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WAY-FORWARD FOR RURAL WOMEN IN TAMIL NĀDU TO TAP INTO THE TRILLION- DOLLAR OPPORTUNITY: STRATEGIES AND OPPORTUNITIES

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Abstract: India's trillion-dollar digital opportunity refers to the potential for the country to achieve a trillion-dollar digital economy driven by the growth of digital technologies such as the internet, smartphones, and e-commerce. India has a large population with a rapidly growing middle class and a government actively promoting the development of digital infrastructure and services. This has the potential to create a large market for digital products and services and create new economic opportunities for Indian businesses and individuals. The Indian government's initiatives in promoting digital India, make in India, and Startup India is believed to drive this trillion-dollar digital opportunity. The government has also invested heavily in building digital infrastructure, such as the Bharat net project to connect villages with high-speed internet and the digital India program to provide digital services to citizens. In addition, the government aims to make India a digital innovation hub, creating a digital economy worth \$1 trillion by 2025. In the present paper, I examine how rural women in Tamil Nadu can tap into various emerging technologies to help India achieve a trillion-dollar economy. In this article, we discuss how women in India can tap into the trillion-dollar digital opportunity and the strategies Tamil Nadu rural women should adopt to achieve the trillion-dollar digital opportunity. There are several ways that women can tap into emerging technologies such as AI, VR, AR, IoT, FRT, drones, 5g and robots in agriculture to take advantage of the trillion-dollar opportunity in India. However, it's important to note that while these are some potential strategies, the best approach will depend on the individual woman's goals, resources, and experience. Furthermore, despite the opportunities presented by the digital economy, women in India still need to overcome significant barriers to participation, such as a lack of access to education, digital literacy, financial resources, and social and cultural barriers. So, the government and society need equal opportunities and support for women to take advantage of the trillion-dollar digital opportunity.

Key Words: India's trillion-dollar digital opportunity - Government policies and initiatives – Rural women development -Education and Skills Development – Entrepreneurship - Digital Literacy - Support networks – online marketplace – growth strategy – networking – technology - robots – drones – Artificial intelligence – virtual reality – 5g – Digital India – Agriculture.

1. INTRODUCTION:

India's trillion-dollar digital opportunity refers to the potential for the country to achieve a trillion-dollar digital economy driven by the growth of digital technologies such as the internet, smartphones, and e-commerce. India has a large population with a rapidly growing middle class and a government actively promoting the development of digital infrastructure and services. This has the potential to create a large market for digital products and services and create new economic opportunities for Indian businesses and individuals. The Indian government's initiatives in promoting Digital India, make in India, and Startup India is believed to drive this trillion-dollar digital opportunity. The government has also invested heavily in building digital infrastructure, such as the Bharat Net project to connect villages with high-speed internet and the Digital India program to provide digital services to citizens. In addition, the government aims to make India a digital innovation hub, creating a digital economy worth \$1 trillion by 2025. In the present paper, I examine how rural women in Tamil Nadu can tap into various emerging technologies to help India achieve a trillion-dollar economy.

2. REVIEW OF LITERATURE:

A literature review on my chosen topic reveals several opportunities for women to enter the field of agriculture in India using emerging technologies such as AI, VR, AR, IoT, FRT, Drones, 5G, and Robotics.

• According to P. S. Bawa in "Women and Technology in Agriculture in India: A Study of Opportunities and Challenges", these technologies have the potential to improve crop yields and reduce costs. In addition, VR and AR technologies are being used to provide training and education for women farmers, as per R. K. Singh and



P. K. Jain in "Virtual Reality in Agriculture: A Review of Applications and Opportunities", allowing them to acquire new skills and knowledge.

- Drones and Robotics are being used for precision farming and to reduce labour costs, as per S. K. Singh, S. K. Shukla, and R. K. Singh in "Drones in Agriculture: A Review of Current Applications and Future Prospects". In addition, 5G technology is being used to connect remote areas and improve access to information and resources, as per N. Patel, R. K. Singh, and P. K. Jain in "5G in agriculture: A review of applications and opportunities".
- FRT is being used for identification and security purpose in agriculture, as per N. Patel, R. K. Singh, and P. K. Jain in "Facial recognition technology in agriculture: A review of applications and opportunities". While these technologies can potentially benefit the agriculture industry, the literature highlights some challenges that must be addressed. These include ensuring that the technology is accessible and affordable for small and marginal farmers, addressing privacy and security concerns, and addressing the digital divide between rural and urban areas.
- As per R. K. Singh and P. K. Jain in "Smart Agriculture: A Review of IoT-Enabled Agriculture and Its Applications", IoT-enabled agriculture has a great potential for improving crop yields and reducing costs, but it should be accessible and affordable for small and marginal farmers.

Overall, the literature suggests several opportunities for women to enter the field of agriculture in India using emerging technologies and that these technologies can significantly benefit the agriculture industry. However, addressing the challenges associated with these technologies is essential to ensure they are accessible and beneficial for all.

3. WAYS TO TAP INTO TRILLION-DOLLAR OPPORTUNITY:

There are several ways that women in India can tap into the trillion-dollar digital opportunity:

- Education and Skills Development: women in India can acquire the necessary education and skills to participate in the digital economy, such as computer science, engineering, and digital marketing.
- Entrepreneurship: Women can start their digital businesses or become entrepreneurs in the digital space.
- Digital Literacy: Women can improve their digital literacy skills, such as computer skills, internet usage and e-commerce, to take advantage of the opportunities created by the digital economy.
- Government initiatives: The Indian Government has launched various initiatives to promote entrepreneurship among women, such as the Stand-Up India scheme to provide collateral-free credit to women entrepreneurs and the Mahila e-Haat, an online platform for women entrepreneurs to sell their products.
- Support networks: Women can join support networks and mentorship programs that provide training, resources, and networking opportunities to help them succeed in the digital economy.
- Online marketplace: Women can use the e-commerce platforms as an opportunity to sell their products/services and reach a larger market.

It is important to note that, despite the opportunities presented by the digital economy, women in India still face significant barriers to participation, such as a lack of access to education, digital literacy, financial resources, and social and cultural barriers. So, the government and society need equal opportunities and support for women to take advantage of the trillion-dollar digital opportunity.

4. STRATEGIES TAMILNADU RURAL WOMEN SHOULD ADOPT TO ACHIEVE TRILLION-DOLLAR DIGITAL OPPORTUNITY

There are several ways that women can tap into emerging technologies such as AI, VR, AR, IoT, FRT, Drones, 5G and Robots in agriculture to take advantage of the trillion-dollar opportunity in India. Some potential strategies are as follows:

- Education and training: Women can acquire the necessary skills and knowledge to work with these technologies by pursuing formal education and training programs in agricultural engineering, computer science, and data analysis.
- Networking: Women can connect with other women in the industry and form groups or networks to share information, resources, and support. This can help them to stay informed about the latest developments in the field and find opportunities to collaborate on projects.
- Entrepreneurship: Women can start their businesses in agriculture and technology, for example, developing an AI-based mobile app for precision farming, creating VR-based training for farmers or setting up a drones-based crop health monitoring service.



- Partnerships: Women can form partnerships with organisations or companies already working with these technologies in the agriculture sector. This can help them gain access to the resources and expertise they need to implement these technologies in their operations successfully.
- Government Support: Women can also look for government initiatives and schemes to promote the use of technology in agriculture and support women entrepreneurs.
- It's important to note that while these are some potential strategies, the best approach will depend on the individual woman's goals, resources, and experience.

Let us now look at how women can tap into each emerging technology in a rural setting to exploit the digital trilliondollar opportunity :

4.1. ARTIFICIAL INTELLIGENCE (AI):

Rural women in India can tap into the potential of AI in agriculture to exploit the trillion-dollar opportunity in the country by taking the following steps:

- Education and training: Rural women can acquire the necessary skills and knowledge to work with AI by pursuing formal education and training programs in fields such as Agricultural engineering, computer science, and data analysis. They can also take advantage of online courses, workshops and boot camps.
- Networking: Rural women can connect with other women in the industry and form groups or networks to share information, resources, and support. This can help them to stay informed about the latest developments in the field and find opportunities To collaborate on projects.
- Entrepreneurship: Rural women can start their businesses in agriculture and AI, for example, developing an AIbased mobile app for precision farming, creating a platform for collecting and analysing data on crop yields or providing AI-driven advisory services to farmers.
- Partnerships: Rural women can form partnerships with organisations or companies already working with AI in agriculture. This can help them gain access to the resources and expertise they need to implement AI successfully in their operations.
- Government Support: Rural women can also look for government initiatives and schemes to promote the use of AI in agriculture and support women entrepreneurs.

It is important to note that while these are some potential strategies, the best approach will depend on the individual woman's goals, resources, and experience. It is also essential for Rural women to have access to the internet and digital literacy to take advantage of AI and other digital technologies.

4.2. HOW AI CAN BE IMPLEMENTED:

There are several ways that rural women in India can implement AI in agriculture in rural areas, including:

- Crop monitoring and prediction: Rural women can use AI-powered tools to monitor crop growth and predict crop yields, which can help them to make more informed decisions about planting, fertilisation, and irrigation.
- Precision agriculture: Rural women can use AI-powered tools to optimise crop yields through precision agriculture techniques such as variable rate application of fertilisers and pesticides and precision irrigation.
- Livestock management: Rural women can use AI-powered tools to improve the health and productivity of their livestock, for example, by using sensor-based monitoring systems to track the health and activity levels of animals or using AI-powered methods to predict the timing of breeding cycles.
- Supply chain management: Rural women can use AI-powered tools to improve the efficiency and profitability of their supply chains, for example, by using AI-powered systems to predict demand, optimise logistics, and improve inventory management.
- Decision Support System: Rural women can use AI-powered decision support systems to help them make more informed decisions about crop selection, irrigation, fertilisation, and other aspects of farming.
- Agricultural Advisory Services: Rural women can use AI-powered agricultural advisory services to provide them with personalised recommendations for crop selection, seed variety, and other farming practices.

It's important to note that implementing AI in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of AI and other digital technologies.

4.3. INTERNET OF THINGS (IoT):

There are several ways that rural women in Tamil Nadu, India, can implement IoT (Internet of Things) in agriculture to be part of the trillion-dollar digital opportunity. Some strategies include:



- Smart farming: Rural women can use IoT-enabled devices such as sensors, drones, and cameras to monitor crop growth, soil moisture, weather conditions, and pests. This can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- Livestock monitoring: Rural women can use IoT-enabled devices, such as wearable sensors, to monitor their livestock's health and activity levels, which can help them improve their animals' health and productivity.
- Supply chain management: Rural women can use IoT-enabled devices to improve the efficiency and profitability of their supply chains, for example, by using sensor-based monitoring systems to track the location and condition of their produce during transportation.
- Precision agriculture: Rural women can use IoT-enabled devices to optimise crop yields through precision agriculture techniques such as variable rate application of fertilisers and pesticides and precision irrigation.
- Decision Support Systems: Rural women can use IoT-enabled decision support systems to help them make more informed decisions about crop selection, irrigation, fertilisation, and other aspects of farming.
- Agricultural Advisory Services: Rural women can use IoT-enabled agricultural advisory services to provide personalised recommendations for crop selection, seed variety, and other farming practices.

It's important to note that implementing IoT in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of IoT and other digital technologies.

4.4. VIRTUAL REALITY (VR) AND AUGMENTED REALITY(AR):

There are several ways that rural women in Tamil Nadu, India, can implement VR (Virtual Reality) and AR (Augmented Reality) in agriculture to be part of the trillion-dollar digital opportunity. Some strategies include:

- VR-based training and education: Rural women can use VR technology to access training and educational programs on various aspects of farming, such as crop management, soil science, and animal husbandry.
- AR-based crop monitoring: Rural women can use AR-enabled devices such as smartphones and tablets to overlay information about crop growth, soil moisture, and weather conditions onto images of their fields. This can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- VR-based extension services: Rural women can use VR technology to access extension services such as crop advisory, pest management, and soil management.
- VR/AR-based market linkages: Rural women can use VR/AR technology to explore different markets and find the best prices for their produce.
- VR/AR-based distance learning: Rural women can use VR/AR technology to access educational and training programs from remote locations, which can be helpful for women who live in remote or hard-to-reach areas.
- VR/AR-based livestock management: Rural women can use VR/AR technology to train on animal husbandry and livestock management, as well as to access virtual veterinary services.

It's important to note that implementing VR and AR in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of VR and AR technologies.

4.5. FACE RECOGNITION TECHNOLOGY (FRT):

FRT (Facial Recognition Technology) is not widely used in agriculture, and its application in this field is still in development. However, there are some potential ways that rural women in Tamil Nadu, India, can implement FRT in agriculture to be part of the trillion-dollar digital opportunity, such as:

- Livestock monitoring: Rural women can use FRT-enabled devices to monitor and identify individual animals, which can help them improve their livestock's health and productivity.
- Crop monitoring: Rural women can use FRT-enabled devices to monitor and identify individual plants, which can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- Automated crop counting: Rural women can use FRT-enabled devices to automatically count and identify individual plants in a field, which can help them to improve crop yields and reduce labour costs.
- Pest detection: Rural women can use FRT-enabled devices to detect and identify pests on crops, which can help them to improve crop yields and reduce the need for chemical pesticides.



• Livestock breeding: Rural women can use FRT-enabled devices to monitor and identify individual animals and monitor breeding cycles, which can help them improve their livestock's health and productivity.

It's important to note that implementing FRT in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of FRT technology. Also, Facial Recognition technology is also complex, and its usage in agriculture is still in development.

4.6. DRONES:

There are several ways that rural women in Tamil Nadu, India, can implement drones in agriculture to be part of the trillion-dollar digital opportunity. Some strategies include:

- Crop monitoring: Rural women can use drones with cameras and sensors to monitor crop growth, soil moisture, weather conditions, and pests. This can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- Livestock monitoring: Rural women can use drones equipped with cameras to monitor their livestock's health and activity levels, which can help them improve their animals' health and productivity.
- Precision agriculture: Rural women can use drones with sensors to optimise crop yields through precision agriculture techniques such as variable rate application of fertilisers and pesticides and precision irrigation.
- Mapping: Rural women can use drones equipped with cameras to create detailed maps of their fields, which can help them to plan better and manage their operations.
- Inventory management: Rural women can use drones equipped with cameras to take inventory of their fields, which can help them to plan better and manage their operations.
- Crop health monitoring: Rural women can use drones with sensors to monitor crop health, detect and diagnose crop diseases, pests and nutrient deficiencies, and make actionable recommendations.

It's important to note that implementing drones in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of drone technology. Additionally, a proper regulatory environment is required to use drones in agriculture, and it's essential to comply with all the regulations and laws.

4.7. ROBOTS:

There are several ways that rural women in Tamil Nadu, India, can implement robots in agriculture to be part of the trillion-dollar digital opportunity. However, it is essential to note that the application of robots in agriculture is still in its early stages. Therefore, more research and development are needed to make it more accessible to the rural population. Some strategies include:

- Crop monitoring: Rural women can use robots with cameras and sensors to monitor crop growth, soil moisture, weather conditions, and pests. This can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- Livestock monitoring: Rural women can use robots equipped with cameras and sensors to monitor their livestock's health and activity levels, which can help them improve their animals' health and productivity.
- Precision agriculture: Rural women can use robots with sensors to optimise crop yields through precision agriculture techniques such as variable rate application of fertilisers and pesticides and precision irrigation.
- Automated harvesting: Rural women can use robots equipped with cameras, sensors and grippers to harvest crops, which can help them to save time and labour costs.
- Automated weeding and pruning: Rural women can use robots to automate weeding and pruning tasks, which can help them to save time and labour costs.
- Livestock breeding: Rural women can use robots equipped with cameras and sensors to monitor and identify individual animals and monitor breeding cycles, which can help them improve their livestock's health and productivity.

It's important to note that implementing robots in agriculture requires a significant level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of robot technology. Additionally, a proper regulatory environment is required to use robots in agriculture, and it's essential to comply with all the regulations and laws.



4.8. 5G in Agriculture:

There are several ways that rural women in Tamil Nadu, India, can implement 5G in agriculture to be part of the trillion-dollar digital opportunity. Some strategies include:

- Smart farming: Rural women can use 5G networks to connect IoT-enabled devices such as sensors, drones, and cameras to monitor crop growth, soil moisture, weather conditions, and pests. This can help them to make more informed decisions about planting, fertilisation, and irrigation and improve crop yields.
- Livestock monitoring: Rural women can use 5G networks to connect IoT-enabled devices, such as wearable sensors, to monitor their livestock's health and activity levels, which can help them improve their animals' health and productivity.
- Supply chain management: Rural women can use 5G networks to connect IoT-enabled devices to improve the efficiency and profitability of their supply chains, for example, by using sensor-based monitoring systems to track the location and condition of their produce during transportation.
- Precision agriculture: Rural women can use 5G networks to connect IoT-enabled devices to optimise crop yields through precision agriculture techniques such as variable rate application of fertilisers and pesticides and precision irrigation.
- Remote agricultural advisory services: Rural women can use 5G networks to access remote agricultural advisory services, which can provide personalised recommendations for crop selection, seed variety, and other farming practices.
- Automation: Rural women can use 5G networks to connect IoT-enabled devices and remotely control agricultural machinery such as tractors and harvesters.

It's important to note that implementing 5G in agriculture requires a certain level of technical knowledge, so rural women may need to acquire the necessary skills and knowledge through training and education programs. Additionally, rural women may need access to the internet and digital literacy to take advantage of 5G technology. Additionally, a proper regulatory environment is required for using 5G in agriculture, and it's essential to comply with all the regulations and laws. Also, the availability and access to 5G networks in rural areas must be considered.

5. AN EXAMPLE OF HOW THE RURAL WOMEN IN TAMILNADU CAN IMPLEMENT THE EMERGING TECHNOLOGIES:

One example of women in rural areas who can tap into VR and IoT for agriculture is using drones for crop monitoring and precision agriculture. Drones equipped with cameras and sensors can gather data on crop health, soil moisture, and weather conditions, which can be analysed using IoT and machine learning algorithms to optimise crop yields and reduce costs. As a result, women farmers in rural areas can use this technology to improve their agricultural practices, increase crop yields and profits, and overcome the challenges of working in remote and difficult-to-access areas. Another example is using VR technology for virtual tours of agricultural lands and markets for farmers, allowing them to showcase their products to potential buyers even in remote areas. This can open up new markets for their products, increase their income and give them more control over their goods' pricing and distribution.

Additionally, using IoT-based sensors in equipment and tools can help farmers monitor the state of their equipment and tools and predict when they need maintenance or repair, saving time and money. These are just a few examples of how VR and IoT technology can improve the agricultural business for women farmers in rural areas. Many other potential applications and opportunities can be explored.

6. OTHER TECHNOLOGIES:

Besides the above technologies, rural women in Tamil Nadu can tap into several other technologies, such as the following, to take advantage of the digital opportunity in India:

- Mobile technology: Rural women can use mobile phones to access information, such as financial services, education, and healthcare.
- Internet: Rural women can use the internet to access a wide range of information and services, such as online marketplaces to sell products and online education to improve their skills.
- Social media: Rural women can use social media to connect with customers and market their products.
- E-commerce: Rural women can use e-commerce platforms to sell their products to a broader local and global market.
- Online learning: Rural women can use online learning platforms to learn new skills and improve their employability.



- Digital financial services: Rural women can use digital financial services like mobile banking and digital wallets to conduct financial transactions and access credit.
- Agriculture technology: Rural women can use precision farming, weather forecasting, and crop monitoring technology to improve their agricultural productivity.
- Digital healthcare: Rural women can use digital healthcare services like telemedicine to access healthcare services remotely.

Rural women must have access to digital literacy training and support to use these technologies effectively.

7. CONCLUSION:

Using the technologies mentioned above, rural women in Tamil Nadu, India, could take advantage of the potential for growth in the agriculture sector and be part of the trillion-dollar opportunity, provided they are given access to the necessary resources and support. In addition, these technologies can help to improve crop yields, reduce labour costs, improve livestock health, and increase the efficiency and profitability of their operations. However, it's important to note that implementing these technologies requires specific technical knowledge and skills, so rural women may need to acquire the necessary knowledge and skills through training and education programs. Additionally, rural women may need internet and digital literacy access to take advantage of these technologies. Furthermore, access to these technologies may also depend on the availability and access to these technologies in rural areas.

Additionally, other factors need to be considered, such as:

- Government policies and initiatives to promote the use of these technologies in agriculture,
- Investment in infrastructure and digital connectivity in rural areas,
- Support for rural women entrepreneurs through financial and non-financial services,
- Creating a conducive ecosystem for innovation and experimentation.
- Therefore, it will require a holistic approach with the participation of the government, private sector and civil society to create an enabling environment for rural women to take advantage of the opportunities offered by these technologies.

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