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RESEARCH ARTICLE

ECONOMIC IMPACTS OF WATER AND SOIL CONSERVATION NATIONAL STRATEGY IN THE TUNISIAN ARID AREA OF EL HAMMA.

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Abstract

Most local Mediterranean regions are suffering from a very alarming depopulation and desertification processes. This problem has been treated depending on the characteristics of each country. Regions most affected are deficient of solid development projects, with a rural and desertlike character. Tunisian Southern can be a very typical case where the agricultural sector represents the unique solution and alternative of local development.

The main purpose of this research is to contribute to the assessment of the impact of water and soil conservation techniques, undertaken as part of Project Planning Integrated Anti-erosion in the watershed of Oued Soukra (El Hamma), done in 2009, and of the agrarian reforms resulting from this project, in terms of social welfare, economical income of farmers and local development of this study area.

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INTRODUCTION

A comprehensive overview of the theoretical and descriptive aspects of land tenure in Southern Tunisia is prepared in this research. It outlines the historical background and major arguments in the land-tenure debate it leads to policy conclusions. The present article will therefore focus directly on some major policy of Water and Soil conservation and its impact on land tenure in this arid area, which may facilitate discussions on policies and programs.

Legal systems and tenure policies in the region are also intertwined with areas of global concern, such as protection of the physical environment and ecological sustainability, on the one hand, and poverty eradication and improvement of the socio-economic environment (more particularly, class relations in rural areas), on the other.

Ecological sustainability is closely linked to the issue of land and water tenure in the area. It acquires particular importance in areas where mobile livestock husbandry is complemented by crop production under marginal conditions. However, environmental issues are also relevant in the densely populated areas where there is a tendency to overuse scarce resources, which frequently leads to other problems, such as increasing salinity in this case.

In the socio-economic sphere, rules and regulations concerning access to land, crop sharing and tenancies are vital to limit poverty among small farmers. Such regulations may help slow the perceptible slide of so many rural households from the status of land operator, albeit insecure, to that of landless laborer, with scant hope of being absorbed in non-agricultural activities. More generally, the issue of equity versus efficiency of land operation is closely linked to existing tenure relations and security.

Some specific topics are discussed through this paper, focusing on the impact of Water and Soil Conservation Program in El Hamma, fulfilled in 2009, such as natural resources, cultural patrimony and governance and institutions, trying to reach sustainable rural development. Thus, we will try to verify: the enhancement of human and land resources, the involvement of local stakeholders, the grade of participative management, so on.

1- Material and Methods:

The aim of this research is to show that a model of rural and sustainable development could be based on agrarian reforms and its theoretical positive impact on terms of agronomy, economy and demography. Thus, we will try to check if there is a socio-economical benefit through these reforms. In order to verify this hypothesis a consultation of previous studies about land use policies in Tunisia, and concretely about agrarian reforms in arid areas was achieved, as well as agricultural and demographic censuses. Besides, we have completed this bibliographical work with an exhaustive survey with all framers beneficiaries of this program.

2- Results and discussion:

The results show an increase and a better diversification of farming productions. Thus, we observed an improved farming rents and a more sustainable use of natural resources.

- Land use changes:

After analyzing the dynamics of the agrarian system, we note that the crop and fruit tree areas have been increased. The upward trend of the fruit tree began in the implementation of the project as shown in table n°1, through the planting of a large number of essentially olive trees and other fruit trees. The extension of the cereal surface is clearly observed, several parcels were previously neglected, are being used in crops system, benefiting from the project. The increase of areas dedicated to cereals is 62 %, and for fruit trees is 130%. The decline of rangeland areas is estimated at -36%.

Table n°1: Dynamic of land use before and after the project in Oued Soukra (2004-2013).

| Land use/Year | 2004 | 2009 | 2013 |
|---------------|------|------|------|
| Fruit tree | 13 | 22 | 30 |
| Cereals | 244 | 186 | 396 |
| Rangeland | 438 | 484 | 279 |

- Crop diversification:

The project includes the improvement of tree plantations areas, not only traditional species (Olive, almond and fig) but also new speculation like the pistachio. It should be noted that leguminous crops area had a significant increase, especially in rainy years. Taking advantage of the first autumn rains, farmers are planting leguminous including peas, lentils, beans and chickpea, mainly for domestic consumption. The farmers claim that after the project, this speculation can reach 40 Ha for a rainy year.

- Evolution of the number of plots:

The number of cultivable plots is increased after the project. The following table shows this evolution before and after the project of water and soil conservation in the area study:

Table n°2: Evolution of the number of plots according the size in Oued Soukra (2004 -2013).

| Year | | Size of the plots | | | | | Total |
|------|--------|-------------------|-----|------|-------|-----|-------|
| | | 0-3 | 3-6 | 6-10 | 10-15 | >15 | |
| 2004 | Number | 56 | 21 | 16 | 9 | 2 | 104 |
| | % | 54 | 20 | 15 | 9 | 2 | |
| 2013 | Number | 78 | 32 | 19 | 7 | 1 | 137 |
| | % | 57 | 23 | 14 | 5 | 1 | |

The number of plots, having undergone an increase of about 32% between 2004 and 2013, passed from 104 to 137 in the mentioned period. This shows the strong demand of agricultural plots by farmers to increase farming for domestic consumption and/or for sale.

-Analysis of farming yields:

Control surface runoff, groundwater's recharge and soil remediation's are the main objectives of structures installation of WSC. Moreover, this sustainable land management had beneficial results bettering farming yields of the most important crops in the area. The table below illustrates the dynamics of crops yields before and after the project:

Table n°3: Evolution of crops yields in Oued Soukra (2004-2013).

| Year | Yield medium / Ha (Qx) | | | |
|------|------------------------|---------|-------|-----|
| | olive tree | Cereals | | pea |
| | | barley | wheat | |
| 2004 | 7 | 5 | 3 | 4 |
| 2012 | 12 | 15 | 9 | 9 |

The results provide information on the increase in yields of major crops. In fact, before the implementation of the project, olive production was insignificant, olive trees have been poorly maintained. Currently, the average yield of olives has increased significantly as a result of not only the creation of new plots of olive trees, but also the positive impacts of tabias construction. The same goes for the cereals, the results show significant growth for both speculations produced. The yields of wheat and barley have an obvious improvement on the order of 200%. This growth is due to the overall benefits of techniques of water and soil conservation, which encouraged farmers to expand acreage of these food crops mainly for family consumption.

The yield of leguminous, including peas, also experienced a significant increase of about 125% after the implementation of the project. The average yield increase is the result of the combined action of the favorable impact of developments mobilization flows, like the rest of the cultures and the improvement of technical routes. Indeed, advanced farming techniques became companions through education and training for farmers in the study area during the implementation of the project.

- Assessment of the farming profitability:

In order to measure this profitability the gross profit margin of the most important farming activities is calculated before and after the project.

Table n°4: Gross profit margin of the most important crops (2004-2013) per farmer en DT.

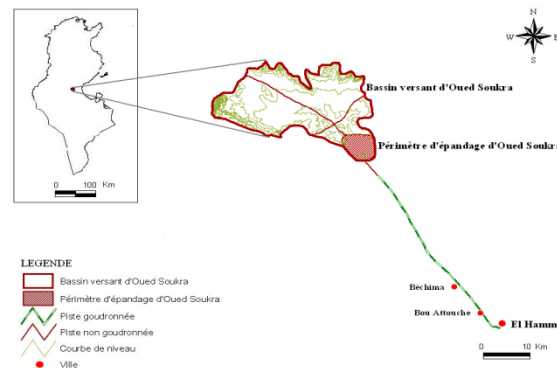
| Concept | 2004 | 2013 |
|---------|-------|------|
| Olive | 1161 | 3392 |
| Wheat | 59 | 380 |
| Barley | 82.75 | 431 |

The results of profitability, before and after the project of the main speculation, demonstrate a considerable increase in farming gross margin, with a better farming productivity, causing a positive impact on the improvement of gross margin, and so on the farming incomes. We note this amelioration in livestock activities. Indeed, we note the same tendency for the gross profit margin of the two existing breeding types: sheep and goat, as shown in the flowing table.

Table n°5: Gross profit margin of livestock (2004-2013) per farmer en DT.

| Breeding | 2004 | 2013 |
|----------|------|------|
| Sheep | 1053 | 1776 |
| Goat | 315 | 560 |

It should be noted that this improvement in breeding profitability is the result of not only water and soil conservation, but also the better condition of rangelands and increased feed intake land crops (cereal stubble, straw, hay, etc.). This encourages farmers to increase their livestock size in order to better their rents.

**Figure 1: Study area**

3- Conclusion:

In arid areas land degradation trains not only environmental and ecological problems, but also hampers agricultural development being the unique activity in such region. In this regard, a strategy against desertification, based on techniques of conservation of natural resources, could be a response to this scourge improving yields, farming incomes, environmental conservation, and social indicators; Interventions against desertification and agricultural development in the study area are generally beneficial to farmers, the local economy and the environment.

For socio-economic impacts, we could be distinguish improving and diversification of farming income, through increasing farming surface, productions and yields. This positive dynamic allowed an improvement of the living conditions of the farmers. All these benefits are contributing to curb the abandonment of agricultural land and therefore, the rural exodus.

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