

The Integration of Fish Farming in Agriculture in Algeria: Incentive Policies for Green Projects

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Abstract:

The Directorates of Marine Fisheries and Aquaculture are working to spread the culture of integrated fish farming in agriculture among farmers and investors, and are launching awareness campaigns to attract the largest possible number of farmers and investors. They also provide technical and financial support through agricultural guidance in the field of aquaculture.

Fish farming plays a significant role in fruit quality and increased production, in addition to completely eliminating the need for chemical fertilizers, allowing for the production of organic agricultural products.

Keywords: Aquaculture, Agriculture, Tilapia, Green Projects.

Jel Classification Codes : Q10 ; Q22 ; Q56.

Résumé:

Les Directions des pêches maritimes et de l'aquaculture s'efforcent de diffuser la culture de la pisciculture dans l'agriculture auprès des agriculteurs et des investisseurs, et lancent des campagnes de sensibilisation pour attirer le plus grand nombre possible d'agriculteurs et d'investisseurs. Elles fournissent également un soutien technique et financier par le biais de conseils agricoles dans le domaine de l'aquaculture.

La pisciculture joue un rôle important dans la qualité des fruits et l'augmentation de la production, en plus d'éliminer totalement le recours aux engrais chimiques, permettant ainsi la production de produits agricoles biologiques.

Mots clés: Aquaculture, Agriculture, Tilapia, Projets verts.

Jel Classification Codes : Q10 ; Q22 ; Q56.

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I. Introduction

Algeria seeks to achieve food security, so encouraging the establishment of model farms has become a necessity, as has been achieved in some northern and desert regions. Integrating freshwater fish farming with these agricultural activities will be beneficial and profitable for farmers and consumers, by reducing costs, increasing profits for farmers, and providing fish products to consumers. This is what the Directorate of Marine Fisheries in Algeria seeks to achieve by raising awareness and training farmers in this field.

Therefore, the main question is:

What is the importance of integrating fish farming in the agricultural sector in Algeria?

To address this main question, the following questions are posed:

- What is the mechanism for fish farming on agricultural farms?
- What are the benefits of integrating fish farming with the agricultural sector?
- What are the policies supporting aquaculture to provide fish products on agricultural farms in Algeria?

To examine the problem presented and answer the sub-questions, the following hypotheses are proposed:

- Integrating fish farming with the agricultural sector is within the framework of a complementary relationship;
- Integrating fish farming with agricultural farms has multidimensional benefits; Algeria has established incentive policies to support fish farming on agricultural farms.

The importance of this research is clearly demonstrated by its focus on developing agricultural activity in Algeria by integrating a new activity, freshwater fish farming. Thus, farmers who were previously limited to activities within the green economy will expand their activities within the blue economy.

This research aims to spread the culture of freshwater fish farming on farms, which could be located in various regions of the country—east, west, north, and south—in addition to fish farming in ponds located within lakes and dams. This is intended to enhance fish wealth and integrate the blue economy into the green economy to contribute to achieving food security in Algeria.

This research will be divided into four sections. The first section addresses the reality of fish production in Algeria, addressing the various problems that have led to low fish consumption in Algeria. The second section examines the mechanism of fish farming on agricultural farms through extensive and intensive systems. The third section examines the benefits of integrating fish farming with agricultural activity, in terms of production, nutrition, and the environment. The

fourth section focuses on policies to support fish farming in agricultural farms in Algeria.

II. The reality of fish production in Algeria:

Algeria's Arab position in terms of fish production from natural sources in 2018 is very low, ranking sixth. When we compare Algeria's fish production with that of Arab countries, we find that Mauritania's production is 7 times greater than Algeria's, Oman's is 4 times greater than Algeria's, and Egypt's is 3 times greater than Algeria's. That is, Algeria's contribution to Arab fish production from natural sources is very small (3.21%) (بن جدية محمد الصالح؛ عبدات عبد الوهاب، 2023) compared to Algeria's enormous potential in this area. This has made the Algerian per capita fish consumption very low and weak (the global average fish consumption was 20.3 kg in 2018 and 20.5 kg in 2019, while the Algerian per capita fish consumption is less than 5 kg/year). (FAO, 2024)

II.1 Problems of marine fishing in Algeria :

The low quantities of fish produced and the weak fish consumption in Algeria, despite the available natural resources, mean that there are problems and difficulties facing this important sector. These problems include the following: (بن جدية محمد الصالح؛ عبدات عبد الوهاب، 2023)

- Material problems: Failure to keep pace with technological developments in the field of marine fishing, in terms of fishing vessels and their equipment, as well as modern fishing methods;
- Financial problems: Most fishermen are financially unable to purchase modern fishing vessels and equipment, given the lack of facilities, loans, or bank financing specific to the marine fishing sector;
- Logistical problems: The lack of modern infrastructure for the marine fishing sector, such as refrigerators for preservation and storage, and means of transportation...;
- Problems related to the shortage of specialized personnel: The lack of qualified human resources in the field of marine fishing, including technical and technological personnel;
- Problems related to fishing technology at sea: The use of fishing methods prohibited by law, such as the use of fishing nets that catch even small fish, leading to a decrease in fish quantities in the future; the lack of a study of the production capacities of each marine fishing area, as the number of fishing vessels increases in an area with limited production capacities, leading to the overstretching of fisheries; The use of explosives and bombs in fishing to facilitate fish harvesting leads to mass fish annihilation. Fishing during the

spawning season also leads to the demise of fish and desertification of marine areas. This can be attributed to a lack of awareness, weak oversight, and strict enforcement of the law.

- Environmental problems: Marine pollution on the Algerian coast is a result of industrial waste and sewage discharges, resulting from the lack of proper planning for industrial zones and the lack of wastewater treatment plants in coastal states.
- Problems of weak demand: High fish prices in wholesale and retail markets have led to consumers' reluctance to purchase fish.
- Lack of marine fish farming basins: due to high production costs.
- Bureaucratic problems: Administrative obstacles hinder major foreign investors from investing in the marine fisheries sector in Algeria. (Extract from the article on the largest investor in the marine fisheries sector in Europe.)

One of the solutions proposed to reduce the decline in fish production and limit the rise in prices is aquaculture in general, specifically freshwater fish farming on agricultural farms, enabling farmers to become producers of agricultural crops and livestock as well as fish. So, what does the term aquaculture mean? What is the term "integrating fish farming with the agricultural sector?" This will be studied in the next section.

II.2 Definition of aquaculture and fish farming integrated with the agricultural sector:

The term aquaculture encompasses both animal husbandry and plant cultivation in fresh and salt water. Aquaculture shares similar objectives with agriculture, particularly those related to raising food production above its natural level through the use of specific technologies and techniques to meet growing human nutritional needs. (the Directorate of Marine Fisheries)

The term integrated fish farming with agriculture refers to the process of introducing and raising fish in a suitable environment for agricultural irrigation. This process involves developing these two activities in parallel or sequentially, each benefiting from the advantages of the other. These advantages can be explained as follows: (the Directorate of Marine Fisheries)

- It guarantees an additional source of protein;
- It reduces malnutrition through the provision of valuable materials;
- It diversifies the returns of agricultural investments;
- It reduces the use of chemical fertilizers;
- It enhances the exploitation of natural and manufactured water bodies;
- It increases the agricultural yield of the investment;
- It develops healthy and sustainable agriculture.

"Agricultural-fish farming integration" refers to the integration of fish farming activities with plant or animal production into a single production unit, allowing

for the recycling of water and nutrients and achieving environmental and economic savings. Therefore, the question that arises is how to integrate fish farming with agricultural activity. This will be examined in the next section.

III. Mechanism for integrating fish farming with agriculture

Integrating fish farming with agricultural activities is a new process in Algeria. Algerian farmers are accustomed to practicing agricultural and pastoral activities, while fish farming was unknown to them. In the past, farmers reused animal husbandry by-products (animal dung) to nourish and fertilize the soil naturally as an effective agricultural method. What if farmers raised fish on their farms? What is the mechanism for integrating fish farming with the agricultural sector? And will the farmer benefit from it? This will be studied in this section.

The process of integrating fish farming with the agricultural sector is carried out according to two systems: the extensive system and the intensive system.

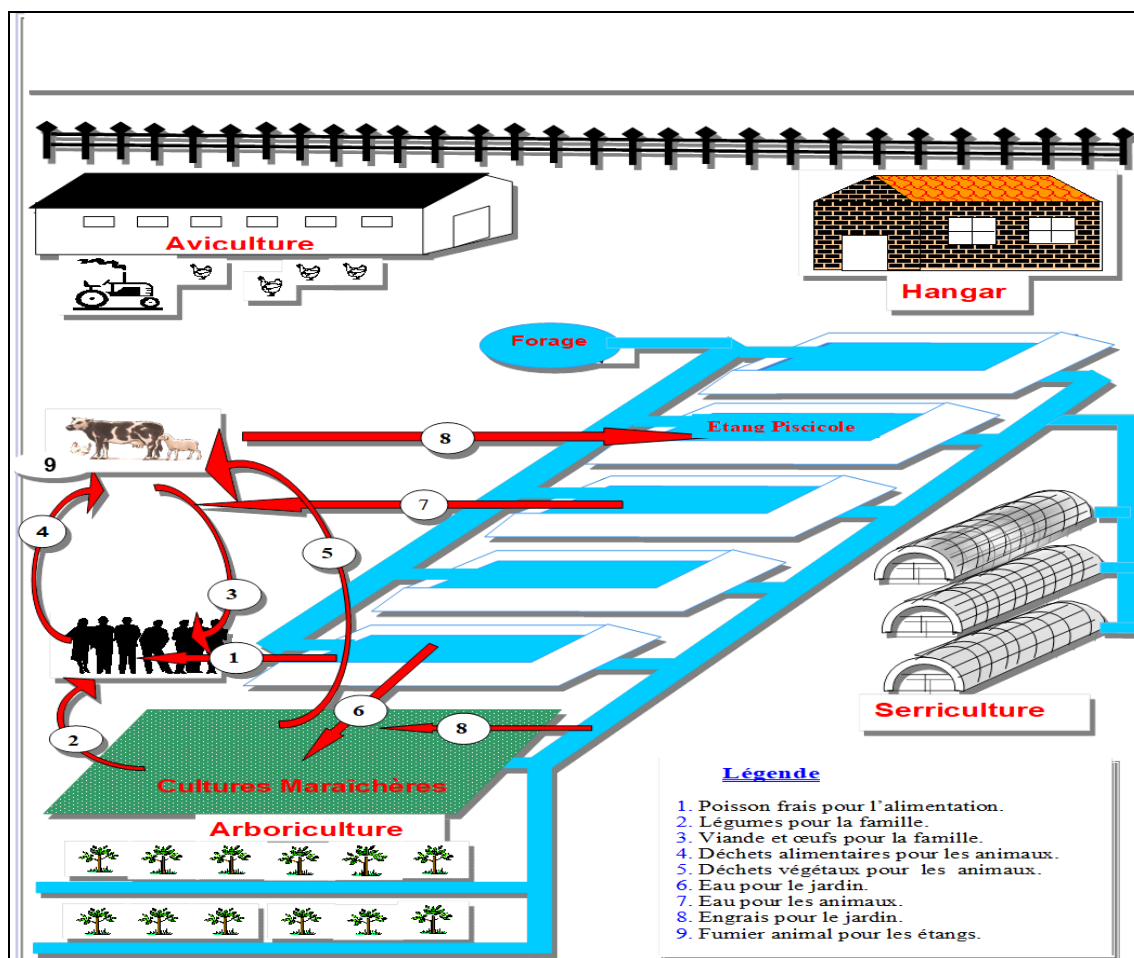
(the Directorate of Marine Fisheries)

- The extensive system: This type of farming aims to produce fish at low costs. The farming area consists of ponds or basins designated for agricultural irrigation, one or two meters deep, with a capacity of 2 to 3 bream per square meter. The bream are fed with farm waste from crops and animal manure as natural fertilizer for the pond (8 to 10 kg per 100 square meters per week). The goal of this fertilization process is to increase the production of natural animal and plant foods and achieve a pH between 6.5 and 8.0, with an average production rate of 60 to 100 kg per 100 square meters.

- The Intensive System: This is a farming system designed for medium and large-scale operations, encompassing areas of more than 500 square meters. The farming area is located in earthen or artificial ponds, or in floating cages ranging in depth from one to three meters. The pond accommodates 20 to 30 fish per square meter, with a size ranging from 3 to 5 cm. They are fed a commercial compound feed rich in protein at a rate of more than 35%, in the form of gravel. The average rearing period ranges from 4 to 6 months in an appropriate water temperature. Aeration, qualified technicians, and good water quality are essential. It is preferable to clean the ponds after each fish harvest.

The process of integrating fish farming with the agricultural sector relies on the nitrogen cycle as an environmental substrate. Organic waste from fish farming is converted into nutrients that benefit plants, reducing the use of chemical fertilizers and creating a closed-loop system. This creates an integrated and sustainable system that reduces waste, improves resource efficiency, and promotes agricultural sustainability. The following figure illustrates this:

Fig.(01): Integrating fish farming with various agricultural activities



Source: Directorate of Marine Fisheries of Setif Province, 2024.

The figure shows that fish farming on farms will provide fresh fish for direct consumption on the one hand and agricultural products (fruits and vegetables) on the other. Furthermore, raising poultry and livestock such as cows and sheep will provide eggs and meat for the family (i.e., for self-consumption). Food waste from the family and plant residues from the farm will be used as food or feed for the animals (poultry and livestock). The water from the fish ponds will be used for watering the animals, greenhouses, and the farm. Being rich in organic matter, it provides a natural fertilizer for the farm, improving both the quantity and quality of its crops. Animal waste is also used as fertilizer for fish ponds.

IV. Integrating fish farming into agricultural farms: multidimensional benefits

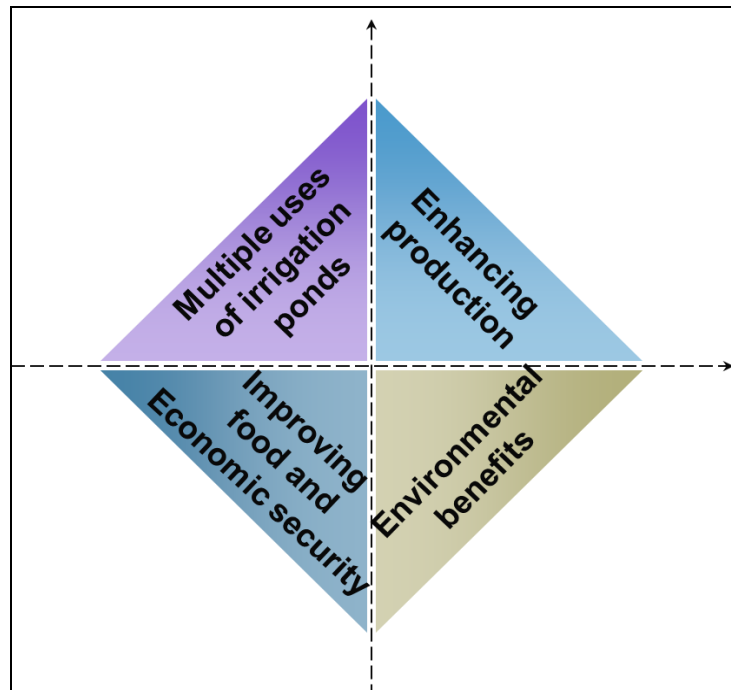
There are several benefits to fish farming in irrigation ponds, particularly in terms of crop or livestock production. As cold-blooded animals, fish expend more effort on growth than on maintaining body temperature, and they also thrive on natural or supplemental feed.

There are several additional benefits that can be derived from integrating fish

farming into agricultural systems. This complementary relationship is illustrated in the following figure:

In other words, practicing aquaculture in irrigation ponds improves the production capacity of many agricultural sectors and increases their yields, as the water used for fish farming is rich in the nutrients necessary for the growth of agricultural crops. Therefore, irrigating farms with fish pond water will yield positive field results in agricultural investments, such as increased crop production and improved quality. These positive results can be explained in detail in the following figure:

Fig.(02): Agricultural-fishery integration: multidimensional benefits



Source: Directorate of Marine Fisheries of Setif Province, 2024.

The figure shows that fish farming on agricultural farms has significant benefits, including: (the Directorate of Marine Fisheries)

1- Boosting production: Integrating fish farming into agricultural farms increases production, as:

- Increased yields and improved quality of agricultural crops due to the use of fish water for irrigation, which is rich in organic matter (natural fertilizer). Scientific experiments have proven that practicing aquaculture in irrigation ponds improves the production capacities of many agricultural sectors, increasing their yields by 20%. In Bangladesh, a project involving 256 farmers demonstrated that income from projects that integrated fish farming with rice cultivation increased by an average of 20% compared to income from fields planted with rice only, because farmers used less fertilizer and pesticides. The total overall benefits of

integration projects increased by an average of 64% in the dry season and 98% in the rainy season. A study in the Philippines demonstrated that switching from rice-only farming to rice-fish farming increased labor costs by 17% and investment by 22%, but resulted in a 67% increase in total income from fish sales. (منظمة الأغذية والزراعة للأمم المتحدة، دون سنة نشر)

- Some plants can be grown in fish ponds, as can terrestrial vegetables and herbs if they can be floated.
- All plants can be used as fertilizer to increase soil fertility or as feed for fish and livestock.
- Seasonal rain-fed ponds can be used for agricultural production during dry periods without adding water or nutrients.
- Alternating fish farming with farming improves soil quality over time.

2- Multiple Use of Irrigation Ponds:

Aquaculture, including freshwater fish farming, allows for conserving freshwater and providing feed. This is because:

- The water from ponds is used for multiple purposes, such as irrigating vegetables and fruits;
- The water from ponds is used for multiple purposes, such as irrigating vegetables and fruits;
- Using pond water for irrigation is very beneficial because it contains algae that improves soil fertility.
- Emptying ponds during fish harvesting can be done with the sludge used as fertilizer for agriculture, or using pond soil to grow fodder and other products.

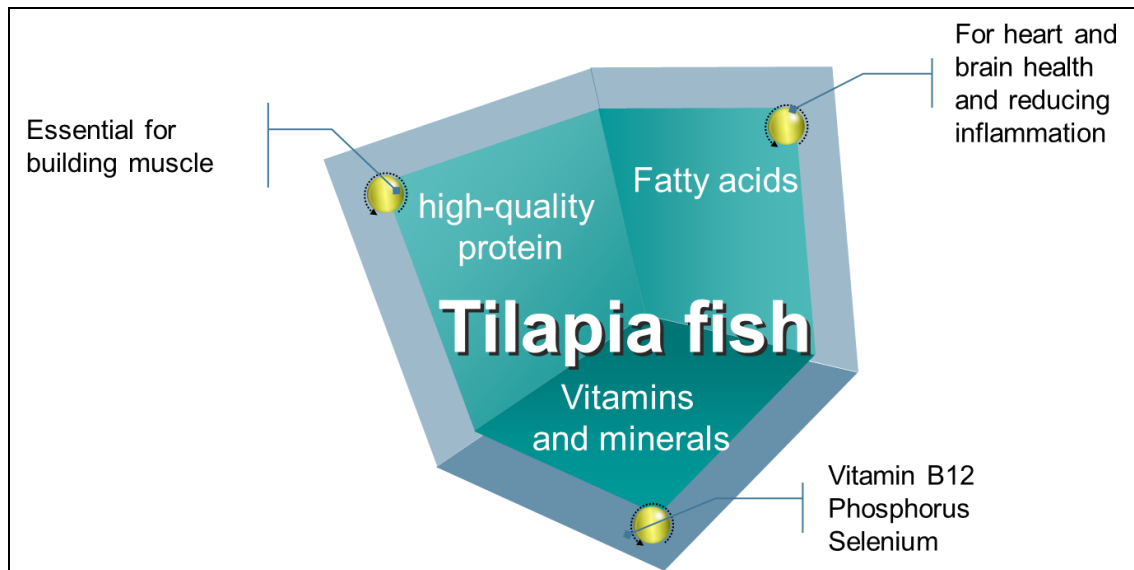
3- Environmental Benefits:

- In cases where field waste is available in significant quantities, using it for fish farming will increase production while simultaneously preventing environmental damage. This is because:
- Some types of integrated fish farming may reduce or even eliminate the need for pesticides, as some fish species eat mosquito larvae.
- Suitable fish species, when raised, feed on weeds and algae, reducing the need for herbicides while simultaneously increasing phosphorus and nitrogen levels in the water, thus reducing the need for chemical fertilizers.

4. Improving food and economic security:

Increasing freshwater fish farming production means increasing the availability of many nutrients essential for overall health, such as proteins, beneficial fats (such as omega-3), minerals (such as calcium, sodium, potassium, chlorine, and iron), and vitamins (such as B1, B2, B6, B12, A, and D). For example, studying the nutritional value of tilapia (a freshwater fish) will highlight the numerous important health benefits consumers will experience. The following figure illustrates this:

Fig.(03): Nutritional benefits of tilapia



Source: Prepared by the researchers based on the following reference :

–Medicoverhospitals, « **Benefits of Tilapia** », in the web site :

<https://www.medicoverhospitals.in/ar/articles/benefits-of-tilapia>, access on : 07/08/2025.

The figure above shows that tilapia contains many important nutrients, including:

- Protein: Tilapia is a source of high-quality protein, essential for building muscle and overall bodily functions.
- Fatty acids: Tilapia contains a significant amount of omega-3 fatty acids, essential for heart health, reducing inflammation, and supporting brain function.
- Vitamins and minerals: Tilapia is a good source of many vitamins (such as vitamins B1, B2, B6, and B12, which are essential for nerve function and the production of DNA and red blood cells) and many minerals (such as phosphorus, essential for bone and tooth formation, and selenium, an antioxidant that helps protect cells from damage and supports the immune system).

In addition, eating fish in general helps you feel full for longer, reducing overeating.

In order to implement fish farming projects on farms in Algeria and achieve these

benefits, financial and technical support policies have been developed for aquaculture in various Algerian provinces, along with incentive measures to encourage investors to enter this sector. Transitioning from institutional support to field implementation of aquaculture integration with agricultural activities poses a challenge that requires careful coordination between farmers, supporting agencies, and technical experts. This integration is carried out according to carefully considered models that take into account the specificities of each agricultural region in terms of climate, water resources, soil type, and agricultural exploitation objectives.

V. Aquaculture support policies in Algeria:

In recent years, Algeria has witnessed a qualitative shift in its agricultural and environmental policies, embodied in the integration of aquaculture activities into the agricultural sector. In this regard, the Directorates of Marine Fisheries and Aquaculture, along with their departments in various provinces, are working to spread the culture of integrated aquaculture within agriculture among farmers and investors. This is achieved by concluding agreements with other sectors and launching awareness campaigns to attract the largest possible number of farmers and investors. Furthermore, they provide technical and financial support through agricultural guidance in the field of aquaculture.

V.1. The National Program to Support Aquaculture and its Objectives in Algeria: This program is embodied in the following axes:

- Launching national fish farming programs domestically, under the supervision of the General Directorate of Marine Fisheries and Aquaculture.
- Establishing experimental stations affiliated with the National Center for Research and Development of Fisheries and Aquaculture (CNRDPA) for continental aquaculture - in addition to marine life culture - located in several regions of the country : (CNRDPA, 2025)
 - Station of ouricia (Setif) reproduction of target species: carp, pike-perch, black bass and perch
 - Station of Hareza(Ain Defla) reproduction of: carp, pike perch, black bass
 - Station of Tabia (Sidi belabbes) : arps , zander , black bass , perch
 - Station of Bechar : Tilapia
 - aharan Aquaculture Development Station Ouargla : Tilapia – catfish
 - Shrimp farming Ouargla : vannamei shrimp grow-out.
- Establishing state-owned technical stations, such as the Batna station, to train farmers and support investors.

- Incorporating integrated aquaculture into agricultural support procedures, particularly through "sustainable agricultural investment" programs.
- Encouraging farmers to diversify their production through subsidized loans from the Agricultural Development Fund (CNMA), as well as customs facilities for the import of specialized equipment. (MINISTERE DE L'AGRICULTURE ET DU DEVELOPPEMENT RURAL, Décembre 2020)

This support is not limited to financial aspects, but extends to technical and training support, through the intensification of training courses in this field and the accompaniment of fish farmers' fish production processes. These include regular training courses on integration systems, water quality management, nutrition, and aquatic animal health.

Incentive measures have also been approved by the Ministry of Fisheries and Fisheries Products through its regional directorates regarding freshwater aquaculture farmers. Farmers practicing aquaculture integrated with agriculture will benefit from an incentive bonus for Tilapia producers, estimated at 50 DZD for every 1 kg produced, according to the 2024 Finance Law. The incentive bonus is paid from the state budget, provided that the aquaculture activity is licensed and that the production quantity exceeds 400 kg per production operation. (hunting), and the minimum weight per unit of red tilapia must be at least 250 grams, equal to or exceeding the minimum commercial size of red tilapia (*Tilapia neolitica*), which is 18 cm per unit. (JOURNAL OFFICIEL DE LA REPUBLIQUE ALGERIENNE N° :57, 2024, p24)

Since the incentive bonus applies to red and Nile tilapia species, farmers of these fish also benefit from:

- The sale of fish intended for marketing and consumption.
- The sale of juvenile fish, given that this species reproduces in large quantities.
- Irrigation water enriched with natural fertilizer to fertilize the soil.
- Support for marine fishing and aquaculture chambers in marketing the product.

Tilapia producers have also been exempted from value-added tax (VAT), and the tax has been reduced to 9% for processors of this species. (Official Gazette of the Algerian Republic, 2023, p18)

The objectives of the national program are: (Documents of the Directorate of Marine Fisheries of Setif Province)

- Aquaculture development: Encouraging the establishment of freshwater fish farming projects, especially in dams and water bodies, and providing technical support to investors.

- Training and guidance: Organizing training courses for professionals and those interested in aquaculture, in cooperation with institutes Specialized.
- Research and Development: Supporting scientific research and applied experiments in the field of aquaculture, in coordination with the National Center for Research and Development in Marine Fisheries and Aquaculture.
- Coordination with Local Authorities: Concluding cooperation agreements with other directorates, such as tourism and traditional industries, to enhance integration between sectors.

V.2. Successful green projects in Algeria:

There are a number of successful experiments in the field of freshwater fish farming, especially red tilapia, in several regions of the country, including:

- In the province of El Tarf: (Directeur local des pêches maritimes et de l'aquaculture à El Taref, 2024)

The marine fisheries and aquaculture sector is working to encourage and develop private investment in integrated fish farming with agriculture, with the aim of increasing fish production and enhancing the production capacity of agricultural crops. By April 2024, 600 farmers had been trained in integrated aquaculture with agriculture. This training was conducted at the Technical School of Marine Fisheries and Aquaculture in El Kala, the Vocational Training Center in the same city, and the Specialized Vocational Training Institute in the municipality of Bouhadjar, under the supervision of specialists in the field.

In the province of El Tarf, pilot experiments were conducted with 13 farmers, and their projects related to integrated fish farming with agriculture were recorded as successful, thanks to their training and familiarity with the ecological and technical conditions for ensuring fish survival and reproduction in irrigation ponds. The stated goal is to achieve an annual production of between 20 and 35 tons of freshwater fish.

The productivity of many agricultural sectors has also increased, and the quality of their products has improved, particularly in agricultural investments located in the municipalities of Ben M'hidi, Besbes, and Draaane. The successful experiences of farmers in the region, after achieving very positive results—such as those achieved in the municipality of Besbas—have prompted these farmers to expand their investments by adding additional ponds. This has also encouraged other farmers to engage in fish farming and contribute to the transfer of their acquired expertise in the field.

Also, in the western province of El Tarf: (ALGERIE PRESS SERVICE, 2024)

Some farmers are integrating their farms with fish ponds, particularly for red

tilapia. For example, in the Ben Amar region, there is a model farm covering 8 hectares for growing pomegranates and peaches. The farm contains a pond 22 meters long, 18 meters wide, and 4 meters deep, with a capacity to accommodate 30,000 red tilapia. After two years of fish farming and irrigation of the trees with pond water, the soil is nourished by fish waste, which has contributed to doubling production. This means that fish farming plays an important role in the quality and abundance of the produce, in addition to completely eliminating the need for chemical fertilizers, allowing for the production of organic crops (i.e., organic, meaning they are produced using natural, environmentally friendly methods free of harmful chemicals such as pesticides and artificial fertilizers).

- In Khenchela province: (Director of the Kosider Agricultural, 2024) The "Cosider Agricultural Foundation" benefited from an incentive bonus for red tilapia production. This institution is a pioneer in this fish farming, with abundant production reaching 30 tons, enabling the provision of fresh fish products to consumers. This incentive bonus aims to encourage the establishment of projects in this sector to increase fish production and create jobs for young people.

- In Oran :(ALGERIA PRESS SERVICE, 2025) The results of the first half of this year's red tilapia farming program in the six farms designated for this species were "positive," with at least 190,000 tilapia being farmed, while an additional 250,000 tilapia are expected to be farmed in the second half.

There are also several investments in red tilapia farming in several other Algerian states, such as Setif, Batna, and Ouargla... This is due to the importance of integrating red tilapia farming into the agricultural sector, which is a sustainable production model that achieves a double return for the farmer.

VI. Conclusion:

After studying this topic, we conclude that integrating fish farming with the agricultural sector is a complementary relationship, where fish waste is used as natural organic fertilizers to enrich the soil, increasing farm productivity. This confirms the validity of the first hypothesis.

In addition, integrating fish farming with agricultural farms has economic benefits (through the production and provision of fish products and increased profits for the agricultural investor), environmental benefits (since recycling fish waste to fertilize the soil avoids the use of environmentally harmful synthetic fertilizers), and health benefits (since fish products contain several vitamins and minerals beneficial to human health), which confirms the validity of the second

hypothesis.

Algeria has established incentive policies to support fish farming on agricultural farms. It has established a national program for marine fisheries directorates across the country to raise awareness among farmers and young investors about the importance of aquaculture in general. It has also approved incentive financial sums to encourage fish production, particularly red tilapia, which confirms the validity of the third hypothesis.

Fish farming in Algeria is an important step toward establishing green projects within the framework of a circular economy. This process conserves agricultural land, irrigation water, and natural fertilization of the soil in an integrated manner, reducing costs and increasing returns for farmers. This ensures the continuity of these promising agricultural projects. Furthermore, fish farming in Algeria is an important step toward achieving food security because it guarantees abundant production for current and future generations, especially if the culture of tilapia consumption spreads throughout Algerian society. This species of fish is also known for its very high productivity, even in a short period of time.

Research results: Aquaculture in general, and freshwater fish farming (tilapia) in particular, can achieve many positive outcomes, such as:

- Meeting market needs for fish products at reasonable prices;
- The possibility of exporting freshwater fish, given the enormous potential of the country's provinces;
- Increasing yields and improving the quality of agricultural crops through the use of fish water for irrigation, which is rich in organic matter (natural fertilizer);
- Completely abandoning synthetic chemical fertilizers and producing agricultural crops with natural fertilizer by recycling freshwater fish waste and using it as fertilizer on farms;
- The possibility of producing natural fertilizer from freshwater fish waste as a final product and selling it, given its high prices in domestic and foreign markets;
- The possibility of establishing small and medium-sized enterprises specialized in various branches of this activity (aquaculture), such as specializing in the production of freshwater fish larvae, specializing in the production of natural fertilizer, specializing in the production of fish feed, specializing in the production and maintenance of freshwater fish farming equipment and devices, etc.
- Creating numerous job opportunities for the labor force, thus alleviating youth unemployment at the local level.

Research proposals: To encourage fish farming on farms, the following are proposed:

- Spreading the culture of freshwater fish farming on farms is a major challenge, given the lack of awareness among Algerian farmers about this new activity. This requires mobilizing the media to highlight the importance of this activity, which will lead to the enhancement of fish resources and the achievement of food security in Algeria;
- Recruiting Algerian chefs and guiding them to excel in cooking freshwater fish in general, and developing delicious recipes for tilapia in particular, to encourage its consumption in Algerian society.
- Continuous coordination is required between the marine fisheries and aquaculture sectors, as well as the vocational training and education sector, the Chamber of Marine Fisheries, and the Chamber of Agriculture, with the aim of training farmers, providing them with technical information, and encouraging them to invest in this profitable sector.
- Continuing awareness campaigns and providing guidance to farmers and investors to attract the largest possible number of them by integrating aquaculture with agricultural and pastoral activities.

VII. Appendices:

- Types of freshwater fish:

1. **Common carp:** It looks like the following image:



The common carp is a climate-tolerant fish, reaching a maximum weight of 28 kg and a maximum size of 50 to 60 cm. Its spawning season is twice a year, in March and June. Its feeding behavior is omnivorous (it is not picky about its food and has a high nutritional flexibility, eating a mixture of plant and animal sources to obtain all the nutrients it needs. This means that these fish are not specialized in one type of food, as they can adjust their diet based on the season, their growth period, and what is available in their environment).

2. **Nile tilapia:** Its appearance is as shown in the following image:



The Nile tilapia has a lifespan of 4 to 7 years. It is intolerant of climatic changes and reaches a maximum size of 45 cm. Its spawning season occurs every 30 or 40 days at temperatures ranging from 25 to 28°C. Its feeding behavior is omnivorous.

3. **Red tilapia:** Its appearance is as shown in the image:



The red tilapia has a lifespan of 4 to 7 years. It is intolerant of climatic changes and reaches a maximum size of 40 cm. Its spawning season occurs every 30 or 40 days at temperatures ranging from 25 to 28°C. Its feeding behavior is omnivorous.

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