

SECOND FEMISE WORKSHOP

Marseille, Nov 25-26, 1999

COMMUNITY-LEVEL IMPACTS OF POLICY, PROPERTY RIGHTS AND TECHNICAL OPTIONS IN THE LOW RAINFALL AREAS OF WEST ASIA AND NORTH AFRICA

Nabil Chaherli

ICARDA-IFPRI

Mustapha Malki (ITGC, Algiers) and Cherif Ait Ammar (INRA, Algiers)

Algeria

Raoul Nasr (JUST, Irbid) and Amer Jabarin (UOJ, Amman)

Jordan

Daniel Deybe

CIRAD

November 1999

Community-level Impacts of Policy, Property Rights and Technical Options in the Low Rainfall Areas of West Asia and North Africa

Section 1: Objectives, significance and conceptual framework

In response to the expanding gaps in agricultural production and domestic demand (and greater dependence on import markets), GATT reforms, the greater integration of international markets and their implications for agricultural trade, governments in West Asia and North Africa (WANA) have initiated various forms of market liberalization programs. Recent market reforms being implemented by some governments, and the subsequent changes in relative input and output supplies and prices, all have an impact on the investment and management strategies of producers in the low rainfall areas.

This project attempts to analyze the impact of market reforms by supporting community and bio-economic modeling research in two representative sites of the WANA region: Sidi Fredj in Eastern Algeria and Felha (Madaba Governorate) in Jordan. These communities have been selected because they represent different development pathways in agro-pastoral systems. While farmers in Sidi Fredj seem to have recently adjusted to their economic and agro-ecological environment, the Felha farmers do not show signs of adaptation to reforms conducted by the Government of Jordan in the context of the Agricultural Structural Adjustment Program.

The need for a community study arises because of three main issues not addressed within a household setting. First, a community focus is needed to capture local output and factor markets. Studies on the agricultural sector and on rural areas assume perfectly competitive land, labor and credit markets, whereas in reality local output and factor markets are far less perfect, and problems such as asymmetric information, moral hazard, and concentrated market power, lead to less efficient forms of market behavior. Second, it is needed to capture environmental externalities arising within the boundaries of a modeled landscape (e.g. rangelands) by recognizing different types of households (those who cause the externality problem and those who bear the cost), and specifying their separate but inter-dependent

decision problems. Third, a community focus is needed to simulate the management of community rangelands. Most models assume that key natural resources are privately owned, and that they are managed in socially optimal ways. But inadequate property rights can lead to more exploitative types of user behavior. Common property regimes could then be tested in a setting where household decision problems are linked together. This is why a community approach encompassing research on household behavior is needed to address the impact of policy, technology and property rights on resource use and incomes in these areas.

Community studies will be done to analyze the impacts of policy and property rights reforms on the agricultural sector, at the low rainfall community and farm household levels, and on technology adoption and performance. The community models will integrate the results from property rights, and economic farm surveys to predict the farm level impacts of alternative policy options and changes in property rights and will be based on qualitative and quantitative assessment of community livelihood strategies and resource management rules and practices.

One of the major challenges facing agricultural economics researchers working on sustainable agricultural intensification strategies in an ecoregional context is the ability to integrate biophysical and socioeconomic information into a coherent analytical framework for analyzing the best development options. Technological solutions to many of the problems of unsustainable and stagnant agriculture abound, but they are often not accepted by farmers. At the same time, many policy and institutional reforms have failed to produce rapid and sustained agricultural growth. It is now widely accepted that partial solutions to the problem are insufficient, and that a combination of appropriate technologies, policy incentives and institutional reforms are required to increase agricultural productivity while maintaining, or even enhancing, the natural resource base.

The models used involve dynamic optimization and include the most significant features of profit-maximizing behavior for an average season, and inter-season uncertainty. The models represent (a) rainfall variability and its effects on yields; (b) farmers' decision-making flexibility; (c) different levels of farmers' aversion to risk. Resource degradation / enhancement over time, as functions of model choice variables, will be simulated and built into the mathematical programming models

through biophysical equations. The general structure of a community model is as follows:

$$\text{Max } Z = \sum_{k=1}^h \sum_{j=1}^n \alpha_k c_j X_{jk}$$

Such that:

$$\sum_{j=1}^n a_{ij} X_{jk} \leq b_{ik} \quad \forall_i \quad i=1, 2, \dots, m \quad \text{and} \quad \forall_k \quad k=1, 2, \dots, h$$

$$F(b_{i1}, b_{i2}, \dots, b_{ik}) = 0 \quad \forall_k \quad k=1, 2, \dots, h$$

$$X_{jk} \geq 0 \quad \forall_j = 1, 2, \dots, n$$

Z is a weighted average of farm type revenues, α the proportion of each farm type, X an activity level, a an input-output coefficient, b the level of resource endowments, c the gross margin parameter and F(.) a transfer function linking resource use at the community level describing the exchange of factors of production. The index {k} refers to farm types, {i} the resource type, and {j} the activity type.

To allow the representation of such factors, farm models use standard methods to capture the effects of income risk from variability in prices, cash crop yields and animal purchase and sales. The community model objective function is to maximize for the whole community a weighted average of farm net incomes associated with crop and livestock activities and resource use across states of nature, subject to constraints on land, labor and capital allocation according to farm/household type. The weighting scheme will be chosen to reflect different equity and cooperation/competition situations over common property resources. Maximization is achieved through selection of optimal sets of farm activities in a mathematical programming framework. The activities draw upon farmer's limited arable and rangeland resources, machinery and labor, and also feed availability. Included in the set of optimal activities are decisions about the crop rotation selection, livestock feeding in each state of nature, machinery and labor use transactions. Season variation is approximated by a number of states of nature to distinguish among historical drought, medium rainfall and good rainfall conditions. Models will have full sets of resource constraints as well as risk constraints.

A set of optimal farm plans by farm type (e.g. small farmers, large farmers, small flock owners, mixed farmers etc.) can be obtained by maximizing the expected weighted net revenues, subject to constraints relative to the probability of occurrence of each state of nature. In each model, different product and input prices will be considered, taking in account different scenarios of market liberalization, land tenure and technology adoption. Crop activities in the model will be based on cereals for grain and grazing, food and forage legumes, trees and pastures. Animal activities are based on different production technologies and marketing strategies for sheep and goats.

If sustainable and equitable agricultural development in the low rainfall areas is to become a reality, environmental, social and economic policies must work together. While specific measures will be tested alone with the community models, an attempt will be made to evaluate changes in an integrated set of macroeconomic, trade and sector policy instruments simultaneously. These sets could include but are not limited to combinations of:

- Targeted credit similar to micro-credit options for selected crop and livestock activities
- Crop and livestock insurance to help farmers cope with drought
- Green payments for farmers and herders to adopt environmental friendly natural resource management strategies
- Revenue assurance and welfare payments to cover climatic and price shortfalls
- Conservation plans for the rangeland and marginal lands
- Reduction in input subsidies and price support (market liberalization)
- Reduction in border protection (tariff rates reform) as a result of WTO membership and a Free Trade Zone Agreement with EU
- Local currency devaluation.

One common feature of the first five policy options is that they could be targeted and tailored according to the needs and constraints of the poor farmers and are non-markets distorting. While these policies could involve some costs related to enforcement and monitoring, it is believed in the development community that they are less expensive than the broadly based policies based on price support (e.g. for

feeds, wheat, barley, fertilizer, fuel etc.). The broader based policies related to macroeconomic and trade policy reforms in Algeria and Jordan will be evaluated with respect to their domestic price implications.

In the proposed study sites, there are two types of resources, crop lands and rangelands, where property rights options need to be defined:

- (i) On cropland, the options depend on the present situation. For example, farmers in low rainfall areas of North Africa were found to make the same types of long-term improvements (wells, trees, stone removal, etc.) on their private lands and on tribal lands where they hold perpetual use-rights. The question becomes whether it will enhance the production system and welfare of the community as a whole if such tribal rights were upgraded to private property. In the Middle East, for example, similar situations are found on *meeri* lands and on land reform lands, respectively.
- (ii) On rangelands, the options will be both in the dimensions of tenure regime and management. Their inclusion in the community models will allow testing different strategies of range management to evaluate the magnitude of welfare changes.

The research will be conducted to (1) provide policy makers, local communities and researchers with means for better understanding and assessment of likely economic, social and environmental consequences of the different policy, property rights and technical options for improved range, livestock and crop management on the low-rainfall areas of West Asia and North Africa; (2) to develop and validate an analytical framework (model) for integrating economic, social, and environmental impact assessments based on the community, with typical households of characteristic subgroups as units of analysis; (3) To compare the likely consequences of different combinations of policy, property rights and technical options, in terms of effects on economic growth, poverty alleviation and environmental sustainability at the level of the community; (4) To disseminate the results through an iterative, participatory research process which involves community members, national technical experts and policy makers, and through publications.

Policy improvements are anticipated through the use of this process primarily in Algeria and Jordan. However, because of the common features in West Asia and

North Africa rainfed agriculture (from Morocco to Iraq), it is expected that the research product will be used as an international public good. Previous research conducted in the region has shown that agro-ecological characteristics in drylands and technical and socio-economic concerns are very similar. The analysis and recommendations would certainly benefit researchers and policy-makers from the whole region interested in the impact of policy and property rights reforms on agriculture at a micro and sector level.

Section 2: First operational findings

Because of the different level of progress made in the two countries, this presentation will focus only on the preliminary results obtained in Jordan. The first step of the analysis in the project is to evaluate the impact of changes in domestic policy before looking at the possible repercussions of trade policy shocks resulting from broader multilateral or bilateral agreements. In order to differentiate between the domestic impact and the international impact, different combinations of policy shocks are considered. In Jordan, the Government is considering correcting the policies that distort economic incentives and encourage farmers to adopt non-sustainable practices. The first scenario explored in this project is phasing-out feedgrain subsidies in livestock production. Because of the linkages existing between agricultural activities, it is expected that changes in input prices will generate some impacts beyond the direct effect in the sector using the specific input. The questions we are trying to answer are the following:

- with domestic price reforms, what kind of agriculture growth will emerge in the agricultural sector;
- what are the equity and environmental impacts generated by these changes in the policy environment? In particular, we are interested, in the potential implications in terms of poverty alleviation and resource degradation.

Simulation of reductions in subsidies for inputs (until complete removal) have been undertaken in order to evaluate the impact on income growth, income distribution as well as resource degradation. Figures 1-2 show the income, equity and environmental impacts of feed price changes for the community site selected in this project.

Result #1: While the current agricultural system is based on livestock production, there is a clear indication from the simulations that a new type of rainfed agricultural system is emerging. The livestock sector is hardly hit by the process of removing feed subsidies. Some substantial reductions in meat supply are to be expected while a shift to fruit trees is taking place to compensate for income losses. Olive trees and other fruit trees have the potential to constitute alternative income generating strategies provided adequate marketing

channels are put in place. An partnership agreement with the EU and the inclusion of agriculture products in AFTA to allow higher market access to this kind of products could provide farmers in rainfed areas to compensate for the losses from livestock production.

Result #2: Reduction in feed subsidies could substantially hurt more the small and poor farmers than the large farmers (see figure 2 for the equity effects of the change in feed subsidies). This result differs from the findings in other countries of the region. For example, work conducted in Tunisia and Morocco (Chaherli et al., 1999) shows that large farmers are affected more than small farmers from reduction in input subsidies. The situation of poor farmers in Jordan tends to be aggravated by their heavy dependence on livestock products and subsidized barley while farmers in Morocco and Tunisia have a more diversified portfolio of activities and a lower reliance on feed purchased through government channels. Further trade liberalization could make feed more accessible to those poor farmers provided adequate measures are taken in terms of marketing.

Result #3: In terms of environmental impacts, reduction in feed subsidies yield two separate effects. Pressure on the rangeland is going down because of the lower level of animals grazing on the range. An increase in feed prices of 25-50% yields a reduction of more than 50% in the number of animals. On the other hand, a increasingly higher portion of those marginal areas previously planted in barley could be converted to fruit trees (a more sustainable farming practice but that requires higher initial investments). On both fronts, the environmental impacts are positive.

Based on these preliminary results of policy shocks in low rainfall environments, we can say that from an operational standpoint, redirecting some of the savings from the feed subsidies to invest more in rural infrastructure and improve access to credit, marketing and input services for small farmers could improve income distribution and yield more sustainable resource management strategies. The next steps of this research will try to combine domestic and trade policy measures and evaluate the aggregate effects of market liberalization. It is expected that a different kind of agricultural growth could emerge from changes in the pricing policy and institutional environment. As Jordan opens up its border to meet its domestic and international obligations, some important production and consumption trends might emerge. This research will try to explore the income growth, sustainable resource management and poverty alleviation implications of these changes.