The Sankalpa: International Journal of Management Decisions
ISSN: 2454-7425
Volume 12, Issue 1 (January - June 2026)

Model farms in the context of sustainable development: Algeria's model

Dr Messaoudi Fatima Zahra
University of Tlemcen (Algeria)
fatima-zahra.messaoudi@univ-tlemcen.dz

Dr Sahraoui Feyza
University of Tlemcen (Algeria)
sahraoui.fayza@univ-tlemcen.dz

Dr Zekri Meriem
University of Tlemcen (Algeria)
Meriem.zekri@univ-tlemcen.dz

Dr Samir Mohammed Ayed
University of Tlemcen (Algeria)
mohammedsamir.ayad@univ-tlemcen.dz

Submission Date: 20.08.2025 | Acceptance Date: 01.01.2026 | Publication Date: 11.02.2026

Abstract:

Algeria's model farms are an essential part of the sustainable development strategy, aiming to improve agricultural production while conserving natural resources. These farms rely on modern and sustainable farming techniques, such as the use of organic fertilizer and effective irrigation, which contribute to increasing productivity and reducing negative environmental impacts. Model farms also enhance farmers' ability to meet economic and social challenges, through job creation and skills development. Thus, these farms are a role model in achieving food security and promoting sustainable development in Algeria.

Keywords: *Sustainable Development; Model Farms; Organic Agriculture; Environment; Food Security.*

1. INTRODUCTION

This essay seeks to shed light on a set of experiences, model farms, within the framework of rural and agricultural projects of research and rural extension, in light of the conceptual monitoring of agricultural sustainable development, which includes sustainable agriculture, sustainable rural development, and sustainable natural resources. The model farms are described and discussed as a strategy that calls for responsibilities, the onus, and terms of the reforms that underpin the research-development 'package' of the farm object, and as a 'site' of strategies that enhance the practices of the involved farmers.

Given the tremendous importance of rural and agricultural development, we shall not exaggerate the function and role of model farms. This academic essay broadly deals with the nature and imperative of model farms as a conceptual, methodological, and institutional space of research, experimentation, and participation strategies in sustainable development frameworks of modern agricultural practices. The emphasis is on strategies: farmers' practices in particular and those of the involved main actors in model farms. It looks at the possibilities, choices, and resources for agriculture and rural economic development in Algeria in view of supplying food security through an integrated qualitative market economy. Agriculture is not the primary sector. The reasons for using the Armenian Djemila model farm as a case study to tackle issues of change and sustainable development in agriculture can be more than intrinsic. Agriculture in Algeria faces water scarcity more specifically, and the desirability of using integrated methodologies for agricultural development in the face of national political change can be all the more explicit in the Djemila

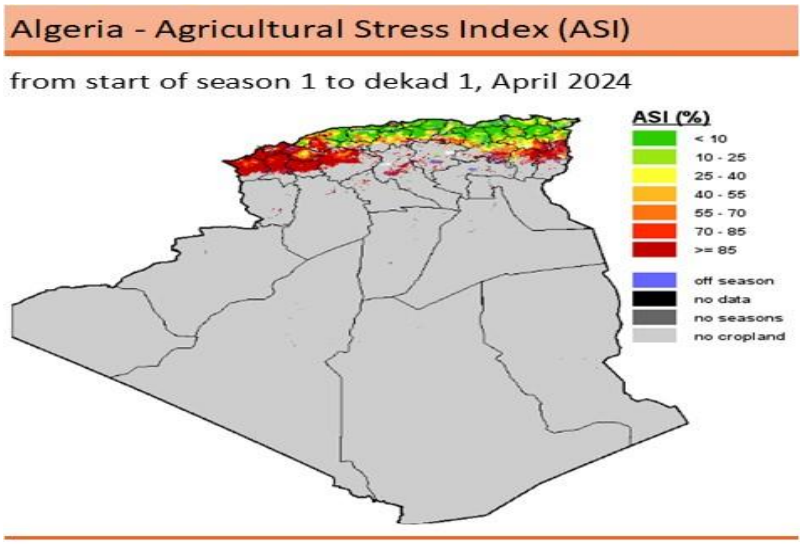
case. Given the historic and traditional experience and self-reliance of the agricultural household system, model options verification through traditional practices clashes with the conventional strip field crop resources rotation; In this context, the following problem statement can be formulated:

How can the implementation of model farms in Algeria contribute to sustainable agricultural development while addressing economic, social, and environmental challenges faced by local communities?

2. Historical Development of Agriculture in Algeria

The development of eco-crops in model farms has become a strategy for inclusive development partly because agriculture has been an important basis for identifying Algerian national identity, a major labor and financial support, and a competitive source of economic investment in the light of Algeria. The development program in the Algerian Sahara proposed the need to establish model farms to develop pilot projects in the southwestern region, with the following objectives: prestige/showcase, raising awareness and capacity building, and establishing contacts between local economic operators and foreign partners. Agricultural development in Algeria can be said to have developed in terms of natural and technological evolution. Changing the nature of food and agriculture in general is an important factor in the development of food systems in Algeria. The production, processing, and consumption of food have produced lower diets and agricultural practices based on the cultural, religious, economic, and natural resource characteristics of individuals, communities, societies, and territories. Custom-based techniques ignore technical progression in agriculture due to social and economic issues. These systematic changes in dietary and physical production were, however, directly reflecting the national lead aspect of the social, economic, and cultural structures of the time. (AROUS, et al., 3-6 October 2013, pp. 3-8) The course of this evolution is conditioned by the occupants of the Algerian territory and their external contact. To expand and enrich the overview of this development, the memory and records of such powerful influences were still present: house architecture, clothing, customs, and most significantly handicrafts and agriculture.

Fig N^0(01): Algeria – Agricultural Stress Index (ASI)



Source: (The Food and Agriculture Organization, 2024)

The Sankalpa: International Journal of Management Decisions
ISSN: 2454-7425
Volume 12, Issue 1 (January - June 2026)

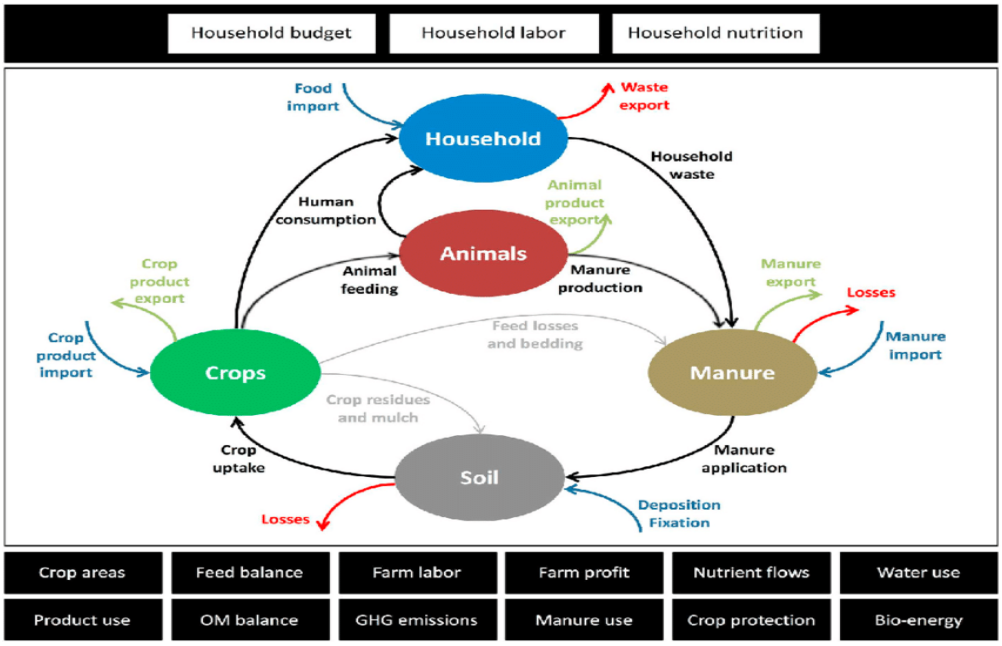
3. Concept of Model Farms

Model agricultural enterprise, i.e., model farm, is a concept from the first half of the previous century. Model farms are those that could be looked at as they are doing outstandingly better than anybody else in the industry, and therefore they can be used as a model by others to follow and improve. Model farms can be clearly defined as the best. They should represent the area of interest; they should come from a specific industrial sector and produce a specific good. On the other hand, definitions of model farms might state that the goal of their operations is, for example, economic efficiency at the required high level of sustainable production.

Model farms are characterized by the following (Darnhofer, 2021, p. 3387):

1) Innovativeness - always making progress;
2) Sustainability - long-term operations;
3) Productivity - improving quantitative production and introducing quality;
4) Education - technical excellence that will be meaningful and valuable for the surrounding farmers, rural and urban communities, in the case of model farms is on the level of education in sustainable and small-scale agriculture for their surroundings;
5) Changes - initiating social, cultural, and economic changes for the betterment. In that way, model farms can be a tool for higher efficiency of rural development and for establishing the development strategy or a number of smaller strategies with a base of shorter, medium-, and long-term objectives. Two common types of model farms are the family farm, as a small proprietor of integrated agriculture, and agricultural cooperatives as production communities. The model farm that is trying hard to integrate protection into farm production and its marketing is closely related to another conception - the use of the farm as an educational tool for the farm, for the villages, and even for the surrounding cities. Biodiversity in model farms is usually managed by integrating resources, and from this, when a household has managed well, they can increase efficiency and collaborate better. If they work separately, they will not achieve such good production levels for selling the commodities.

Fig N^0(02): Schematic showing farm resource flows



Source: (Lenora , et al., 2019, p. 51)

Model farms are also sustainable agriculture and have sustainable commodities for selling as well. However, from a capitalistic perspective, the new technologies do not always concern many farmers; therefore, it has to be pushed and done by the counterparts who control and know well the agricultural technologies. (Dogliotti, et al., 2014, pp. 76-86) It is a fertilizing.

4. Importance of Model Farms in Sustainable Development

Given the essential role of agroecosystems in producing food, ensuring access to water, and supporting natural resources, their incorporation into the conservation of biological diversity is important for the promotion of sustainable socio-economic development. Model farms that work in harmony with agricultural production and ecosystem conservation are important when focusing on the harmonious and sustainable interaction of environmental sustainability, socio-economic sustainability, and food security. In ecologically sustainable agriculture, the multistory use of agricultural crops, the use of environmentally friendly plant protection methods, and the normal biological activity of microorganisms and insects under preserved soil structure are examples showing that this agricultural system is consistent with organic activities. (Carl, Jeroen , Sieglinde , & Pablo , 2023, pp. 1-15) Model farms promoting sustainable management practices are also important in encouraging the development of animal production in harmony with animals' natural living environments. In other words, the diversity of animal and plant species not only promotes greater agro-technical potential but also reduces the risks of agricultural production. Model farms that integrate environmental sustainability, economic sustainability, and social equity are, apart from demonstrating with practice the most suited approaches for nature protection and the promotion of ecosystem services, also educational platforms for knowledge transfer to farmers and the wider public.

Fig N^0(03): Various Dimensions of Sustainable Agriculture
Source: (Grover, 2024)

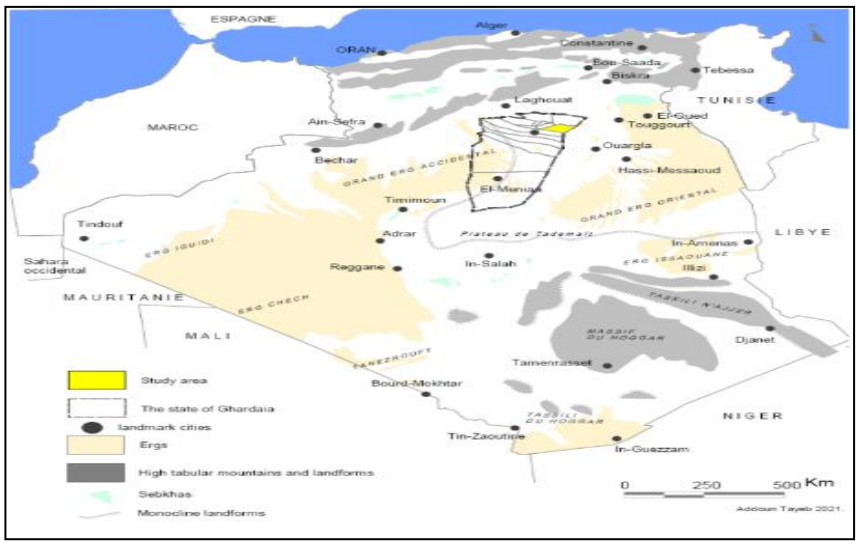
An important impact of model farms, therefore, is the social values demonstrated by the transfer of proven solutions to communities practicing sustainable management. Model farms also serve as awareness platforms on key issues related to rural development, including environmental challenges and the need to adopt a sound approach to nature conservation and ecosystem services.

National laws and international conventions related to the conservation of biological diversity should also actively support model farms. Given the need for innovation to increase agricultural productivity, agreements need to support mechanisms with the prospect of these lands being able to operate for the long term because their multifunctional character through combinations of agricultural productivity and ecosystem services is needed from agriculture while reducing the externalized environmental impact. (Ramesh , Keshav , Sandesh , & Deepak , 2024, p. 23) In summary, more financially effective production in model farms is required to achieve more agricultural output to meet the quantity of products. Also, the conversion to ecologically based agriculture is particularly beneficial as it limits the economic impact of heavy use of external inputs in managed farms. Model farms, therefore, are important on the path to social change and a more balanced use of environmental resources.

5. Algeria's Agricultural Sector: Overview

Algeria's agricultural sector is mostly divided between cereal crops (a major contributor to food security), fruit and vegetable crops, and pasture. The area under crops and pastures experienced a modest increase, amounting to 8.0%, while the pond's area has decreased by 2.5% compared to the period 1985–2004. Grain crops experienced the highest decrease in areas cultivated (49.1%). The sector contributed, during the last year of the period 1985–2004, an estimated average of 13.5% to the annual Gross Domestic Product (GDP) and employed, on average, 31.1% of the total population. The government is currently granting tax deductions to promote private investment in agriculture (Jannike , Jim , Mark , Ken , & Katrien , 2023). Algeria has also set up a system of National Agriculture and Rural Development, which is part of Algeria's national economic and social policy; it operates, therefore, within the framework of the global approach established for the development of the country as a whole. This policy is based on several fundamental objectives such as the production of wealth, improving the living conditions of the rural population, and the integration of these populations into national economic life. (Frédéric & Valeria , 2011, pp. 115-132) However, some problems and challenges still mark the agricultural sector, including land degradation, desertification, salinity, and water scarcity.

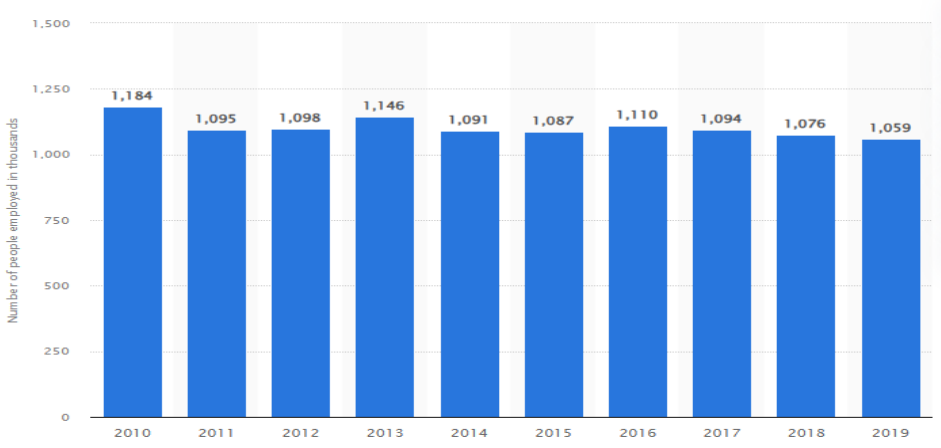
Fig N^0(04): Location of the region of Zelfana



Source: (Addoun & Hadeid, 2022)

Algeria is overwhelmingly dependent on earnings from the hydrocarbon-export sector for its income; the rest of the agricultural sector is not sufficiently developed to counteract any significant shock to the crude oil market. The importance of agriculture is not decisive in rural development, as in the rest of the Maghreb countries, given the high diversification of the rural economy and society. However, their food security is heavily dependent on efficiency and productivity in the agricultural sector. Agriculture employed about one quarter of the Algerian workforce during the period of 1987–2008; in 1992, the workforce percentage was up to 30%. Moreover, the workforce is predominantly in trade or commerce, and only 12% are fully employed in cultivation. The average yield for wheat production in Algeria in 2005 was 17.6 quintals per hectare with 12.9% of cultivated area. Progress is being made to increase cereal production with the capability of the country to be self-sufficient in grain crops when government policy focused on the preparation and support for the agricultural sector, especially at the end of the 2000s, in that direction via the implementation of programs and regulations followed as the agricultural orientation law. This law allows, for example, the granting of interest-free loans, tax exemptions, and investment subsidies, and the livestock sub-sectors between 2004 and 2019 recorded an overall growth of 13% in the number of heads. In 2019, Algeria's main agricultural products were barley, durum wheat, tomatoes, carrots, onions, garlic, honey, and olives. As for livestock, the number of sheep and goats increased by 39%, cattle by 9%, and poultry by 4%. In the same context and for the same period, the benchmark prices for livestock experienced a decline of about 3.7%, particularly with regard to sheep, with a decrease of 6.3%. Agricultural investment is a priority of the Algerian government, which has developed and adopted a systematic policy over the past. It has adapted the principles of sustainable development to the environmental, socio-economic, and cultural characteristics of Algeria. (Hounesou, Goudjo, & Senou, 2021) A substantial effort has been made during the period 2004-2009 to modernize the agricultural sector to increase productivity, improve profitability, and develop rural employment. However, to maintain the growth of the agricultural sector and achieve sustainable economic and social development, ensuring food security for the population, it is also necessary to achieve self-sufficiency in strategic products, especially cereals. Lastly, the Algerian government encouraged, protected, and supported training for young people to equip them with the agricultural intelligence necessary to serve the national agronomic field and to ensure sustainability in rural life (Statista Research Department, May 2, 2024).

Fig N^0(05): Number of people employed in the agricultural sector in Algeria from 2010 to 2019*(in 1,000s)*



Source: (Statista Research Department, May 2, 2024).

6. Initiatives for Sustainable Agriculture in Algeria

During the last few years, different programs, projects, and research activities to promote sustainable agriculture became part of an agricultural development approach followed in Algeria. At the level of the Algerian state, some initiatives are undertaken to promote ecological agriculture. The main milestones of this policy are the organic label and, at the level of PPAR, the introduction of small fields and distribution micro-irrigation in some farms. On the side of civil society, a few NGOs and collectives of peasants convey sustainable agriculture practices and philosophy. In some local communities, especially in the western part of the country, some associations have created gardens with alternative water systems.

Promotion of organic farming is specifically encouraged. An action plan for the development of the agriculture sector based on the national sustainable development strategy is currently being discussed in the Ministry of Agriculture. Algeria has implemented in its high plateaus a project that promotes conservation agriculture. The research activities promoting agro-ecology are facilitated by the existence of lines of research on the integrated management of plant protection, water, and the environment where the experiment stations are actually a canopy of agro-ecological principles. In the few orchards where chemical controls are minimized, part of the research activities is also in synergy with that proposed. The practical evolution of agriculture in an ecological way is still very limited because of the macroeconomic and agricultural policy directions; the seriousness of the impact of the achievements from the projects is not possible to measure in a precise way. The CNAT has developed a partnership with the Superior National Agronomic School of Algeria that offers an education program with a master's course on Integrated Management of Agriculture in the Saharan countryside. The Integrated Management of Agriculture in the countryside is basic training for high-level executives in agricultural institutions, technical and scientific research, and those involved in extension services (Landini, 2016, pp. 399-413). A national debate is ongoing among policymakers, researchers, farmers, representatives, and universities concerning the concept of biodiversity and conservation agriculture. The creation of research programs has received support because the leading positions recognize that the integrated management of agriculture is a priority in the fragile ecosystem of the high plateaus facing desertification.

7. Establishment and Evolution of Model Farms in Algeria

Model farms are generally created to have successful examples of agricultural and animal production in defined territories, where they are developed and improved from year to year, thanks to the progress made in the technological field, as well as in the field of national and international marketing. The concept of model farm originated in Holland in 1960, then in New Zealand in 1990 (Ministère de l'agriculture et du développement rural, 2022). One of the richest countries in the world is Holland, where developing refrigeration systems for seeds, training and selection of varieties, agricultural machinery, combined soil cultivation methods, organic and biofertilization of soil, integrated crop protection, and restructuring of agricultural techniques, biotechnology of the livestock field, the development of organic agriculture, and the processing and export of its agricultural and agri-food products generates incredible revenues (Mutsvangwa-Sammie & Manzungu, 2021, pp. 181-186).

In general, model farms are considered to be "a development tool since it meets the basic requirements of farmers and livestock producers, industrialists and traders, and their customers. At the level of man and the environment, it tries to use a system that respects the norms and rules in force, and to have a significant socio-economic impact, to provide jobs, product satisfaction, and technical support." Under the provisions of executive ordinance, model farms for cattle breeding, feedlot, and non-feedlot can be created.

Fig N⁰(06): Methodological approach

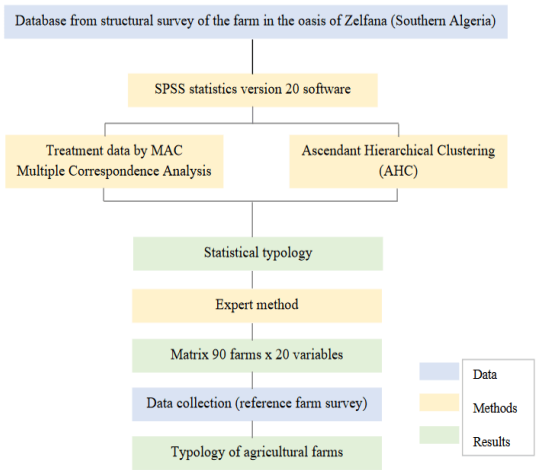
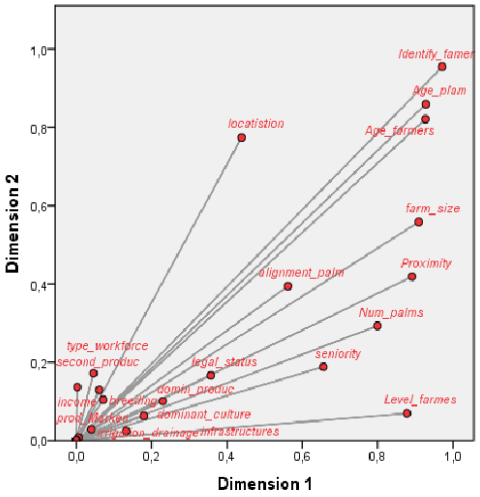


Fig N⁰(07): Discrimination measures



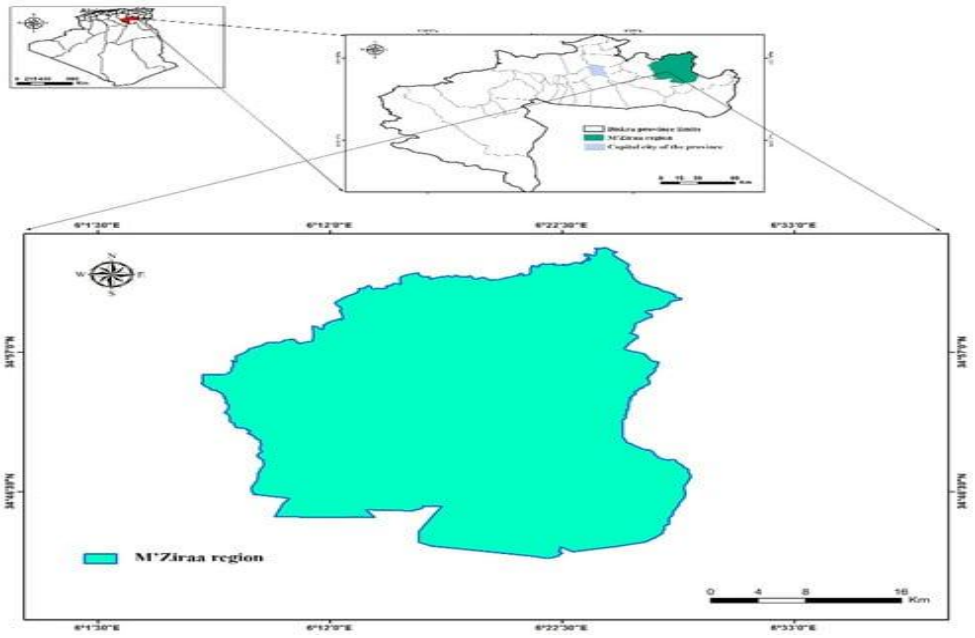
Source: (Addoun & Hadeid, 2022)

These model farms are growing progressively and according to technological progress, taking into account the prospects of local, national, and international market development. As an application of reform, the model farms are the result of regulatory changes and the consideration of new parameters, particularly with regard to the preservation of the environment and the rational use of resources.

8. Success Stories and Impact of Model Farms in Algeria

Some of the projects financed directly in recent years have led to model farms, which are also success stories. Meanwhile, these farms have reached a steady state and entered the sustainability phase. The case studies presented below describe four model farms and illustrate how sustainable and economically viable these farms or units are. Although small, their role is central to local communities, whether in terms of improving food security, initiating conversation, or encouraging the participation of villagers in solving problems, or regulating income through jobs and monetization of products. In addition, they are considered the best examples of what can be achieved by working with good crop or animal waste. Today, we can speak quite objectively, given that these farmers not only break traditional yields but also vary with hybrid seeds, make cheese with powdered milk, and introduce special animals. The innovation and creativity added to the Value Chain pilot. All these examples inspire and suggest to other farmers, augur success for projects with other poor people, and reflect the wider national context. In other words, they are "scalable" (Ouendeno , Daoudi, & Colin, 2015, pp. 396-403) models that can be replicated in other valleys.

Fig N⁰(08): Study area location Biskra region (M'ziraa).



Source: (Aidat, Benziouche , Cei , Giampietri, & Berti , 2023)

The first case study is a "hôtel des éleveurs." This livestock farm provides jobs, a daily wage regime with modern contracts, social life, and school supplies for the children of the "hôtel" employees, demonstrating consumption through the multifunctional "hôtel training center," which attracts scientists and decision-makers from around the world. This farm includes a number of novel integrations, including ecologically urban farms. Welfare, adaptability of animals to damage, and thousands of tourists are also considered. This study also presents a unit of a cooperative and a cheese factory run by a woman. Innovative, ambitious, and visionary, these small companies are essential but always carry risks. It is very likely that the "first" artistic and technical failure at mass bar attendants will mean that the survival of "minus fromagers" only marginally generates rates against all odds. The third case study is a "ferme de montagne (Toillier , Bancé , & Faure , 2021, pp. 133-150)." This farm integrates mountain tomato plots and sheep farming. This study demonstrates how poverty is reduced by providing access to water and work; improved nutrition through animal protein, better payments in kind, and more eye-catching post-workshop employment; the fight against dependence of the marginal farmer on predominantly dominant financial aid, debt due to family, and social recognition; and the fight against desertion and marginality through solidarity, patriotism, and renewal of old passions. The transfer of inter-field workshops, requiring equal group conditions, must be adapted to the specific situation, making it more profitable, creating synergies, and fostering a more global reaction.

9. Challenges and Barriers Faced by Model Farms in Algeria

Model farms face numerous challenges and barriers that obstruct their growth and development, relating to biophysical, technical, regulatory, financial, and social factors. The lack of available financing represents a very serious barrier to model farm development. The accessibility and adequacy of water, electricity, and agricultural supplies remain logistical problems for most model farms involved. The responsibilities of the various control and follow-up structures are increasingly compounded by the heavy administrative burden and the limited resources of the management units. The issue of environmental conservation and adaptation to the

risks of extreme climate change is proving to be a significant challenge for model farms opting for sustainable agriculture. The model farms find themselves in sites threatened by soil erosion and are subject to degradation. In the context of a semi-arid climate, the loss of land due to sporadic flooding was cited by some as a deplorable and regrettable situation. Stored rainwater is prone to evaporation. The excessively rugged terrain is also difficult for model farmers. Among the main restrictions are the challenges it poses to the road transport of agricultural products. In addition to the track left for the transport of milk to the dairy, it should be a dirt track from the window to the exit of the farm. The regulatory restrictions in terms of official agricultural subsidies represent an inconvenience that was not felt by the farmers surveyed. In this case, mail is not working because the land is likely to decline. As it was said, we were very lucky to be able to harvest from small-scale agriculture. To combat the deplorable effects of contamination, farmers would qualify for aid. Farmers are prepared to follow the process through to the end. The current state of farmland is very low in value. "Land degradation" negatively impacts the calculated profit per acre. Some farmers manage to overcome cultural resistance with time. Raising awareness among public farmers is necessary, but "what is necessary is their acceptance and their proper application."

10. Lessons Learned and Best Practices from Algeria's Model Farms

Throughout the analysis, we attempted to learn lessons from the experiences of model farms in Algeria, based on testing and projects. Model farms that adopted a strategic plan with 154 projects, of which 47 farms have been the subject of a shift in primary productive systems by meeting the criteria of proximity and concentration of poverty among the settlers, are distributed in several regions of northern Algeria. (Mahgoub, Klimke, El Agamy, & El Agamy, 2024) The idea of diversification seeks the participation of the farmer and supports their involvement in these projects. One of the most important lessons from the work is the vital importance of project management and the mobilization and allocation of resources, whether technical or financial. It is certain that the incorporation of suitable technologies in the different components of the project cycle is a fundamental management principle governing the follow-up of the advancement of work in model farms.

1. An innovative approach to the design and implementation of modern farms has yielded excellent results.
2. The importance of technology is vital for ensuring the progress and success of the projects, in conjunction with guaranteeing the sustainability required in local development.
3. The adaptability of local products to resources and human capital is essential for the sustainable integration of the farm in the markets.
4. A participatory approach in the elaboration, planning, and implementation of the projects, combined, if necessary, with the resolution of social issues, is an important element in guaranteeing success.
5. Capacity building, particularly the development of the skills of people involved in the projects, must be based on a long-term vision to ensure the sustainability of the projects and the development of the farm.
6. An innovative and flexible system of follow-up and evaluation is a useful management tool, not only for correcting the strategy but also for capitalization. The evolution of traditional and modern sectors of livestock farming highlights these prospects in planning regarding the designed production systems in which the role of the technical extension advisors is profitably integrated.

11. Comparative Analysis with Model Farms in Other Countries

The preceding section presented a picture of the farms promoted as model practices in the three projects under consideration. (Houdret & Amichi, 2020, p. 40) A wide range of different farms have been identified, which can be associated with various civilizational models, depending on the country's stage of development and other elements. This makes them difficult to socialize between different milieus, each of which is endowed with its own socio-agro-ecological conditions. Nevertheless, international learning and exchanges remain an important dimension, at least to diagnose the limits of those factors that depend entirely on the historical and structural precedents of the examined country.

Among the model farms described, there are a number that correspond to a special niche of highly innovative farms across the globe. Another example of model farms is success stories of sustainable farms with high yields. They produce and process coffee and exchange experiences and knowledge with other local, regional, and global commercial and non-commercial, scientific, technical, and policy stakeholders. Model farms also correspond to global farm trends such as: - development of farms in desert conditions that offer high income rents based on climate and soil conditions, - high technological potential in terms of agriculture automation, processing, valorization, and management of water resources, - collaborative and transformative models such as: social and environmental entrepreneurship, collective management of the farms and resources, and transition towns based on nutrient cycles and agro-ecosystems rather than a farm as an isolated profitable unit. All model farms are closely connected with the surrounding environment and local community. (Gamage, et al., 2023, p. 30) They are open to external stakeholders and include the rural 'inside' world. Many regional differences are visible in the discharged models. However, they share many common issues that make them co-shareholders for the future milieu developments.

12. Policy Recommendations for Enhancing Model Farms in Algeria

This chapter argues that good coordination is necessary to have a more effective association between public policies and model farms, and vice versa. This coordination is necessary and essential for implementing the basic axes of the concept of sustainable development in model farms. The relevance of this approach for the innovation and sustainability of agriculture will depend on an external environment that supports the efforts of model farms. This effort should translate into the promotion of a public policy that is conducted in coherence with the objectives of innovation and the capitalization of achievements in agriculture.

As a conclusion from our analysis, the following policy recommendations for state governance are presented with the aim of encouraging small farmers to switch to the strategy of transforming model farm agriculture into a conventional activity. We believe that:

1) these procedures may come within the framework of an accompaniment of knowledge;
2) possible opposition to these proposals already indicates the direction of local culture;
3) it will be useful to continue research on policy proposals with young and experienced farmers in an environment that allows for more open debate on local development. This is a policy for farmers and territorial authorities that is intended to be favorable to the development of small farming. This would go in the direction of the strategies and values already planned in the government policy.

Indeed, an economic incentive would enable farmers to deal with parallel economic and ecological objectives on an almost constrained scale. These would have a clear impact on life.

13. Conclusion and Future Directions

Algeria has a long road ahead of it to protect itself from the global challenges facing agriculture and food systems. Model farms have been identified as a key cog in the policy machinery to assist the country in achieving its human and sustainable development goals, especially with respect to safe and nutritious food for all. This paper has looked at four model farms to derive insights into the achievements and challenges in model farm development. Conclusions have been drawn with respect to the African context of Algeria and agricultural development models in the Mediterranean region. Model farms have played a key role in promoting best practices, but the degree of innovation is still under question. Sustaining these farms has been a challenge, and they have had limited impact so far. Future policies need to go beyond training for better productivity and reduce vulnerability. In the final instance, improving sustainability and therefore resilience of farm systems and society is regarded as a litmus test for failure or success in supporting these pilots.

The recommendations cover both research thrusts to improve our understanding of model farm approaches and more practical policy recommendations. Without strong partnerships among larger numbers of actors, this will not be possible. There are high expectations of the potential impact of model farms in Algeria to achieve human and sustainable development objectives. In many respects, the Model Farm Program can be considered a testing bed, or pilot phase, which is revealing the problems that are likely to be faced in a mass extension among the rest of the farming sector, in light of the limitations of existing government personnel in the Department of Agriculture and Land Affairs. It would seem that the limitations encountered in the pilot phase suggest the need for government to invest heavily in agricultural extension services, particularly its human resources, in a focused and directed way so that the institutionalization of 'best practice' extension to the masses can actually be achieved. This paper has shown that, in the case of model farms, they are essentially post-commercial farms and that the modest success/impact of the model farm can be found outside the 'fringe benefits' of the demonstration in new knowledge that exists in the minds of the workers that manage the project. A large investment to extend model farms will need to look at remedying this weakness, which is essentially the institutionalization of agricultural extension services, providing skills and generating social networks.

14. Bibliography List:

Hounesou, D., Goudjo, G., & Senou, M. (2021, August 9). Access to Finance and Difference in Family Farm Productivity in Benin: Evidence from Small Farms. *Scientific African, 13*(3). doi:10.1016/j.sciaf.2021.e00940

Addoun, T., & Hadeid, M. (2022, March 28). Typology of agricultural farms in the South-East of Algerian Sahara: the case of Zelfana oasis. *Agrarian Academic Journal*. doi:10.32406/v5n1/2022/102-116/agrariacad

Aidat, T., Benziouche , S., Cei , L., Giampietri, E., & Berti , A. (2023, September 30). Impact of Agricultural Policies on the Sustainable Greenhouse Development in Biskra Region (Algeria). *Sustainability , 15*(19). doi:10.3390/su151914396

AROUS, S. A., ARAAR, H., DRIOUECH, N., EL BILALI, H., BELSANTI, V., & SISTO, L. (3-6 October 2013). 4th International Symposium “Agrosym 2013”. *Agricultural extension*

and advisory services in Algeria at crossroads: pressing problems and innovative solutions, (pp. 3-6). Jahorina (East Sarajevo), Bosnia and Herzegovina.

Carl, J., Jeroen , G., Sieglinde , S., & Pablo , A. (2023, June). Strategies Steering Intensification Pathways of Farmers in Central Malawi. *Human Ecology , 51*(3), 1-15. doi:10.1007/s10745-023-00413-0

Darnhofer, I. (2021, March 18). Farming Resilience: From Maintaining States towards Shaping Transformative Change Processes. *Sustainability, 13*(6). doi:10.3390/su13063387

Dogliotti, S., García, M., Peluffo, S., Dieste, J., Pedemonte, A., & Bacigalupe, G. (2014). Co-innovation of family farm systems: A systems approach to sustainable agriculture. *Agricultural Systems, 126*(C), 76-86.

Frédéric , G., & Valeria , H. (2011, January). Vers un modèle de développement et d'identités professionnelles agricoles globalisés ? Dynamiques d'innovation autour du semis direct en Argentine et en France. *Revue Tiers-Monde, 207*(3). doi:10.3917/rtm.207.0115

Gamage, A., Gangahagedara, R., Gamage, J., Nepali Sewwandi Jayasinghe, N. S., Kodikara, N., Suraweera, P., & Merah, O. (2023, March). Role of organic farming for achieving sustainability in agriculture. *Farming System, 1*(1), 30. doi:10.1016/j.farsys.2023.100005

Grover, N. (2024, October 14). *Sustainable Agriculture - Agriculture Notes*. Récupéré sur Prepp.in: https://prepp.in/news/e-492-sustainable-agriculture-agriculture-notes

Houdret, A., & Amichi, H. (2020, November 30). The rural social contract in Morocco and Algeria: reshaping through economic liberalisation and new rules and practices. (Routledge, Ed.) *The Journal of North African Studies*, 40. doi:10.1080/13629387.2020.1848560

Jannike , V., Jim , H., Mark , T., Ken , G., & Katrien , D. (2023, February). Production variability and adaptation strategies of Ugandan smallholders in the face of climate variability and market shocks. *Climate Risk Management, 40*(7). doi:10.1016/j.crm.2023.100490

Landini, F. (2016, September). Unfolding the knowledge and power dynamics of the 'farmers–rural extensionists' interface in North-Eastern Argentina. *The Journal of Agricultural Education and Extension, 22*(5), 1-5. doi:10.1080/1389224X.2016.1227050

Lenora , D., Adam , M., Tsai-Wei , C., Stephanie , A., Shantonu , a., & Carl , T. (2019, July). A model to examine farm household trade-offs and synergies with an application to smallholders in Vietnam. *Agricultural Systems*(173), 51. doi:10.1016/j.agsy.2019.02.008

Mahgoub, I., Klimke, M., El Agamy, F., & El Agamy, S. (2024). A Historical Perspective of North African, Levantine, and Gulf Family Businesses in the 20th Century. In P. F. Pérez, *Global Family Capitalism A Business History Perspective* (1 ed.). New York: Routledge. doi:10.4324/9781003388197

Ministère de l'agriculture et du développement rural. (2022). *Série B des données statistiques agricoles en Algérie.* Alger, Algérie: MADR.

Mutsvangwa-Sammie, E., & Manzungu, E. (2021). Unpacking the narrative of agricultural innovations as the sine qua non of sustainable rural livelihoods in Southern Africa. *Journal of Rural Studies* (86), 181-188.

Ouendeno , M., Daoudi, A., & Colin, J.-P. (2015, December). Les trajectoires professionnelles des jeunes dans la néo-agriculture saharienne (Biskra, Algérie) revisitées par la théorie de l'agricultural ladder. *Cahiers Agricultures, 24*(6), 396-403. doi:10.1684/agr.2015.0793

Ramesh , B., Keshav , B., Sandesh , P., & Deepak , S. (2024, September). Sustainable poultry farming practices: a critical review of current strategies and future prospects. *Poultry Science , 103*(12). doi:10.1016/j.psj.2024.104295

Statista Research Department. (May 2, 2024). *Import value of agriculture, hunting, and fishery products to Algeria 2014-2019.* Retrieved Junuary 16, 2025, from https://www.statista.com/statistics/1186110/import-value-of-agriculture-hunting-and-fishery-products-to-algeria/

The Food and Agriculture Organization. (2024, April 25). *GIEWS - Global Information and Early Warning System*. Retrieved from https://www.fao.org/giews/countrybrief/country.jsp?code=DZA

Toillier , A., Bancé , S., & Faure , G. (2021). Emergence et cloisonnement de sous-systèmes de conseil pour l'intensification écologique de l'agriculture au Burkina Faso. Dans P. Gasselin , S. Lardon , C. Cerdan , S. Loudiyi , & D. Sautier , *Coexistence et confrontation des modèles agricoles et alimentaires. Un nouveau paradigme du développement territorial ?* (pp. 133-150). Versailles, France: Quae.