Targeting Research for Enhanced Impact on Poverty in Marginal Areas: The Representative Case of the Dry Areas of Syria

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Targeting research for enhanced impact on poverty in marginal areas: The representative case of the dry areas of Syria

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1. Introduction

Marginal areas are often characterized by having a high incidence of 'marginal' people with relatively homogeneous determinants of poverty (TAC, 1999), low agricultural potential, inadequate infrastructure, and neglect by policy makers and research (Kuyvenhoven et al., 2004). In such areas responses to poverty include privatization, specialization, intensification, diversification, migration for wages, and exiting agriculture (Dixon et al., 2001). Public investments have traditionally concentrated on higher rainfall and irrigated areas, while research, extension, market development, credit provision, and infrastructure in the marginal dry areas have often been neglected. As a result there is a shortage of improved agricultural technologies. Many researchers and development thinkers believe that agricultural research contributes to poverty alleviation, if it can address the diverse challenges and opportunities of rural people and identify development pathways that build on technological innovations. These pathways can be described as patterns of change in livelihood strategies (Pender, 2004) determined by comparative advantages in agricultural potential, access to markets, population density, local organizations and services, and natural resources.

1.1 Objectives

The study analyzed the livelihoods of people living in the Khanasser valley, a sub-region of north-west Syria and assessed the likely impact of breeding and natural resource management technologies on local livelihoods and natural resources. We specifically aimed at determining who the poor rural people living in this marginal area are, by studying the diversity and interdependence of household livelihoods. We propose an operational classification that

helps in assessing the relationship among different groups of people and the natural resources they manage and depend on, the relative contribution of different livelihood sources, and the main local poverty challenges. Based on this, we discussed how household characterization can help to better target research to reduce rural poverty in similar marginal areas. The analysis is used to introduce specific interventions and development pathways that improve the targeting of agricultural options to local farmers.

1.2 The Khanasser benchmark site

The Khanasser study area is situated in northwest Syria. It extends over 450 km^2 at the border between rainfed crop lands and the steppe. The area is characterized by ecological problems (low - 200-250 mm annual - rainfall with drought risk, resource degradation, water scarcity and low quality, UNDP, 2002, La Rovere et al., 2003), socio-economic constraints, market marginalization, and widespread poverty. The area can be defined as a dry marginal rainfed mixed crop-livestock farming system (*cfr.* Dixon et al., 2001; World Bank, 2002). Two-thirds of the population of about 27,000 (Aw-Hassan et al., 2003) reside in the valley. In the last decades, 40% of households migrated to large cities or abroad in search of jobs. The dominant land tenure is private, with areas of reform and state lands. Main crop enterprises are rainfed barley, and wheat. Recently there has been a transition towards alternative farm enterprises such as cumin, a field cash crop, and olives, that provide oil consumed locally. Degradation of natural resources and pastures has driven the need for policies that banned irrigation from arable areas and cultivation from the steppe, and induced a shift from sedentary and semi-sedentary systems to areas formerly occupied by migratory pastoral systems. Recent major livelihood trends and strategies include non-farm labor migration, also and often outside the country, and the spread of intensive lamb fattening.

The area is considered by the International Centre for Agricultural Research in the Dry Areas (ICARDA) a benchmark site where problems typical of marginal areas are tackled. The study is part of the BMZ-funded Khanasser project that developed locally-specific technological options, applicable to similar marginal areas, and an integrated approach to

assess and out-scale a range of feasible options to other marginal areas. The project applied an Integrated Natural Resources Management approach aimed at improving livelihoods, productivity, and agro-ecosystem resilience at different scales by integrating research into stakeholder-driven processes of adaptive management and innovation (INRM website).

2. Research approach

The approach integrates quantitative and qualitative methods, and data and knowledge at various levels of analysis in a stepwise manner (La Rovere et al., forthcoming). It includes:

- A Rapid Rural Appraisal baseline survey at 58 local villages to identify homogeneous groups by cluster analysis of dominant livelihood strategies at the community level. A few of the baseline variables were mapped and overlaid with Geographical Information Systems to identify representative communities (Aw-Hassan et al., 2003).
- A Sustainable Livelihoods approach (Ellis, 2000; Campbell et al., 2001) to classify households into representative typologies, by a set of interlinked questionnaires:
    - Rapid interviews of all households in the representative villages to arrive at homogeneous clusters sharing similar productive activities and strategies
    - 80 in-depth semi-purposive random sample individual interviews with household in the pre-identified clusters, to encompass each typology[1] in proportion to the number of households living in the representative villages.
- A range of participatory and other assessment methods (timeline analysis, seasonal calendars, policy analysis, multi-annual market analysis) to identify trends in communities' history, resources and in livelihood strategies (La Rovere and Aw-Hassan, 2005), to understand the external factors that influence rural livelihoods.
- In addition, relative poverty across household typologies was estimated by the Lorenz curve of income distribution and the Gini coefficient across the rural population.

[1] A livelihood source is considered as main when it contributes to at least 75% of total household income.

We analyzed the likely impact of adopting feasible, ecologically sound, viable, and socially acceptable technologies on livelihoods and natural resources, and the policy and institutional conditions that need to be in place to make possible and enhance their impact.

Comparative static enterprise budget analysis assessed ex-ante the feasibility of a portfolio of agricultural technologies[2] developed locally over a period of more than six years and their future relevance for livelihoods, by quantifying their relative profitability, costs and benefits, and marginal rates of return (MRR) with / without the technology, and to identify the main constraints that limit adoption. Net profits per hectare and MRR of technologies over their intensity of household capitals (factors of production) use were compared to assess their relative magnitude and opportunity cost, versus alternative land uses and returns. Data on technologies was collected by annual or multi-annual farm household surveys: 153 semi-detailed enterprise budgets at the farm household level, and 84 detailed budgets, integrated with multi-level multi-stakeholder technology evaluation (La Rovere and Aw-Hassan, 2005).

3. Results

Based on their diverse forms of productive and social capital, livelihood strategies, and income structure, we characterized local households into three major typologies (Table 1):

- Agriculturists, who integrate on-farm crop production, lamb fattening and waged labor.

- Laborers, who are semi-landless and mostly rely on off-farm earnings and migration.

- Pastoralists, who are extensive herders, or migrate for wages.

Agriculturists and pastoralists were sub-divided based on whether they had significant off-farm labor ('agriculturist-laborers', 'pastoralist-laborers') or not ('pure agriculturists,' 'pure pastoralists'). The laborers were sub-divided based on whether their secondary livelihood source - besides wages - was cropping ('laborers-farmers') or herding ('laborers-herders').

[2] Traditional: new barley varieties selected by farmers using a farmer-breeding Participatory Plant Breeding approach (PPB); supplemental sprinkler and surface irrigation on wheat for improved water use efficiency.
Diversification: improved vetch crop by drought-tolerant varieties to reduce yield risk; management of rainfed cumin to stabilize yield and improve marketing; olive trees on slopes with water harvesting to increase yield and reduce groundwater use; barley intercrop with Atriplex shrubs to stabilize feed production and increase dry years biomass; or Phospho-Gypsum (PG) amendment to improve soil fertility and increase yields in dry years.
Intensification: mainly, capital intensive lamb fattening businesses that use lower-cost purchased feed.

The main livelihood activities and capitals of the household typologies identified in the Khanasser area and details on their assets are in La Rovere et al. (forthcoming). In essence:

- In terms of physical and natural indicators, the pastoralists own largest herds, the agriculturists own most fattened lambs and have largest landholdings, irrigated areas, and per capita land ownership ratios. While the 'laborer-farmers' can count on sufficient arable land for limited cropping, the 'laborer-herders' are the least endowed in land, animals, and water.
- In terms of economic and financial indicators, the agriculturists (> 1.3 $/day per capita) are among the wealthiest groups, while the laborers, with less that 1 $/day per capita, are the poorest. Communities where 'agriculturists' are the majority and livelihoods are based on lamb fattening and cropping have 1.29 $/day average per capita incomes; those dominated by 'laborer-farmers' and to a lesser extent 'agriculturist-laborers', with livelihoods based on a mix of cropping, herding and off-farm labor have average per capita incomes just above 1 $/day; while the income-poorest communities dominated by only the laborers and livelihoods based on seasonal migration have 0.86 $/day average per capita income.

Table 1 Household typologies assets and capitals in Khanasser

3.1 Livelihood challenges

Powerful socio-economic and ecological forces drive livelihoods strategies in dry areas. Those of Khanasser are detailed in La Rovere et al., 2003, La Rovere and Aw-Hassan (2005):

- **Physical** and **natural**: drought, groundwater depletion, declining soil fertility and crop productivity, rangeland degradation. Differences exist in the quality and quantity of arable land ownership and in the ownership of wells and livestock;
- **Economic** and **financial:** decreased real per capita incomes linked to the growing size of families, lack of cash and erosion of savings, and heavy reliance on costly informal finance of consumption and investment. A net disposable income surplus left after meeting health and living costs (cfr. with per capita consumption expenditure in Syria, 1.32 $/day, FAO, 2003) exists only for agriculturists and 'pastoralist-laborers'.

Access to credit and favourable terms of borrowings are crucial but, in the absence of formal systems, this is regulated by complex social relationships.

- **Social** and **human:** population growth and declining job opportunities in rural areas, mounting living costs, male migration to cities, feminization of agricultural labor, quality and access to education, rural extension, health services, sanitation, electricity, telephones, infrastructure, and diversified food and nutrition, are priority challenges.

3.2 Aggregate economic indicators

The aggregate annual economic turnover (Table 2) generated by people in the study area, inclusive of remittances and waged earnings, is quantified at about 0.5 billion Syrian Pounds (SP), or 10 million US$. The laborers' households (50% of total population) own or manage less that a third of the land and generate only a third of the total annual economic turnover, in the form of off-farm earnings from outside the area and outside agriculture. The agriculturists (39% of total population), own or manage 42% of the land and generate 53% of the annual economic turnover. The relative ratio of economic turnover generated by the pastoralists (over their population, 14%/11%) is similar to that of the agriculturists (53%/39%, higher than 1), hence they are in a more economically favourable position than the laborers (ratio of 33%/50%, lower than 1). Inequality across the rural population is given by the computed 0.217 cumulative Gini coefficient, which suggests the presence of relatively low rural inequality. Since productive sectors such as industry do not exist in the area, this only reflects inequality within agriculture and not between rural and urban areas.

Table 2: Household shares of population, land, and economic turnover in Khanasser

3.3 Livelihoods strategies diversification

The process of diversification, which is among the commonest strategies in marginal areas where opportunities are scant, is driven by the dynamic responses of households to the above mentioned social and ecological uncertainties (details in La Rovere et al., forthcoming):

The **agriculturists'** livelihoods have been evolving as the traditional mixed system was complemented by lamb fattening (half of their incomes), new field crops, and remittances.

The **laborers** earn most of their income from various off-farm activities, in and outside agriculture. They have highest per capita revenues from migration, their main source of liquidity, rely on credit and borrowing, and may face a riskier future as their main activities, crop production and waged labor, are strongly affected by climatic and marketing variability.

The **pastoralists'** incomes are dominated by extensive herding; they have large families, high costs to buy food, water, and transport livestock. Some of them are diversifying their strategies by integrating off-farm work. Forage scarcity makes them dependent on purchased feeds, not always accessible to many due to the declining role of feed-delivery cooperatives.

3.3 Comparative assessment of technologies

The benefits deriving from the use of local technologies developed in the Khanasser project are discussed below based on La Rovere and Aw-Hassan (2005), where demand data on the intensity of use of the different livelihood capitals invested in the technologies is reported. In there, annual enterprises are compared with the average annuities of long term enterprises. The resulting overall considerations and comparative conclusions are:

Financial capital use: Annual field crops requiring highest initial investment are irrigated wheat and cumin. Olive orchards grown on hill slopes require large costs at the beginning of the multi-annual investment. Barley needs relatively low initial costs. Net economic returns to capital are highest for irrigated cumin, rainfed vetch, and wheat; modest in dry years for barley; negative for the Atriplex-barley intercrop. The net return on invested capital for lamb fattening is relatively low due to very large initial costs, although net profits are very high.

Natural resources use:

- **Water**: wheat uses agricultural water and groundwater in less economically efficient ways than other local irrigated crops. Lamb fattening uses little water, if considering the water drunk by fattening lambs. Though feed production requires water, feeds are produced outside Khanasser, hence fattening does not deplete local water but imports it in the form of feeds.

- **Grazing**: Vetch, Atriplex, the application of the PhosphoGypsum (PG) amendment, irrigation on wheat, and improved barley varieties increase the seasonal forage biomass for extensive sheep grazing.

- **Land, and soil fertility**: The economic returns of crop yield to land are highest for cumin and wheat, lowest for olives. Trees, however, capitalize the value of marginal sloping lands that cannot be cultivated with crops. Intensive lamb fattening has the highest returns to land. Enterprises with positive effects on soil fertility are vetch (N-fixation), application of PG (increased P_2O_5 content) and water harvesting on olive trees (soil and water conservation).

Human resources (labor) use: Labor intensive technologies that generate local employment are also suited to marginal areas (Kuyvenhoven et al., 2004). High net economic returns over labor, seasonal labor demand, and the supply of labor on-farm are indicators of the fact that the diffusion of enterprises such as olives, vetch, or cumin can generate employment locally.

4. Discussion

In Khanasser the poorest households are the landless and those with livelihoods mostly based on migration and off-farm wages. Income from migration, albeit a vital source of earning, is often insufficient to let them emerge out of poverty. Several 'pastoralists', with livelihoods mostly based on extensive herding in remote steppe areas where off-farm work opportunities are virtually absent, are also among the poorest. Most per capita disposable incomes in the area were found to be below 2 $/day, while for the laborers this was below the widely accepted 1 $/day indicator of dire income poverty.

4.1 Relevance of technologies for livelihoods and poverty reduction

The various enterprises researched and assessed by the project are relevant in different ways and to different extents to the rural people living in marginal dry areas. The preconditions that these options need to meet to become effective for benefiting rural people (e.g. marketability of olives and cumin, institutional support for the PPB process or PG use, credit for lamb fattening or to buy equipment for water use efficient irrigation) are given in Table 3. When the outlined pre-conditions are met, improved farming technologies, even if

initially adopted mostly by the relatively better off-farmers, can become options also for the poor. Implications of their adoption will interest land, fertilizer, water, and feed use, which will impact on production and availability of food, groundwater levels, aggregate forage availability, soil fertility, and farmer income and welfare. La Rovere and Aw-Hassan (2005), and La Rovere et al. (forthcoming) discuss in detail the pathways out of poverty based on these technologies, and the implications and likely impacts deriving from their adoption.

Table 3 Relevance of enterprises and technologies for different people, enabling conditions for improved livelihoods, and implications livelihood typologies

4.2 Different likelihood and patterns of impact

There are 3 sectors of rural people on which technologies impact in diverse ways (Figure 1):

Figure 1 Degrees of potential impacts on sectors of rural society in Khanasser

- The relatively better off, but still essentially poor agriculturists, endowed with market-enabling assets (access to water, land, lamb fattening), larger numbers of wage-earning family members and higher education levels are those who can benefit directly from agricultural research by diversifying into various enterprises and adopting new agricultural technologies, and indirectly through its positive spillovers. They can combine capabilities and assets to emerge out of poverty and attain better wealth, adjust more quickly to market opportunities, diversify horizontally (in different crops), vertically (in value added activities), or *choose* to leave full time agriculture. Relatively few of them are forced to migrate or to exit agriculture. In the study area these households amount to about 45% of the total.

- The poorest and virtually landless groups, the laborer-herders and some pastoralists with livelihoods based on remittances, have lowest incomes per capita, and insufficient assets. These households, about 30% of the total, are, *de facto*, excluded in the short term from the *direct* benefits of agricultural research and may benefit only from longer-term investments by government and development organizations aimed at creating the enabling education, health,

financial, and infrastructure conditions. They may benefit indirectly from other options, such as those that stabilize barley production, improve extensive animal production, and from the positive employment spillovers generated in rural labor markets by farming improvements and employment spillovers from new enterprises, and are the most likely to exiting farming.

- In between the above sectors of rural society there are those who have enough productive assets (arable land, labor) to use agricultural research solutions, find opportunities in rural areas without having to exit farming, and benefit of: broad-based growth stirred by research spillovers, increasing labor demand from technology-induced productivity growth, labor-absorbing value-added technology, and input price decline. These households, which include a large share of poor people, are among the next most likely beneficiaries of research to reduce poverty. These diversify in less capital intensive crops such as barley, benefit moderately from extensive animal production technology and from crop production (via off-farm work). Since the pathways to improve their livelihoods are based on off-farm earnings, they can remain competitive in agriculture if various enabling conditions that allow them to benefit of agricultural options are in place (Table 3). In the study area these households are 25% of all. It is towards these that agricultural research should be targeted more effectively.

5. Conclusions and implications

The main responses of Khanasser households to the challenges of living in marginal areas are diversification of livelihood strategies, specialization in intensive activities, migration, and exiting agriculture. Rural households are heterogeneous as their assets, capabilities, resilience and opportunities are diverse. The presence of different types of households implies that different technologies are suitable for different endowments and that the enabling conditions differ between types. This diversity of options can lead to a variety of impacts. The definition and operative adoption of household typologies is an element of development-oriented research that allows hypotheses and technologies to be tested vis-à-vis the intended beneficiaries, to design policies that account for livelihood diversity and for the

interdependence of different groups through labor exchanges and people mobility. It also facilitates the identification, targeting, up and outscaling of research solutions.

The direct beneficiaries of agricultural research in the Khanasser marginal area are the poor households endowed with enough natural and labor resources that can make a main living from farming, or the relatively better off that can adopt technologies. The poorer, virtually landless laborers and more remotely located households with livelihoods only marginally based on farming, representing about a third of the total population, are therefore not among the *direct* beneficiaries of agricultural research. These often *have to* rely on off-farm earnings or exit agriculture, as they have no obvious farming-based opportunities. Agricultural research cannot directly alleviate their state of poverty, particularly in the short term, but is well placed to identify and advocate alternative policy intervention pathways.

Agricultural options that are accessible, profitable, affordable, ecologically sound, and suitable for this marginal area are limited. The experimental results of this study suggest that interventions that can positively impact on the livelihoods of poor farmers in Khanasser comprise a portfolio of selected options emerging from this project, coupled with measures that ensure their feasibility, relevance, and adoptability by different users under diverse conditions (Table 3). The technologies likely to be adopted and successful that were identified by the study are those that contribute to:

- A more efficient use of water, to preserve ground water mainly during time of *drought*: water harvesting technologies, water use efficient irrigation, drought-resistant crop varieties.
- Reversing the declines in biomass and pasture degradation, by increasing the reliance on better feeding strategies and local production of lower cost feed.
- Counteracting the decline in job opportunities by the spread of labor intensive technologies, as viable alternatives to off-farm waged migration.
- Buffering the volatility of farm incomes by yield-stabilizing technologies, access to market information, improved post-harvest technologies, and diffusion of rainfed cash crops.

- Improving nutrition, food diversity, and health and lowering household food expenditure by the diffusion of dairy, fruit and oil, and on-farm vegetables production.

Unlike many Green revolution areas where a high degree of homogeneity facilitated the spread of modern varieties, for marginal dry areas a 'new' Green revolution that does not heavily depend on external inputs but combines drought tolerant genetic material, nitrogen-fixing crops, tillage and water practices for drought resistance, and other context-specific innovations can boost the portfolio of locally feasible options. Though these investments yield lower returns compared with other areas, the combination of traditional, alternative, and emerging options may yield higher returns for marginal lands than earlier technology did.

Agricultural research can have only moderate and variable impacts on other paramount challenges for livelihoods in marginal dry areas – health, education, unemployment, trade - that need to be addressed at the institutional and policy levels. In this study we demonstrated that not all rural population in the marginal dry areas will be necessarily lifted out of poverty by agricultural research. The poorest households with no agricultural assets will not directly benefit from agricultural research. We argue that in addition to the investment in agriculture-based innovations for the part of the rural people with agricurtal assets, long-term social investments for the poorest rural sectors in marginal areas may yield higher returns than investments in agriculture. Research for developing rural areas must identify these issues and stimulate a critical reconsideration of where, how, and to whom it should be targeted to impact on poverty. Several research organizations, in fact, often end up working with the better off, educated, endowed, and innovative farmers. This can certainly facilitate the testing and adoption of technologies, but does not always allow reaching those who are in greater need of new options. When this happens, the likelihood that growth, driven by the delivery of technological improvements will prevalently benefit the larger or better off farmers is high and may contribute to creating or widening inequality gaps. Choices must therefore be made as to whether, where, and how agricultural research should directly address rural poverty and its multifaceted causes, or it should be limited to improving the livelihoods of only a fraction

of farmers. Large parts of people in these areas need policy and intuitional interventions with long-lasting impacts on human capabilities, to emerge out of poverty. This would allow setting more realistic expectations of agricultural research and make possible to accept that agricultural research addresses only part of the more complex problem of rural poverty.

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Figure 1 Degrees of potential impacts on sectors of rural society in Khanasser

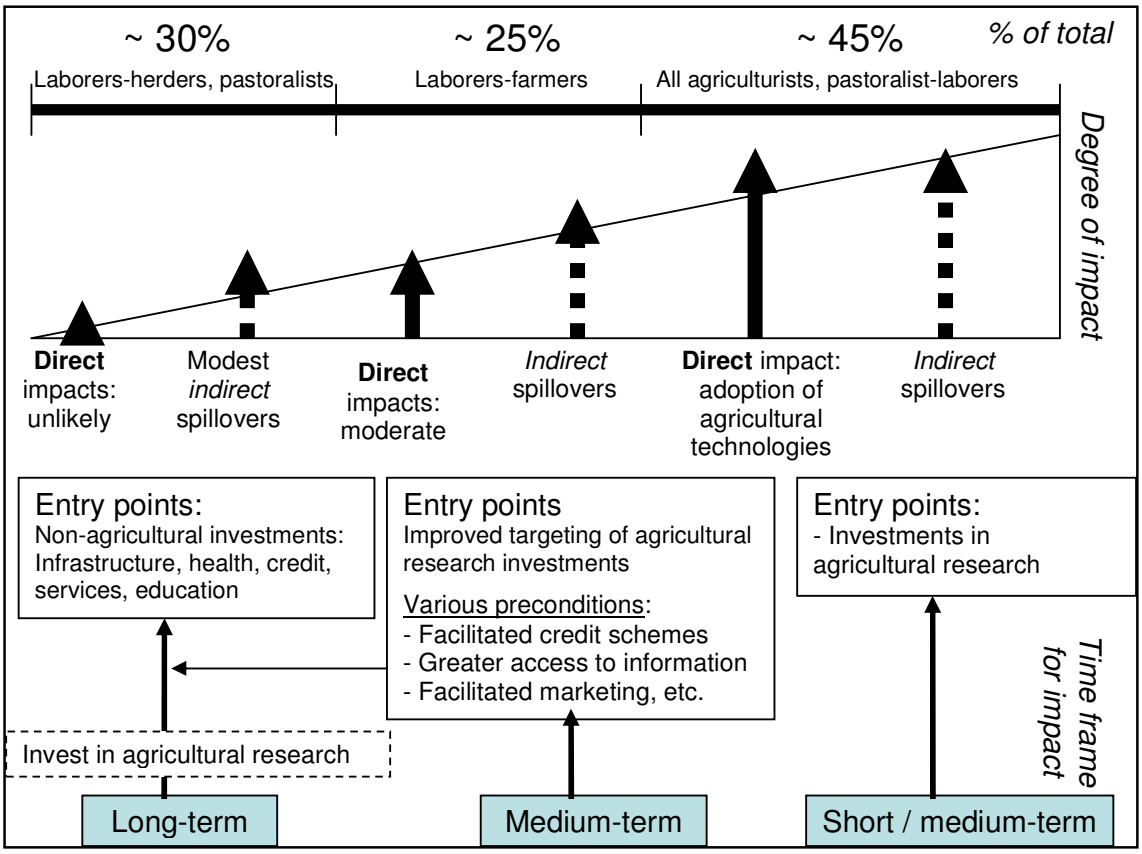

Table 1 Household typologies assets and capitals in Khanasser

Livelihood typology		Household typologies					
		Laborers		Agriculturists		Pastoralists	
'Main livelihood activities'		*With farming*	*With herding*	*No off farm work*	*With off-farm work*	*With off-farm work*	*Scarce off-farm work*
- Cropping		8%		17%		0%	
- Livestock	% share	11%		23%		82%	
- Lamb fattening	of income	0%		48%		7%	
- Off-farm wages		81%		12%		11%	
Per capita income	US$/day[3]	0.82	0.48	1.72	1.30	1.43	1.15

Table 2: Household shares of population, land, and economic turnover in Khanasser

Household sub-typology	Laborers	Agriculturists	Pastoralists
Share of population over total	50%	39%	11%
Share of land over total	29%	42%	33%
Share of economic turnover over total	33%	53%	14%

[3] Based on an exchange rate of 51 SP / US$ as in 2002.

Table 3 Relevance of enterprises and technologies for different people, enabling conditions for improved livelihoods, and implications

Enterprise	*Technology*	*Relevance for different livelihood types*		*Conditions that the options need to meet in order to become effective…*	*Implications of the diffusion of enterprises and technologies:*	*Main likely impacts of diffusion of technology on:*
		Currently	*Potentially*			
Olives	*Water harvesting* *Improved management*	*Agriculturists*	*Agriculturists* *Laborer-Farmers*	*Enhanced marketability and competitiveness*	*Less costs for irrigation water* *Expansion of olive orchards* *Fuel subsidies, water pricing*	*Production, food consumption* *Seasonal labor demand* *Aggregate groundwater use*
Barley	*New varieties (by PPB)*	*Agriculturists* *Laborers*	*Laborers*	*PPB process institutionalized*	*Expansion of PBB varieties*	*Feed (barley) availability* *Incomes, risk reduction*
	Phospho-Gypsum (PG)	*Agriculturists (Laborer-Farmers)*	*Laborer-Farmers*	*Institutional solution to transport PG*	*Transport, fertilizers subsidy* *Wider expansion of PG*	*Feed (barley) availability* *Incomes, soil fertility* *Adoption of the technology*
	Atriplex *intercrop*	*(Agriculturists)*	*Agriculturists (Laborer-Farmers)*	*Participatory extension pathways developed* *Communal institutions to avoid conflicts*	*Expansion of* Atriplex *intercrop* *Changing access to grazing areas* *Increased credit availability*	*Feed availability in dry years* *Adoption of the technology*
Cumin	*Improved management*	*Agriculturists*	*Agriculturists* *Laborers*	*Marketability enhanced* *Marketing information available*	*Expansion of cumin* *Fertilizers subsidy* *Output price fluctuations*	*Incomes, land use*
Vetch	*Improved management (New varieties)*	*Agriculturists*	*Agriculturists* *Laborers*	*Local institution for low-cost seed delivery*	*Expansion of vetch*	*Incomes, forage, soil fertility*
Wheat	*Irrigation technologies (New varieties)*	*Agriculturists*	*Agriculturists* *Laborers*	*Micro-credit for water use efficient irrigation*	*Expansion of irrigation technologies* *Fuel subsidies (for pumping water)* *Water pricing or subsidy*	*Groundwater resource, land use*
Lamb fattening	*Lower cost feeds*	*Agriculturists*	*Agriculturists (Laborers)* *Pastoralists*	*Pro-poor start-off strategies* *Marketability enhanced, market information* *Suitable credit schemes in place*	*Expansion of fattening* *Export regulations, feed subsidies* *Increased credit availability*	*Incomes, feed demand* *Adoption by poor farmers*