ROLE OF NANOTECHNOLOGY AND AUTOMATION WITH A HUMAN TOUCH TO REDUCE COSTS AN FINANCIAL APPLIED STUDY IN THE NATIONAL PROGRAM FOR THE DEVELOPMENT OF WHEAT CULTIVATION IN IRAQ

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ABSTRACT

The aim of the research is to identify contemporary technologies and their use in the agricultural sector as it is a vital and important sector, as nanotechnology and automation were used with a human touch to reduce direct costs represented in the cost of materials and direct wages, as relying on traditional methods in the cultivation and production of the wheat crop leads to higher costs and crop production Low quality. The researchers adopted the inductive and deductive approaches in the theoretical aspect. In the practical aspect, the researchers relied on analyzing the data obtained from the National Program for the Development of Wheat Cultivation in Iraq. The researchers concluded that the adoption of nanotechnology and automation with a human touch clearly contributed to reducing Material costs and direct wages, which is reflect in the result on the reduction of total costs.

Keywords: Nanotechnology, Automation with a Human Touch, Reduce Costs.

INTRODUCTION

Due to competition In today's world, both locally and globally, the traditional methods of production have become unable to keep pace with developments in the business environment, as high production costs have become specifically cost Direct materials and direct wages constitute an obstacle to the continuation and survival of economic units because of their use of traditional production methods that rely mostly on raw materials and labor to a large extent. And because today's world is constantly evolving, these methods have become useless, so we find that some economic units have started searching for contemporary technologies that can contribute significantly to reducing costs while maintaining product quality to achieve customer satisfaction. Assuming search by using contemporary techniques, the economic unit will be able to reduce direct material costs and direct wages. One of these techniques is nanotechnology, or the so-called "*micro technology*", as the technology has gained great interest in recent years due to its wide applications in several fields, including (medicine, engineering, environment, industry, agriculture...etc). These nanoparticles are sized (100-1) nanometers has distinctive properties that exceed those found in conventional materials in terms of strength, hardness and melting point. In addition to jidoka or the so-called Automation With A human Touch) refers to a strategy High automation reduces the amount of work people do in the production process as it represents the element human It has some supervisory functions instead of production functions, that is, it is a quality control process and a principle of waste-free manufacturing that allows machines or workers to discover an unnatural condition and stop work, which leads to the reduction of defective production and reduction of lost working time and thus leads to lower costs and reduce labor. If this research aims to find NS Reducing direct costs by adopting and

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implementing contemporary production methods such as Nano andjidoka, as these two technologies offer great potential in reducing costs if they used in the right way, and as a result, the total costs are reduced.

VIEW THE LITERATURE

The literature related to research variables was reviewed, as a specific number of research articles were included due to their importance and contribution to the study of research variables earlier. In the following table 1, we review some of these studies.

Table 1
PRESENTATION OF THE LITERATURE RELATED TO THE RESEARCH VARIABLES

No	Researcher's name and year	Study Title	Results
	Muhammad & Al-Ma'ini: 2013	Using agile accounting tools to reduce costs	Calculating production costs, achieving significant savings in costs and the production cycle, reducing waiting time, reducing the stock of raw materials and other financial and non-financial benefits that can be achieved using the lean accounting method.
	Shanawa: 2017	The role of nanomaterials in reclassifying modern industrial product costs	• Technical development has contributed to highlighting materials with advanced specifications The traditional concept of cost classification does not meet the ambition in light of the use of nanotechnology in the manufacturing process ● Nanomaterials are low cost materials
	Shawy: 2017	The role of clean production standards management in reducing economic, environmental and health risks according to the philosophy of (jidoka Japanese	It is beneficial for all technicians of the company in question to acquiesce in the idea and ethics of clean manufacturing and not resist change towards its standards and increase the level of preventive awareness (Jidoca).

Source: Prepared by the student based on the above sources

NANOTECHNOLOGY

Origin and Concept of Nanotechnology

Nanotechnology is not new, it has existed since the existence of creation, as nanoparticles are found in the human body, animal and plant, and despite the presence of nanomaterials, the historical birth of nanotechnology is indebted to the researcher and physicist Richard Feymman) when he gave a lecture on 12/29/1959 at the annual meeting of American physicists and pointed out in the lecture that there is more that we can do at smaller levels than the scale of lengths and sizes in materials (Al-Khazraji et al., 2013).

NSy general 1975 Eric Drexler formulated the concept of nanotechnology Interest in nanotechnology manifests itself with an invention scanning tunneling microscope scanning tunneling microscope (STM) from company IBM in 1981 as this microscope images nano-sized objects (Boysen, 2011).

Start The word *"nano"* must be defined, *"it is a Greek word derived from nanos, which means dwarf."* Today, the word nano is used as part of a billionth of a meter. In engineering and technology sciences, nanoscales range from (1 to 100 (nanometers) (Hayek, 2013). As for nanotechnology, joachim defined it as the design, characterization, production and application of structures, devices and systems by controlling shape and size at a nanometer scale (Joachim et al., 2009). It is *"a group of emerging technologies in which the*

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structure of the material is controlled at the nanometer scale to produce new materials that have useful and unique properties" (Ramsden, 2014). Nanometers at the nanoscale, as the materials represent a larger surface area to volume ratio than conventional materials (Preeti, 2016).

Synthesis of Nanomaterials

Nanomaterials are synthesized in two ways: from top to bottomNS and the way from the bottom up. The materials are prepared from top to bottom through mechanical-physical methods such as grinding traditional materials to produce nanomaterials (Abobatta, 2018). This method is called the method of shredding or fragmentation, as the materials of small sizes are converted to a smaller size and for the same material (Williams et al., 2007). This approach is more simple and its procedures include grinding, crushing and printing (Kelsall, et al., 2018). As for the method of preparation from the bottom up, this method depends on the condensation of atoms or molecular entities in the gaseous or liquid phase to obtain nano-sized materials., 2207: 30). As kelsall mentioned, the installation of materials in this way is according to the characteristics to be engineered, as the functions and properties can be completely engineered, and this process is highly controlled and is more complex than the method of preparation from top to bottom (Kelsall et al., 2018).

Properties of Nanomaterials

Nanomaterials have unique properties that distinguish them from materials in the form of mass determined palate (E- Boysen et al., 2011).

1. **Interact with other elements**: Nanomaterials can chemically react with other elements such as gold when it is converted to a nanoscale.
2. **Optical properties (color change)**: The color of gold changes depending on the size of its particles, as gold reflects light in nanoscale and the electronic cloud on the surface of gold nanoparticles resonates with different wavelengths of light depending on its frequency.
3. **Melting at low temperatures**: In mass form a substance like gold has a certain melting temperature regardless of whether you are melting a small ring or a large piece of gold however when you get to the nanoscale the melting temperatures start to vary as much as hundreds of degrees.

The difference between nanomaterials and conventional materials. There are several differences between Nano-sized materials and several points as shown in the following table 2 can summarize materials-size materials mass (traditional):

Table 2
THE DIFFERENCES BETWEEN NANOMATERIALS AND TRADITIONAL

Traditional Materials	Nanomaterials	Categories
Particles larger than 100 nanometers in all dimensions	Particles ranging in size from 1-100)) nm in bI At least one count.	the definition
We can see the molecules of most conventional materials with the naked eye	Nanomaterials cannot be seen with the naked eye	visual monitoring
The density of conventional materials is higher and their mass is greater	The density of nanomaterials is low and their mass is smaller	Density
Conventional materials cannot penetrate and remain in cell walls and membranes	Could Penetration of cell walls and membranes due to their small size	hack
Plaster. The sand. gravel; Raw cement, salt, etc.	These include nanoparticles, titanium dioxide, graphene, and others	Examples about it

Source: Prepared by the researcher based on (Schwirn et al., 2014) & (Saleh, 2020) & (Rabouw et al., 2016).

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Jidoka

Grew upget distracted and conceptHa

In the late nineteenth centurynote *"Sakichi Toyoda"* That his mother works to make weaving for the family using a manual loom to produce a small amount of it, which led him to create a general loom 1902 Get rid of extravagance in movement and traditional loom work (Mortti, 2012) later invented (Sakichi) Nola works with a motor with a special mechanism designed to stop in the event of a thread break. This machine later became the basis for automation with a human touch, and it is one of the main pillars of building the Toyota Production System, and due to the discovery of errors, the defects resulting from work were reduced Dekier, (2012) was not taken care of Jidoka Equally concerned with JIT Because the concept represents a unique culture or tradition that was developed at Toyota and is not fully recognizable as JIT , in the nineties of the last century, Taiichi ohno production engineer at Toyota Motor co By institutionalizing the idea of stopping production at every defect, if a production unit or work team was allowed to stop the production line completely in the event of a problem or malfunction at that stage or the production line Adolf et al. (2014), and prepare jidoka The backbone of the Toyota Production System and one of the two main pillars in the Toyota home with the JIT without Jidoka The Toyota production system will not complete as it helps to stop the process safely due to problems with the quality or production process (Anoop et al., 2020). The Figure 1 Toyota house TPS And how to exist jidoka It is of great importance in implementing the system, and its absence causes a defect, which leads to the collapse of the roof of the house.

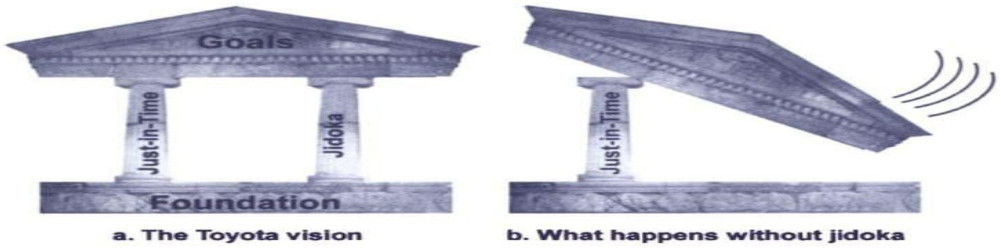

Figure 1
APPEARANCE 1 TPS

Source: Baudin, 2007

The transition from manual work to automated work went through four steps, which are summarized as follows: (Hirano, 2009: 655-657).

1. Handwork manual labor It simply means that all work is done manually, especially if the labor cost is low
2. Mechanization mechanism it means leaving part of the manual work for the automated work. At this stage, the work was joint between the worker and the machine, but the worker does most of the work
3. Automation The machine takes over all the work in the processing, as the worker only adds materials and presses the operating key, and the machine is left to work alone. Among its disadvantages, it is not possible to know if the machine produces a defective product.
4. Automation with a human touch the worker prepares the work materials, presses the operating key, and leaves the machine to do the processing. At this stage, there is no need to worry about the defective production, as the machine will detect the defective production when it occurs and the machine will stop automatically.

There are several definitions of Jidoka According to the views of her book, Hassanein referred to it as *"automation with a human touch, or automation with a human touch, or*

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automation by imparting human intelligence to the machine, meaning that the machine stops automatically when an error occurs, and the role of the worker is limited to control and supervision" (Hasnain & others, 2015: 420), and know herBaudin *"The ability to stop the production line by man or machine in the event of quality problems or delayed work."* Baudin, 2007: 1).

Another defined it as "*process improvement in order to get rid of waste."* Mendes, 2013: 5). As for Jhing He defined it as *"high quality construction and intelligent automation with defect prevention strategies"* (Ching et al., 2014: 344). While mentioned soliman Another definition of jidoka *"It's automation equipment that has human intelligence to stop itself when it has a problem at work"* (Soliman, 2016: 4).

Principles Jidoka

There are four principles to be followed to implement jidoka which: (Subramanion et al., 2018: 102):

1. Detecting any malfunctions in the current system
2. Stop the process
3. Take immediate corrective action
4. Analyze the root cause of problems and find a permanent solution to them

Benefits of Jidoka

Automation with a human touch contributes to achieving several benefits for organizations, which are summarized as follows: (Szmelter, 2012:5)

1. Increases the speed of troubleshooting.
2. Producing high quality products due to the discovery of errors early in the work and not passing it to the later stages.
3. Reduce expenses by reducing work in progress and equipment damage and avoiding additional processing of defective work in progress.
4. It improves operator morale especially if they are train to solve problems (rather than just calling a technician).
5. It can reduce direct labor costs and optimize the use of resources by allowing one employee to *"supervise"* multiple machines.

Differences between Automation and Jidoka

There are several differences between the automata and all has a human touch and can be summ up in schedule the following Table 3:

Table 3
THE DIFFERENCES BETWEEN AUTOMATION AND AUTOMATION WITH A HUMAN TOUCH

Automation with a human touch	automation	Categories
Supervisors can multitask and increase efficiency.	Manual procedures are simpler, but human supervision is still required.	people
Computer error detection and correction are independent.	Complete machine cycle before activating the stop button.	machines
Automatic shutdown prevents system failure, so errors are avoided.	Due to machine malfunction, defects can be generated in large quantities.	the quality
Bugs are found and corrected faster.	Errors are found later .	Error diagnosis

Source: Prepared by the researcher based on: (Boakye-Adjei et al., 2014)

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The Role of Nanotechnology in Reducing Costs

Most of the economic units seek to follow up the work of nanotechnology and the goods and services it provides in the market it works Nanotechnology as a business strategy in economic units help her with Reducing costs and achieving profits and surely New nanotechnology products contribute to production material Comparatively low weight vehicle NS Using traditional materials to achieve lighter and less expensive products NS (Abdi, ehsan et al., 2016:343). Nanotechnology has many advantages, as it works to improve the quality of products, reduce their cost, and reduce the cost of shipping and storage (Rababah, 2017). The Alliance of Economy with Nanotechnology (Nano Economy) emphasized Nano Economics on the Producing highly competitive products, the lowest cost and the highest quality without having a negative impact on the environment, opens the way for the production of new and advanced products. The market for Nano products has reached a trillion dollar in a year 2015 according to the report *"Rncos" Global* Nanotechnology Market (Ahmed, 2017: 4). Nanotechnology is understood as the main factor for innovation, as it does not only provide new goods, but also provides a new added quality to the commodity and opens new areas of production and ways to new markets, as it is a new source for saving raw materials and thus reducing costs wullweber, (2015) when the use of nanomaterials The cost of the raw materials used in the production process will be low because we have used traditional materials that are basically low cost and are converted into Nano-sized materials, which led to the use of smaller quantities of these nanomaterials compared to raw materials, as well as direct labor costs NS It has been reduced due to the use of automation in the production process-Aj (Shnawa, 2017).

The role of Automation Technology with a Human touch in Reducing costs

Production systems have gone through countless changes During the past periods, as the technology gained Automation with a human touch, which is one of the Lean Manufacturing techniques, has many unique advantages such as giving the operator permission to stop the production line and solve problems when identified in order to reduce waste in time as well as obtain high quality through production follow-up. Lean production technologies occupy an important position through its role in reducing Coststekin et al. (2018) in order for the economic unit to be able to pursue its operational excellence and improve its performance to keep pace with contemporary market developments as it has become more competitive all over the world, it began to resort to the use of lean manufacturing tools and techniques to get rid of businesses that do not add value from In order to increase efficiency and reduce costs Belekoukias, et al. (2014) low cost and high quality, it is certain that make higher profits and then Achieving a competitive advantage with which the economic unit can face its competitors (Ewers et al., 2016). By relying on high automation, the cost is reduced Direct winding represented by direct wages to a large extent and also reduces the limits of inventory and spoilage, as direct costs represent a large proportion of production costs, which may reach (75%) or more as an average for different products (David, 2019).

Practical Side

An introduction to the National Program for the Development of Wheat Cultivation in Iraq

An indicative scientific research program that means transferring modern technologies to farmers in order to raise the yield of wheat in ways that are compatible with

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the farmer's mentality, level of awareness and material income. The program has identified environmental and technical problems and presented treatments to solve them. It enters areas that increase annually in all governorates of Iraq to reach, in the tenth year of the program's life, an area 5 One million acres as a final goal is sufficient to reach self-sufficiency in local wheat.

The cost per acre of wheat production according to traditional methods

According to the traditional methods, lists were prepared to calculate the cost items for cultivating the wheat crop in Iraq Model farms selected by the National Program for the Development and Cultivation of Wheat in Iraq The costs were obtained from the results of the survey form that was distributed have a sample of farmers from each of the governorates covered by the program plan The following is a list of the costs of Baghdad governorate for growing wheat, note or the area of typical farms in the governorate90 acres, as shown in the table 4.

Table 4
THE COST OF PRODUCING THE WHEAT CROP ACCORDING TO TRADITIONAL METHODS FOR THE AGRICULTURAL SEASON 2021 – 2020 BAGHDAD PROVINCE

Total space cost for typical farms	The cost of one acre	cost items		
864,000	9,600	Seeds		Materials
2,173,500	24,150	urea	Fertilisers	
2,362,500	26,250	dab		
4,050,000	45,000	potassium sulfate		
67,500	750	Minor elements		
240,660	2,674	pesticides		
9,696,960	107,744			Total material cost
900,000	10,000	tillage wages		wages
900,000	10,000	Land smoothing fees		
900,000	10,000	settlement fee		
900,000	10,000	Manual sowing fee		
450,000	5,000	Fertilization Fee		
450,000	5,000	control wages		
4,500,000	50,000	The cost of automated work		
1,767,330	19,637	Employee wages throughout the season		
10,767,330	119,637			total wage costs
20,464,290	227,381			Total direct costs
180,000	2,000	babble		Until the harvest
1,350,000	15,000	harvest costs		
27,000	300	Loading / transporting / unloading (for materials)		
720,000	8,000	crop cleaning fees		after harvest
2,277,000	25,300			Total indirect agricultural costs
1,440,000	16,000	download		
720,000	8,000	Transfer		
720,000	8,000	evacuation		
2,880,000	32,000			total marketing costs
25,621,290	284,681			Total cost of wheat cultivation

Source: Prepared by the researcher

The percentage of damage from the crop to the cultivated land was also determined by about 3% due to pests and bushes and accordingly it was determined space damage for farms and as follows:

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Damaged area = Damage percentage × Typical farm area
= 3% × 90
= 2.7 damaged space

Total damage cost = damaged area × The cost of one acre
= 2.7 × 284,681
= 768,638.7 Total damage cost of typical farms

Damage cost per acre = total damage cost ÷ Total area of typical farms
= 768,638.7 ÷ 90
= 8,540.43 Dinar cost of damage per acre

Cost of Wheat Production According to Nanotechnology and Automation with a Human Touch

The role of nanotechnology in reducing material costs

Nano fertilizers play an important role in plant nutrition, whether through foliar feeding or through ground additives.[1)]. There are currently more than800 Nano-fertilizer products and table 5 shows the fertilizers that have been replaced by Nano-fertilizers.

Table 5
THE APPLICATION OF NANOTECHNOLOGY TO REDUCE MATERIAL COSTS, BAGHDAD GOVERNORATE / AL-RUSAFA

The difference between the two costs	The cost of a acres	Price / dinars	Quantity / per acre	Nano Fertilizer	The cost of acres is in dinars	price/ dinars	Amount per acre	conventional fertilizer
16,150	8,000	20,000	400 grumble	Nano nitrogen N 7	24,150	345	70 kg	urea
18,750	7,500	15,000 Liter	0.5 Liter	Fertilizer and pesticide N,P,K,Ca	26,250	525	50 kg	dab
37,000	8,000	20,000	400 grumble	chelated nano potassium NK	45,000	1,800	25 kg	potassium sulfate
2,250))	3,000	10,000	300 grumble	Nano-micronutrients	750	750	0.250 grumble	Minor Elements
68,970	26,500	Total cost of fertilizers and nanoparticles per acre			95,470	The total cost of conventional fertilizers per acre		

Source: researcher numbers

By comparing the costs of fertilizers used in traditional methods and Nano-fertilizers, we note that the cost of using Nano-fertilizers has contributed significantly to reducing costs compared to traditional fertilizers because they are used in larger quantities than in Nano-fertilizers, as shown in the table 5, and the percentage of decrease in the costs of fertilizers and pesticides can be extracted as follows:

The cost of fertilizers and traditional pesticides per acres = fertilizers + pesticides
= 95,470 + 2,674
= 98,144 Dinars per acre

[1)] So far, no ground additives for nano fertilizers have been used in Iraq.

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The cost of traditional fertilizers and pesticides for typical farms = the cost of fertilizers and pesticides × Typical farm area
= 98,144 × 90
= 8,832,960 Dinar

The cost of fertilizers and Nano pesticides per acre = 26,500 Dinars per acre

The cost of fertilizers and Nano pesticides for typical farms = Nano fertilizers and pesticides × Typical farm area
= 26,500 × 90
= 2,385,000 Dinar

The difference between the two costs = the cost of traditional fertilizers and pesticides – The cost of fertilizers and Nano pesticides
= 8,832,960 - 2,385,000
= 6,447,960 Dinar

Reduction percentage = the difference between the two costs ÷ The cost of traditional fertilizers and pesticides ×100
= 6,447,960 ÷ 8,832,960
= 73% reduction when using nanomaterials as an alternative to traditional materials

The Role of Automation with a Human Touch in Reducing Costs

Photo manipulation app using a drone to detect crop damage early

Time is the most important factor in the world of agriculture. The more diseases that the plant is expose to due to pests and jungles are discovered at an early stage, this contributes greatly to controlling it and not spreading it. In the plane, as the plane photographs the field during the average germination period, after taking pictures, it was send to the computer to analyze it and discover whether the plant is infected or not infected with agricultural pests. In traditional methods, plant diseases are not detected early, but it can take about a month until the plant dies. When using the high automation represented by the drone, the images can be analyzed and given a result on the same day and for large areas that the plane covers an area 10 acres in one trip, which takes about an hour in Figure 2.

Figure 2
APPEARANCE 1 AGROCAM MAPPER FW

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The cost of the plane 4,690) dollar [2] (total amount) 7,241,600 Iraqi Dinar) the life span of the aircraft 1000 Hours of work the depreciation of the aircraft is calculated through the following equation.

Depreciation = cost of the aircraft ÷ Actual total working hours
= 7,241,600 ÷ 1,000
= 7,241.6 Dinar

One hour of the plane's work covers area 10 acres. As a result, the aircraft depreciation per hour is dived by 10 acres to show the share of one acres of the depreciation expense and my agencies:

Acres' share of depreciation expense = depreciation expense per hour ÷ Covered area per hour
= 7,241.6 ÷ 10
= 724.16 Dinar per acre

In addition to the labor wages for operating the aircraft by a specialist, which is estimated at 25000 dinars per hour and one hour covers an area 10 acres, if the hourly work wages are as follows:
Labor wages per acre = 25,000 ÷ 10
= 2,500 Dinar per acre

The cost of operating the aircraft per acre = depreciation premium + labor wages
= 724.16 + 2,500
= 3,224.16Dinar, the cost of making the plane per acre

The cost of making the plane for the total area = the cost of one acre × Total area of typical farms
= 3,224.16 × 90
= 290,174.4 Dinar, the cost of flying the plane

By comparing the cost of damage using traditional methods and the cost of using a drone, the following becomes clear:

Table 6
THE DIFFERENCE BETWEEN THE COST OF DAMAGE USING TRADITIONAL METHODS AND A DRONE

discount percentage % [3]	The difference between the two costs	The cost of damage by using the drone	The cost of damage using traditional methods
63 %	478,464.3	290,174.4	768,638.7

The source is the numbers of the researcher. Based on the foregoing, it can be conclude that the use of this aircraft reduced the costs of damage caused by the use of traditional methods in the cultivation and production of the wheat crop by a percentage. 63 Thus, the spoilage was eliminated through early detection and control, thus achieving quality and an increase in production to cover the population's need of wheat crop and achieve self-sufficiency.

[2] The dollar is equivalent to 1460 dinars in the date of preparing the research

[3] The percentage of reduction in the cost of damage = the difference between the two costs ÷ the cost of conventional damage x100

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Reducing costs by using a Spray Jeta Fertilizer and pesticides

Ascend device DJI Agars T30 Drone Efficient aerial spraying to new heights Thanks to the capacity spray tank 30 kg enables more effective spray helps T30 helps reduce fertilizer use and increase yield through best practices perhaps Menu On the data. Thanks to the branch targeting technology and adjustable arms, get up Agars T30 slant spray, ensuring even application of insecticide and fertilizer liquid and double the number of drops. So Availability 16 spray nozzles NS Extensive coverage cover an area 40 acres per hour Figure 3.

Figure 3
APPEARANCE 2 AGRAS T30

Is characterized by The Plane Agras T30 has a fully enclosed chassis for added durability And All critical components have three layers of protection and are classified according to a standard IP67 It is a *"global standard for protection and is used in all electronic devices in order to assess the quality and sensitivity of the device to dust, water and heat."* Ideal NS For long-term use of pesticides and fertilizers and for resistance to dust and corrosion plane price 5.998 $ and equivalent to 8817060 Iraqi dinars estimated useful life200 working hour.

The drone used to spray fertilizers and pesticides can be use to reduce costs related to manual labor wages.

Depreciation premium per hour = cost of the plane ÷ work hours
= 8,817,060 ÷ 200
= 44,085.3 dinars per hour

Since one hour of work in the plane covers an area 40 acres, if the hourly depreciation premium is divided by the area covered in the hour as follows:
Depreciation premium per acres = depreciation premium per hour ÷ Covered area per hour
= 44,085.3 ÷ 40
= 1,102.1325 Depreciation premium per acre

The typical farm's share of aircraft costs = depreciation premium per acres × Typical farm area
= 1,102.1325 × 90
= 99,191,925 dinars for the area of typical farms

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In addition to the labor wages for operating the aircraft by a specialist, which is estimated at 25,000 dinars per hour and the hour covers an area 40 acres, if the hourly wages are:

Labor wages per acre = one hour labor wage ÷ Covered area per hour
= 25,000 ÷ 40
= 625 Dinar per acre
The cost of operating the aircraft per acre = depreciation premium + labor wages
= 1,102.1325 + 625
= 1,727.1325 Dinar, the cost of making the plane per acre
The cost of the plane's work for a typical farm area = the plane's work cost per acre × For a typical farm area
= 1,727.1325 × 90
= 155,441.925 Dinar the cost of fertilization and control by drone
The cost of traditional fertilization and control for typical farms = fertilization fees + control fees
= 450,000 + 450,000
= 900,000 Dinar the cost of fertilization and conventional control

It should be noted the number of times fertilizers are sprayed during the agricultural season, as urea fertilizer is sprayed in three stages during the period of branching, elongation and lining, and potassium sulfate fertilizer and micro-elements are sprayed in the branching stage As for Sama Al-Dab, it is added during the sowing period, so there are four stages of fertilizer spraying, which requires the use of the aircraft for four stages, so the cost of fertilization and control is as follows:

The cost of fertilization and control by plane for the agricultural season = the cost of fertilization and control in one stage × number of stages
= 155,441.925 × 4
= 621767.7 Dinar the cost of fertilization and control for four stages

Table 7
THE DIFFERENCE BETWEEN THE COST OF FERTILIZATION AND CONVENTIONAL CONTROL AND THE USE OF AIRCRAFT

The cost of fertilization and conventional control / dinars	Cost of fertilization and pest control by plane / dinars	The difference between the two costs	discount percentage %
900,000	621,767.70	278,232.30	31%

Source: Prepared by the researcher

Based on the results that have been achieved due to the use of nanotechnology and automation with a human touch, the results can be generalized to the rest of the governorates of Iraq due to the significant reduction in costs, as the results can be generalized to the remaining governorates covered by the program plan are (Diyala, Babylon, Basra, Diwaniyah, Waist, Holy Karbala, Najaf, Salah al-Din, Nineveh, Kirkuk, Anbar, Dhi Qar, Maysan, Muthanna).

CONCLUSIONS

After completing the research with its theoretical and applied aspects, the researchers reached a set of conclusions that can be summariz as follows:

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1. Reliance on traditional methods in the agricultural sector and lack of interest in developing the sector and keeping pace with developments in the business environment incurs high costs in addition to lower quality and productivity.
2. The use of contemporary technologies such as Nano and Automation with a human touch contributes significantly to reducing direct costs Materials and direct wages.
3. Nanotechnology is of great importance when used in the agricultural sector, as it clearly contributes to reducing the costs of direct materials and then reducing the total costs, as shown in the results of the table 5 As the traditional costs were (8,832,960) While the total cost decreased when using nanotechnology, the cost was (2,385,000) The cost reduction rate is approx. 73 %.
4. By using automation technology with a human touch, direct wage costs can be reduced as a result of relying on high automation and reducing dependence on the human element. On the other hand, the human element remains of great importance in the operation and management of machines. The traditional costs of spoilage (768,638.7) The result of the reduction in the use of the plant disease detection aircraft to eliminate spoilage was (290,174.4) As the percentage of cost reduction 63% And as shown in the table 6, and the cost of fertilization and insect control was in the traditional methods (900,000), and as a result of the use of the fertilizer and pesticide spray plane, the costs were reduced to (621,767.7) capacity reduction ratio 31 % As shown in the table 7.

Recommendations

Based on the findings of the researchers, some recommendations can be mad, as follows:

1. The necessity of transformation in the agricultural sector from traditional methods of producing and cultivating wheat to contemporary methods represented by nanotechnology and automation with a human touch because of their importance in keeping pace with developments in the business environment and because of the agricultural sector of great importance in achieving self-sufficiency and filling the population's need for food crops
2. The use of fertilizers and Nano pesticides as they add quality to crops and are environmentally harmless and clearly contribute to reducing the costs of direct materials
3. Studying the possibility of manufacturing fertilizers and Nano pesticides locally, as they are inexpensive, and because importing them from abroad is at a relatively high cost compared to manufacturing them locally.
4. Use theat has a human touch as it shortens the cost and time factors.
5. The researchers recommend the management of the National Program for the Development of Wheat Cultivation in Iraq to rely on contemporary technologies represented by nanotechnology and automation with a human touch because of their importance in reducing costs, increasing productivity and producing high quality crops.

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