



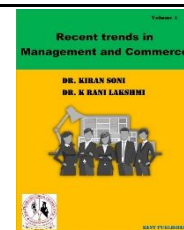
## Recent trends in Management and Commerce

Vol: 1(2), 2020

REST Publisher

ISBN: 978-81-936097-6-7

Website: <http://restpublisher.com/book-series/rmc/>



# Wireless Sensors in Agriculture and Food Industry Using the ARAS Method

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### Abstract

Wireless sensors in agriculture and food industry. Agriculture for Wi-Fi sensors and Wireless sensors in the food industry. Three styles of networks: big name community, hybrid community, and mesh network, developed and standardized Bluetooth technology Star networks use, such as beacons and scatterers are Each piconet is a primary node connects to seven slave nodes, whereas each Scatternet and more than one piconet Forms an ad-hoc network. Zigbee generation makes use of hybrid star networks, which use a couple of grasp Non-routing slave nodes Nodes with routing capabilities to connect. agricultural production and offer well-timed remarks to users. Nowadays, wireless sensor networks (WSN) are broadly utilized in agricultural monitoring to improve the satisfaction and productivity of agriculture. In this software, sensors collect various styles of statistics (ie, humidity, carbon dioxide stages, and temperature) in real-time shows. Stores, plant life, hospitals, parking plenty, or even eating places use wi-fi sensor networks (WSN) to improve patron experience, save emergencies, enhance delivery chains, and greater. Wireless sensors are used in the agricultural enterprise. Farmers can screen cattle. The sensors then gather data for evaluation. Therefore, ability threats such as diseases or animal feeding schedules are diagnosed through the tool to assist farmers to maintain their cattle healthy. A wi-fi sensor network is a radio frequency (RF) microcontroller and transceiver, Sensors, and machine made from strong sources. A wireless sensor with self-recovery capabilities Networks solves problems or traditional to allow programs that cannot be solved by technologies have improved. Once available, wireless sensor build is in its early development stage Many new programs not previously considered possible This technology allows us to detect Agriculture and wireless sensors in food establishments Applications are even rarer. Agriculture and Food A wireless sensor are suitable for industry This is an overview of the technology The article intends to present. The additive ratio assessment ARAS method for complex decision problems Tries to simplify and for alternatives that can reflect the difference between by the corresponding indicator (degree of use). Selects the "best" alternative. Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extendability, Battery life.Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4). Range (m) is showing the highest value of rank whereas Slave enumeration latency is showing the lowest value. Wireless sensors in agriculture and food industry for Additive Ratio Assessment method. Range (m) is showing the highest value of rank whereas Slave enumeration latency is showing the lowest value.

**Keywords:** SPSS, Radio, Data rate, Feature, WiFi (IEEE 802.11b).

### Introduction

Wireless sensor generation is in its early improvement section. Applications of wireless sensors in agriculture and The meals corporation stay rare. This article intends to offer a top-level view of to be had wireless sensor technology Applicable to the agriculture and meals industry. A wi-fi sensor network is a system along with radio frequency (RF) transceivers, sensors, microcontrollers, and electricity properties. Wireless sensor networks with self-organizing, self-commanding, self-diagnosing, and self-restoration capabilities had been advanced to resolve problems or enable applications that the conventional generation cannot cope with. Once to be had, those technologies will allow the invention of many new packages that couldn't previously have been considered possible [1]. Technological development in WSN is diverse in agriculture Express and manage parameters made possible. Sensor and Wireless Radio Frequency (RF) Recent advances in formulation and they are with internet for agriculture Extensive use of coordinate sensor architectures offers opportunities. with less subject Emerging Wi-Fi era, power Because of needs and fewer reason statistics charge capabilities developed for precision agriculture, WSNs have become the most appropriate era for monitoring the rural environment [4]. WSN can operate in a large variety of environments and Proportion, size, power, and flexibility compared to stem and advantages in assigned intelligence When the station cannot be contacted immediately, A message in more than one hop at a time can be sent. By installing zone car configuration, Whether nodes are moved, fetched or The network can protect the feature even if it is removed Medical, Agricultural, Environmental, Military, Appliance/Building, toys, motion tracking, and various other fields Monitoring programs have been developed. sensor Architectures for Networks Over the past 50 years Analog 4-20 mA designs to bus and network Topologies have changed widely. Bus recital Wiring and required communication bandwidth reduce Wireless sensors plus wiring Reduce

requirements and assigned intelligence [5]. Agricultural and meals enterprise wastes consist of straw, leaves, cobs, skins, and many others., and broken agricultural produce Pre-harvest and post-harvest losses due to. For every kg harvested for grain, 1-1.5 kg of straw, cob, or other Residues are formed. Four India approx 127 million tons of tops and greens and 198 million Produce tons of food grains, approximately 200 Produce a million tonnes of agricultural waste resulting and harvest losses of vegetables in India Ranging from at least 5% to almost one hundred%.5 Area of the result which debts for 20-30% of manufacturing, three, crores of India's annual loss in foreign money 6 kinds of cereal, fruits and 32% of total food waste for vegetables inside the US respectively, 23% and 25% [18].The food enterprise, in general. There are many demanding situations related to granular facts alignment when developing a quit-to-give-up virtual between agencies/organizations. Therefore, move-employer statistics sharing becomes extra tough inside the agri-meals zone, wherein information from farms is currently very restrained [17]. Agricultural practices introduced to Australia from Europe are nicely acceptable to land with special seasonal patterns, hydrological and nutrient cycles, and geography. As in different countries in which land has been overcrowded, these practices have brought about troubles along with soil erosion, reduced water high-quality, and lack of biodiversity and salinity. These issues are normally interlinked: extra in an inland area can cause erosion [7]. A wi-fi sensor community consists of a massive variety of micro sensor nodes with small lengths and coffee values. It can self-prepare thru wireless conversation. Data acquisition is the acquisition of data It is the main function of the network. of Environmental Monitoring Compared to traditional methods, agricultural A wireless sensor to display the environment We do networking 3 large blessings: (1) wiring is not sensible, the community is used handiest as soon as, and the individual- Impact on managing neighborhoods is small; (2) Nodes The denser the records, the higher the accuracy of the acquisition contains; (3) robust computation, storage capacity, Allowing collaboration between nodes Sensor nodes are suitable unobserved some distance flung sensing. Therefore, it is feasible to show the parameters of the geologic environment through a wi-fi sensor network, which could be a route for environmental monitoring Based on future wi-fi sensor networks [8]. A sensor node is usually rechargeable Made with batteries, they are less efficient and a project for prolonged-time period use, those batteries offer energy to the sensor nodes, which makes every A portion The sensor nodes take better portraits Do constant power Consumption means every node is the sum of the element (i.e., sensor, Microcontroller unit and radio Vol.), each issue will act as a supplement one of a kind power stages. Therefore, the lifestyle of a sensor node is its Discharge batteries under a set operation threshold It's time. To provide an infinite lifetime for sensor nodes Many students have developed energy reduction strategies. Multiple power of WSNs used in agricultural applications This section evaluates mitigation techniques. The objectives of each approach, Wireless protocols, developments, benefits, and Boundaries are also discussed [10]. Wireless sensor community applications are frequently heterogeneous and ought to obey many forms of requirements. Therefore, building the Classification of programs is A difficult task many teachers who Associate WSN programs with their domain have been named got recognized army, Structural Engineering Packages Among these Environmental, Health, Civil, and packages, winery packages are one of the most vital eventualities [11]. Agriculture and the meals industry are constrained to mass media and labeling, while neglecting mutual facts trade, as an instance direct verbal exchange among producer and client and rising digital information motors. From the diversity of instances discussed, and equally from the range of feasible scenarios, it needs to be clean that the very complex dynamics between information needs, data delivery, and records processing are exciting with regards to food first-class and safety. The assumption is that market failures attributable to information asymmetry can be solved sincerely by supplying higher facts, at the same time as coping with meal customers facing exceptional and protection uncertainty. Instead, handling records from the agriculture and meals quarter [12]. Describes in detail agriculture and meals company and numerous Agricultural practices. Key to infrared thermal imaging The advantage is that the temperature of any material It is non-, untouchable, and negative. [13]. Agriculture and food system, is miles Extensive house building operations, Automation, Security, Consumer Electronics, non-public computing gadgets, scientific Monitoring, and toys. Long for these projects Battery life modes, reliability, automatic or Semi-automated system, social nodes effortlessly Ability to add or remove, walls and ceilings Alerts that can be passed through require technology that provides occasional gadget price [14]. Detection of environmental contaminants is a major project within the agricultural and meals industries. Indeed, extensive meal infection by way of insecticides and different contaminants has raised public issues. Fast, reasonably-priced, and touchy wireless sensors are therefore required. Enzyme technology offers a short and price-effective method to the modern issues of the agri-food industry. This paper critiques the latest developments in wireless sensor technology used in agri-food industries, especially the layout of a bioconjugation strategy [19]. The food industry is seeking innovation in this zone, to have speedy and practical food for clients nice. In this way, there is now a need to broaden structures to categorize, monitor, and sort the components of an equipped-made meal, so that a have a look at became developed to introduce an automatic approach for simulating the meals prepared by using the patron for the duration of the meal using a computational vision approach of photos which includes meals (geared up-made food), segmentation and extraction. Using strategies for evaluation [15]. Agriculture and Food Industries. Pathogenic microorganisms can reason meal contamination at any factor in the chain at production stages. Conventional techniques consist of constraints of those strategies, the emergence of resistance, low overall performance, immoderate fees, and dangerous consequences on meals, fitness, and the environment, many countries have followed legal guidelines and guidelines to limit their use. To conquer one's problems, an environmentally first-rate, price-effective possibility method is urgently wanted. Probiotics are stay microorganisms that, whilst consumed in enough portions, confer fitness advantages to the host with the aid of supplying pathogen-protecting interest and dietary blessings. From the issue of food microbiology, animals Use of probiotics among animals is Zoonotic in the gastrointestinal tract (GIT). Reduces pathogens, food for these pathogens Prevents transmission through, Therefore, probiotics have been proposed as potential antibiotics manner of protection in opposition to provide unique emphasis to probiotics, their choice standards,

mechanisms of movement and their capability as possibility biocontrol retailers, in agriculture (livestock and aquaculture sectors) and meals industries [20].

### Materials & Methods

**Radio:** Radio is spoken word through radio wave transmission, usually with radio receivers For many male or female listeners prepared Track, and news from unmarried broadcasting stations and send other types of packages. The period radio received popularity within the early 20th century with the improvement of numerous radio-based technology. The word intestate is derived from the Latin ' radios', meaning Derived from, ie 'ray' or 'beam'.

**Data Rate:** Data fee is described as the number of records transmitted over a community in a given period. It is from one device to another or peripheral data between the instrument and the computer Transmission speed. It usually is measured in megabits per second (Mbps) or megabytes in keeping with the second (Mbps). Data charges define the speed of records transfer in wi-fi communications. Data charge is defined as the variety of bits transmitted from one tool to some other or over a community consistent with 2d. Data quotes are usually expressed in bits according to the second or bytes in line with the second.

**Nodes per master:** The total number of nodes required for a cluster will vary depending on the organization's needs. However, as a basic and general guideline, any cluster that prioritizes availability should have at least a dozen worker nodes and two primary nodes. Because a dedicated master node fails and there is only one backup, the cluster lacks a quorum and cannot elect a new master. Three dedicated master nodes, a recommended number, provide two backup nodes, and the quorum (2) required to elect a new master in case the master node fails. Master nodes perform specialized roles in validating new blocks and managing the block chain.

**Slave enumeration latency:** A census is a survey of every unit, everyone, or everything in the population. This is known as an absolute calculation, i.e. an absolute number. The central government conducts a population census every ten years. The federal constitution mandated that slaves be counted as one-third of the citizens for tax purposes and appropriations by the House of Representatives. Collect data on your immediate family: names. Where to find slave table Ancestry.com has 1850 and 1860 slave indexes, as does Family Search (1850, 1860). Microfilmed slave schedules are available at NARA, and the Family History Library has books with slave schedules and/or codes for various states.

**Data type:** A record type, in programming, is any type of variable that contains the value and any kind of math, Specifies relational or logical functions. it could use without blunders. Most modern pc languages apprehend 5 basic kinds of data sorts: crucial, floating factor, character, character string, and composite kinds, with various particular subtypes defined inside each vast kind. A statistic A type tells a compiler or interpreter, How programmers use statistics A type of information that says wants. Most programming languages are integer, real person, or string, and boolean Guide the selection of types of information to be included. In programming and databases, statistics kinds are used to specify the form of a variable. For instance, it determines which operations may be completed with those variables and that could result in mistakes. For instance, whilst saving textual content, mathematical operations which include addition aren't viable.\

**Range (m):** Range later Confirmed: "We are O-Range Color Love it, but avoid all jokes We are officially called 'The Range' Called." The store set the record straight However, many shoppers find themselves unable to "see it "Couldn't", and now the range should be referred to as The Orange. After months of anticipation, The Range's brand new 70,000 sqft branch has opened on the former Seaton Hill Barracks site on William France Road in Derriford, Plymouth. A large crowd witnessed the ribbon-cutting ceremony

**Extensibility:** Extensibility is a capability of a software system, which A major change in code or the basis of its capabilities without changes in structure Allows and accepts significant stretch is ability. Expandable systems technology, Provide tools and languages, thus Developers can expand or add to their capabilities. There are three different forms of software extension: white-box extension, gray-box extension, and black-box extension, based on which artifacts they are and how they are modified. In my opinion, "stretchable" means something. Can expand in a specific, pre-designed way. "Extensible" refers to the general ability of credit to be easily expanded in previously undefined ways.\

**Battery life:** Ask around and you'll get a variety of answers. Some cars will last five or six years out of battery, while others will need a new one after two years. Generally, your car will need a new battery after three to four years. When your battery is hot, even when not in use, it will drain very fast. This type Enable power saving mode and disable location services, Switch to dark mode, disable automatic Wi-Fi, limit apps running in the background, manually disable screen pixels, disable background data access, and track misbehaving apps.

**Feature:** An aspect is a distinctive characteristic or a special attraction. Aspect can also mean giving special attention to something. The word aspect has many other senses as a noun and a verb. An aspect is a unique quality or characteristic that something has. "Outstanding feature" refers to a person, place, or most notable or outstanding characteristic. For example, "My great aunt Ruby's best feature was her beautiful, penetrating gray eyes. A feature is a character longer than a message. Features come in many varieties and they are magazines, Widespread in newspapers and online are used. A feature is often covers the issue in greater depth than the message; Or Let's look at the ongoing story from a different angle.

**WiFi (IEEE 802.11b):** 802.11a uses an orthogonal frequency as opposed to FHSS or DSSS Sector multiplexing encoding scheme. 802.11b (in addition (also known as 802.11 Hi-Rate or Wi-Fi) Extending to Wireless LANs and 802. Eleven offers eleven Mbps transmission (with a fallback to five.5, 2, and 1 Mbps) in the 2. Four GHz band. However, you should remember

the fact that 802.11b speeds will always be/are used even in greenfield networks. If the sign first-rate between AP and client degrades enough, they will subsequently switch to 802.11b (or lower) because of its power. For your reference, gradual pace to fast pace: b, g, n, ac. Note that you could pick which router to paint with inside the photograph. If all of the devices for your network support wi-fi n (802.11ac is faster, however, maximum devices do not help it), then choose "802.11n only".

**Bluetooth (IEEE 802.15.1):** 802.15. 1, usually referred to as Bluetooth is low-data-cost, low-power Wi-Fi networking that is fashionable, and lightweight Aimed at switching cables between gadgets [IEEE802. 15.1]. Bluetooth protocol layer, Figure 1 As shown in, along with other IEEE networking layers Incredibly unusual in comparison. 802.15. 1, typically called Bluetooth, low-data-charge, low-energy is wireless networking with It is lightweight devices [IEEE802] cables aim to change. 15.1]. Other IEEE Networking Compared to layers Bluetooth protocol layer is quite unusual.

**ZigBee (IEEE 802.15.4):** Zigbee and IEEE 802.15. 4 Wi-Fi sensor network Social infrastructure required for programs Standards-based ethics. 802.15. Defines four Physical and MAC layers, plus ZigBee Network and alert layers Define. Zigbee and IEEE 802.15. 4 Social needed for Wi-Fi sensor social projects Standards-based providing infrastructure Ethics. 802.15. Four physical and MAC Defines layers, and the ZigBee network defines warning layers. Network (WPAN) is a protocol and well-matched interconnection for data verbal exchange devices with the use of low-statistics-rate, low-energy, and coffee-complexity short-range radio frequency (RF) transmissions. The popular IEEE 802.15. Four fashionable and its counterpart ZigBee are regularly confused. They are not identical factor. The dressmaker of wi-fi packages has a wide preference of standards and protocols, ranging from the easy to the pretty complex.

**Method:** ARAS for complex decision-making problems The method is through "best" choices Simplify and appropriate indicator (utility-scale) alternative and the best solution Reflects difference and is different Eliminates the influence of units of measurement. [16]. ARAS technique might be used. A regular MCDM trouble is related to the project of Limited variety of results Ranking the options, each of them Based on various selection criteria are clearly described, in line with the ARAS method, decide an application characteristic fee. The relative effectiveness of the complexity of the viable opportunity is at once a scheme [17]. Aggregate Ratio Rating (ARAS) in transport companies Measured performance indicators Approach to assessment. The assessment becomes achieved inside which has been evaluated based on 20 overall performance indicators. The received results had been established during the 3-phase manner of the sensitivity evaluation method [18]. The ARAS approach is primarily of the argument that events the complex international may be understood through the usage of easy criteria describing the opportunity below attention describing normalized and of weighted scales for the sum of values optimum opportunity is argued to be most fulfilling. Alternative in evaluation [19]. of renewable energy systems (polysilicon solar PV energy, solid oxide fuel cell, phosphoric acid fuel cell, and offshore wind energy systems) energy Sustainability with expert input To assess the importance of indicators ARAS hybrid method. The newly proposed method is superior in combination with the ARAS method Based on the SWARA technique. SWARA technique means economy, regulation, business enterprise, production, Layout and architecture, coverage, and environment in various fields including sustainability Today with massive software A subjective needs-weighting technique [20]. Aras Valley, wherein winter temperatures are not too low, most of the fruit grown within the valley is from the Rosaceous own family and consists of strawberry and mulberry. of valleys Under natural conditions, wild apricots hundreds of human selection subject years Generally humans are low with small fruits Cut back first-class wild apricot bushes low yields, and susceptibility to pests and illnesses [21]. ARAS approach using gray numbers. Classical decision making in ARAS Different from the technique approach is a new technique for fixing MCDM troubles in which the Functionality belonging to preferences Values are compared to feature cost by the test maker at the beginning of the method A better alternative is determined. This Can be linked to ambiguity good judgment and grey idea Gray Additively Rating (ARAS-G) is the ARAS Combines the pattern with gray as a technique principle. ARAS method literature is new However, it has many fields and sectors It has been used in many studies [22]. Flash-lamp photolysis ARAS measures with 1,9, one hundred and one confirmed that After the initiation of photosynthesis First 150 PS test Time, oscillations inside the flash became unusable due to lamp Round. In existing tests PMT intensity due to excimer flash changed into removed via monochromatic and electronic interference was eliminated via the usage of for all trigger signals optical isolators and Excimer laser proper safety[23]. ARAS cannot cope with ambiguity and subjective judgments and/or Facts and/or incomplete information Uncertainty derived from the absence of Inherent uncertainty of elements and/or inaccuracy in mind Failure to do so will result in unreliable and May be unreliable estimates. The advantage of the use of fuzzy good judgment is that it takes into consideration the uncertainty that exists. This method that's a completely useful idea for coping with unknown and complex conditions. Headaches [24]. The ARAS method, options to sort and/or Such to analyze use facts special eventualities. Therefore, via using this approach, choice makers are Their positivity, and pessimism and Demonstrate sensible attitudes Given the opportunity. In the paper, a numerical case look at an e-mastering route exam is investigated. The cause for that lies in the importance of this form of mastering. To create an amazing e-getting-to-know path, the Advantage of direction below attention Cons and compared to the opposition and determining its position Essential. In that sense, creators realize which components of the course need development and which are of great satisfaction. The software of the proposed combined method has been validated to be more affordable and suitable in this case [25].

## Result and discussions

**TABLE 1.** Wireless sensors in agriculture and food industry

	Feature	WiFi (IEEE 802.11b)	Bluetooth (IEEE 802.15.1)	ZigBee (IEEE 802.15.4)
Radio	250	56	189	78
Data rate	200	48	296	45
Nodes per master	140	75	202	129
Slave enumeration latency	150	85	105	170
Data type	240	145	120	150
Range (m)	350	150	285	300
Extendability	163	145	136	147
Battery life	190	170	180	165

Table 1 shows the Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4). Figure 1 shows Wireless sensors in agriculture and food industry Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life. From the figure 1 and table 1 it is seen that Range (m) is showing the Highest Value for Feature and Nodes per master is showing the lowest value. Battery life is showing the Highest Value for WiFi (IEEE 802.11b), and Data rate is showing the Lower value.

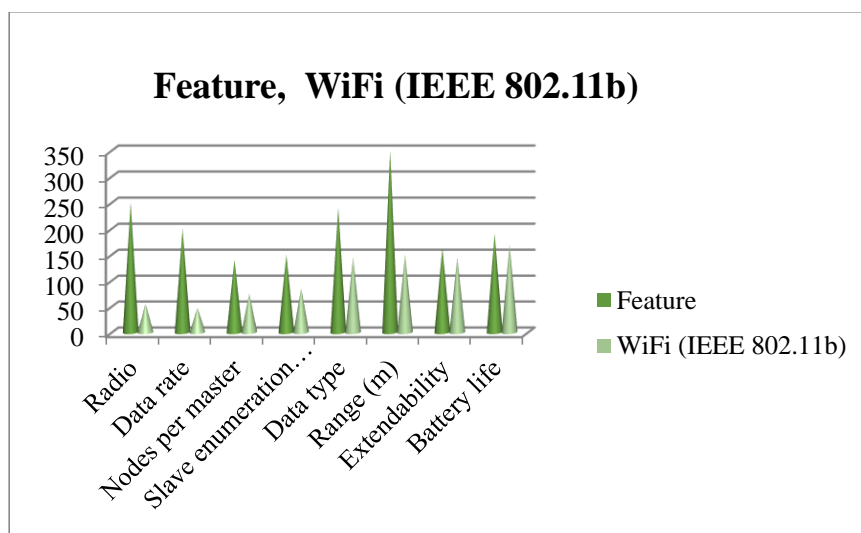
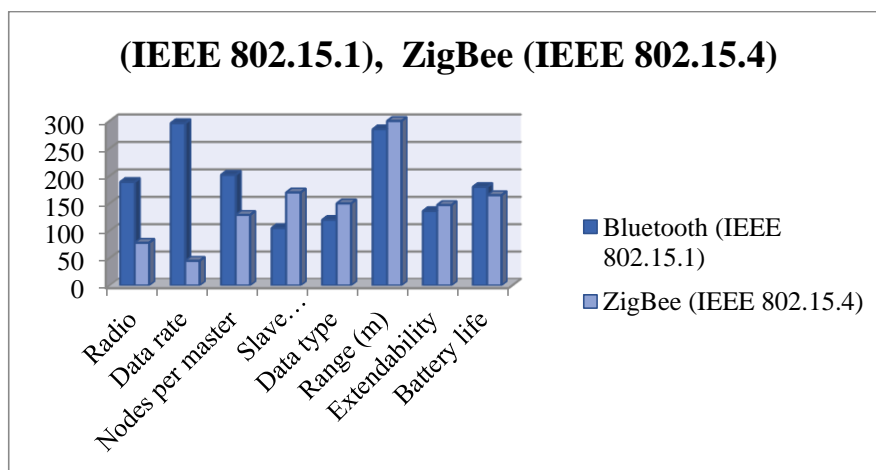
**FIGURE 1.** Feature, WiFi (IEEE 802.11b)**FIGURE 2.** (IEEE 802.15.1), ZigBee (IEEE 802.15.4)

Figure 2 shows the (IEEE 802.15.1), Wireless sensors in agriculture and food industry ZigBee (IEEE 802.15.4) Data rate is showing the Highest Value for Bluetooth (IEEE 802.15.1) and Slave enumeration latency is showing the lowest value. Range (m) is showing the Highest Value for ZigBee (IEEE 802.15.4) and Data rate is showing the lowest value.

$$X_{max} = \text{Max} (X_1 \dots X_n) \quad (1)$$

**TABLE 2.** Calculation of maximum value

	Feature	WiFi (IEEE 802.11b)	Bluetooth (IEEE 802.15.1)	ZigBee (IEEE 802.15.4)
Max	350	170	296	300
Radio	250	56	189	78
Data rate	200	48	296	45
Nodes per master	140	75	202	129
Slave enumeration latency	150	85	105	170
Data type	240	145	120	150
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Table 2 shows the Calculation of maximum value Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4). Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life Calculation of maximum values are derived by using the formula (1).

$$X_{1nor} = \frac{x_1}{\sum(x_1 + x_2 \dots x_n)} \quad (2)$$

TABLE 3. Normalised Matrix

	Feature	WiFi (IEEE 802.11b)	Bluetooth (IEEE 802.15.1)	ZigBee (IEEE 802.15.4)
Max	0.172159	0.162835	0.163626	0.202156
Radio	0.122971	0.05364	0.104478	0.052561
Data rate	0.098377	0.045977	0.163626	0.030323
Nodes per master	0.068864	0.071839	0.111664	0.086927
Slave enumeration latency	0.073783	0.081418	0.058043	0.114555
Data type	0.118052	0.138889	0.066335	0.101078
Range (m)	0.172159	0.143678	0.157546	0.202156
Extend ability	0.080177	0.138889	0.07518	0.099057
Battery life	0.093458	0.162835	0.099502	0.111186

Table 3 shows the Normalised matrix for Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4).Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life Normalised matrix values are derived by using the formula (2).

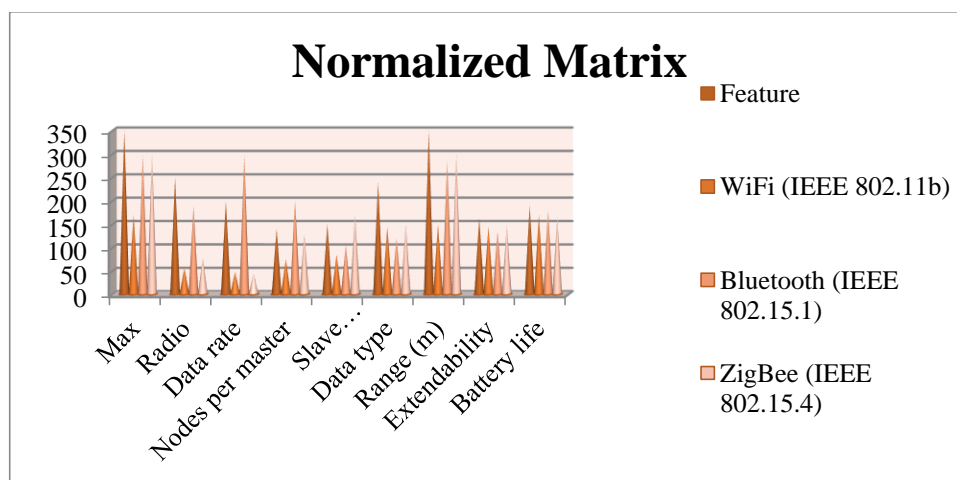


FIGURE 3. Normalised matrix

Figure 3 shows the Normalised matrix for Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4).Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life Normalised matrix values.

$$X_{wnormal1} = X_{n1} \times w_1 \quad (3)$$

TABLE 4. Weighted Normalized Matrix

	0.25	0.25	0.25	0.25
Weighted Normalized Matrix				
Feature	WiFi (IEEE 802.11b)	Bluetooth (IEEE 802.15.1)	ZigBee (IEEE 802.15.4)	
Max	0.04304	0.040709	0.040907	0.050539
Radio	0.030743	0.01341	0.026119	0.01314
Data rate	0.024594	0.011494	0.040907	0.007581
Nodes per master	0.017216	0.01796	0.027916	0.021732
Slave enumeration latency	0.018446	0.020354	0.014511	0.028639
Data type	0.029513	0.034722	0.016584	0.02527
Range (m)	0.04304	0.03592	0.039386	0.050539
Extend ability	0.020044	0.034722	0.018795	0.024764
Battery life	0.023364	0.040709	0.024876	0.027796

Table 4 shows the weighed normalized matrix for Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4). Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life Weighted normalised matrix values are derived by using the formula (3).

$$S_i = \sum(X_1 + Y_1 \dots Z_n) \quad (4)$$

$$K_i = \frac{X_{wnor1}}{\sum(X_{wnor1} + X_{wnor2} \dots X_{wnorn})} \quad (5)$$

TABLE 5. Final Result

	Si	Ki	Rank
	0.175194	1	
Radio	0.083412	0.476113	7
Data rate	0.084576	0.482755	6
Nodes per master	0.084823	0.484168	5
Slave enumeration latency	0.08195	0.467764	8
Data type	0.106089	0.605548	3
Range (m)	0.168885	0.963986	1
Extend ability	0.098326	0.561237	4
Battery life	0.116745	0.666377	2

Table 5 shows the final result and rank of the Wireless sensors in agriculture and food industry in Additive Ratio Assessment method. And it shows the SI, KI, Rank. SI values are derived by using the formula(4), And KI values are derived by using the formula(5).

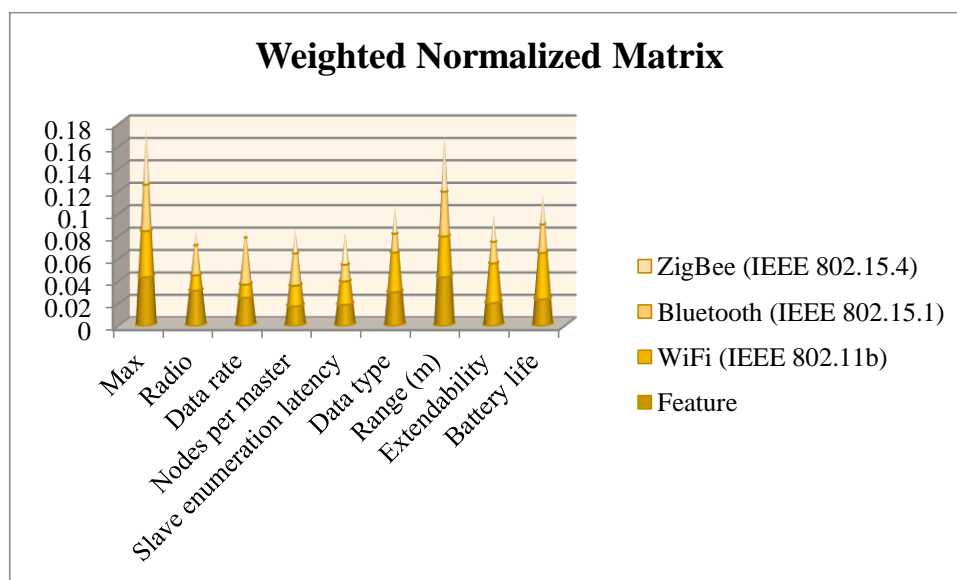


FIGURE 4. Weighted normalised matrix

Figure 4 shows the weighted normalised matrix weighed normalized matrix for Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4).Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life Weighted normalised matrix values weighted normalised data.

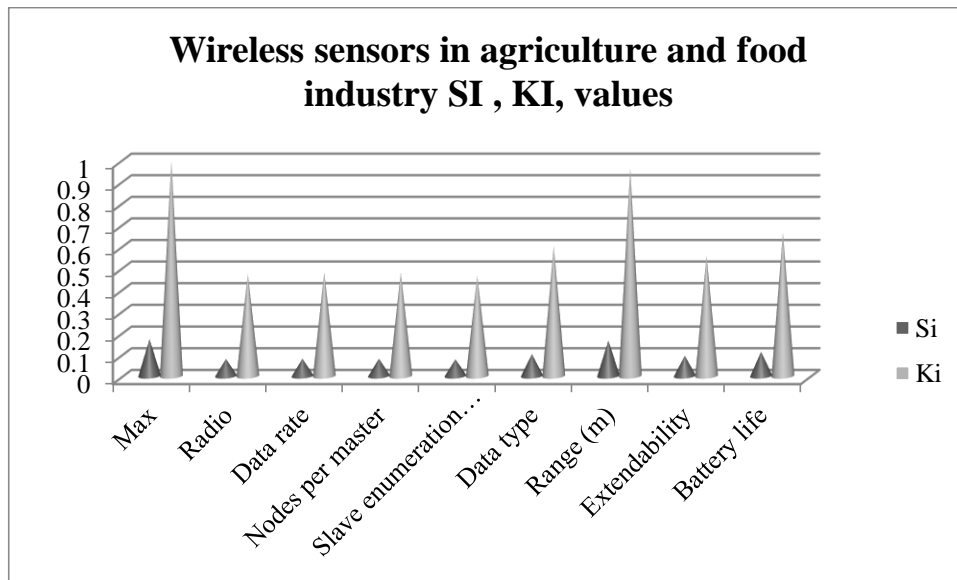


FIGURE 5. Wireless sensors in agriculture and food industry SI, KI, values

Figure 5 shows the weighted normalised matrix weighed normalized matrix for Wireless sensors in agriculture and food industry in Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), ZigBee (IEEE 802.15.4). Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life in Range (m) is showing the highest value for Si Value Slave enumeration latency is showing the lowest value. Range (m) is showing the highest value for Ki Value Slave enumeration latency is showing the lowest value.

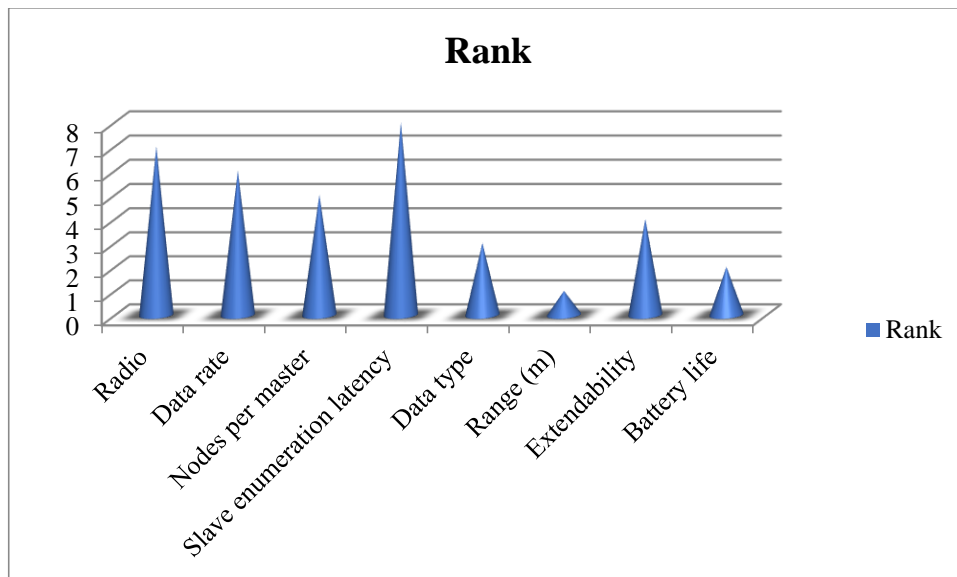


FIGURE 6. Shows the Rank

Figure 6 shows the Rank Wireless sensors in agriculture and food industry for Additive Ratio Assessment method. Range (m) is showing the highest value of rank whereas Slave enumeration latency is showing the lowest value.

### Conclusion

Agriculture for Wi-Fi sensors and Wireless sensors in the food industry. Three styles of networks: big name community, hybrid community, and mesh network, developed and standardized Bluetooth technology Star networks use, such as beacons and scatters are Each piconet is a primary node connects to seven slave nodes, whereas each Scatternet and more than one piconet Forms an ad-hoc network. Zigbee generation makes use of hybrid star networks, which use a couple of grasp Non-routing slave nodes Nodes with routing capabilities to connect. agricultural production and offer well-timed remarks to users.



Nowadays, wireless sensor networks (WSN) are broadly utilized in agricultural monitoring to improve the satisfaction and productivity of agriculture. Radio is spoken word through radio wave transmission, usually, with radio receivers The total number of nodes required for a cluster will vary depending on the organization's needs. However, as a basic and general guideline, any cluster that prioritizes availability should have at least a dozen worker nodes and two primary nodes. Because a dedicated master node fails and there is only one backup, the cluster lacks a quorum and cannot elect a new master. A census is a survey of every unit, everyone, or everything in the population. This is known as an absolute calculation, i.e. an absolute number. The central government conducts a population census every ten years. A record type, in programming, is any type of variable that contains the value and any kind of math, Specifies relational or logical functions. it could use without blunders. Most modern pc languages apprehend 5 basic kinds of data sorts: crucial, floating factor, character, character string, and composite kinds, with various particular subtypes defined inside each vast kind. Range later Confirmed: "We are O-Range Color Love it, but avoid all jokes We are officially called 'The Range' Called." The store set the record straight However, many shoppers find themselves unable to "see it "Couldn't", and now the range should be referred to as The Orange. Extensibility is a capability of a software system, which A major change in code or the basis of its capabilities without changes in structure Allows and accepts significant stretch is ability. Expandable systems technology, provide tools and languages, thus Developers can expand or add to their capabilities. Ask around and you'll get a variety of answers. Some cars will last five or six years out of battery, while others will need a new one after two years. Generally, your car will need a new battery after three to four years. An aspect is a distinctive characteristic or a special attraction. Aspect can also mean giving special attention to something. The word aspect has many other senses as a noun and a verb. The additive ratio assessment ARAS method for complex decision problems Tries to simplify and for alternatives that can reflect the difference between by the corresponding indicator (degree of use). Selects the "best" alternative. Radio, Data rate, Nodes per master, Slave enumeration latency, Data type, Range (m), Extend ability, Battery life. Feature, WiFi (IEEE 802.11b), Bluetooth (IEEE 802.15.1), and ZigBee (IEEE 802.15.4) Range (m) is showing the highest value of rank whereas Slave enumeration latency is showing the lowest value.

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