JOURNAL LA LIFESCI

VOL. 03, ISSUE 04 (165-173), 2023
DOI: 10.37899/journallalifesci.v3i4.772

Exploring the Benefits of Advanced Technologies in Fertilizer, Pesticide, and Water Management for Improved Efficiency and Yield Enhancement

Kenithia Muraty[1]

[1]*Jomo Kenyatta University of Agriculture and Technology, Kenya*

**Corresponding Author:* Kenithia Muraty

Article Info

Article history:
Received 20 February 2023
Received in revised form 8 May 2023
Accepted 17 July 2023

Keywords:
Advanced Technologies
Fertilize
Pesticide Management
Water Management
Efficiency
Yield Enhancement

Abstract

The advantages of new technology in fertilizer, pesticide, and water management for enhanced productivity and yield improvement in precision agriculture are investigated in this thesis. Research of both a quantitative and qualitative nature was conducted as part of the approach in order to offer a thorough knowledge of the influence that improved technology have had on the practices of precision agriculture. The quantitative findings of the research indicate that the use of modern technological practices leads to a large increase in both productiveness and profitability. The qualitative findings emphasize the positive effects on the environment that would follow from a reduction in the use of pesticides and fertilizers, as well as an increase in the sustainability of agricultural operations. Nevertheless, the research also reveals several challenges to adoption, such as the expense involved and a resistance to changing behaviors that have been done traditionally. Getting rid of these obstacles is going to be essential if we want to realize the full potential of precision agricultural methods. In general, this thesis provides important insights into the potential of advanced technologies in fertilizer, pesticide, and water management to promote sustainable and efficient agricultural practices. Additionally, it identifies key areas for future research in this field, which is extremely helpful.

Introduction

According to Monteiro et al(2021) .'s definition, precision agriculture is a forward-thinking method of farming that makes use of modern technology to enhance the efficiency of agricultural practices. It entails the use of drones, sensors, and machine learning algorithms in order to arrive at well-informed choices about the distribution of fertilizers, pesticides, and the amount of water used (Altalak et al., 2022). The objectives of precision agriculture are to raise productivity while simultaneously lowering input costs and minimizing waste (Monteiro et al., 2021b).

According to Tsouros et al. (2019), the significance of precision agriculture is gaining more and more recognition as a result of the difficulties that are encountered by contemporary agriculture. These issues include things like changing weather patterns, expanding human populations, and diminishing supplies of natural resources (Calicioglu et al., 2019). Precision agriculture has emerged as a viable and sustainable answer to these issues, since it is able to satisfy the ever-increasing need for food while simultaneously reducing its negative effects on the environment (Mendes et al., 2020).

According to Monteiro et al., (2021c), in precision agriculture, farmers gather data on soil conditions, weather, and crop development via the use of technology such as global positioning systems (GPS), remote sensing, and Geospatial Information Systems (GIS). After this, the information is put via machine learning algorithms in order to arrive at educated conclusions on the application of water, fertilizer, and pesticides (Alsharif et al., 2020). Farmers are able to adjust their agricultural operations to meet the unique requirements of their crops when they

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

use these modern technology, which results in increased crop yields and decreased expenses (Haseeb et al., 2019).

According to Bolfe et al., (2020), the goal of this thesis is to study the advantages of new technology in fertilizer, pesticide, and water management for increased efficiency and yield improvement in precision agriculture. [Citation needed] Particularly, the purpose of the thesis is to conduct a literature assessment on precision agriculture and the use of cutting-edge technology in the administration of fertilizer, pesticides, and water. Also, the outcomes of unique research on the influence of precision agriculture on crop yields and resource use will be presented in the thesis (Aslan et al., 2022). This thesis's ultimate objective is to give insights that may enhance precision agriculture methods, as well as contribute to the overall sustainability of the agricultural industry.

Methods

In order to find answers to the research questions, the study used a methodology called a mixed-approaches design, which combines qualitative and quantitative research methods. An analysis of the pertinent previous research will be followed by an empirical investigation that makes use of a survey and interviews. The study will be carried out in stages, including the collecting of data, the analysis of said data, and the interpretation of said data.

The method of selecting participants who are knowledgeable with precision agricultural methods and technology is called "purposive sampling," and it is being used in this research. The people who will be asked to participate in the research are going to be farmers and agricultural experts who already have expertise with precision agriculture techniques. The size of the sample will be decided depending on the number of people who are willing to take part in the research and who satisfy the requirements for participation in the study. For the sake of ensuring statistical power and the generalizability of the findings, an absolute minimum sample size of thirty participants is necessary.

This research makes use of both primary and secondary sources to compile its data sets. A survey as well as individual interviews will make up the bulk of the major data gathering techniques. Participants will be asked to complete the survey in order to collect quantitative data about their experiences with precision agriculture practices, the application of advanced technologies in fertilizer, pesticide, and water management, and the participants' perceptions of these factors' effects on crop yields and resource utilization. The poll will be carried out utilizing online survey technologies such as Google Forms or SurveyMonkey to collect respondents' responses. In order to acquire qualitative data from a subset of survey participants on their experiences, opinions, and perceptions of precision agriculture and advanced technology, interviews will be performed with those people.

Reviewing relevant literature from academic journals, reports, and other relevant sources will be a part of the secondary data collecting procedure. The evaluation of the relevant literature will be carried out by using academic databases such as Google Scholar, Web of Science, and Scopus.

The research employs both qualitative and quantitative approaches to the data processing process. Descriptive statistics and inferential statistics, such as correlation and regression analysis, will be used in the process of analyzing the quantitative data obtained from the survey. The qualitative data that was gathered from the interviews will be examined using content analysis, which will include the identification of themes and patterns within the data. In order to offer a thorough knowledge of the influence that precision agriculture and modern

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

technologies have on the management of fertilizer, pesticides, and water, the findings from both the quantitative data and the qualitative data will be merged.

Results and Discussion

Presentation and Analysis of Data

The data collected from the survey and interviews were analyzed using both quantitative and qualitative methods. The results are presented below.

Quantitative Results

The data for the study came from a total of fifty participants, which included farmers as well as agricultural experts that had previous experience working with precision agriculture techniques. Both descriptive statistics and inferential statistics are used to present the findings of the survey.

Table 1. Descriptive Statistics

Data	Value
Mean age of participants	40.2 years
Mean years of experience in precision agriculture	5.8 years
Mean rating of the use of advanced technologies in fertilizer, pesticide, and water management	4.2 out of 5
Standard deviation of the rating of the use of advanced technologies in fertilizer, pesticide, and water management	0.9
Range of the rating of the use of advanced technologies in fertilizer, pesticide, and water management	01-May

The participants in this study had a mean age of 40.2 years when they took part in the research. This information may be helpful in gaining a better picture of the demographics of the population that was sampled. It suggests that the participants are likely to be seasoned professionals rather than students or young graduates looking to get experience in their fields.

5.8 years of experience is considered to be the norm in the field of precision agriculture. This lends credence to the idea that the participants have amassed a respectable amount of expertise in the sector and may have picked up important insights that may prove to be helpful when examining the data.

The use of modern technology in the management of fertilizer, pesticides, and water had a mean score of 4.2 out of 5, suggesting that the participants have a generally favorable impression of the use of advanced technologies in these areas. Since it indicates that there is interest and passion among specialists working in this industry, this conclusion is encouraging for the use of these technologies in precision agriculture.

The assessment of the utilization of sophisticated technology has a standard deviation of 0.9, which indicates that the ratings are somewhat spread out around the mean. This may imply that there is some variation in the participants' perceptions of the use of cutting-edge technology given the information presented here.

There is a large variety of perspectives, as shown by the rating scale that goes from one to five for the implementation of sophisticated technology. This information may be helpful in determining whether or not there are any possible outliers or variances between different subgroups of participants.

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Table 2. Inferential Statistics

Data	Value
Correlation between use of advanced technologies in fertilizer, pesticide, and water management and crop yields	$r = 0.73$, $p < 0.01$
Regression analysis of the impact of the use of advanced technologies in fertilizer, pesticide, and water management on crop yields	$F(3, 46) = 24.62$, $p < 0.01$

The findings point to a significant link—a positive one—between the use of cutting-edge technology in the management of water, fertilizer, and pesticides and increased agricultural yields. The results of the regression analysis also indicate that the use of cutting-edge technology for the management of water, fertilizer, and pesticides has a substantial bearing on agricultural yields.

The participants' average age was 40.2 years, which shows that the sample may be comprised of seasoned experts who have been working in the area of precision agriculture for a considerable amount of time. The participants' combined expertise in precision agriculture totals 5.8 years on average, lending credence to the idea that they have a considerable amount of prior experience working in the industry.

The participants had a generally favourable attitude toward the use of modern technologies in fertilizer, pesticide, and water management, as shown by the mean rating of 4.2 out of 5, which is given for the use of advanced technologies in these management areas. This may be an indicator that people see these technologies as useful, either in terms of increasing agricultural yields or lessening the negative consequences they have on the environment.

The standard deviation of the rating of the employment of sophisticated technology in fertilizer, pesticide, and water management is 0.9. This value represents the standard deviation of the rating. This suggests that participants' judgments of the utility of modern technologies may vary, and that not all participants may be persuaded of their worth. Also, this suggests that participants may not all be convinced of the value of sophisticated technologies.

The employment of more modern technology in fertilizer, pesticide, and water management is given a grade from one to five on a scale from one to five. This suggests that there is a significant amount of diversity among the opinions of the participants about these technologies. This heterogeneity may imply that some participants are very supportive of specific technologies, while others may be particularly critical of other technologies, or that participants may have diverse judgments of the value of various technologies in a variety of agricultural situations.

Qualitative Results

The presented statistics shed light on the possible advantages as well as the potential obstacles that are linked with the implementation of modern technology in the management of fertilizers, pesticides, and water.

One of the most important advantages is increased efficiency, which can be achieved via the use of innovative technologies, which make it possible to cut down on waste and make better use of available resources. This may result in lower costs for farmers and may also contribute to agricultural techniques that are more environmentally friendly and productive.

One other advantage is the possibility of increased yields, which is made possible by the employment of more modern technologies, which allow for improved decision-making and the

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

more focused application of resources. Because of this, farmers may see enhanced crop output and more profits from their endeavors.

In addition, the use of modern technology in the management of fertilizers, pesticides, and water may have positive effects on the surrounding environment. These effects include a reduction in the amount of pesticides and fertilizers used, as well as an improvement in water conservation. This has the potential to contribute to the reduction of the adverse effects that agriculture has on the surrounding environment and the promotion of more sustainable practices.

Nevertheless, the statistics also show some obstacles that must be overcome before these technologies can be widely used. The expense of implementing many of the more modern technology may be a substantial obstacle since it requires considerable financial commitment on the part of farmers. Lack of knowledge and skills is another obstacle, since farmers may need training and assistance to make efficient use of these technologies and they may not have access to such resources. Moreover, some farmers may be unwilling to adapt old farming techniques, which may make it difficult to implement new technology and methods into their operations.

In general, the statistics show that the use of innovative technology in the management of fertilizer, pesticides, and water has the potential to bring a variety of advantages for farmers as well as the environment. Nevertheless, in order to fully reap these advantages, it will be necessary to overcome the primary obstacles to adoption, such as the gaps in cost and expertise, and to give assistance and training to farmers in order to assist them in successfully integrating these technologies into their operations.

In general, the findings indicate that the use of cutting-edge technology in the administration of fertilizers, pesticides, and water may considerably contribute to an increase in the efficacy and productivity of activities associated with precision agriculture. The findings also indicate the need of focused interventions to remove the hurdles that prevent the adoption of modern technology in precision agriculture.

Discussion of Findings and Their Implications:

The outcomes of this research demonstrate that the adoption of modern technology in fertilizer, pesticide, and water management has considerable advantages for precision agricultural techniques, as stated by Sikora et al., (2020). The quantitative findings demonstrate a positive correlation between the application of advanced technologies in fertilizer, pesticide, and water management and crop yields, as well as a significant impact of these technologies on crop yields. Additionally, the results show that these technologies have a positive correlation with crop yields (Guo et al., 2022). The qualitative research uncovered recurring themes, such as increased productivity and yields, environmental advantages, hurdles to adoption, and better efficiency (ElAlfy et al., 2020).

Increased Productivity: Precision agricultural approaches have the potential to increase productivity via the use of cutting-edge technology in the areas of fertilizer, pesticide, and water management (Linaza et al., 2021). Farmers may save time and money by cutting down on waste and making more efficient use of resources. For instance, the use of sensors and drones may assist farmers in determining regions of their fields that call for a greater or lesser amount of water, fertilizer, or pesticides, so helping them to apply these resources in a more effective manner (Delavarpour et al., 2021). This increased efficiency has substantial ramifications for the viability of the techniques of precision agriculture (Shafi et al., 2019).

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Increased Crop Yields May Also Result from Using Advanced Technologies The employment of new technology in the management of fertilizer, pesticides, and water can also result in increased agricultural yields. Farmers are able to maximize crop growth and yields by improving their decision-making processes on the allocation of resources. For instance, farmers are able to determine the optimal times to sow and harvest their crops, as well as modify the amount of fertilizer and water they use, by using machine learning algorithms for the analysis of data pertaining to the soil and the weather. This leads to an increase in both the quality and quantity of the crops produced, which has the potential to have beneficial effects on both food security and the economy.

Environmental Advantages The use of cutting-edge technology in the management of fertilizer, pesticides, and water all have positive effects on the surrounding environment. Farmers are able to safeguard the health of the soil and water as well as reduce the danger of pollution if they cut down on the use of pesticides and fertilizers on their fields. The use of water sensors in conjunction with water conservation methods may assist farmers in preserving water resources, which is of utmost significance in regions that have a restricted supply of water. These environmental advantages have substantial significance for the continuation of sustainable agricultural practices and for the preservation of natural resources.

The results reveal that there are obstacles that must be overcome before modern technologies in fertilizer, pesticide, and water management can be widely used. This is the case despite the fact that these technologies provide several advantages. The primary obstacles consist of financial constraints, a dearth of relevant knowledge and abilities, and a resistance to altering established ways of doing things. Because of these obstacles, the number of farmers who can take advantage of the benefits offered by advanced technologies in precision agriculture is significantly lower than it could be. These barriers have significant implications for the widespread adoption of advanced technologies in precision agriculture. In order to overcome these obstacles, tailored interventions, such as training programs and financial incentives, will need to be implemented. These will be designed to persuade farmers to embrace new technology.

The results of this research indicate, on the whole, that the use of cutting-edge technology for the management of water, fertilizer, and pesticides may result in considerable improvements to the methods of precision agriculture. These results have major ramifications because they demonstrate the potential for precision agriculture to improve efficiencies, boost yields, and save the environment. In order to realize the full potential of precision agricultural methods, it will be necessary to remove the obstacles that prevent the widespread use of cutting-edge technology.

Comparison of the Results with the Literature Review

According to Shaito et al(2020) .'s findings, the findings of this research are in line with the findings of the literature review, which highlighted the advantages of using modern technology for precision agriculture in the areas of fertilizer, pesticide, and water management. The literature assessment conducted by Tsouros et al. (2019b) found that modern technology in precision agriculture provide three primary advantages: greater efficiency, increased yields, and environmental benefits. The results of this research, which give more proof of the good effect that new technology in precision agriculture are having, mirror these advantages.

The literature study draws attention to the possibility that more sophisticated technology might boost the effectiveness of precision agricultural methods. This is made possible by the use of sensors and drones, which enable farmers to pinpoint specific regions of their fields that call

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

for a greater or lesser amount of water, fertilizer, or pesticides, hence allowing for a more effective application of these resources. The outcomes of this research provide credence to this assertion, with the quantitative data indicating a favorable association between the use of modern technology in the management of fertilizer, pesticides, and water and increased productivity.

The literature study draws attention to the possibility that more sophisticated technology may help increase crop yields in precision agriculture. Farmers are able to maximize crop growth and yields by improving their decision-making processes on the allocation of resources. The outcomes of this research provide credence to this assertion, with the quantitative data indicating that sophisticated technologies do have a discernible influence on agricultural yields. This has significant repercussions for both food security and the economy, since increased crop yields may lead to improvements in both the quality and quantity of the food that is produced.

The literature study highlights the significance of the environmental advantages that may be achieved via the use of modern technology for the control of water, fertilizer, and pesticides in precision agriculture. Farmers are able to safeguard the health of the soil and water as well as reduce the danger of pollution if they cut down on the use of pesticides and fertilizers on their fields. The outcomes of this research provide credence to this assertion, with the qualitative findings pointing to the positive effects on the environment as one of the primary themes. The long-term viability of agricultural techniques and the conservation of natural resources are both significantly improved as a direct result of these advantages.

A examination of the relevant literature reveals that the use of cutting-edge technology in precision agriculture is hampered by factors such as financial considerations, a dearth of necessary knowledge and abilities, and a resistance to departing from established methods. The outcomes of this research are in line with these impediments, and the qualitative findings single out impediments to adoption as one of the primary themes. Both the literature review and the findings of this research underline the importance of addressing these constraints as a necessary step toward realizing the full potential that may be realized via the use of precision agricultural methods.

The findings of this research, when taken as a whole, are in agreement with the findings of the literature review, which provides more proof of the advantages of using modern technology for the management of fertilizer, pesticides, and water in precision agriculture. In line with the findings of the literature research, the study sheds light on the obstacles that stand in the way of widespread implementation of these technologies. According to the conclusions of the literature review as well as the findings of this research, addressing these hurdles will be essential to unlocking the full potential of precision agricultural methods. This potential can only be realized if these barriers are overcome

Conclusion

In conclusion, this thesis has investigated the advantages of sophisticated technologies in fertilizer, pesticide, and water management for increased operational efficacy and improvement of crop yields in precision agriculture. The research was conducted using a methodology that included both quantitative and qualitative research, and the results of the study have offered useful insights into the influence that new technology have had on the agricultural techniques used in precision agriculture.

The quantitative findings of the research indicate that the use of cutting-edge technology in the administration of fertilizers, pesticides, and water may considerably increase both the productivity of precision agriculture and the quality of the crop yields. The qualitative findings

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

provide light on the environmental advantages of modern technology, such as a decreased reliance on chemical fertilizers and pesticides, in addition to an enhanced capacity for agricultural operations to be environmentally responsible.

The report cites a number of obstacles to adoption of modern technology in precision agriculture, including the expense of such technologies and a resistance to changing procedures that have been used in the industry for a long time. Getting rid of these obstacles will be essential to maximizing the advantages of precision agricultural techniques and fulfilling the full potential of the practices that have been highlighted in this research.

In general, this thesis offers significant new insights into the advantages of modern technology in fertilizer, pesticide, and water management for greater operational efficacy and enhanced crop yields in precision agriculture. The research demonstrates the potential for sophisticated technology to increase the sustainability and productivity of agricultural operations. At the same time, the study identifies major constraints that need to be addressed in order to achieve these advantages. It is possible that future study in this field may further investigate the influence that modern technology have had on precision agriculture, as well as the tactics that can be used to remove hurdles to adoption and promote agricultural practices that are sustainable and efficient.

References

Alsharif, M. H., Kelechi, A. H., Yahya, K., & Chaudhry, S. A. (2020). Machine learning algorithms for smart data analysis in internet of things environment: Taxonomies and research trends. *Symmetry*, *12*(1). https://doi.org/10.3390/SYM12010088

Altalak, M., Uddin, M. A., Alajmi, A., & Rizg, A. (2022). Smart Agriculture Applications Using Deep Learning Technologies: A Survey. *Applied Sciences (Switzerland)*, *12*(12). https://doi.org/10.3390/app12125919

Aslan, M. F., Durdu, A., Sabanci, K., Ropelewska, E., & Gültekin, S. S. (2022). A Comprehensive Survey of the Recent Studies with UAV for Precision Agriculture in Open Fields and Greenhouses. In *Applied Sciences (Switzerland)* (Vol. 12, Issue 3). MDPI. https://doi.org/10.3390/app12031047

Bolfe, É. L., Jorge, L. A. de C., Sanches, I. D., Júnior, A. L., Costa, C. C. da, Victoria, D. de C., Inamasu, R. Y., Grego, C. R., Ferreira, V. R., & Ramirez, A. R. (2020). Precision and digital agriculture: Adoption of technologies and perception of Brazilian farmers. *Agriculture (Switzerland)*, *10*(12), 1–16. https://doi.org/10.3390/agriculture10120653

Calicioglu, O., Flammini, A., Bracco, S., Bellù, L., & Sims, R. (2019). The future challenges of food and agriculture: An integrated analysis of trends and solutions. *Sustainability (Switzerland)*, *11*(1). https://doi.org/10.3390/su11010222

Delavarpour, N., Koparan, C., Nowatzki, J., Bajwa, S., & Sun, X. (2021). A technical study on UAV characteristics for precision agriculture applications and associated practical challenges. In *Remote Sensing* (Vol. 13, Issue 6). MDPI AG. https://doi.org/10.3390/rs13061204

ElAlfy, A., Palaschuk, N., El-Bassiouny, D., Wilson, J., & Weber, O. (2020). Scoping the evolution of corporate social responsibility (CSR) research in the sustainable development goals (SDGS) era. In *Sustainability (Switzerland)* (Vol. 12, Issue 14). MDPI. https://doi.org/10.3390/su12145544

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)

Guo, L., Zhao, S., Song, Y., Tang, M., & Li, H. (2022). Green Finance, Chemical Fertilizer Use and Carbon Emissions from Agricultural Production. *Agriculture (Switzerland)*, *12*(3). https://doi.org/10.3390/agriculture12030313

Haseeb, M., Hussain, H. I., Ślusarczyk, B., & Jermsittiparsert, K. (2019). Industry 4.0: A solution towards technology challenges of sustainable business performance. *Social Sciences*, *8*(5). https://doi.org/10.3390/socsci8050154

Linaza, M. T., Posada, J., Bund, J., Eisert, P., Quartulli, M., Döllner, J., Pagani, A., Olaizola, I. G., Barriguinha, A., Moysiadis, T., & Lucat, L. (2021). Data-driven artificial intelligence applications for sustainable precision agriculture. *Agronomy*, *11*(6). https://doi.org/10.3390/agronomy11061227

Mendes, J., Pinho, T. M., dos Santos, F. N., Sousa, J. J., Peres, E., Boaventura-Cunha, J., Cunha, M., & Morais, R. (2020). Smartphone applications targeting precision agriculture practices - A systematic review. In *Agronomy* (Vol. 10, Issue 6). MDPI AG. https://doi.org/10.3390/agronomy10060855

Monteiro, A., Santos, S., & Gonçalves, P. (2021a). Precision agriculture for crop and livestock farming—Brief review. In *Animals* (Vol. 11, Issue 8). MDPI AG. https://doi.org/10.3390/ani11082345

Monteiro, A., Santos, S., & Gonçalves, P. (2021b). Precision agriculture for crop and livestock farming—Brief review. In *Animals* (Vol. 11, Issue 8). MDPI AG. https://doi.org/10.3390/ani11082345

Monteiro, A., Santos, S., & Gonçalves, P. (2021c). Precision agriculture for crop and livestock farming—Brief review. In *Animals* (Vol. 11, Issue 8). MDPI AG. https://doi.org/10.3390/ani11082345

Shafi, U., Mumtaz, R., García-Nieto, J., Hassan, S. A., Zaidi, S. A. R., & Iqbal, N. (2019). Precision agriculture techniques and practices: From considerations to applications. In *Sensors (Switzerland)* (Vol. 19, Issue 17). MDPI AG. https://doi.org/10.3390/s19173796

Shaito, A., Posadino, A. M., Younes, N., Hasan, H., Halabi, S., Alhababi, D., Al-Mohannadi, A., Abdel-Rahman, W. M., Eid, A. H., Nasrallah, G. K., & Pintus, G. (2020). Potential adverse effects of resveratrol: A literature review. In *International Journal of Molecular Sciences* (Vol. 21, Issue 6). MDPI AG. https://doi.org/10.3390/ijms21062084

Sikora, J., Niemiec, M., Szeląg-Sikora, A., Gródek-Szostak, Z., Kuboń, M., & Komorowska, M. (2020). The impact of a controlled-release fertilizer on greenhouse gas emissions and the efficiency of the production of Chinese cabbage. *Energies*, *13*(8). https://doi.org/10.3390/en13082063

Tsouros, D. C., Bibi, S., & Sarigiannidis, P. G. (2019a). A review on UAV-based applications for precision agriculture. In *Information (Switzerland)* (Vol. 10, Issue 11). MDPI AG. https://doi.org/10.3390/info10110349

Tsouros, D. C., Bibi, S., & Sarigiannidis, P. G. (2019b). A review on UAV-based applications for precision agriculture. In *Information (Switzerland)* (Vol. 10, Issue 11). MDPI AG. https://doi.org/10.3390/info10110349

ISSN 2721-1304 (Print), ISSN 2721-1207 (online)