Perceived Determinants for Adoption of Robotic Technology for Increased Tomato Production in Akwa Ibom State

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Abstract
The main purpose of the study was to examine the perceived determinants for adoption of robotic technology for increased tomato production in Akwa Ibom State. The study adopted the descriptive survey design. The population of 1,160 registered tomato farmers and the sample of 327 respondents selected using stratified random sampling technique was used for the study. Questionnaire titled: ''Perceived Determinant for Adoption of Robotic Technology for Increased Tomato Production Questionnaire (PDARTITPQ) was used for data collection. The instrument had a reliability coefficient of 0.86. Mean statistics was used to answer the research questions while Analysis of Variance (ANOVA) was used to test the null hypotheses at .05 level of significance. Findings showed that to a moderate extent tomato farmer perceived that availability of extension services and cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State respectively. Findings further revealed that the perception of tomato farmers in Akwa Ibom North-East, North-West and South do not differ significantly on the extent of availability of extension services and cost implication on the adoption of robotic technology for increased tomato production in Akwa Ibom State. It was concluded that improved extension services as well as reduced cost implication of robotics technology would in no small measure foster the adoption of the technology for increased tomato production. The study recommends that Ministry of Agriculture should equip agricultural extension agents with the necessary knowledge and skills through professional development to effectively support tomato farmers in the adoption of robotic technology.

Key Words: Adoption, cost, extension, robotics, technology, tomato**.**

Introduction

Tomato (*Lycopersicon esculentum)* is an important dietary component. Tomato is cultivated both in tropical and temperate climates. In the tropical climate, tomato is cultivated in the open field while in the temperate climate, it is cultivated under greenhouse. In warm climate with the right light intensity for growth, about 45 days are necessary from germination to the flowering period of a plant, from the opening of the flower bud and 90 - 100 days to reach the beginning of fruit ripeness (Nuez, 2015). In temperate climate, the growing time depends on the variety. The typical time to harvest tomatoes is between 60 – 100 days after transplanting seedlings and 100 – 120 days after planting the seeds. Lamptey and Koomson (2021) asserted that tomato is the most important vegetable compared to all the other vegetables. Tomato among vegetables, is known as a good source of vitamin A and C, reduces prostate and lung cancer and lowers cholesterol in the blood. Tomato (*Lycopersicon*

esculentum) fruits can be eaten raw and when cooked or processed can be used for any of these products; soup, stew, juice, Jam, Jelly, ketchup, sauces, puree, paste and other products. In terms of human health, tomato is a major component in the daily diet and constitutes an important source of minerals, vitamins, and antioxidants, like lycopene. Conventionally, tomato is cultivated manually using crude implements.

In precision agriculture, automation and robotics have become one of the main structures which focuses on minimizing environmental impact and simultaneously maximizing agricultural produce. The term "automated agriculture" is used to relate any parts of the equipment or machine that is designed to remove the manual intervention in agriculture. The effort of agricultural automation is mainly focusing on autonomous vehicle applications such as robot or tractor where it is being used to minimize the tough, deadly, risky and long working conditions experienced by farmers and at the same time offers a precise and efficient operation and control system.

Robotics encompasses the design, construction, operation, and application of robots, which are automated machines capable of performing tasks with precision, speed, and efficiency. The rapid advancements in fields such as computer science, electronics, and materials science have driven the development of increasingly sophisticated robotic systems, transforming various industries and revolutionizing the way we live and work (Vukobratović, 2019). Robotics in farming is changing the way tomato is grown. These robots and techniques are improving farming by solving big problems and helping farms run more smoothly, produce more, and harm the environment less. Robots in farming have many different uses, all of which aim to make farming more efficient, productive, and eco-friendly (Rai *et al.*, 2023).

Figure 1: Weeding robot
Gadha Sreekumar (2023)

Figure 2, Tomato harvesting using robot
Gadha Sreekumar (2023)

Sundararajan *et al.* (2023) posits that the integration of green nanotechnology into agriculture, utilizing biosensors and green-synthesized nanomaterials, further supports the eco-friendly aspect of robotic farming by reducing excessive pesticide use and enhancing crop productivity. The integration of robotics into agriculture is compelled by the need to address various challenges such as labor shortages, the environmental impact of traditional farming methods, and increasing food demand. These robots have tools such as sensors, cameras, and GPS to move around, spot plants, and perform tasks such as seeding, getting rid of weeds, and spraying very accurately. The role of robotics in agriculture in Akwa Ibom State is further complicated by the availability of extension services and cost implication of farming practices to meet the challenges of modern agriculture. The success of promoting the growing and increased tomato production, like any other agricultural products by the adoption of improved technology among farming communities to a large extent depend on the performance of the extension workers within the community. Adoption of Agricultural technology is an exceptionally important determinant of farming's contribution to socio-economic development of any economy. Technology adoption according to Phillip *et al*. (2022) is the process by which people or organizations accept and use new technologies.

Figure 3: Innovation adoption model
Phillip *et al*. (2023)

Technology adoption among farmers is higher when extension services are made available to create awareness. Extension workers can provide valuable information, training, and technical support to farmers, enabling them to understand the practical applications of robotic systems and build the necessary skills for their effective utilization. For instance, a study by Manda *et al*. (2019) in Zambia investigated the socio-economic and institutional factors affecting the adoption of agricultural technologies, including robotic systems, among smallholder farmers using survey research design with the population of 206 farmers sample size of 108 farmers selected using and purposive sampling technique. Mean and standard deviation was used to answer the research questions while ANOVA was used to analyze the data collected. The results suggested that the availability and responsiveness of extension services were crucial in determining the farmers' ability to access information, receive training, and obtain technical support, all of which influenced their decision to adopt these innovative technologies. The availability and quality of extension services play a significant role in facilitating the adoption of robotic technology among tomato farmers. The accessibility and responsiveness of extension services can influence the willingness of farmers to adopt these innovative technologies. Computer vision not only accelerates disease detection but also introduces an unprecedented level of accuracy in identifying subtle anomalies at early growth stages. These advancements culminate in a system that not only addresses the operational challenges of micropropagation but also contributes to the creation of robust, disease-resistant plant and population

While the technological allure of automation is evident, a comprehensive understanding of its economic implications is essential for informed decision-making by agricultural enterprises. The adoption of automated systems entails significant initial investments in infrastructure, technology acquisition, and workforce training. Simultaneously, it promises to yield operational efficiencies, labor cost reductions, and improvements in overall productivity over the long term. The economic imperative, therefore, hinges on a meticulous examination of the costs incurred in adopting automated systems and the tangible benefits accrued in return.

Cost implication is another crucial factor for farmers consider before embarking on production. Cost implication involves evaluating both the initial investment costs and the ongoing operational costs associated with implementing and using the technology. The technological allure of automation of farming operations such as robotic is evident. However, a comprehensive understanding of its economic implications is essential for informed decision making by tomato farmers. According to Gazieva (2024), the adoption of robotic systems entails significant initial investments in infrastructure, technology acquisition and workforce training. Simultaneously, it promises to yield operational efficiencies, labor cost reductions and improvements in overall productivity over the long term. The economic imperative therefore hinges on a meticulous examination of the costs incurred in adopting robotic systems and the tangible benefits accrued in return (Gazieva, 2024).

Salimi *et al.* (2020) investigated the key factors of Davis's model in automation acceptance in agriculture. The research adopted a survey approach through a questionnaire. Questionnaire data were collected from 378 people and respondents include university students, farmers and experts in a randomized sampling from the Ministry of Agriculture. By means of modelling, it was found that there was an inverse relationship between social and individual factors with perceived usefulness, as well as an inverse relationship between social factors with perceived ease-of-use, while there was a positive and significant relationship between other factors. Tomato farmers may likely adopt robotic technology if perceived to be cost effective. Therefore, there is an ever-increasing expectation on the agricultural industry to make production not only cost-efficient, but also socially and ecologically sustainable.

By exploring these perceived determinants extension services and cost implication - the study aims to provide a comprehensive understanding of the multifaceted factors that influence the adoption of robotic technology for increased tomato production in Akwa Ibom State, Nigeria. It is pertinent to ascertain the determinants of adoption of robotic technology in tomato production with aim of improving the integration of robotic technology into tomato production in Akwa Ibom State.

Statement of the Problem

Tomato production is one of the veritable areas in food crop production that deals with growing of tomato for the purpose of consumption, agro-industrial use and other economic usage. It is a vital sector in Akwa Ibom State, contributing significantly to the economy and livelihoods of the people. Some technological inventions such as Internet of things, global positioning system, artificial intelligence, linked sensor and cloud computing, robotics technologies are tailor-made for crop production operations like soil detection, plant monitoring, weed detection and removal, pest management, yield monitoring and harvesting. It is obvious that despite availability of these technologies, most tomato farmers are conservatively using traditional farming system of slash and burn clearance system, use of manual labour and simple tools which makes prevalence of drudgery persistence in tomato production. More so, farmers in Akwa Ibom State often experience low crop yields, leading to food insecurity and limited income generation. There seems to be lack of awareness, access, and understanding of robotic technologies. It is against this background that this research aimed to examine the determinants for adoption of robotic technology for increased tomato production in Akwa Ibom State

Purpose of the Study

The main purpose of the study was to examine the perceived determinants for farmers' adoption of robotic technology for increased tomato production in Akwa Ibom State. Specifically, the study sought to:

i. Examine the perceived extent to which availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

ii. Examine the perceived extent to which cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State

Research Questions

The following research questions guided this study

i. What is the perceived extent to which availability of extension services determine the adoption of robotic technology for increased tomato production in Akwa Ibom State?
ii. What is the perceived extent to which cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State?

Null Hypotheses

The following null hypotheses were tested at .05 level of significance.

i. The perception of tomato farmers in the Akwa Ibom North-East, North-West, and South do not differ significantly on the extent of availability of extension service determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.
ii. The perception of tomato farmers in the Akwa Ibom North-East, North-West, and South do not differ significantly on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

Methodology

The study adopted the descriptive survey design. A descriptive survey design as explained by Nwankwo (2016) is that in which the researcher collects data from a large sample drawn from a population and describes certain characteristics of the sample as they are at time of the study. The design is deemed suitable for the study on the basis that it allow for collection of quantitative data without attempt to manipulate variables or establish causal relationships, making them ideal for situations where the goal is to describe, rather than explain or predict phenomena.

The study was conducted in Akwa Ibom State. Akwa Ibom State is one of the Nigerian oil rich states located in the South- South coastal region of Nigeria. It lies between latitude 4^{o} 33^{l} and 5^{o} 33^{l} North and longitude 7^{o} 35^{l} and 8^{o} 25^{l} East. The state has three major ethnic groups namely; Ibibio, Annang and Oron. Akwa Ibom State is divided into three senatorial districts; Akwa Ibom North-East, Akwa Ibom North-West and Akwa Ibom South Senatorial Districts.

The population for this study comprised 1,160 registered tomato farmers in Akwa Ibom State (Akwa Ibom State Agricultural Development Project (AKADEP), 2023). It comprised 362 registered tomato farmers from Akwa Ibom North-East Senatorial District, 448 registered tomato farmers from Akwa Ibom North West and 350 registered tomato farmers from Akwa Ibom South.

The total sample size of 327 respondents was selected for the study. The sample size was determined using Taro Yamane Formula as follows:

Formula for calculating Sample size

$$(n)= \frac{N}{1+N\,(e)^2}$$

n = sample size
e = level of significance
N = Population size

$$n = \frac{1,160}{1+ 1,160\ (0.05)^2}$$

$$n = \frac{1,160}{3.9} = 297$$

$$n = 297$$

10% attrition rate = 30 + 297 = 327

Stratified random sampling technique was used to select respondents from the thirty one Local Government Areas in the study area for the study. It comprised 102 registered tomato farmers from Akwa Ibom North-East Senatorial District, 126 registered tomato farmers from Akwa Ibom North-West Senatorial District and 99 registered tomato farmers from Akwa Ibom South Senatorial District.

Data for the study were collected using a researcher-structured questionnaire titled: ‘‘Perceived Determinant for Adoption of Robotic Technology for Increased Tomato Production Questionnaire (PDARTITPQ)’. The instrument comprised of two sections A and B. Section A elicited information on respondents’ demographic characteristics while section B elicited information on the two sub-variables of perceived determinants for adoption of robotics technology for increased tomato production. The items in section B was structured under five points rating scale with response option of Very High Extent (VHE), High Extent (HE), Moderate Extent (ME), Low Extent (LE) and Very Low Extent (VLE). Respondents were required to tick option that suits their opinion.

The instrument was submitted to three experts for face validation from the Department of Agricultural Education, Faculty of Vocational Education, Library and Information Science, University of Uyo. The experts scrutinized the items on the instrument; some of the items were reworded and rephrased while others were replaced to ensure that it measures what it is designed to measure.

The validated instrument was administered to 20 respondents that were part of the population who were not part of the sample of the study using inter-item method of reliability. Data collected were analysed using Cronbach alpha statistics to establish the reliability of the instrument. The analysis yielded a reliability coefficient of 0.861 which indicated that the internal consistency of the instrument was high thus the instrument was deemed suitable for the study.

The researcher briefed the research assistants on how to carry-out the administration of the questionnaire. Sufficient time was given to respondents to enable them complete the instrument without undue pressure. Out of the 327copies of questionnaires administered 314 copies were properly completed and retrieved for collation, coding and data analysis. This gave

the retrieval rate of (96.02 %). Mean statistics was used to answer the research questions while Analysis of Variance (ANOVA) was used to test the null hypotheses at .05 level of significance respectively.

Results

Research Question 1: What is the perceived extent to which availability of extension services determine the adoption of robotic technology for increased tomato production in Akwa Ibom State?

Table 1:Summary of Mean showing perceived extent of availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State

S/N	Items	Categories	N	Mean	Decision
1	The frequency of extension visits to my farm is sufficient to effectively support the adoption of robotic technology	AK N-E	102	3.65	High Extent
		AK N-W	126	3.02	Moderate Extent
		AK S	86	3.74	High Extent
2	Guidance provided by extension agents would support the implementation of robotic technology for tomato production	AK N-E	102	3.71	High Extent
		AK N-W	126	3.82	High Extent
		AK S	86	3.63	High Extent
3	Access to extension demonstrations of robotics technology would motivate me to adopt robotics for increased tomato production	AK N-E	102	2.90	Moderate Extent
		AK N-W	126	2.93	Moderate Extent
		AK S	86	3.93	High Extent
4	Active collaboration of extension agents with research institutions would motivates me to adopt robotic technology for tomato farming	AK N-E	102	3.98	High Extent
		AK N-W	126	3.98	High Extent
		AK S	86	3.00	Moderate Extent
5	The responsiveness of extension services to the specific farmers' needs would support my acceptance of robotic technology	AK N-E	102	3.80	High Extent
		AK N-W	126	3.02	Moderate Extent
		AK S	86	3.03	Moderate Extent
	Cluster Mean	**AK N-E**	**102**	**14.94**	**Moderate Extent**
		AK N-W	**126**	**14.97**	**Moderate Extent**
		AK S	**86**	**15.03**	**Moderate Extent**

N = 314; AK N-E = Akwa Ibom North-East Senatorial District; AK N-W = Akwa Ibom North-West Senatorial District; AK S = Akwa Ibom South Senatorial District

Table 1 shows the perceived extent to which access to extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State. It indicates that the mean scores of respondents in Akwa Ibom North-East Senatorial District, Akwa Ibom North-West Senatorial District and Akwa Ibom South Senatorial District on all the items are within the limit of 2.50 -3.49 and 3.50 – 4.49, which are remarked moderate extent and high extent respectively. The cluster mean of Akwa Ibom North-East Senatorial District (14.94) which implies that to a high extent farmers Akwa Ibom North-East Senatorial District perceived that access to extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State while the cluster mean of

Akwa Ibom North-West Senatorial District (14.97) and Akwa Ibom South Senatorial District (15.02) implies that to a moderate extent farmers in the three senatorial districts perceived that access to extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

Research Question 2: What is the perceived extent to which cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State?

Table 2: Summary of Mean showing perceived extent to which cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State

S/N	Items	Categories	N	Mean	Decision
1	I would adopt robotics technology if I have clear understanding of the initial capital investment required to purchase the technology	AK N-E	102	3.00	Moderate Extent
		AK N-W	126	3.02	Moderate Extent
		AK S	86	3.03	Moderate Extent
2	My awareness of the potential long-term cost savings gains would foster the use of robotic technology in my tomato farm.	AK N-E	102	3.60	High Extent
		AK N-W	126	3.01	Moderate Extent
		AK S	86	3.99	High Extent
3	My access to government financial assistance would support my adoption of robotic technology for tomato production	AK N-E	102	3.50	High Extent
		AK N-W	126	3.87	High Extent
		AK S	86	3.85	High Extent
4	I believe that insight the labor and operational costs reduction potentials of robotics technology would enhance my adoption	AK N-E	102	3.70	High Extent
		AK N-W	126	3.81	High Extent
		AK S	86	2.89	Moderate Extent
5	Long-term financial benefits of adopting robotic technology will justify my adoption of the technology for tomato production	AK N-E	102	3.98	High Extent
		AK N-W	126	3.97	High Extent
		AK S	86	3.89	High Extent
	Cluster Mean	**AK N-E**	**102**	**12.09**	**Moderate Extent**
		AK N-W	**126**	**11.83**	**Moderate Extent**
		AK S	**86**	**12.10**	**Moderate Extent**

N = 314; AK N-E = Akwa Ibom North-East Senatorial District; AK N-W = Akwa Ibom North-West Senatorial District; AK S = Akwa Ibom South Senatorial District

Table 2 shows the perceived extent to which cost implication determine the adoption of robotic technology for increased tomato production in Akwa Ibom State. It indicates that the mean scores of respondents in Akwa Ibom North-East Senatorial District, Akwa Ibom North-West Senatorial District and Akwa Ibom South Senatorial District on all the items are within the limit of 2.50 -3.49 and 3.50 – 4.49, which are remarked moderate extent and high extent respectively. The cluster mean of Akwa Ibom North-East Senatorial District (12.09), Akwa Ibom North-West Senatorial District (11.83) and Akwa Ibom South Senatorial District (12.10) implies that to moderate extent farmers in the three senatorial districts perceived that cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

Null Hypothesis 1: The perception of tomato farmers in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

Table 3: Analysis of Variance showing the difference on the perception of tomato farmers on the extent of availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Group	.322	2	.161	.042	.961
Within Group	1197.465	311	3.850		
Total	1197.787	313			

Result in the Table 3 indicated that the calculated F-value .042 and the F-Sig .961 at 2 and 311 degrees of freedom and 0.05 level of significance. Since the F-Sig value .961 is greater than the p-value of .05 the null hypothesis which stated that the perception of tomato farmers in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State is retained. Hence, the perception of tomato farmers in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State. Since there is no significant difference, a post hoc analysis was not employed.

Null Hypothesis 2: The perception of tomato farmers in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

Table 4: Analysis of Variance showing the difference on the perception of tomato farmers on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Group	5.196	2	2.598	.739	.479
Within Group	1044.684	311	3.359		
Total	1049.880	313			

Result in the Table 4 indicated that the calculated F-value .739 and the F-Sig .479 at 2 and 311 degrees of freedom and 0.05 level of significance. Since the F-Sig value .479 is greater than the p-value of .05 the null hypothesis which stated that the perception of tomato farmers

in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.is retained. Hence, the perception of tomato farmers in the Akwa Ibom North-East, North-West and South do not differ significantly on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State. Since there is no significant difference, a post hoc analysis was not employed.

Discussion of Findings

Perceived Availability of Extension Service on the Adoption of Robotic Technology for Increased Tomato Production

Finding showed that tomato farmers perceived that to a high extent availability of extension services determines the adoption of robotic technology for increased tomato production in Akwa Ibom State. Result also indicated that there is no significant difference on the perception of tomato farmers in the Akwa Ibom North-East, North-West and South on the extent of availability of extension services determine the adoption of robotic technology for increased tomato production in Akwa Ibom State.

The finding points to the fact that the improved quality of extension services would trigger regular visit to tomato farmers for knowledge sharing, provide adequate guidance, display quality demonstration and collaborate with research institutions for innovative tomato farming. More so, the responsiveness of extension agents to tomato farmers' challenges, are likely to motive farmers for adoption of robotics technology. On the other hand the findings establish that epileptic extension service would discourage farmers from adopting robotic technology since farmers basically requires the services of extension agent in curbing any problem that would emerge while utilizing the technology.

The finding is in-line with the finding of Manda *et al*. (2019) who submitted that the availability and responsiveness of extension services were crucial in determining the farmers' ability to access information, receive training, and obtain technical support, all of which influenced their decision to adopt these innovative technologies.

Perceive Cost Implications on the Adoption of Robotic Technology for Increased Tomato Production

Findings of the study revealed that tomato farmers perceived that to a high extent cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State. It was also observed that there is no significant difference on the perception of tomato farmers in the Akwa Ibom North-East, North-West and South on the extent of cost implication determines the adoption of robotic technology for increased tomato production in Akwa Ibom State.

The finding may be triggered by the fact that clear understanding of the initial capital investment, operational cost, potential long-term cost, savings and efficiency gains would

guide tomato farmers in making decisions on the adoption of robotics technology. Meanwhile, access to government financial assistance would help tomato farmers subsidize the cost implications of adopting robotics technology. This implies that more cost effective the robotics technology is, the more tomato farmers tend to adopt the technology. Therefore, strategic approaches to reducing the cost of purchasing, installing, operating and maintenance of robotics technology is necessary in enhancing farmers' acceptance and adoption of the technology.

The finding is supported by the finding of Salimi *et al.* (2020) investigated the key factors of Davis's model in automation acceptance in agriculture and found that the better a person understands the usefulness of automation, the more likely this person is to adopt it thus, making the risk and issues related to it play an important role in farmers' decision making.

Conclusion

This study has provided valuable insights into the perceived determinants that determines the adoption of robotic technology for increased tomato production in Akwa Ibom State, Nigeria. The study established that farmers' level of technological awareness, availability of extension services, cost implications, cultural acceptance and government policy can either hinder or support the adoption of robotic technology for increased crop production especially tomato production. Therefore, improving technological awareness, extension services, cultural acceptance and agricultural policy as well as reducing the cost implication of robotics technology would in no small measure foster the adoption of the technology for increased tomato production.

Recommendations

Based on the findings of this study it is recommended that:

i. Ministry of Agriculture should equip agricultural extension agents with the necessary knowledge and skills through professional development and training programmes to effectively train and support tomato farmers in the adoption of robotic technology.
ii. Policymakers and Government Agencies should formulate policies that provide financial incentives, subsidies, and tax rebates to encourage tomato farmers to adopt robotic technology.

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