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**THEME**

**DESIGN OF A VERTICAL AQUAPONICS SYSTEM ADAPTED  
TO THE ALGERIAN CONTEXT**

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## ABSTRACT

This study examines the design of a smart vertical aquaponics system adapted to Algerian peri-urban areas to address water scarcity, lack of structured agricultural practices in these regions, and food security. By integrating aquaculture and hydroponics into a closed-loop system, and using IoT sensors, LEDs and renewable energy, the prototype ensures efficient use of resources. Tested in a theoretical case in Blida, the system has demonstrated its scalability, environmental benefits and potential for local food production. Although challenges such as upfront costs persist, this innovative approach offers a sustainable solution to Algeria's agricultural and environmental challenges.

**Keywords:** Vertical aquaponics; Connected agriculture; Water conservation; Urban and peri-urban agriculture; Algerian agriculture; Environmental sustainability.

## المخلص

تبحث هذه الدراسة في تصميم نظام أكوابونيك عمودي ذكي يتكيف مع المناطق شبه الحضرية الجزائرية لمعالجة ندرة المياه، والافتقار إلى الممارسات الزراعية المنظمة في هذه المناطق والأمن الغذائي. من خلال دمج تربية الأحياء المائية والزراعة المائية في نظام الحلقة المغلقة، واستخدام أجهزة استشعار إنترنت الأشياء ومصابيح LED والطاقة المتجددة يضمن النموذج الأولي الاستخدام الفعال للموارد. وقد أثبت النظام، الذي تم اختباره في حالة نظرية في البلدية، قابليته للتوسع وفوائده البيئية وإمكاناته لإنتاج الغذاء المحلي. على الرغم من استمرار التحديات مثل التكاليف الأولية، إلا أن هذا النهج المبتكر يقدم حلاً مستداماً للتحديات الزراعية والبيئية في الجزائر.

**الكلمات الدالة:** الزراعة المائية العمودية؛ الزراعة المتصلة؛ حفظ المياه؛ الزراعة الحضرية وشبه الحضرية؛ الزراعة الجزائرية؛ الاستدامة البيئية.

## RESUME

Cette étude examine la conception d'un système aquaponique vertical intelligent adapté aux zones périurbaines algériennes pour répondre à la rareté de l'eau, au manque de pratiques agricoles structurées dans ces régions, et à la sécurité alimentaire. En intégrant l'aquaculture et l'hydroponie dans un système en boucle fermée, et grâce à des capteurs IoT, des LED et des énergies renouvelables, le prototype assure une utilisation efficace des ressources. Testé dans un cas théorique à Blida, le système a démontré sa scalabilité, ses bénéfices environnementaux et son potentiel pour la production alimentaire locale. Bien que des défis tels que les coûts initiaux persistent, cette approche innovante offre une solution durable aux enjeux agricoles et environnementaux de l'Algérie.

**Mots-clés :** Aquaponie verticale ; Agriculture connectée ; Conservation de l'eau ; Agriculture urbaine et périurbaine ; Agriculture algérienne ; Durabilité environnementale.