# The extent of economic success of the sustainable agricultural development strategy in the desert environment

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**Abstract:** The agricultural sector suffers from several problems in the state of EL-Oued in southern Algeria at the farm level as a productive unit in the rural desert area due to human practices. Changing the way of dealing with the components of agricultural work brings many benefits in various fields.

The implementation of the strategy of sustainable agricultural development achieves positive results on four axes: first, the economy ensures a higher income for the farmer with less and regulated expenditures; second, the crop is more productive and of quality; third, preserving the environment through less resource consumption with the ability to recycle agricultural waste, which reduces the environmental pollution of soil and water; fourth, biodiversity of animal and plant organisms. All axes are in the interest of man as an activist, consumer, and living being who influences and is influenced by the environment in which he lives.

Keywords: Sustainable agricultural development; economic feasibility; environment; desert area; agriculture.

## 1. INTRODUCTION

A simple change in agricultural practice has the potential to transform the face of agriculture in terms of space and production in the El-Oued state. The method is critical to the success of the agricultural process, and the farmer will not be persuaded of the benefits of a new method unless it is supported by scientific evidence on the one hand and guarantees him a higher economic return on the other.

A sustainable agricultural system has been adopted in grassroots agriculture as a way of developing agriculture by applying sustainable strategies based on existing possibilities. A field process comparison can be made between agricultural operations with current methods and sustainable methods of agriculture in terms of agricultural work and economic cost to reach a clearer picture of the pros and cons of each method and determine which of the two methods is most effective for the farmer and the environment**.**

## 2. SUSTAINABLE AGRICULTURAL DEVELOPMENT:

The idea of sustainable agricultural and rural development was one of the ideas that crystallized in the eighties, in response to the growing observation that national and international agricultural policies and programs should involve a broader range of economic, environmental, and socio-cultural issues than traditional areas of agricultural productivity, agricultural production, and food security. The importance of the notion of sustainable agricultural and rural development was demonstrated and confirmed at the Earth Summit held in Rio in 1992, with chapter XIV of Agenda 21 defining the specific programs and actions needed to promote sustainable agricultural and rural development and the commitment of Member States to such programs and actions. (United Nations FAO, 2001)

There have been some encouraging developments since the Rio Summit, with the emergence of some valuable new approaches and policies as a result of the focus on sustainability. Many farmers and other rural actors have found local solutions to the challenges of sustainable production and environmental protection, bringing tangible benefits to forests, wildlife, water, and soil, and reducing negative impacts on agriculture while maintaining or increasing production. (United Nations FAO, 2001)

## 3. EL-OUED STATE IS AN AGRICULTURAL POLE IN THE ALGERIAN DESERT:

The state of El Oued is located 650 km southeast of the capital Algiers. The state has witnessed a remarkable development in agricultural investment starting from the year 2000 and has achieved a qualitative leap in agricultural expansion area and production. The state of El-Oued is considered the first nationally in agricultural production in Algeria, and it ranks first in the production of potatoes and peanuts, as well as advanced ranks in the production of dates, tomatoes, and vegetables in general.

The state of El Oued is naturally characterized by a desert climate of high evaporation compensated by the presence of an important water resource represented by groundwater which is the most important element of agricultural work. Soil is sandy, dismantled, and poor in organic matter but has a high potential for reclamation and allows agricultural growth vertically and horizontally after reclamation.

Natural factors in the desert environment are complementary to each other. Harsh climatic conditions are offset by the abundance of groundwater and the ease of soil reclamation. Despite the disparity in the region's natural elements, it stimulates agricultural activity and its obstacles can be overcome through human effort.

## 4. ADOPTION OF A SUSTAINABLE AGRICULTURAL SYSTEM IN HERBAL AGRICULTURE:

Agricultural practices in agricultural activities differ between the current system and the sustainable system. The following table summarizes the most important points of difference between the two systems, including:

**Table 01. Table comparing agricultural activities between the local system and the sustainable system**

| Activity | Local system | Sustainable system |
|---|---|---|
| **Running** | Twice (02) per year | Between 03-04 times a year |
| **Wind bumpers** | Palm leaves and Sand barrier (tabiya) | Trees and maize |
| **Seeds** | Buy hybrid seeds (F1) | Local seed production |
| **Control** | Chemical | Integrated biological |
| **Irrigation** | Center-pivot irrigation | Moving drip |
| **Crop** | Just one | 2 crops (main and secondary) |

***Source:*** *Riene djaber (2019), field study*.

### 4.1- Tilling:

In the current system, the farmer plows the field at the beginning of the agricultural season and then fertilizes and sows directly in a short time, not giving enough time for the soil to regenerate or for organic matter to decompose and also does not allow the killing of fungi and seeds of parasitic plants present from previous crops.

Concerning sustainable agricultural development strategy and in order to achieve higher soil efficiency on the one hand and fight pests on the other hand, the farmer must plow twice:

* Initial plowing: it is at the end of the harvest of the previous season, in particular at the beginning of the summer (June) in order to expose the remnants of the roots to the heat of the sun and eliminate them. It is preferred to water the soil several times after the previous harvest to allow weeds and seeds from the previous crop to grow, as well as to eliminate them before flowering either manually or with chemical pesticides.

* **Secondary plowing**: at the beginning of the growing season to soften and level the soil and mix fertilizers.

**4.2- Seeds:**

The farmer in the current agricultural system relies on imported seeds that are hybridized (F1)[1]. Their prices vary from season to season according to supply and demand as they consume a high percentage of agricultural capital and place farmers in commercial dependency with seed production companies, and the results are not guaranteed.

By adopting sustainable agricultural development strategies and establishing a private seed bank, the farmer achieves several objectives in various aspects, including ensuring the desired results in production because the seeds are previously tested, the ability of local seeds to resist and adapt to the characteristics of the desert environment, and the farmer ensures the saving of a significant amount of money, (for example: saving more than 80% of the budget allocated to potato seeds).

**4.3- Wind bumpers:**

In a desert region famous for its abundance of winds and at different times of the year, wind bumpers are a basic necessity for the agricultural process of any kind. In the current system, a fence of palm branch (locally called "Zerb") is formed around the cultivated area to protect it from air currents. The process is very necessary and irreplaceable but in the current ways, it is very expensive and also needs to be renewed at least once a year or two.

The strategy of sustainable agricultural development adopts less expensive means within the field and around the plantations, especially center-pivot irrigation or drip irrigation. The walls of the palm branch (Sorghum bicolor)[2] can be replaced by sorghum bicolor by planting them in the form of a line (05-10 cm wide) around the cultivated area or dividing the area into squares or circles with lines of white corn if they are large. It is less expensive (250 DZD/kg) and can also be considered as an agricultural crop that farms can benefit from as animal feed or use in the organic fertilizer industry.

**4.4- Fertilization:**

The desert soil in the state of El-Oued is disjointed soil and very poor concerning organic matter and plant nutritional needs. To provide it, the farmer deliberately adds animal dung as the basic material for crop fertilization before planting and then compound fertilizers (N.P.K.) after planting the crop at various times. The farmer buys animal manure where the amount added per hectare is (about 12 tons)[3], then scatters animal manure on agricultural land directly without sterilization or treatment. Hence, the fermentation process occurs within the soil, causing the seeds to rot as decomposition takes time, and by the end of the process, the plant is ready for harvest and thus does not benefit from the decomposing elements in the soil.

The sustainable fertilization strategy is based on fermented compost instead of animal manure and consists of natural elements that the farmer can provide from his farm where it consists of 50% dry plant material, 30% green plant material, and 17% animal manure (Qasa, 2020); collected, fermented, and stirred for 18 days to be ready for use[4].

Compost is characterized by its ability to keep the soil moist longer as well as prevent the spread of weeds as their seeds are eliminated in the fermentation process.

01 hectares of potato crop needs 07 tons of compost (SARL MAG SUB, 2019)**.** To provide this amount, we need 1.2 tons of animal manure; that is 10% of the amount added in the current system, while the rest of the elements can be supplied from the residues of the previous agricultural crop.

**4.5- Irrigation Management:**

One of the distinctive climatic characteristics of the state of El-Oued is the high temperature on most days of the year, which makes the interest in the irrigation process very important. Any malfunction in the irrigation system

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[1] They are seeds produced by hybridizing two plants together to reach desirable special properties, but the good properties of F1 hybrid seeds deteriorate in the new seeds produced by their plant. To maintain the quality of your crop, you'll always have to buy new hybrid F1 seeds.

[2] Sorghum is a species of herbs and contains about 30 species harvested in the form of grains used as animal feed, especially for poultry.

[3] Field Investigation 2019.

[4] Hot smearing method (Berkeley method) 18 days.

leads to the failure of all agricultural work and a loss for farms. Through the management of the irrigation process, we seek to reduce financial costs and agricultural pests and raise the productive efficiency of the crop. Farms in the state of El-Oued use all known irrigation systems, but the most prominent of them are:

- Center-pivot irrigation:

The most commonly used, especially in the Oued Souf region, is a simulation of rainfall commensurate with most types of grassy crops. However, this type of irrigation system is characterized by a large consumption in the amount of water used, which reflects negatively on the agricultural crop with the growth of fungi and the formation of limestone husks as well as large consumption of energy.

- Irrigation tank:

It_means the installation or construction of a tank for watering instead of watering from the pump directly. The irrigation tank has many benefits, including reducing the cost of electricity, allowing the deposition of dust at the bottom of the tank, which contributes to the non-clogging of pipes or sprinklers, and also facilitating the process of treatment and fertilization by adding liquid medicines or fertilizers (fertilizer tea) to the tank directly to reach the whole crop equally.

- Irrigation scheduling **:**

To avoid water waste, the farmer can calculate the amount of water his crop requires from planting to harvesting and set up an irrigation schedule based on the daily need. For the success of the process, the farmer installs a meter for irrigation water before center-pivot irrigation or drip network and calculates the amount of water flowing to the agricultural field, and then manually or automatically cuts off water from the field when the required amount is met.

4.5.3. Water consumption of irrigation methods**:**

The comparison in the volume of irrigation water consumption aims to determine the efficiency of irrigation systems in terms of saving water consumption and energy (low costs). To highlight and compare these indicators, we have taken the need for water of 01 hectares of potato crop as a reference point.

***** Calculating the water need for potato crop per hectare**:**

To calculate the water need of the potato crop in one center-pivot irrigation (approximately 01 hectares), mathematical equations were used in addition to several indicators related to the plant (length of roots, plant age ...) and others related to soil (permeability, porosity, and moisture content ...). Also, the water need was calculated at the Technical Institute of Desert Agricultural Development (ITDAS) and the results were 2900 $m^3$/ha for the season with a yield of 333 Q/ ha, i.e. we need 87 liters to produce 01 kg of potatoes (**جمال**, 2016).

***** Calculating water consumption with center-pivot irrigation**:**

To calculate local consumption, we conducted a field investigation and contacted a group of farmers from different municipalities to clarify the methods and quantities of watering provided by the farms to water one center-pivot irrigation of potatoes. The results were that most peasants used a seven-horsepower pump to withdraw groundwater to water two center-pivot irrigation together. The flow of these pumps is 30 $m^3$/h. Watering is carried out for 10 hours/day during the 130-day growing season, which means that the water consumption is 30 $m^3 \times 10$ hours× 130 days = 39,000 $m^3$, i.e. 19,500 $m^3$ per center-pivot irrigation, with an average production of 328 Q/ha. This means we need 594.5 liters to produce 01 kg of potatoes in center-pivot irrigation. If the volume of water consumption in the center-pivot irrigation is compared to the actual need of the plant of 2900 $m^3$, the current consumption is equivalent to 07 times the actual need of the crop.

4.5.4. Energy consumption in irrigation**:**

We tried to link the energy consumption of various irrigation systems to the value of the electricity bill based on the hours of operation of the pump and engines throughout the watering period.

*Calculating the cost of energy in center-pivot irrigation:

In center-pivot irrigation, watering is carried out directly from the pump, that is, the hours of watering (1300 hours) are the same as the hours of operation of the pump. We calculate the energy consumed in total and put the value in a simulation program for billing according to the Electricity and Gas Distribution Company (SONALGAZ). The table below shows the value of the bill for 01 hectares watered with center-pivot irrigation.

**Table2. Electricity consumption in center-pivot irrigation (01 hectares)**

| Engine | KWat/h power | Number of hours during potato growing season | electricity consumption KWh |
|---|---|---|---|
| **Water pump** | 5.6 | 1300 | 7280 |
| **Pivot engine** | 0.75 | 1300 | 975 |
| **Total consumption kWh** | | | 8255 |
| **Invoice by SONALGAZ (DZD)** | | | 19889.7 |

***Source:*** *Riene djaber (2019), field study*.

According to the table, the electricity costs of center-pivot irrigation during a single agricultural season are 19,889.7 DZD. It is a significant value added to the burden of production costs.

*Calculating the cost of energy using the water tank:

If the water tank is used, the number of operations of the pump decreases and depends on the capacity of the tank. Moreover, if we take into account the irrigation scheduling (ITDAS), the largest daily water volume needed by 01 hectares of potatoes is 50 $m^3$. Therefore, we propose a tank with a capacity of 60 $m^3$ to meet the daily need. Note that we will use linear drip in the irrigation process with the water meter to calculate the amount of water provided to the agricultural field as needed at each stage of plant growth and watering by scheduling irrigation. The results were as shown in the table:

**Table 3. Cost of electricity consumption per hectare of potatoes watered by linear drip**

| **Linear drip watering** | **during the season** |
|---|---|
| Pump duration (hour) | 260 |
| Total Electricity consumption(KWh) | 1456 |
| Invoice by Sonelgaz (DZD) | 3508.10 |

***Source:*** *Riene djaber (2019), field study*.

In Table (3), we calculated the number of hours of operation of the pump to meet this need by dividing the volume of daily consumption (60 $m^3$) by the pump used (30 $m^3/h$) and then multiplying the result by the number of days (130 days) to get the total number of hours (260 hours). Thus, the volume of energy consumed during the season is 1456 kWh and by placing this consumption in the billing model of the Electricity and Gas Company, we find that the financial value is estimated at 3508.10 DZD during the season. It is a value that represents 1⁄6 pivot sprinkler irrigation costs.

4.5.5- Irrigation system costs:

To highlight the cost difference between approved and reliable irrigation systems, we focused on three indicators: irrigation efficiency (lack of waste), energy consumption, and maintenance costs as shown in the table:

**Table 4. Compare irrigation costs to 01 hectares during one agricultural season**

| Method | Irrigation efficiency | Energy Consumption (DZD) | Seasonal costs (DZD) (maintenance /installation) | total costs (DZD) |
|---|---|---|---|---|
| center-pivot irrigation | 13% | 21228.42 | 10000 | 31228.42 |
| **Linear drip** | 84% | 1506.7 | 110000 | 111506.7 |

*Source: Riene djaber (2019), field study.*

Table 4 shows the discrepancy between irrigation methods, where each method has its pros. Linear drip is characterized by high efficiency in irrigation, resource saving, and energy consumption; however, seasonal maintenance costs are extremely high, making farmers reluctant to use this type of irrigation except in narrow areas. The current agricultural method (center-pivot irrigation) consumes water at a significant rate and consumes more energy than the drip method. Its seasonal maintenance is minimal, making it the most common in large agricultural areas because its total costs are 70% lower than the drip method.

**4.6- Mixed agriculture :**

In the local agricultural system, agriculture in center-pivot irrigation with a single crop may be repeated for several consecutive agricultural seasons, affecting the strength and biological characteristics of the soil on the one hand and turning it into a suitable environment for pests on the other, in addition to the fact that agriculture becomes an inconclusive adventure. If the crop is not exposed to pests, the farmer may not make a profit if prices fall in the market**.**

To avoid agricultural adventure and unexpected results, sustainable agriculture adopts mixed farming, which is a simple principle where a by-crop is grown alongside the main crop that fits with it on the one hand and provides it with biological protection on the other, such as planting onions with potatoes**.** (Dagher A, 2015)

The farmer can grow onions as a secondary crop occupying 1/4 of cultivated area along with 3/4 of potatoes as the main crop area, (Agricultural Scientific Research Department, 2008). The farmer can reduce the area of the secondary crop and plant onions on the edges of the cultivated area to secure them from pests**.**

In this way, the farmer has achieved two objectives: the first is natural biological control of pests, which means a healthy and quality product on the one hand and reduced costs of chemical treatment on the other**.** Second: Make an extra profit from the sale of the second crop, and achieve protection against the risk of low prices for the main crop.

## 5. THE ECONOMIC FEASIBILITY OF THE LOCAL AND SUSTAINABLE SYSTEMS IN HERBAL AGRICULTURE:

In this part, we try to make an economic comparison in terms of expected costs, revenues, and profits between the two systems, where we will take the crop of 01 hectares of potatoes (the most common) as a model for making a comparison**.**

**5.1. Costs**

After conducting a field investigation, we divided the costs into two parts:

* Assets: These are the costs of non-renewable equipment that are incurred once at the beginning of the agricultural process and are not repeated in the subsequent seasons of the planting process such as: irrigation means (center-pivot irrigation, leveling the land ...).

* Seasonal costs: Each agricultural season is related to the type of crop and its agricultural processes (planting, protection, watering,). We calculated the cost in the current agricultural system based on the data of the field investigation as shown in the table:

**Table 5 Fixed costs of growing a hectare of potatoes between the local and sustainable systems**

| | Activity | | local system | Sustainable system | difference (DZD) | % |
|---|---|---|---|---|---|---|
| **Fixed costs** | **Land settlement** | | 64000 | 64000 | 0 | 0.00 |
| | **Axial spray installation** | Chassis | 150000 | 160000 | 10000 | 6.67 |
| | | Installation | 3000 | 3000 | 0 | 0.00 |
| | **Wind bumpers** | | 5000 | / | **/** | / |
| | **Manpower** | | 30000 | 30000 | **0** | **0.00** |
| | **Total (1)** | | 252000 | 257000 | **5000** | 1.98 |

***Source:*** *Riene djaber (2019), field study.*

Table 5 shows that the basic work of agriculture is similar in cost with different value, mainly the structure of the center-pivot of the sustainable system because it is more complex than the current system, in addition to the presence of wind bumpers in the local system as a fixed cost because it lasts between 3 and 5 years when completed. Unlike the sustainable system, it depends on the sorghum plant as wind bumpers and is renewed every season, so it is included with seasonal costs.

The total fixed costs of a sustainable system are 2% higher than the local system, which is weak and makes no difference.

**Table 6. Fixed costs of growing a hectare of potatoes between the local system and the sustainable system**

| | Activity | | Local system | Sustainable system | difference (DZD) | % |
|---|---|---|---|---|---|---|
| **Fixed Costs in the agricultural season** | **Running** | | 16000 | 32000 | 16000 | 100 |
| | **Organic fertilization** | | / | 2500 | / | / |
| | **Wind bumpers (sorghum)** | | 240000 | 50000 | -190000 | -79.17 |
| | **Care** | **N.P.K** | 37800 | 37800 | 0 | 0.00 |
| | | **Incubate** | 12000 | 12000 | 0 | 0.00 |
| | | **Potash** | 18600 | 18600 | 0 | 0.00 |
| | **Potato seeds** | | 120000 | 20000 | -100000 | -83.33 |
| | **Harvest potato crop** | | 98400 | 98400 | 0 | 0.00 |
| | **Other costs** | | 50000 | 50000 | 0 | 0.00 |
| | **Transplant workforce** | | 50000 | 50000 | 0 | 0.00 |
| | **Electricity costs** | | 19889.7 | 3508.1 | -16381.6 | - 82 |
| | **Total (2)** | | **662689.7** | **374808.1** | -287882 | -43.44 |
| | **Total (3) = (1)+(2) (DZD)** | | **914689.7** | **631808.1** | -282882 | -30.93 |

***Source:*** *Riene djaber (2019), field study*.

From Table 6, it is clear that seasonal work is similar in cost except for those affected by sustainable agricultural development strategies, including high costs of plowing in the sustainable system due to the multiplicity of tillage times for good soil preparation, and the decrease in the value of costs in the sustainable system for the seeds by 83.3%, fertilization by 79.17%, and electricity costs by 82%, which are important percentages that reduce the total seasonal costs to 44%.

Table 5 and Table 6 show a difference in costs, which is 31% lower in the sustainable system than in the current system, which is a significant percentage.

### 5.2. Revenue:

There is a difference in the type of crop grown in the same area as we indicated earlier. The current system depends on the cultivation of one crop (potatoes), while the sustainable system is based on mixed agriculture (main crop: potatoes, secondary: onion). We can calculate the production of white corn as another secondary crop as well, which can be sold to make profits. In costs, we neglected the value of the seeds of the secondary crop (onions) because in the sustainable system the farmer can use local seeds from the previous season so their cost is simple and neglected. Furthermore, the cost of harvesting the secondary crop was combined with the cost of harvesting the main crop based on the cost of harvesting the crop for the entire area with its main and secondary crops.

**Table 7: Calculating the revenue of one hectare of potato crop**

| Crop | Production (Q) | | quintal Price (DZD) | Revenue (DZD) | | Difference (DZD) | % |
|---|---|---|---|---|---|---|---|
| | Local | Sust | | Local | Sust | | |
| potatoes | 328 | 246 | 3500 | 1148000 | 861000 | -287000 | -25 |
| Onion | 0 | 250 | 2500 | 0 | 625000 | 625000 | / |
| Total | | | | 1148000 | 1486000 | 338000 | 29 |

***Source:*** *Riene djaber (2019), field study*

From Table 7, we note that the average production of the potato crop is 328 Q/ha in the current system corresponding to 246 Q/ha which means 3⁄4 production value which corresponds to the cultivated area. The area cultivated in the sustainable system can produce more than the current system thanks to the aforementioned sustainable development strategies. As for the onion crop, we calculated the production of a quarter of a hectare in accordance with the area cultivated, where the average production per hectare in the state of El-Oued is 1000 Q/ha. However, we fixed the amount of production and focused on the difference between the sustainable and current systems in the activities practiced in agriculture. The results were that the sustainable system is 29% higher in yields than the current system without counting the high yield per hectare in the sustainable system and also the yield of white corn.

### 5.3. Surplus :

Surplus production is the financial value that can be collected from each agricultural season, that is, seasonal profits. Assets are not included in the calculation of seasonal profits. The surplus is calculated by subtracting the total revenue during the season from seasonal costs, as table 8 shows:

**Table 8: Calculating the seasonal surplus of one hectare of potato crop**

| Agricultural system | Local (DZD) | Sustainable (DZD) | Difference (DZD) | % |
|---|---|---|---|---|
| Total (2) seasonal expenses (DZD) | 662689.7 | 374808.1 | -287882 | -43 |
| Total (4) incomes | 114800 | 1486000 | 338000 | 29 |

| | | | | |
|---|---|---|---|---|
| (DZD) | 0 | | | |
| Surplus (5) = total(02) +total(04) | 485310.3 | 1111191.9 | 625881.6 | 129 |

*Source: Riene djaber (2019), field study*

According to table 8, the percentage of seasonal costs in the sustainable system is reduced by 43% from the current system and this contributes to the preservation of farm capital. Also, we note the increase in revenues by 29%, which encourages farmers to move more toward a sustainable agricultural system. The seasonal surplus in the sustainable system exceeds the current system by 129%, equivalent to 2.3 times, which proves the economic efficiency of this system.

5.4. Capital recover**:**

To calculate the duration needed by the farmer to recover the capital spent on one hectare of herbal agriculture with all the seasonal costs and assets, we divide the total costs (3) by the seasonal surplus (5) of the project. We will find the number of agricultural seasons to recover the capital of the project, and Table 9 shows this:

**Table 9: Number of seasons for the recovery of hectare capital grass cultivation**

| **Agricultural system** | **Local (DZD)** | **Sustainable (DZD)** |
|---|---|---|
| Total (3) total costs (DZD) | 914689.7 | 631808.1 |
| Surplus (5) (DZD) | 485310.3 | 1111191.9 |
| Number of seasons | 1.9 | 0,6 |

*Source: Riene djaber (2019), field study*

From Table 9, it is clear that the period for restoring the initial capital of one hectare of potato cultivation and herbal agriculture, in general, is two agricultural seasons for the current system and half a season for the sustainable system (i.e. the farmer recovers capital and remains a part of the profits). The period taken in the sustainable system (1⁄3 current system) also allows the peasant to increase investment in agricultural activity.

## 6. RESULTS:

- Local methods have more disadvantages than pros in most phases of the agricultural process.

- Sustainable methods are easy to apply and have the same natural and financial resources as local methods.

- The method of sustainable agricultural development is distinct from the local one:

* Soil conservation and regeneration.

* Irrigation efficiency and economy.

* Low consumption and financial burdens where we find:

** Concerning seeds, the cost is 1/5 of what it costs in the local method.

** Concerning fertilization, the cost is 1/5, which in the local method costs 1/10 of what is consumed in the local method, and is characterized by the recycling of agricultural waste for the compost industry.

** Concerning irrigation, the cost of energy is 1/20 of what it costs in the local method, and the volume of water consumption is 1/7 of what is consumed in the local method, which contributes to the preservation of resources.

- Time to recover capital per hectare in sustainable agriculture is 2⁄3 less time in the current system.

- Profits in the sustainable system increased by 2.3 times, or 129% than the local system.

## 7. CONCLUSION:

A survey of agricultural work in the state of El-Oued revealed the magnitude of the farmer's effort to achieve agricultural development in a desert environment characterized by the sensitivity of its natural resources (soil, water ...). The harshness of its climate (heat, drought, wind, etc.) is an impediment that reduces the productive efficiency of the agricultural process in real-time (low crop production and quality) and has been exacerbated by soil and water pollution.

In order to overcome these obstacles, it is necessary to reconsider the agricultural methods adopted by farmers by adopting strategies for the sustainable use of natural agricultural resources, which focus on adopting modern techniques to increase soil productivity, adapt to changes and obstacles, and emphasize the link between water, soil and production on the one hand and achieve an economic return on the other. The farmer can increase profits by 2.3 times than the current method by implementing sustainable strategies on the ground, where the sustainable method generates 129% capital gains and ensures agricultural biodiversity.

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