

Study of Natural Resources Biodiversity for Sustainable Development of the Plain of M'sila, North Western Area of the Basin of Hodna Algeria

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Abstract: Plain M'sila which covers an area of 780 km² is characterized by an arid climate with very diverse natural resources like agriculture such as cereals and tree crops or natural like steppe species example *stippa tenacissima* L., and *Artemisia herba alba* and a sheep herd size large which is around 130 heads. Unfortunately, this wealth is subject to various constraints that hamper its proper management which are orders of ecological, agronomic, economic and social. To overcome these limitations of remedies are recommended for each factor. From an ecological perspective, it is recommended to do some practical steps, such as, setting the ground on both sides of El-Ksob River, purification of polluted waters of the dam, installed a sewage system in the living spaces of the area North Western Basin Hodna and finally preserve apricot orchards avoiding intercropping and in the distance of planting and the installation of windbreaks. The agronomic factor, it is very strategic need to improve the genetic diversity of different crops by increasing the number of adapted varieties, cultivars multiply endangered, expand irrigated areas and rehabilitating old orchards and fields, modernize farming practices and install an effective drainage system. For the economic side, we need fertilizers pesticides and fertilizers are carried to the farmers and at decent prices. Socially, more interventions are ground to suggest as the opening track inside the orchards and fields, halt urbanization at the expense of cultivated areas, the problem of land and then encourage young people has practiced this noble profession.

Key words: Natural resources, Basin Hodna constraints, solutions, sustainable development, biodiversity

INTRODUCTION

The area North Western Hodna Basin is a vast expanse covering an area is close to 780 km², relatively degraded, surrounded by mountain high enough (Bahlouli *et al.*, 2012), this degradation is accentuated by the many successive years of drought that has experienced this zone has an associated overgrazing that has aggravated this situation.

This degradation has affected all forms of natural resource, whether it is plant, animal or water, including natural resources that specifies the study area, the apricot which is one of the best wealth of the province of M'sila, it occupies a very important place in the lives of local people. The area planted with this crop has increased from 3.200 ha in 2001 to 6.750 ha in 2006 with production from 4.899-216.000 q (Bahlouli *et al.*, 2009).

The North Western area of the Basin Hodna through a critical period, several factors hinder the smooth development of this area, these are ecological factors; such as, erosion of the edges on both sides of El-Ksob River, the irrigation water is very polluted and unfit for

irrigation, wastewater discharge to the apricot orchards and grain fields surrounding and El-Ksob River, these waters will return to orchards and fields by irrigation and climate change that caused an early bud break and flowering in apricot which make trees more vulnerable to the effects of Spring frosts.

Agronomic factors, at the study area is a range of cereal varieties or apricot with a very limited genetic variability very close together, this phenomenon has led to a consolidation of the date of maturity and susceptibility to disease and climatic factors (Bahlouli *et al.*, 2008) and ignorance of modern farming techniques (Pruning, fertilization and phytosanitary treatments).

Economic factors, lack of maintenance of orchards and fields due to high input costs forcing farmers to the minimum possible content, the supply of cleaning products are either absent or inadequate due to low supply of products on the domestic market.

Social factors, the division of land among heirs has caused lots of heterogeneous perspectives, varieties and forms of conduct. The aging of the local workforce as a

result the local knowledge of indigenous people is endangered, especially the refusal of young people to work the land towards less painful and faster with a profit. Invasion of the buildings on the orchards and fields, concrete has strangled the space for crops which can cause their final disappearance.

MATERIALS AND METHODS

Plain M'sila which is located in the Northern Western Basin Hodna, it fits within the geographical basin of the high plains of Algiers.

The study area presents a criterion which is very interesting: The North; the distribution of the population is dense with the existence of an urban and a rural area relatively inhabited. To the South, the population is less dense urban areas with a relatively remote and less populated rural areas because of drought, poverty and lack of resources (Bahlouli *et al.*, 2012).

Area M'sila is between the isohyets 500 mm at the Northern reliefs (Mountains of the Hodna) and 150 mm at the Chott (Plain Hodna) with an annual average rainfall of 213.20 mm (Lakroune, 1999).

The soils of the mountains of Hodna consist of limestone marls and conglomerates. The alluvial plain is covered with 15-50 m thick that represent the best soils for irrigated agriculture.

On the basis of a general diagnosis of the various constraints of development of different natural resources, we could include four main types of factors: Environmental, agronomic, economic and social. Solutions have been proposed to overcome these problems and that each factor cited.

RESULTS AND DISCUSSION

Ecological factors

Constraints: Among the existing water resources in this study area, the dam Ksob was achieved in 1947 with a capacity of 29.5 hm³ year⁻¹.

Table 1 shows the distribution of groundwater resources at the commune level occupied by the study, these are statistics of 2010.

Among the ecological constraints that hinder the development of different cultures, the erosion of the edges on both sides of El-Ksob River, pollution of irrigation water, the discharge of wastewater to the apricot orchards, neighboring grain fields, El-Ksob River and climate change that caused an early bud break and flowering in apricot.

Table 1: Drilling and sources of the study area

Common	Drilling		Sources	
	Number	Flow (m ³ day ⁻¹)	Number	Flow (m ³ day ⁻¹)
M'sila	26	28530	1	648
Ouled Derradj	10	7085	-	-
O.A. Guebala	10	5615	-	-
Souamaa	12	7860	-	-
Tarmount	4	14083	-	-
O. Mansour	7	7862	-	-
Chellal	3	2919	-	-
O. Madhi	7	8467	-	-
K. Ced El Djir	2	3715	-	-

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An excessive concentration of salts in the soil results in particular, in plants, for delays or difficulties in germination and reduced growth. Plant tolerance to the presence of salts varies among species; from sensitive plants include fruit trees such as apple and apricot and some vegetables, carrots, salad a drop in performance is to be feared diced 2 mS cm⁻¹. Among the plants with medium tolerance include most major crops wheat and vegetables tomato potato and some fruits: Fig, olive, grape, a drop in performance is to be feared diced 4 mS cm⁻¹. Tolerant plants have a few major crops such as barley and some vegetables: Spinach, the tolerance limit is 8 mS cm⁻¹.

Solutions: To overcome these constraints has several solutions are recommended:

Fixing soil on both sides of El-Ksob River: To fight against the collapse of two banks of El-Ksob River under the action of water especially during the great floods of the river; therefore, it is recommended to plant forest trees that have a strong root system and the construction of gabion stone to secure the land and halt the spread of the bed of the river. Among the tree species most suitable to these types of situations: Casuarina, eucalyptus and tamarix.

Water purification dam El-Ksob: Most natural waters carrying mineral elements or organic suspension which may clog filters, pumps or distribution equipment, to be deposited in reservoirs and canals and irrigated lands.

The chemical quality of irrigation water, specifically salinity, can result in some contexts pedoclimatic by an accumulation of salts in the root zone of plants and significantly alter the physicochemical properties of the floor leading to the sterility and degradation of some soil properties.

Based on measurements made on the waters of the dam El-Ksob which confirmed the pollution of these waters, it is recommended to install filters specific purification on many levels and treatment with chemicals appropriate to minimize its effect negative cultures.

Installation of a sewerage system in the living spaces:

Wastewater discharged into the orchards and fields are a major pollution source for crops, the installation of a sewerage system is it mandatory to fight against the onset of many diseases that cause plant dieback.

Selection of late varieties to escape the Spring frosts:

In recent years, climate change induced in an early bud break and flowering. According to Coutanceau, the most severe frosts are those that occur at the start of vegetation causing the destruction of buds, flowers and young fruit. A recent study on the date of onset of different phenological stages of apricot tree of 3 years from 2005-2008 showed that trees of different varieties tend ridden and has flourished as early as 10-15 days, this finding is more clear in the early varieties as Tounsi and Bullida (Bahlouli *et al.*, 2011).

According to Chahbar, early flowering and the difference between varieties are due largely to a change in the level of needs of these varieties in cold; so, late varieties are the most demanding cold. The earlier flowering of the apricot makes a culture closed to Spring frost-prone areas. The earlier flowering causes flower bud drop which greatly reduces the yield of fruit trees. The selection of late varieties is, therefore, essential to escape the adverse effects of climate variations.

Preservation of apricot orchards and grain fields:

Apricot orchards and grain fields are very fragile situation, several constraints on the bypass several orders, they must be protected by breezes winds to fight against dry winds and drying, avoid planting for intercropping for young apricot orchards which may constitute concurrent permanent trees for water and nutrients and fertilizers. Observe the distance of planting to facilitate cultural practices such as pruning and fruit picking.

Agronomic factors

Constraints: Several factors affect the type agricultural natural resources, severely hindering the smooth conduct of cultures, the most important factors are: Lack of genetic diversity, the study area has a very limited range of varieties with a very close genetic variability other factors may be added as the aging of apricot orchards, over 65% of the trees exceeded their break-even points and

ignorance of local farmers modern farming techniques (Pruning, fruit thinning, fertilization and phytosanitary treatments).

The continued deterioration in already poor soil led to a depletion of topsoil, especially if the minerals are not replaced which is the case in most plots. Absence of a proper drainage system caused the water back and this phenomenon increased with flood irrigation.

Solutions: All agronomic disadvantages must have adequate and immediate solutions.

Improve the genetic diversity of cultivated species:

The study area has a very limited number of varieties of apricot (7-8 varieties) and a reduced number of varieties of cereals, several studies on the behavior of these varieties have revealed a great similarity of the trees different varieties of apricot spend their phenological stages in the same period with a gap of 20 days maximum which leads to a consolidation in the mature stage thus minimizing the consumption period of the leak. The mature phase is extremely short, less than a week, for most varieties of apricot (Lichou, 1998).

Test crosses or behaviors are required on new varieties introduced to diversify the gene pool of the study area and crops have spread over time.

Multiplication by vitro cultivation of cultivars with

extinction: Agriculture in the Northern Western Basin Hodna practiced in irrigated area since colonial, since then several endemic varieties and clones have disappeared very suitable, this phenomenon is more accentuated in the culture of apricot or there are between 7-8 varieties and clones that have disappeared, other varieties are being distinguished by farmers because of neglect due to their low production or their susceptibility to diseases and pests, this genetic erosion has greatly weakens the plant heritage.

Culture, *in vitro*, will help to redress some cultures for a valuation of old varieties using new fertilization techniques to improve production and increase plant resistance to certain diseases most answered. This technique also helps to conduct tests for a short period of new varieties introduced in order to identify the most suitable and most appropriate for the communities arid and semi-arid.

Diversified crops and planted new orchards of apricot:

Land holdings are still occupied by the same cereal species regardless of any crop rotation with other species which can enrich the soil any more in keeping it clean. Most apricot orchards in the study area are in post-profitability due to the aging of the trees, the yield

per hectare is, therefore, increasingly weak, making the occupation of land by those trees unprofitable. Planting seedlings instead of old trees is needed to better exploit the plots.

Practice of rehabilitation of old orchards can be considered in case of middle-aged trees, by practices of rejuvenation sizes, to spread as long as possible the productivity of these trees. This practice will give a second chance for these trees flourished and recovered.

To modernize, mechanize and improve agricultural practices: The plots of the study area are still subject to traditional farming practices, minimizing the operating cost of crops. And modern techniques should be practiced more efficient on land.

The drip irrigation: That is not used in the study area despite its effectiveness scientifically proven, especially fruit trees, this technique will allow better use of water and avoided wastage due to technical flood irrigation.

The size of fruit trees: The size is the search for balance between vegetation and fruiting (Vidaud, 1989), there are different types of sizes that are practiced throughout the entire life of the tree as formative pruning, fruit size, the size of thinning, rejuvenation pruning and regeneration size. We must act with moderation as pruning wounds often lead gummy exudations which it is very difficult to rid the tree later (Laumonier, 1960).

Phytosanitary treatments: Many diseases and pests affecting crops, such as fungal, viral, bacterial or because of insects and are likely to lead to the disappearance of culture or decrease in production (Lichou, 1998). A control program must be installed to control and destroy all suspected outbreak.

Tillage soil: Continuous work is a critical element in the maintenance of good crops as it allows the destruction of weeds, loosening and aerating the soil to facilitate the infiltration of rainwater, build and cleaning irrigation canals to water flow more easily. Unfortunately, this operation is neglected by the farmers, either through lack of means or by laziness which has made the ground and piled infested with weeds.

Fertilization: Fertilization aims to control the power of the tree by providing nutrients in quantity, quality and when it needs it. It is significant reserves in the area of soil or subsoil where the roots grow the plant. The absorption of nitrogen and potassium is important in fruit and shoot growth where the need for a good correction of the soil

before planting. But by lack of fertilizer or because of the high cost of products, makes the application of this technique insufficient.

Manage the distribution of irrigation water: Irrigation water perimeters cultivated the study area is fed by the dam of El-Ksob, a program of supply of such water is controlled by the Office of Irrigation Area of M'sila, weekly water rations are distributed among the different plots, on a scheduled contested by most farmers considered insufficient.

A hydro-geological study must be done to detect new sources of water such as boreholes or dams that will allow better meeting the water needs and increasing the productive potential of crops. The irrigation of fields and orchards tree is often poorly led for the former irrigation start very late and doses of either insufficient or excessive water intake and water unevenly distributed during the annual cycle of the tree.

Establishment of drainage comprehensive and effective: The plots it is grain or apricot orchards in the study area are located at the edges on both sides of El-Ksob River on a vast plain, irrigation is by open canals to from the dam or pumping of the river by the flood irrigation method. The lack of a drainage system causes poor drainage of excess water; crops are, therefore, exposed to the negative effects of this situation such as disease decay and water logging.

The development of a drainage system is comprehensive and effective a great need to have healthy and orchards free from diseases.

Economic factors

Constraints: Lack of maintenance of cultures due to high input costs forcing farmers to settle the minimum possible supply cleaning products is either absent or inadequate due to lack of products on the market.

Solutions: A new policy on production and import of pesticides and fertilizers must be installed to overcome this drawback in order to have market agricultural products and basic necessities at affordable prices, facing this great obstacle hinders the proper development of agriculture in general.

Social factors

Constraints: Fragmentation and compartmentalization of the plots among heirs have created heterogeneity of views: Varieties and planting density, 68% of apricot

orchards are <2 ha (Bahlouli *et al.*, 2009). Other shares aging local workforce and the refusal of young people working the land, the risk of eliminating the local expertise, especially with the invasion of concrete that has strangled the space for crops, this can cause permanent loss of some cultivated species.

Solutions

Solving the problem of land: The problem of land is a major handicap for the proper management of the plots, this problem must be solved in a courageous and effective, each parcel owner must have a specific prescribed manner to better the lead and maintain it.

Development of tracks: To facilitate access to distant plots, it is recommended to open roads within the fields and orchards to circulate better gear travails as trailers, power tillers and tractors, transport workers and plant material will, therefore, be more fluid.

Prohibit urbanization at the expense of the plots: The number of buildings at the study area and constantly changing; unfortunately, this is done at the expense of grain fields and orchards of apricot, these orchards that have turned to small gardens in large buildings.

A law must be developed to handle this situation, to prohibit any construction within the perimeters grown, without going through a technical study that takes into account the manufacturer's incessant need to done this but without touching the original form of cultures.

Promote the ancestral knowledge: Agriculture and especially the apricot is grown in the study area for decades, some knowledge is established; unfortunately, this advantage is disappearing with the aging of the workforce qualified and the refusal of young people to other activities more profitable and less difficult. This invaluable knowledge should not be lost; a local recovery program must be established to encourage young farmers to persist in this activity, providing guaranteed sales of agricultural products with a very competitive price and the sale products and agricultural equipment at nominal prices.

CONCLUSION

Agriculture in the Northern Western Basin Hodna has been practiced for several generations, several species are grown and including grains and fruit farming, particularly apricot, apricot fruit is consumed in various forms: Fresh and dried form of jam.

Unfortunately, these crops are in a situation deteriorates under the influence of several factors of ecological types, agronomic, economic and social remedies must be made urgently to address the problems that accumulate from year to year.

From an ecological perspective, we must set the ground on both sides of El-Ksob River to limit the extension of the bed of this river, the purification of polluted water from the dam to some degree, installed a network of sanitation in places of living of the study area to stop the dumping of sewage in perimeters cultivated, select cereal varieties suitable and productive and apricot varieties to late flowering in order to escape the Spring frosts very harmful, as it must protect crops against winds by installing windbreaks.

To address agronomic factors, it is recommended to improve the genetic diversity of crop species in the study area by increasing the number of varieties adapted to the environment with different annual cycles, multiply *by vitro* cultivation of cultivars with extinction, plant new farmlands, modernize farming practices with the gradual introduction of mechanization, create a new organization of the distribution of irrigation water, install an effective drainage system and then review the extension system to better close the farmers of new agricultural techniques.

Economically we must straighten the plots cultivated by continuous availability in the domestic market, fertilizers and pesticides and with affordable prices.

The social importance to the management and maintenance of cultures is that by doing several operations such as opening paths within fields and orchards to facilitate transportation of workers and goods, prohibiting the construction of houses to healthy fields and orchards, except in cases of absolute, final settlement of the problem of land and finally encourage the younger generation has exercised this noble profession in order not to lose the know-how inherited for several generations.

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