDA in collaboration with the Agricultural Research and Extension Authority (AREA) of the Ministry of Agriculture to analyze the policy and institutional factors affecting terrace maintenance in Yemen, Farmers and officials working in government and other institutions such as banks and development programs were interviewed to (i) assess how socioeconomic changes over the last four decades have influenced terrace maintenance, and (ii) determine how aware rural mountain communities are of the resources available to maintain their terraces and build their livelihood assets.

Analyses of this study indicated that, although conditions prior to the 1960s promoted investment in terraces and land conservation, the socioeconomic climate following that decade has favored less investment in land improvement, leading to terraces being abandoned and degraded (Table 21).

Table 21. Factors influencing terrace maintenance in Yemen's mountains before and after the 1960s.

Factors contributing to sustainable land use	Factors contributing to land degradation during and after the 1960s
- Labor was abundantly available and relatively cheap - Land was the main source of food and livelihoods - There was a strong sense of community cohesion, which was necessary for survival in remote villages - Communities were relatively isolated from the rest of the world, which fostered self-sufficiency in food - Customary rules were strongly applied and collective action taken	- Male out-migration created labor shortages - The opportunity cost of labor increased, as other sources of income could be accessed - Trade and subsidized food prices caused the communities' reliance on subsistence farming to decline - Economic returns gained from production decreased - Mobility and communication improved, causing 'labor migration' and reducing the cost of imported food - Socioeconomic changes weakened community cohesion - Modern laws and social change undermined local rules and collective action

Source: ICARDA annual report 2003.

Important policy gaps that affect both the adoption of sustainable terrace farming and the livelihoods of rural communities in Yemen's mountains were identified. Agricultural support, mainly through a diesel subsidy, has largely benefited irrigated agriculture and large-scale farmers. Farmers in the mountain terraces, who mainly depend on rainfed crops and seasonal springs, have received no tangible benefits from such schemes. Similarly, support that targeted the development of large spate irrigation systems benefited spate systems in the flat downstream areas, but had no impact on mountain terraces. Also, subsidized wheat imports, which mainly benefit urban consumers, have reduced the profitability of rainfed farming on mountain terraces where cereal crops dominate. This has reduced the returns obtained from investment in terrace reconstruction and rehabilitation. Therefore, though the policy may have helped poor rural households' access cheaper staple foods like wheat, the negative effects on food production and employment outweigh any positive effect on food security for rural mountain households.

Access to capital for agricultural improvement was also identified as an area of concern. Three main institutions provide financial capital to rural communities in Yemen: the

Cooperative and Agricultural Credit Bank (CACB), the Agricultural and Fisheries Production Fund (AFPPF), and the Social Fund for Development (SFD). The different programs and credit facilities provided by these institutions seemed ideal for addressing the issues faced by small-scale farmers in Yemen's mountains, such as poverty, technology access and land improvement, including terrace rehabilitation. But, the study found that small-scale farmers' access to the opportunities offered by these institutions is negligible. This is because: (i) there has been a systematic bias in favor of large farms and irrigation rather than soil and water conservation in the upper catchment's areas, such as the mountain terraces. (ii) CACB loans during the period 1990-2000 were neither pro-poor nor pro-rainfed agriculture. The relatively few borrowers were not the poorest farmers, who depend on rainfed agriculture and live in the mountains. (iii) the number of projects funded by the AFPPF was small in relation to need, while the locations of those that were funded did not reflect the poverty concentrations of the different governorates. (iv) local Directorates of the Ministry of Agriculture seem to believe that the SFD lacks either the will or the capacity needed to implement programs that benefit rural mountain farmers. (v) rural communities in the study are unaware of these programs.

The study identified and recommended the following policy, institutional, and technological interventions to strengthen natural resource management and sustainable livelihoods in Yemen's mountains and close the policy–development gap:

- Community-based organizations, such as enterprise production and marketing groups, saving and credit associations, and water users' associations, should be organized. These will enhance community coordination when acquiring credit and increase community bargaining power, market access, and access to other services from development institutions. Such local organizations could collectively maintain and rebuild terraces, as well as perform other land improvement activities.
- Saving and credit associations, capable of accessing funds from formal financial institutions, should be created at the village level, as grass-roots microfinance intermediaries. The inability of rural credit institutions to reach the rural poor, in particular those living in the mountains, calls for these institutions to be restructured, with community capacity building as an explicit goal.
- Water shortages, identified by the communities studied as the single most important problem they face, need to be addressed. Water harvesting and storage structures already exist, but their efficiency needs to be improved. Farmers have good ideas about how to improve them and have developed proposals based on these ideas.
- Rural credit could be used to support investment in these and in terrace maintenance.
- Before effective technology development and transfer can take place in the terraced mountain areas, researchers need to understand their complex multiple agricultural systems, which use different types of crops and animals, each suited to different conditions. The uses and niches of these species need to be recognized, in relation to seasonal variations and the altitudinal gradients present even in relatively small micro-watersheds. The limited number of functional climate stations in Yemen hampers the characterization of these complex environments. In particular, farmers would benefit from greater access to fertilizers and improved sorghum, wheat, barley and legume seed, as well as from improved agronomic practices to increase the yield of high value crops, such as potatoes and coffee.
- The marketing of cash crops, particularly potato and coffee, should be supported using information generated by marketing studies. More and stronger links are also required between institutions and farmers.

3. Methods

The main research methods used for in this research are participatory rural appraisal and formal survey of households. The main objectives of the formal survey are: (1) To collect relevant socioeconomic data and determine the association between terrace

degradation (investment) and the socioeconomic variables, and (2) To examine the impact of farmers' income, labor constraints, and security of access to land on production and investment decisions

3.1 Participatory rural appraisal (PRA)

The MTP research teams implemented a community participatory research approach, for which they were trained earlier. The methodology involved land users, knowledgeable farmers and community members in problem identification and analysis.

Detailed guidelines were developed for community characterization and for collecting land information database in a GIS framework. These guidelines were distributed to the teams. The aim of this was to gain understanding of the communities in the research sites, their resources and relate that to land use, terrace conditions and maintenance.

Three reports detailing the description of these communities, there production systems, livelihood strategies, poverty levels as perceived by the local people, local criteria for poverty assessment, limitations for their productive enterprises, and their resources, based on PRA, were prepared for three micro-watersheds. The reports also contain the lists of problems identified by the communities and verified by the research teams during their extensive field visits and discussions with the farmers.

As the implementation of PRA commenced and progressed, the National Professional Officer and the research teams at each site organized meetings with the farmers during the field visits to discuss with the communities the data and information collected. The meetings involved political leaders in some communities and traditional leaders in others. It was made very clear that the project, with farmers' participation, will develop solutions to major problems and seek support from various sources but the project itself does not have development actions. This was an important issue to avoid raising expectations and making promises, while at the same time emphasizing and seeking community participation and support.

3.2 Livelihood questionnaire

A formal questionnaire was developed with participation and consultation of the 3 research teams in the study areas than tested in the field in participation with some household heads before adoption it. The questionnaire focused on the following topics:

- Measurement of (Human, Financial, Natural, Physical, Social) capitals.
- Subjective assessment of livelihood by households' themselves.
- The agricultural innovations that farmers learned for the last 5 years.
- The major expenditures of the family for the last year (12 months).
- Migration and sending money from aboard.
- Source of energy.
- Land tenure and property rights.
- Land degradation.
- Productivity and factor affecting the productivity of crops and livestock.
- Food security
- Rural investment
- Gender issues
- Household objectives

3.2.1 Sample size and Data collection

176 households were selected randomly and interviewed January – March 2003 in the three locations. Sample distribution according to the three watersheds is presented in table 1.

Table 1: Sample distribution by watershed (Number of households)

Watershed	Location in watershed			Total
	Top	**Moderate**	**Bottom**	
Wadi Yasqum	7	21	9	37
Al –Qimmeh	20	20	20	60
Al-Naqilain	25	29	25	29
Total	52	70	54	179

3.2.2 Data analysis

4. The wealth index and its variation

In conducting the analyses in this study, we were interested in how income sources differ between households. We need to introduce one of the major differentiating factors: asset status, as this will be used in the descriptive results presented in the subsequent sections.

Wealth ranking, a PRA technique, was undertaken for three locations during PRA to explore local perceptions of household stratification. Table 2 presented the key issues regarded 'wealth' as the main differentiating factors mentioned by local people at Al-Naqilain micro-watershed location to characterize different well being categories of the rural households.

Table 2. The criteria of the local people to characterize different well being categories of the rural households.

Households categories	Owned cultivated area		Ownership livestock		Owned car, tractor, mill, shop, etc.	Non agriculture activities		Some members working in the Gulf
	Area ha	Cultivated crops	Type of animal	Number of head		Kind of activity	Duration of activities	
Well off	More than 2.6	Cereal vegetable qat and forage	Cows Goat Sheep	> 2 > 4 > 4	Private car or tractor or shop	Private activity	All the year	More than two
Moderately	1-2.6	Cereal vegetable and qat	Cows Goat Sheep	1-2 3-4 3-4	Have car for rent or mill or small shop	Employee	Most of the year	One
Poor	Less than 1	Cereal and forage	Cows Goat Sheep	- 1-2 1-2	-	Labor	From time to time	-

Source: PAR Report.

In the wealth ranking, bout 22% of the households classified themselves as well off, 48% as moderate, and 30% as poor. Variables identified by the key factors as important in distinguishing households were: owned cultivated area; owned livestock numbers; ownership of car, tractor, mill, shop, etc.; and non-agricultural activities. Cavendish (1999; 2002), in his household studies from nearby Shindi Ward in Chivi; and Compble et. al. (2002) in a study on household livelihoods in sami-arid regions used wealth quintiles to explore patterns of income distribution. We undertook a preliminary questionnaire analysis and identified wealth status as the most important factor to be considered in describing household livelihoods. It was thus necessary to develop some means of differentiating wealth levels among households, and to do this a wealth index based on household assets was developed. We could not use wealth ranking from PRA, as the household survey covered areas that encompassed more households than could be included in a wealth ranking exercise. The wealth index that was developed uses variables that were identified as important criteria in differentiating households in the PRA wealth ranking.

4.1 Creating the wealth index and wealth quartiles
The wealth index was created using 'Factor Analysis' which is based on 'Principal Components Analysis' method (PCA). This analysis refers to a variety of statistical techniques whose common objective is to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables. However, this technique involves combining several original variables into a few derived variables. In this case, there is a single derived variable, which is interpreted as a wealth index. Five main elements were hypothesized that it can be represented the household wellbeing. Theses elements include human capital, income, assets, housing condition, and credit availability. Several variables were used to represent each element as the follows:

- Human Capital
    - Total number of household (HH).
    - Number of HH members who contribute money to the rest of family
    - Number of household members migrating to work abroad
- Income
    - Remittance from abroad

- % income from labor wage in agriculture.
- % income from remittance from aboard
- Assets
  - Total area of the owned land
  - Number of goats
  - Value of qat trees
  - Value of coffee trees
  - Value of houses
- Housing condition
  - Type of house
  - Number of rooms in the house
- Credit
  - Availability of any credit source

For calculating the wealth index in this study, the above variables coefficients estimated by factor analysis are multiplied by the standardized values of the respective variables for each factor. Construct household-specific wealth indices, as scores obtain from factor analysis, is:

$$X^* = w_1X_1 + w_2X_2 + w_3X_3 + \ldots + w_nX_n$$

Where X^* represents the scores for each household.

Then, it was used to divide the scores of the sample that included 176 cases into wealth quartiles with 44 households in each category. Table (x) shows distribution of households in the sample by wealth quartiles and watersheds. It seems that households' percentage of poor families at Al-Naqilian watershed (Ibb province) were higher than the other locations, and well-being families at Wadi Yasqum (Lahaj province) were much higher compared to the other two locations.

Table (x) **Household distribution by wealth quartiles and watersheds**

| Wealth quartile categories | | Watershed | | | |
		Wadi Yasqum	Al – Qimmeh	Al-Naqilain	Total
Lowest 25%	Count	1	7	36	44
	% within watersheds	2.7%	11.7%	45.6%	25.0%
25%-50%	Count	7	15	22	44
	% within watersheds	18.9%	25.0%	27.8%	25.0%
50%-75%	Count	7	21	16	44
	% within watersheds	18.9%	35.0%	20.3%	25.0%
Top 25%	Count	22	17	5	44
	% within watersheds	59.5%	28.3%	6.3%	25.0%
Total	Count	37	60	79	176
	% within watersheds	100.0%	100.0%	100.0%	100.0%

While it may have made sense to have classes that were not equal in size, it is more appropriate from a statistical perspective to have equal-sized classes (Campbell et al., 2002), and we cannot assume that the four unequal-sized classes recognized in the PRA wealth ranking in three watersheds apply to all the other villages. We did explore different ways of constructing the wealth classes, including the use of classes defined by 'natural' breaks in the wealth index, but settled on the current system after much preliminary data analysis.

4.2 Wealth quartile characteristics

The distribution of households among wealth quartiles was not the same at the three locations (Table x). There was significant statistical difference in the wealth index by watersheds ($F = 58.3$, $df = 6$ & 176, $p > 0.01$). However, the main reasons for the differences among the watersheds probably are related to income from government job, number of household members migrating to work abroad, remittance from abroad, total owned land, having irrigated or supplemental irrigated land, number of owned sheep and goats, number of owned qat trees, and number of owned coffee trees.

There are, in average, more owned qat and coffee trees per household in Wadi Yasqum watershed (Lahaj Province), and also amount of remittance from abroad, and percentage of income from government job are significantly higher compared to the other two locations (Table xx). Thus, the percentage of household who classified in the top 25% category at Lahaj was higher.

Table (xx) Differences in wealth indicators among households by watersheds

Indicator	Watersheds			Total	Sig.
	Wadi Yasqum	Al – Qimmeh	Al-Naqilain		
Income from government job (%)	32.3	27.0	7.5	19.3	***
Number of household members migrating to work abroad	1.4	0.0	0.1	0.4	***
Remittance from abroad (Ryial)	137527	1167	18835	37764	***
Total area of the owned land (ha)	2.4	1.3	0.4	1.1	***
Having irrigated or supp. Irri. Land (1=yes) (0=otherwise)	0.8	0.3	0.4	0.5	**
Number of sheep and goats (head)	3.8	7.1	0.3	3.3	***
Number of qat trees	310	92	0	97	***
Number of coffee trees	787	112	0	204	*

5. The assets available to households

Households use a variety of resources as inputs into their production processes as they attempt to meet and extend their livelihood needs. These can be classified as human, financial, physical, natural and social capital, as has been popularized in the sustainable livelihoods approach (Carney 1998). Five capital assets were used as a means to structure this section, as it ensures that all the components of the livelihood assets are addressed. Similarly, in our modeling we have used the capital assets framework as an organizing principle. By breaking down the assets into different

components one risks having a disaggregated rather than an integrated perspective. Thus in the last section (5.6) of the chapter we return to an integrated perspective of households and their assets.

As households make choices about how to use their resources to further their livelihoods, the allocation of human capital, chiefly labor, is arguably the most important resource decision (Mortimore 1998). We give this decision considerable attention. Decisions regarding investments in financial capital tend to play a lesser role, as the scarcity of cash prevents frequent and large investments. Furthermore, limited availability and transferability of natural capital prevents frequent and major decisions regarding land allocations. In this section we describe the capital assets, and in section 6 describing how the assets translate into production will be discussed.

5.1 Human capital
In highland mixed farming system, labor can often be regarded as the chief resource available to households. We begin below by investigating household size, composition and health. Next, we discuss how investments in human capital are made through education. We then investigate how households allocate their time between alternative activities.

The next section looks at the seasonality of the opportunity cost of labor, in order to explore whether there are particular labor bottlenecks. We then investigate the extent to which households may go beyond the labor resources available within their households, by hiring outside labor. The final section summarizes and indicates the need to broaden the concept of human capital to human capability.

5.1.1 Household size, composition and health

Households comprise an average of 10.4 members. Wealthier households tend to have more adult males and females, while there are no differences for children amongst wealth quartiles (Table xx5.1). In other words, households with more adults appear to be able to create more wealth, while children do not appear to contribute to household wealth. As household resources are invested in children, returns to households appear to be received when they mature and can contribute more towards household production as adults. Consistently for all wealth classes there are more adult females than males, a reflection of the greater degree to which males move from the household on a relatively permanent basis to take up employment in urban areas. Our case studies show that women are increasingly moving into long-distance trading of a wide variety of farm and non-farm products (e.g., garden produce, second-hand clothes, non-timber forest products). This requires that they move temporarily to other areas, but they seldom move away permanently.

	Wealth quartiles				Average	Sig.
	Lowest 25%	25%-50%	50%-75%	Top 25%		
Number of adult males	2.4	2.8	3.1	4.5	3.2	***
Number of adult females	2.7	3.0	3.2	4.8	3.4	***
Number of children (7-12 years)	1.6	1.6	1.5	2.3	1.8	N.S
Number of children (<7 years)	1.3	1.6	2.5	2.5	2.0	*

Total number of HH	8.1	9.1	10.3	14.1	10.4	***

Residency

	Wealth quartiles					
	Lowest 25%	25%-50%	50%-75%	Top 25%	Average	Sig.
No of adult males resident at the village	2.07	2.14	2.68	3.59	2.62	***
No of adult females resident at the village	2.41	2.84	3.07	3.82	3.03	*
No of adult males non-resident in the village	0.61	0.70	0.68	1.55	0.89	*
No of adult females non-resident in the village	0.07	0.14	0.00	0.07	0.07	N.S

5.1.2 Education

Households may undertake significant investments in terms of school fees, uniforms, school supplies, and forgone labour, in order to educate family members. While there is no difference among wealth quartiles at levels of primary education, secondary education is associated more with higher wealth households, while no education is more associated with the lowest quartiles (Table 9). The number of family members with post-secondary school education is extremely low. Zimbabwe had an extremely strong drive to provide education for all after independence, as reflected in the number of people with primary school education. The current trends are worrying as increasingly children are being withdrawn from school, especially secondary school, due to the introduction of school fees and the fact that households have less disposable income. Shocks such as the death of breadwinners may also result in withdrawal from school (e.g., Box 13). Lack of employment opportunities in the country has also discouraged children from completing the basic four years of secondary education. It is now common to hear young children querying why they should keep on going to school given that their older brothers and sisters, who completed secondary and even tertiary education, are unemployed. Rather than 'waste' time and school many decide to join the exodus to South Africa seeking jobs.

	Wealth quartiles					
	Lowest 25%	25%-50%	50%-75%	Top 25%	Average	Sig.
Number of household members with illiterate	3.3	3.3	2.9	2.9	3.1	N.S
Number of household members can read and write	0.7	1.4	1.5	2.3	1.4	**
Number of household members with school education	2.2	2.0	2.7	4.5	2.8	***
Number of household members with post secondary school education	1.6	1.8	1.6	2.9	2.1	*

(%)

	Wealth quartiles				average	Sig.
	Lowest 25%	25%-50%	50%-75%	Top 25%		
Type of house - Mild	65.9	20.5	18.2	4.5	27.3	***
- Cement	34.1	79.5	81.8	95.5	72.7	
Having a separate kitchen	86.4	88.6	84.1	86.4	86.4	N.S
Having a separate bathroom	50.0	40.9	54.5	56.8	50.6	N.S
Having a separate water closet	43.2	45.5	27.3	52.3	42.0	N.S

(%)

	Wealth quartiles				Average	Sig
	Lowest 25%	25%-50%	50%-75%	Top 25%		
Is any of the household member sick with cancer or another disease	15.9	15.9	4.5	2.3	9.7	*
have any knowledge regardless agriculture	29.5	56.8	40.9	61.4	47.2	**
participate in any agricultural or extension training course	4.5	9.1	0.0	29.5	10.8	**
Has any of your household finished the university study	13.6	15.9	13.6	22.7	16.5	N.S

	Wealth quartiles				
	Lowest 25%	25%-50%	50%-75%	Top 25%	Total
Total number of household (HH)	8.1	9.4	10.3	14.3	10.5
Value of owned cars and /or pick ups	0	31818	140909	108636	70341
Food expenses	92561	149503	164523	224132	157680
Credit availability (1=yes) (0=no).	0.7	0.6	0.5	0.1	0.5
Number of household members migrating to work abroad	0.1	0.2	0.2	1.0	0.4
% income from government job	3.7	6.3	30.4	36.9	19.3
Trust in the community (1=yes) (0=no)	0.9	0.9	1.0	1.0	0.9
Type of the house	1.3	1.8	1.8	2.0	1.7
Number of rooms	3.3	4.3	4.7	5.6	4.5
Facing food shortage in the last five years (1=yes)	0.5	0.3	0.3	0.3	0.4
Women in the household working as off-laborer in agriculture	1.7	1.9	1.9	1.9	1.9
Education (0=illiterate) (1=otherwise)	0.3	0.4	0.6	0.8	0.5
# of HH members who contribute money to the rest of family	1.3	1.8	1.8	2.6	1.9
Total owned area (ha)	0.4	0.7	1.0	2.4	1.1
Having irrigated or supp. Irrigated land	1.9	1.6	1.5	1.2	1.5
Applying crop rotation in the farm	1.6	1.5	1.5	1.8	1.6
No. of sheep and goats	0.3	2.1	2.9	8.1	3.3
No. of cattle	0.8	0.8	1.0	0.8	0.9

5.2 Financial capital

Number of household members who contribute money to the rest of household

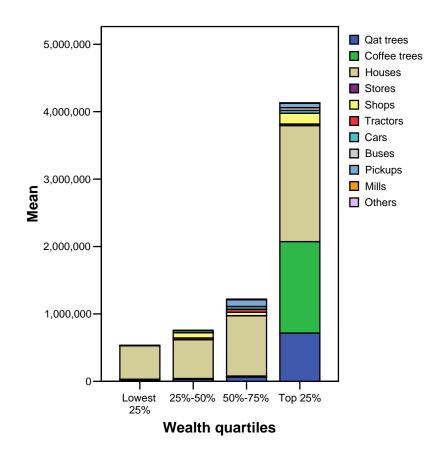| No of Household members	Wealth quartiles				Total
	Lowest 25%	25%-50%	50%-75%	Top 25%	
1	70.5%	40.9%	52.3%	38.6%	50.6%
2	27.3%	43.2%	25.0%	2.3%	24.4%
3		15.9%	13.6%	34.1%	15.9%
4	2.3%		9.1%	13.6%	6.3%
5				9.1%	2.3%
6				2.3%	.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Average numbers	1.3	1.7	1.8	2.6	1.9

Sig 0.001

%

		Wealth quartiles				Average	
		Lowest 25%	25%-50%	50%-75%	Top 25%		Sig
Receiving remittances from a family member or a relative		15.9	20.5	34.1	43.9	28.3	*
spending the received money	Home consumption	100.0	70.0	73.3	73.7	76.5	N.S
	Saving	0.0	20.0	6.7	15.8	11.8	
	Both	0.0	10.0	20.0	10.5	11.8	
saving something from the total income in the last year		7.7	15.6	21.6	28.9	19.5	N.S
Availability source that lend to spend on the farm		75.0	56.8	45.5	13.6	47.7	***

5.3 Physical capital

	Wealth quartiles					Sig.
	Lowest 25%	25%-50%	50%-75%	Top 25%	Average	
Number of qat trees	27.3	32.9	160.2	166.0	96.6	N.S
Number of coffee trees	0.7	52.0	642.0	119.6	203.6	N.S
Number of houses	1.0	1.0	1.0	1.2	1.1	*
Number of stores	0.0	0.1	0.1	0.2	0.1	*
Number of shops	0.0	0.1	0.3	0.2	0.2	*
Number of cars	0.0	0.1	0.1	0.1	0.1	N.S

Number of pickups	0.0	0.0	0.2	0.1	0.1	*

Value of Physical capital

5.4 Natural Capital

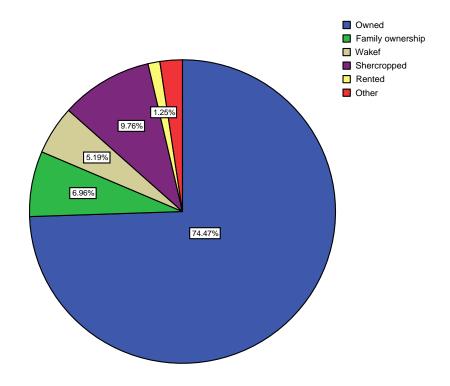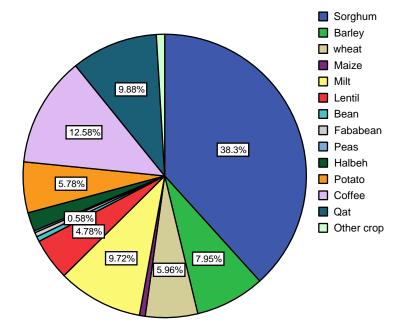|		Wealth quartiles					
		Lowest 25%	25%-50%	50%-75%	Top 25%	Average	sig
Total holding area (ha)	Mean	0.4	0.7	1.0	2.4	1.1	***
	Std. Deviation	0.4	0.6	0.7	3.4	1.9	
Number of plot pieces	Mean	8.8	20.7	27.1	38.8	23.7	*
	Std. Deviation	14.6	52.1	47.6	51.7	45.1	
Irrigated land area (ha)	Mean	0.011	0.025	0.047	0.114	0.049	*
	Std. Deviation	0.038	0.063	0.088	0.309	0.168	
Distance between the drinking water source and the house (m)	Mean	611.2	1017.5	1383.2	1306.6	1078.6	**
	Std. Deviation	851.1	1119.2	1138.7	1014.8	1070.5	

Average holding area (ha)

Wealth quartiles	Owned	Family ownership	Wakef	Sharecropped	Rented	Other
Lowest 25%	.208	.0177	.0360	.043	.024	.0182
25%-50%	.462	.0663	.0401	.185	.011	.0015
50%-75%	.495	.1880	.0750	.114	.006	.0076
Top 25%	2.095	.0327	.0760	.085	.014	.0764
Total	.815	.0762	.0568	.107	.014	.0259

%

	Wealth quartiles				
Holding type (%)	Lowest 25%	25%-50%	50%-75%	Top 25%	Average
Owned	59.8	60.4	55.9	88.1	74.5
Family ownership	5.1	8.7	21.2	1.4	7.0
Wakef	10.4	5.2	8.5	3.2	5.2
Sharecropped	12.4	24.1	12.9	3.6	9.8
Rented	7.0	1.4	0.7	0.6	1.3
Other	5.2	0.2	0.9	3.2	2.4
	100.0	100.0	100.0	100.0	100.0

Legend:
- Owned
- Family ownership
- Wakef
- Shercropped
- Rented
- Other

74.47% — Owned
6.96% — Family ownership
5.19% — Wakef
9.76% — Shercropped
1.25% — Rented

Land use (All groups)

Legend:
- Sorghum
- Barley
- wheat
- Maize
- Milt
- Lentil
- Bean
- Fababean
- Peas
- Halbeh
- Potato
- Coffee
- Qat
- Other crop

38.3% — Sorghum
7.95% — Barley
5.96% — wheat
9.72% — Milt
4.78% — Lentil
0.58% — Halbeh
5.78% — Potato
12.58% — Coffee
9.88% — Qat

Land use by crops

Crop		Wealth		Average

		quartiles			
	Lowest 25%	25%-50%	50%-75%	Top 25%	
Sorghum	42.78	41.12	42.98	33.27	38.30
Barley	7.47	13.70	11.41	3.83	7.95
Wheat	4.71	10.84	8.96	2.66	5.96
Maize	1.79	1.56	0.49	0.06	0.66
Milt	8.10	3.22	5.25	15.31	9.72
Lentil	3.71	7.17	8.29	2.16	4.78
Potato	21.34	9.71	4.55	0.41	5.78
Coffee	0.17	3.68	6.17	23.31	12.58
Qat	4.90	4.02	5.29	16.23	9.88
Other crop	5.03	4.98	6.61	2.76	4.40
Total	100.00	100.00	100.00	100.00	100.00

% within Wealth quartiles

		Wealth quartiles				Total
		Lowest 25%	25%-50%	50%-75%	Top 25%	
Do you have livestock	Yes	72.7%	85.0%	82.1%	95.3%	83.7%
	No	27.3%	15.0%	17.9%	4.7%	16.3%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Sig at 4%

Average number of animals owned by household

Wealth quartiles	Number of goats	Number of cows	Number of ox	Number of sheep	Number of donkeys
Lowest 25%	.07	.70	.11	.25	.43
25%-50%	.34	.73	.09	1.77	.52
50%-75%	.52	.80	.20	2.34	.61
Top 25%	2.95	.61	.16	5.11	.73
Total	.97	.71	.14	2.37	.57
Sig.	***	N.S	N.S	**	N.S

Livestock number in comparison with the last five years

	Wealth quartiles				Total
	Lowest 25%	25%-50%	50%-75%	Top 25%	
No change	32.4%	33.3%	15.4%	25.6%	26.5%
Decreased	55.9%	53.8%	66.7%	59.0%	58.9%
Increased	11.8%	12.8%	17.9%	15.4%	14.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

N.S

Availability and ownership of natural pasture lands

	Wealth quartiles				Total
	Lowest 25%	25%-50%	50%-75%	Top 25%	

Availability natural pastures surrounding the village	61.4%	68.2%	88.4%	95.5%	78.3%
Ownership of natural pasture land — Private	71.4%	30.0%	34.2%	12.2%	34.3%
Public	25.0%	56.7%	63.2%	68.3%	55.5%
both	3.6%	13.3%	2.6%	19.5%	10.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Sig ***

5.5 Social capital

Relationship with the village head * Wealth quartiles Crosstabulation

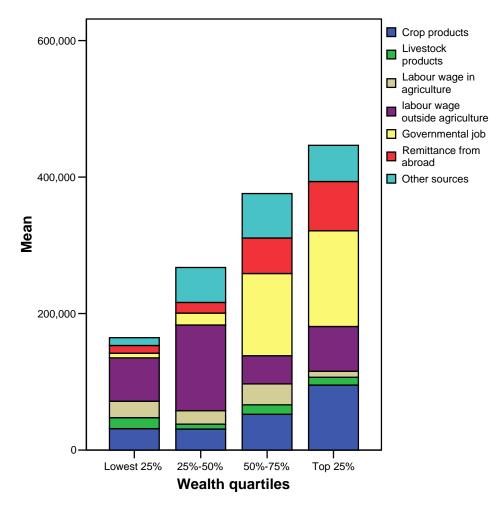| Relationship type	Wealth quartiles				Total
	Lowest 25%	25%-50%	50%-75%	Top 25%	
No relation	2.3%	2.3%		2.3%	1.7%
Good	79.5%	84.1%	90.9%	97.7%	88.1%
Fair	15.9%	11.4%	9.1%		9.1%
Bad	2.3%	2.3%			1.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

N,S

%

	Wealth quartiles				Total	
	Lowest 25%	25%-50%	50%-75%	Top 25%		Sig
Have the relatives any influence on the mutual work concerning the terraces	11.1	33.3	51.3	50.0	37.2	**
Availability of cooperative in the village	0.0	0.0	0.0	6.8	2.0	*
Availability of other social organizations in the village	0.0	2.7	2.6	2.3	1.9	N.S
Exchanging the benefits from agricultural work among farmers in the communities	69.8	66.7	81.0	74.4	72.9	N.S
Availability of trust among the households in the village	86.4	88.6	95.5	97.7	92.0	N.S
Conducting election for a local council	100.0	100.0	100.0	97.7	99.4	N.S
Having commercial relations with some traders	27.3	34.1	29.5	25.6	29.1	N,S
Household member married to someone living in a city	16.3	23.7	25.0	40.7	25.0	N.S
Using of the public services provided by the Government	88.6	88.4	95.5	90.9	90.9	N.S
Using of any developing project run by the Government	77.3	79.5	72.1	54.8	71.1	N.S

6. Household productive activities, the generation of cash and subsistence gross income

6.1 Land production

Income sources (%)

	Lowest 25%	25-50%	**Wealth quartiles** 50-75%	Top 25%	Average
Crop products	19.04	11.51	13.95	21.32	16.72
Livestock products	9.74	2.68	3.68	2.57	3.87
Labor wage in agriculture	14.66	7.4	8.16	1.96	6.64
labor wage outside agriculture	38.59	46.91	10.96	14.69	23.58
Governmental job	4.15	6.51	32.07	31.42	22.72
Remittance from abroad	6.86	5.84	13.84	16.15	12.04
Other sources	6.95	19.15	17.34	11.88	14.42
Average household annual income (Riyal)	164659 *(101093)* *US$ 915*	267517 *(286441)* *US$ 1488*	375853 *(233567)* *US$ 2088*	446518 *(247082)* *US$ 2480*	313637 *(250210)* *US$ 1742*
Average annual income per capita (Riyal)	27063	31655	40180	35386	33571
Average income per day per person US$	0.42	0.48	0.62	0.55	0.52

6.2 Livestock production

6.3 On-farm activities

Number of household members migrating to work inside Yemen * Wealth quartiles Crosstabulation

% within Wealth quartiles

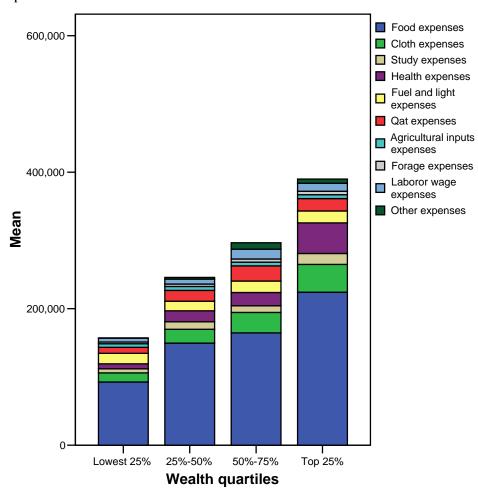|		Wealth quartiles				
		Lowest 25%	25%-50%	50%-75%	Top 25%	Total
Number of household members migrating to work inside Yemen	0	61.4%	63.6%	75.0%	72.7%	68.2%
	1	25.0%	25.0%	13.6%	18.2%	20.5%
	2	9.1%	11.4%	4.5%	4.5%	7.4%
	3	4.5%		6.8%	4.5%	4.0%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

N.S

Number of household members migrating to work abroad * Wealth quartiles Crosstabulation

		Wealth quartiles				
		Lowest 25%	25%-50%	50%-75%	Top 25%	Total
Number of household members migrating to work abroad	0	88.6%	86.4%	81.8%	61.4%	79.5%
	1	11.4%	11.4%	18.2%	13.6%	13.6%
	2		2.3%		11.4%	3.4%
	3				4.5%	1.1%
	4				2.3%	.6%
	5				4.5%	1.1%
	6				2.3%	.6%
Total		100.0%	100.0%	100.0%	100.0%	100.0%

Sig at 2%

6.4 Wages and remittances

6.5 Gross income patterns
Expenditures

% of annual expenditures

	Lowest 25%	25-50%	Wealth quartiles 50-75%	Top 25%	Average
Food expenses	58.9	60.8	55.5	57.5	57.9
Cloth expenses	8.5	8.3	10.1	10.5	9.6
Study expenses	3.8	4.5	3.3	4.1	3.9
Health expenses	4.7	6.5	6.5	11.5	8.0
Fuel and light expenses	9.8	5.7	5.7	4.5	5.8
Qat expenses	5.6	6.4	7.5	4.7	6.0
Agricultural inputs expenses	3.4	2.4	1.8	1.5	2.0
Forage expenses	1.6	1.4	1.6	1.3	1.4
Laborer wage expenses	3.6	2.9	4.9	3.0	3.6
Other expenses	0.1	1.0	3.1	1.6	1.7
Total	100.0	100.0	100.0	100.0	100.0
Average annual household expenditures (Riyal)	157069	245877	296602	389970	272380

Wealth quartiles	Home consumption of sorghum (%)	Seeds of sorghum (%)	Sold in market for Sorghum (%)	other for sorghum (%)	Total
Lowest 25%	79.8	10.7	9.2	0.0	100
25%-50%	82.9	10.9	5.8	0.0	100
50%-75%	85.3	10.6	3.2	0.0	99
Top 25%	89.4	9.5	0.8	0.0	100
Total	84.3	10.4	4.7	0.0	100
			*		
N= 152					

Wealth quartiles	Home consumption of barley (%)	Seeds of barley (%)	Sold in market for barley (%)	other for barley (%)	
Lowest 25%	84.6	15.4	0.0	0.0	100.0
25%-50%	83.3	15.0	1.7	0.0	100.0
50%-75%	79.4	18.9	1.7	0.0	100.0
Top 25%	76.3	23.7	0.0	0.0	100.0
Total	81.1	17.9	1.0	0.0	100.0
N=55					

Wealth quartiles	Home consumption of wheat (%)	Seeds of wheat (%)	Sold in market for wheat (%)	other for wheat (%)
Lowest 25%	78.00	22.00	.0000	.0000
25%-50%	88.00	12.00	.0000	.0000
50%-75%	78.33	19.58	2.5000	.0000
Top 25%	78.67	23.00	.0000	.0000

Total	80.93	18.57	1.0000	.0000

N=30   N.S

Report

Mean

Wealth quartiles	Home consumption of maize (%)	Seeds of maize (%)	Sold in market for maize (%)	other for maize (%)
Lowest 25%	87.50	8.75	3.7500	.0000
25%-50%	86.67	6.67	6.6667	.0000
50%-75%	95.75	4.25	.0000	.0000
Top 25%	97.67	2.33	.0000	.0000
Total	91.86	5.64	2.5000	.0000

N=14 N.S

Report

Mean

Wealth quartiles	Home consumption of el dekhen (%)	Seeds el dekhen (%)
Lowest 25%	91.33	8.67
25%-50%	91.80	8.20
50%-75%	93.50	6.50
Top 25%	93.83	6.17
Total	93.30	6.70

N=38 N,S

Report

Mean

Wealth quartiles	Home consumption of lentil (%)	Seeds of lentil (%)	Sold in market for lentil (%)	other for lentil (%)
Lowest 25%	70.0000	25.0000	5.0000	.0000
25%-50%	66.6667	31.1111	2.2222	.0000
50%-75%	64.0909	30.4545	5.4545	.0000
Top 25%	72.1429	27.8571	.0000	.0000
Total	67.4194	29.3548	3.2258	.0000

N= 31 N.S

Mean

Wealth quartiles	Home consumption of potato (%)	Seeds of potato (%)	Sold in market for potato (%)	other for potato (%)
Lowest 25%	31.4	14.7	53.9	.0
25%-50%	51.4	8.6	40.0	.0
50%-75%	41.7	14.4	45.0	.0
Top 25%	30.0	13.8	53.8	2.5
Total	37.4	13.4	49.2	.3

N= 38 N.S

Report

Mean

Wealth quartiles	Home consumption of qat (%)	Seeds of qat (%)	Sold in market for qat (%)	other for qat (%)
Lowest 25%	38.13	.00	61.88	.0000
25%-50%	39.09	.00	60.91	.0000
50%-75%	40.36	.00	59.64	.0000
Top 25%	47.27	4.09	48.64	.0000
Total	42.55	1.64	55.82	.0000

N=55 N.S

Report

Mean

Wealth quartiles	Home consumption of coffee (%)	Sold in market for coffee (%)
Lowest 25%	50.00	50.00
25%-50%	29.29	70.71
50%-75%	39.55	60.45
Top 25%	48.18	51.82
Total	42.68	57.32

N=41 N.S.

Report

Mean

Wealth quartiles	Home consumption of livestock production (%)
Lowest 25%	100.00
25%-50%	100.00
50%-75%	100.00
Top 25%	100.00
Total	100.00

N=80

Wealth quartiles	Home consumption of livestock (%)	Sold in market for livestock (%)
Lowest 25%	36.25	63.7500
25%-50%	59.47	40.5263
50%-75%	54.42	45.5769
Top 25%	59.53	40.4688
Total	54.09	45.9140

N=93 N.S

Report

Mean

Wealth quartiles	Home consumption of forage (%)	Sold in market for forage (%)
Lowest 25%	90.48	9.52
25%-50%	89.82	10.18
50%-75%	96.43	3.57
Top 25%	97.22	2.78
Total	93.94	6.06

N=113 N.S

7. Exploring household strategies
7.1 Quantitative analysis
7.2 the trends and patterns

8. Net income and poverty
8.1 Total net income
Preliminary results indicated that average of annual income for the total sample was 313,700 Riyal/year/household. This average was much higher in Lahag compared to Ibb province (452,000 vs 199,000 Riyal). Average income quartiles were created, the lowest 25% quartiles was about 104,000 Riyal/year (about US$ 630) compared to 650,000 Riyal/year (about US$ 3940) for the top 25 % (Table 1).

Averages of annual income quartiles (Riyal/year)

Group	Lahag	Hajja	Ibb	Average
Lowest 25%	91540	109000	104397	104336
25%-50%	216429	199357	184230	194166
50%-75%	309836	312176	310429	310904
Top 25%	764693	587567	653600	652914
Average	452472	379077	198911	313637

8.2 Poverty

Table 1. Household well-being by provinces (as household perception)

Household well-being	Province			Total	% Total
	Lahag	Hajja	Ibb		
Very poor	6	7	3	16	9

Poor	8	10	20	38	22
Moderate	18	33	46	97	55
Good	5	10	10	25	14
Total	37	60	79	176	100

Household well-being * Wealth quartiles Crosstabulation

		Wealth quartiles				Total
		Lowest 25%	25%-50%	50%-75%	Top 25%	
Household well-being	Very poor	5	7	1	3	16
	Poor	16	10	7	5	38
	Moderate	21	21	30	25	97
	Good	2	6	6	11	25
Total		44	44	44	44	176

Sig at 2%

8.3 Patterns of variation in components of net income
8.4 Building and balancing capitals to derive income

9. Modeling livelihood change
9.1 The Bayesian Network approach and model structure
9.2 Main driving variables of vulnerability and cash income
9.3 Livelihood assets and markets
9.4 Raising cash income

10 Making a difference
10.1 The sustainable livelihoods perspective — should we be bolder?

10.2 The causes of poverty and options to alleviate poverty

Two major groups continue to be excluded from most development initiatives: poorer farmers in dryland areas and pastoralists. There are many threats to the stability and sustainability of natural resource based systems and additional pressure has resulted from weak or inappropriate food policies, which have supported low urban prices at the expense of poorer farmers and livestock herders. Nonetheless, lessons have been learned and there has been a gradual acceptance of the need to re-orientate development towards the elimination of poverty, based upon sustainable resource use. Five broad strategic initiatives are proposed:

Sustainable resource management. Natural resources need to be conserved, through improved watershed management in hill and mountain areas, soil conservation in sloping lands and improved range management in pastoral areas. Components include: strengthening local resource-user groups; better management practices; and improved long-term policies.

Improved irrigation management. Increased efficiency in irrigation water management is essential to support the intensification and diversification of

production and to reduce resource depletion. Components include: schemes based on both surface and underground water technology; and adjustments to water charges and other regulatory measures.

Re-oriented agricultural services. The re-orientation of agricultural research systems to fully involve farmers will underpin intensification in the Irrigated and Rainfed Mixed Systems and enterprise diversification in all systems. Components include: extension services based on a variety of public and private service providers; and greater support for rural agribusinesses to create off-farm employment for farmers.

Revitalized agricultural education systems. New approaches to science and higher education learning systems are particularly important in the training of agriculturalists who will work in both the public and private sectors. Components include: the adoption of the significant advances in interdisciplinary learning and systemic thinking which have played such an important role in agricultural education elsewhere in the world.

Rationalized agricultural policies. Policies need to re-orientate development towards the elimination of poverty based upon sustainable resource use. Components include: eliminating subsidies for the importation of cheap grains, as well as other forms of support for low urban prices at the expense of poorer farmers and pastoralists.

Some results available
- Household well-being by province
- Percentage of Household Well-being by Provinces
- Creating the Average Income Quartiles
- Cross-tabulation between Income Quartiles and Household Well-being
- Averages of annual income quartiles (Riyal/year)
- Percentage of Income Quartiles by Provinces
- Financial Capital
- Income Quartiles (Average 3 Provinces)
- Income Quartiles (Lahag Province)
- Income Quartiles (Hajja Province)
- Income Quartiles (Ibb Province)
- Income sources (Average All Groups)
- Income sources (Lowest 25% Group)
- Income sources (Average 25% - 50% Group)
- Income sources (Average 50% - 75% Group)
- Income sources (Average Top 25% Group)
- Average Expenses (Average all Provinces)
- Average Expenditures (Average all Groups)

- Average Income and Expenditures (All Groups)
- Natural Capital
- Total owned area and no. of pieces
- Total owned area by provinces
- Total owned area by location in watershed
- % of households having livestock
- Livestock owned numbers
- Soil Depth (% of households)
- Soil Fertility (% of households)
- Natural pastures surrounding the villages (% of households)
- Relationship between natural pasture ownership and notice degradation in the natural pastures
- Physical Capital
- Average numbers of physical capital per household
- Value of Physical Capital by income quartiles
- Value of Physical Capital by location in the watershed
- Human Capital
- Averages of household number and income
- Receiving remittances from family members and saving money
- School Availability
- Sending daughters to Preparatory School
- Sending Sons to Preparatory School
- Acceptance sending daughters to preparatory school by type of school available in the village
- Social Capital
- Migration to outside rural areas (% of households)
- Social relationship (% of household)
- Cropping Pattern
- Cropping Pattern in Lahag
- Cropping Pattern in Hajja
- Cropping Pattern in Ibb
- Farmers' Practices (% of households)
- Inputs used on sorghum