THE TRANSFORMATION OF THE AGRICULTURE SECTOR AND LABOUR MARKET DUE TO THE FOURTH INDUSTRIAL REVOLUTION (4.0)

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ABSTRACT

The Fourth Industrial Revolution (4th IR) shall see the merging of artificial intelligence as well as information technology like a new solution to respond to the industrial and social issues around the world, by combining cyber and physical disciplines. The 4th IR will be sending a domino effect of far- and wide-reaching consequences all over the labour-intensive field of agriculture. Explaining the Indian Agricultural Industrialization method, as well as taking a case survey, the following article seeks at defining the manner in which the changes in the Agri-labour market can be gradually explained and examined. The aim of the following article is to evaluate the effect of the implementation Industry 4.0 on Agri-labour market throughout the industry. The article concentrates on the evaluation of expected effects in areas such as Agricultural Industrialization, labour market as well as labour efficiency. Merging artificial intelligence as well as big data will develop into a high-tech industry which operates on its own. Such technologies enable precision agriculture, like the yield monitoring, assessing soil moisture, identifying insect pests, detecting harvest time, and monitoring crop health condition. Particularly, the Internet of things (IoT) will determine the temperature, humidity, and quantity of sunlight in production farms, which is making it possible for remote control through mobile devices. It will not only improve the production of the farms but then also increase their value. This paper sums up several important features of the 4th IR as well as the history that led to the 4th IR. The research examines its effect on the Indian Agriculture production system as well as the labour market.

INTRODUCTION

Agriculture plays a key role in our country economy as well as the everyday lives of the vast majority of rural Indians. Agricultural advancement has been acclaimed as one of the essential tools that could be used for putting an end to extreme poverty, therefore enhancing common prosperity, and feeding an estimated world-wide population of 9.7 billion people by 2050. The possibilities for economic growth this sector create in accordance with the conditions of increasing incomes amongst the world's poorest population will not come without a cost. Modern-day agriculture is solely responsible for a huge share of environmental destruction, which leads to the decline of continental and marine ecosystems, diminishing water resources, as well as driving climate change. Unless India is to reduce these roadblocks, its agriculture will need to be modernized via the contribution of technologies that fall under the Fourth Industrial Revolution (4IR).

The term 4IR comprises a variety of innovative, developing, and breakthrough technologies such as Big Data, the (IoT), (AI), Blockchain, and Drones, to mention a few. It also makes provision for revolutionary techniques of organization, distribution, and production that is based upon digital transformation as well as automatization which can wipe boundaries between physical objects, transforming them into an all-encompassing, sophisticated system of interrelated and interdependent components. Consequently, such technologies have the possibility to have a positive effect on the efficiency and profitability of the agricultural sector as well as the creation of new-found locally based added value, particularly in India. The Fourth IR is built on the Digital Revolution, which represents new methods wherein technology develops embedded in societies as well as the human body. The Fourth IR has been marked by emerging technology advances in a wide range of fields, involving robotics, nanotechnology, artificial intelligence, biotechnology, quantum computing, 3D printing, The Internet of Things, and autonomous vehicles. The fourth IR is taking place in Infront of our eyes. For India, the Fourth IR creates enormous opportunities to overtake several stages of growth, accelerating its journey on its way to becoming a developed economy. In many different ways, the Fourth IR is a leveler. Technologies that are currently being used in India shall be the same as those in use in developed countries. Robots, IoT, AI, are all technologies transforming the Agriculture industry in the industrialized world and are prepared to do the same in India.

In this context, the paper has attempted to discuss the fourth Industrial Revolution as well as its effect on the Indian Agricultural sector as well as the Agri labour market. One thing that is very clear is that the Industry 4.0 revolution will be extremely technology intensive.

OBJECTIVES OF THE STUDY:

The primary objective of the paper is to talk about the anticipated changes in the Agriculture Industries, Agri-labour market, productivity as well as the less skilled and marginalized labour caused by the 4th Industrial Revolution. The paper has also attempted to discuss the challenges of the Agriculture sector as well as active labour market policy and social protection, and adopting the 4th IR and how to train engineers and unskilled labourers to deal with the emerging skill needs of 4th IR.

METHODOLOGY:

This research primarily uses secondary data. The relevant sources of the information collected are being published and not published sources such as books, magazines, journals, reports, publications, unpublished doctoral dissertations, and the website of numerous online journals, etc.

HISTORY OF INDUSTRIAL REVOLUTION

Prior industrial revolutions have already been characterized by the implementation of different techniques for production. The World's First Industrial Revolution utilized water as well as steam power to mechanize production. The World's Second Industrial Revolution used electric power to create mass production. The World's Third Industrial Revolution used Information technology and Electronics to Automate production. The World's Fourth Industrial Revolution is building up at the third revolution along with a digital revolution that is taking place ever since the middle of the last century. It is described by a combination of technology that is blurring the boundaries between the physical, digital, as well as biological spheres. In its wide definition., 4.0 IR is characterized by swift technological advancement by increasing the use of mobile communications as well as interconnections Internet of Things, Artificial Intelligence, Robotics, Big data, Autonomous vehicles, Nano Technologies, 3D printing, Quantum Computing, and Biotechnology, etc.
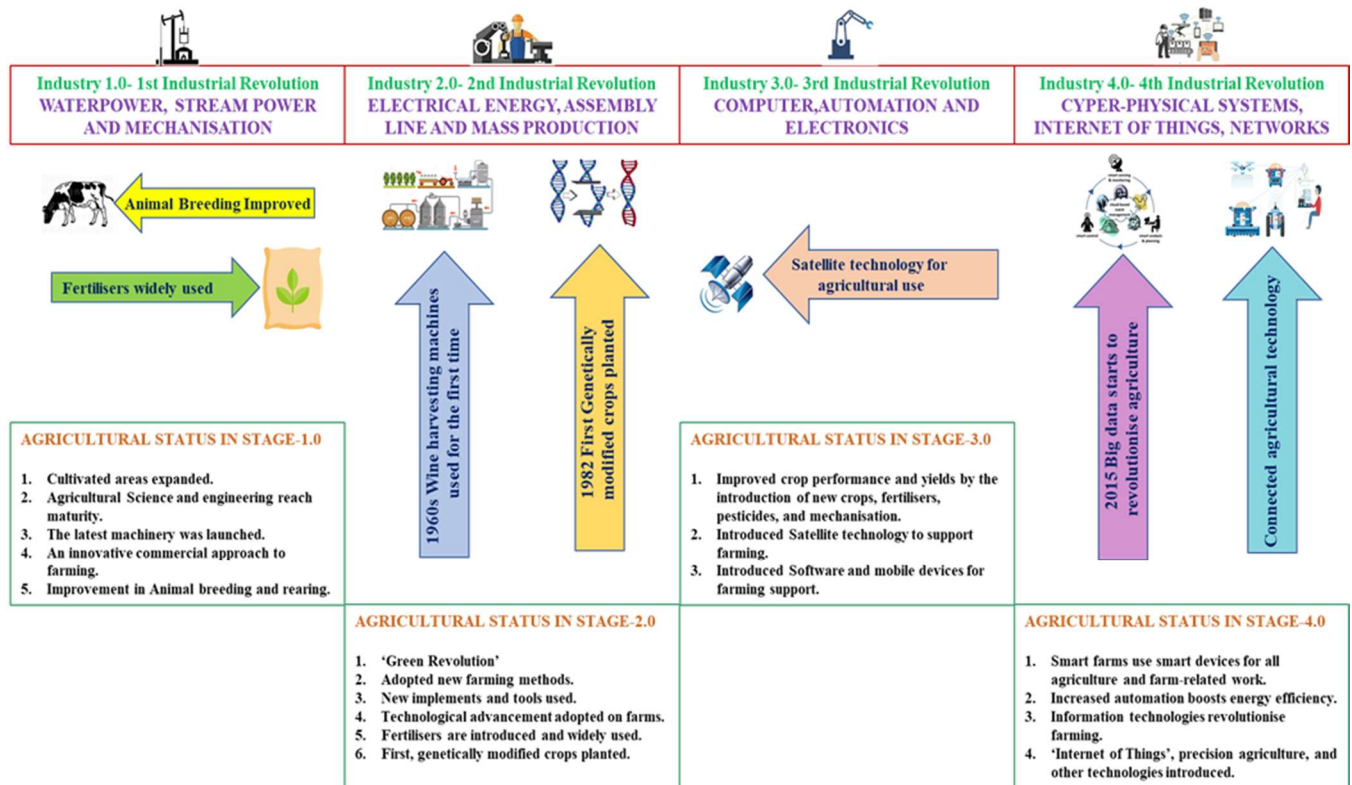
INDUSTRIAL REVOLUTIONS FROM 1.0 TO 4.0

Figure 1: Industrial Revolutions from the 1.0 to 4.0

THE FUTURE OF AGRICULTURE IN THE 4th INDUSTRIAL REVOLUTION

Industrial Revolution 4.0 agriculture technologies seem to come straight out of science fiction. Already few companies are developing a swarm of small self-sufficient robots that can plant seeds. Operated by a farmer's handheld tablet, which has been operating with the support of satellites as well as the cloud-based software, the swarm will have the ability to place each seed in the right spot with more accuracy than current methods can. Technology is going to reduce the need for tractors, planter bars, as well as the tractor operators. Due to the fact that the swarm may adjust the seed locations for altering conditions, it will boost the yield, by lower costs, quicker planting speeds, as well as a reduced effect on the environment. Thus, many new technologies, products, as well as services are showing that the whole sector is soon-to-be unrecognizable to the

participants of a generation before. To be prepared for this future, agricultural firms should take the right steps now.

ADVANTAGE OF 4th INDUSTRIAL REVOLUTION IN PRECISION FARMING

Precision farming that uses, high-resolution 3D aerial imagery from drones, Internet of Things (IoT) sensors, and AI-powered analysis tools to assess the characteristics of soil and the conduct of crops down to a square inch might soon. substantially decrease the need for fertilizers as well as pesticides completely.

EMERGING CONCEPTS OF PRECISION AGRICULTURE

Emerging concepts such as precision agriculture, that involves the use of drones, robotics, sensors, as well as biological inputs, biological data, farm management software, gene editing, and cloning, artificial intelligence, 3D printing, machine learning, and blockchain may lead not just to a more effective agricultural system, but also to one that reduces the waste while at the same time being more economically and ecologically feasible.

Generally well-defined as creating the methods of agriculture to be more precise across all areas, precision agriculture, which combines data and analytics along with crop science to allow scientific agriculture decisions, is becoming more and more common around the globe. Leveraging technologies like GPS, weather data, soil sensors, as well as IoT used for decisions related to fertilizer application, harvesting time and seed spacing, irrigation, precision farming leads significant yield gains at the same time improving resource utilization in order to identify precise applications of agricultural inputs. The precision farming marketplace, which is anticipated to reach more than $10 billion US dollars in the year 2025 the same time a utilizing new method, includes popular emerging technologies such as:

Robotics: Robots can take out everything from nursery replanting as well as crop seeding to autonomous tractors which have the ability to identify and calculate the required application doses for specific fields in need of agricultural inputs. Robotics will not only allow data production but at the same time prevent crop loss, optimize efficiency, monitor ecosystems, and avoid pollution.

Hydroponics: The understanding that nutritious water alone may be used to grow plants in a soil-less medium-or water environment has resulted in new techniques of growing food in the indoor environment.

Vertical farming: This practice of producing foods in the vertically loaded layers by the use of hydroponics, enables the growth of certain plants within the facilities without requiring the use of chemicals. Such facilities could also be monitored completely by robots.

Bio-Farming: A biological method to farming has been based on assessing the microbial life into the soil and then again implementing the microbes, nutrients, and fertilizer tea, which the soil needs to recover its balance. This can be achieved by using only chemical-free, organics inputs, and natural, as well as for preventing monoculture on agricultural land.

THE USE OF NEW EMERGING AND BREAKTHROUGH TECHNOLOGIES OF 4IR IN AGRICULTURAL SECTOR

The 4IR comprises a wide variety of innovative, developing and breakthrough technologies such as a)Artificial Intelligence (AI) b)the Internet of Things (IoT) c)Big Data, d) Blockchain, e)and Drones to name a few.

Example of IoT, AI and Big Data applications that run on farms are already available as well as have been set to convert the agriculture by enabling intelligent and precise agriculture, which produces higher productivity and profitability. IoT tools gather data that can assist farmers effectively manage their farm's field sensors that are linked to the IoT will be able to record information regarding soil humidity and nutritious levels, which will lead to improvements in water consumption beginning with effective irrigation systems, determine custom fertilizer mixtures based upon the soil profiles as well as determine the best time to plant and harvest. Moreover, IoT sensors will be able to eliminate the requirement for manual surveillance in greenhouses as the fully controlled atmosphere could be adjusted to alter temperature, moisture, light levels and to carry out automatic irrigation. IoT applications may also be used to monitor the condition, procreative cycle, and place of livestock.

Similarly, Big Data as well as AI may be able to help farmers get access to complicated information that could advise farming choices. AI raises the value of collected data by examining and transforming it into information in order to support farm administration decision making. It can be implemented at a variety of sizes ranging from converting data gathered on specific animals and plants in accordance with the level of the whole farm by providing information for crop planning and tracking. Big Data as well as AI offer agriculture increased allotment and procreation costs through focus on distribution of inputs such as fertilizers and chemical applications.

Blockchain, on the other part, can enhance tracing, increase producers' profits and safeguard agreements and transactions in agriculture. It also has the ability to create economic incentives for environmentally and economically advantageous production methods. In the instance of establishing improved transparency in the agricultural distribution chains, a Blockchain can assist in providing an absolute record (traceability) from within the origin to the retail outlet of a product. Moreover, Blockchain can assist increase profits of makers in agriculture by offering improved monitoring of their stockpiles and streamlining their food value chain, which leads to more revenue for the farmers. A Blockchain through design in cryptographically is safe and can assist secure agreements and transactions, specifically in land registering and agricultural insurance.

Drone technology supports several key applications for agricultural purposes, for example, the crop scouting and surveillance, crop quantity and vigor assessments, precision spraying, inspection, crop inventory, of farm infrastructure, creation of prescription maps, high-level resolution mapping and analyzing of specific fields, crop damage evaluation and the insurance claim forensic evidence. Through scanning a crop utilizing both visible and close to infrared light, drone-carried devices might determine which plants reflect the different quantities of green light as well as the near-infrared light. Such information may create multispectral images that track the changes in plants and specify their health. Farmers could consequently examine crops for disease, as well as in the event of destructive weather incidents, document losses more effectively and efficiently for insurance claims. Drones may also be used to track livestock remotely and potentially enhance profits through an appropriate time monitoring, denying the need for physical checks.

THE AGRICULTURAL SEGMENT HAS PROVEN TO BE SLOW TO EXECUTE AND TO TAKE ADVANTAGE

In comparison with other industries, the agriculture sector has been to be slow to deploy and take advantage of a wide range of technologies that are driving the Fourth Industrial Revolution. Divided rural markets, weak infrastructure, and heavy regulatory burdens have been raised expenses for food systems, at the same time that income has been limited by the market dynamics and the growing difference between commercial agriculture and little farm landlords.

MAXIMIZING THE USAGE OF 4th IR IN AGRICULTURE SECTOR OF INDIA

Agriculture sector: Technological innovation has been utilized in several ways in the agricultural sector in developed countries by increasing the use of technology and mechanization in production to improve agricultural productivity direct input or by the use of ICT as a means to empower agricultural producers to make informed decisions indirect involvement. Particular examples of using ICT involve the use of smartphone mobile apps in the agricultural sector, the usage of Geographic Information Systems (GIS) for agriculture and fisheries or satellite technologies as well as other agronomy sciences. that an increase in substantial agriculture and fishing outputs. Customers and producers are also more and more aware and mindful of environmental issues, fair trading, and the significance of agricultural biological products along with their particular characteristics such as opposed to chemical products as well as mass production. The usage of ICT in order to encourage these biological as well as organic products is frequently used for the sale and promotes a high-quality product together with a wide variety of approaches including the packaging, sizing, and prices.

IMPACT OF INDUSTRY REVOLUTION 4 INTEGRATION ON THE AGRICULTURAL LABOUR MARKET.

Industry 4.0 offers businesses huge innovative opportunities, innovative Agricultural production materials, new agricultural processes, new production methods as well as improved efficiencies. Transformation is not going to happen instantly but gradually. The consequences of Industry 4.0 on the Agricultural labour market is going to be very inconsistent. Hence, the effects of the Industrial Revolution 4.0 will at first be steady but rise rapidly as an increased awareness of the

advantages and market forces bring hold. Industry 4.0 has been set to affect all interested parties in the agricultural and Agri-manufacturing industry, involving the size, structure, and location of the workforce. alterations in production will be accompanied by modifications to the agricultural labour market. Currently, we are discussing overall trends in the labour market within the framework of Industry 4.0. The requirement for low-qualified workers reduces. The effect of automation will inevitably lead to a decrease in low-skilled positions, especially with regard to Agri-manufacturing. The requirement for an upskilled workforce (software engineering, highly skilled creative workforce) rise.

Automation, as well as robotization, will decrease middle-level management (replaced by management software). There Is an Increase in a wide range of occupational fields and especially in the service professions, most considerably in the ICT as well as scientific professions. New employment opportunities will be generated by Industry 4.0. This is going to provoke powerful demand for creating new occupations that combine mechanical engineering with the knowledge of cybernetics, electronics, as well as informatics.

Integration Industry 4.0 result in changes in the structure labour force between different sectors. We are able to anticipate a decline in the labour force in the production area and a rise in the labour force in services. The conventional establishment of work will convert in accordance with the impact of new processes which are more interlinked and continuous from a rigorous division between professions. It is obvious that the character of jobs will shift in the future, as will the total number of employment opportunities as well as their structure.

THE PRIORITY AREAS OF ACTION FOR INDIAN LABOUR MARKET TO ADOPT THE 4th IR.

The 4th IR is at this juncture can not be avoided, however, the extent to which it enters various sectors of the economy differs. At the Same Time, the effects on the jobs are hard to foresee, certain components are crucial to carefully handle the whole process of transformation. By doing this, obstacles to occupational, geographic location, and sector-specific mobility must be removed.

SKILL LADDER TO BE IMPROVED

Gaining the appropriate skills to enhance the capacity to adapt to the necessity of the labour market and propel the whole process of technological development ahead is crucial.

A mixture of equally technical skills (such as STEM) You may be aware that STEM is an abbreviation for Science, Technology, Engineering, and Mathematics. And core skills (critical thinking, creativity, teamwork, communication, etc.) are required to best equip the workforce and promote strength to the growing labour markets. Training, versatility, reskilling, lifelong education, and training throughout the entire life cycle are all important in and out of employment. Education as well as training systems should be prepared to build skills towards the future. In a specific, collaboration between policymakers, business, and training providers are needed in order to guarantee adequate supply with demand in the job market.

SECTORAL APPROACH TO EMPLOYMENT CREATION INCLUDING INDUSTRIAL POLICIES

As India will be more and more testimony to the impact of technological transformation in the working environment, the consequences will differ significantly between sectors. An efficient strategy for development calls for growing sectors that generate more value-added as well as employment, with huge multiplier impacts and upstream as well as downstream connections to the domestic economy. The significance of industrial as well as other sector-specific strategies for structural changes might be reaffirmed in light of the national, regional, as well as global developments. The all-new economic expansion model would have to be, in order for it to be comprehensive and sustainable, built across higher technological value-added as well as productive sectors that foster quality employment as well as other qualitative dimensions of the national economy.

THE SIGNIFICANCE OF LABOUR MARKET GOVERNANCE

India can progressively participate in global markets based on higher productivity and improved working conditions. Although transforming the increase in productivity transformed in improved wages and better living standards requires effective labor market societies, which contain the following efficient legal protection of workers' constitutional rights in various forms of employment, Represent of worker's voice, as well as collective negotiations. Efficient industrial

relationships are key for achieving stability, efficiency, and fairness, which will guarantee sustainable and inclusive growth.

ACTIVE LABOUR MARKET POLICY AND SOCIAL PROTECTION

Through faster changes under IR4.0, labourers who are more often shifting from one job to another will have to be encouraged. Efficient functioning labour market policies which assist to link individuals with jobs are essential to continually help labourers to build new skills ensure a seamless transition from present job to the other offer skill training as well as unemployment benefits throughout the differences between the jobs. Only with appropriate social protection, comprising unemployment insurance, labourers can transition from lower to higher efficiency sectors as well as jobs shall be enabled.

THE 4IR CHALLENGES AND OPPORTUNITIES IN LABOUR SECTOR

The 4IR has the possibility to increase global revenue levels and enhance the quality of life for people across the globe. Up to this point, the people who have earned the greatest benefit from it have been customers able to pay for and gain access to the digital environment technology has made it possible for new products and services which enhance the efficiency and satisfaction of our private lives. In the near future, technological innovation will also result in a delivery-side phenomenon, with long-term improvements in effectiveness and productivity. Transport and communications expenses will decrease, logistics services and worldwide supply chains will become increasingly effective, and the expense of trade will lessen, all of that will open up new markets as well as stimulate economic growth.

Moreover, the revolution might yield greater disparity. especially in its possibility to interrupt labor markets. As automation replacements for labor across the economy as a whole, the combined net displacement of labourers by means of machines could worsen the divide between returns to capital and then returns to labor. Furthermore, it is also likely that the movement of workers by way of technology will, through aggregate, result in net growth in secure and rewarding job opportunities. Technology is thus one of the major reasons why incomes get deteriorated, or perhaps even decreased, for the vast majority of people in high-income countries: the increasing demand for highly qualified workers has risen at the same time as the demand for employees with

less education as well as lower skills has diminished. The outcome is a job market with a powerful demand on the high and low ends, although a hollowing out of the middle.

INDUSTRY 4.0 LIST OF OCCUPATIONS MOST LIKELY IMPACTED

Industry 4.0 has an impact on almost every industry. An economist estimates that 50 percent of positions are at risk of automation. However, a few businesses may be more automated than robots such as human employees, and there is a certain set of expertise. In the very near future, we expect to see a decrease in the number of full-time employees in manufacturing and agricultural positions, so many of those positions have already been gradually eliminated due to increased automation. Robots are able to handle tasks within the factory more safely and efficiently. On top of the list are the industries that are most vulnerable within the food cooking, cleaning sector, drivers, construction sector, and agricultural sectors. In addition to manufacturing roles, the automated system can also affect Postal, export, product delivery, as well as courier services and customer service industry jobs.

THE IMPACTS OF 4th IR ON THE ECONOMY OF INDIA

The transformation of the whole systems of production, governance, as well as management the 4th IR provides a broad range of the challenges and opportunities in the job, along with both direct and indirect effects on sectors throughout the economy of agriculture, industry, and services and types of workers among them the most vulnerable categories youth, and women, etc. Technological innovations may be supported by the structural change of the country's economy. Move away from farming to the manufacturing as well as services sectors by helping to promote the labour movement of workers in all sectors and occupations and or improving work by boosting up workers from heavy duties.

SUGGESTIONS

Considering the above we suggest how to solve the impact of 4IR digitalization of Agriculture labourers.

- The government should conduct an impact analysis of IR 4.0 digitalisation and its effect on Agriculture labourers. New technologies should be registered, and especially damaging technology prohibited. The government should put into effect programs that will re-educate farmworkers, who should learn to use digital technology and empower themselves for beneficial employment.

- Associations must adapt to the evolving system. Labor unions have a duty to arrange for rural communities, do research, and teach society regarding 4IR and keep the government accountable for any and all activities harmful to the working class. Wide alliances between trade unions, rural groups, and progressive NGOs are required.

- Unions will no longer be able to afford to overlook the informal labour force. They constitute an unreliable source of subscriptions as well as a support base, although this change is essential in order to adapt to the evolving capitalist landscape as well as make progress towards the long-term sustainability of the trade union.

CONCLUSION:

The Fourth Industrial Revolution alters the present Agri-labour market. Industry 4.0 will enhance labour efficiency, although at the same time there are going to be significant job market changes, particularly jobs with fewer skilled labourers will be in danger. Industry 4.0 is going to bring new jobs through elevated skill prerequisites, particularly in the area of digital as well as information technology. Incorporating Industry 4.0 for Agriculture and related businesses can involve improving their manufacturing efficiency, decreasing raw material and energy costs, as well as reducing transportation costs. Firms that have an established digital and online environment are more ready for the introduction of Industry 4.0. Incorporation of Industry 4.0 will inevitably lead to an increase in labour efficiency and Agricultural business accomplishment. Moreover, we will not be able to eliminate the influence of the contradiction of effectiveness in the long term if not the prospects of labour productivity increase are exaggerated.

The Fourth IR offers opportunities for India to put into place methods that will enable for the suitable agricultural answers to the revolution, consistent with global replies in this space. This can be accomplished by employing a systematic approach to comprehend the current global trends and value-chain structures and the establishment of an environment that is conducive to efficient agricultural systems. Furthermore, the fourth IR might yield more inequality, especially in its possibility to interrupt labor markets. As automation replaces labour throughout the entire economy, the combined net displacement of labourers by machines could worsen the difference between returns to the capital as well as returns to labor. Moreover, it is also probable that the displacement of workers by way of technology is going to, in total, affect in a net increase in secure and fulfilling jobs. The Fourth IR technology offers an opportunity to enhance agricultural competitiveness as well as a chance to defeat the structural deficiencies of our existing agricultural system as well as the limits of intensive farming. There are a few steps that we need to take to lead the change. We have to analyze the effect of the 4th IR on our agricultural environment. It is imperative to examine the impacts on every front of agriculture, the impacts on rural as well as agricultural livelihood, as well as the impact on agricultural structure and work. We need to consider managing data and its consequences. In the foreseeable future, the information will be a resource, and data-quality is expected to be competitive. Data must be regulated so as to ensure that high-value agricultural data could be constantly produced and administered. We need to facilitate the building of an infrastructure that supports technology-centered agriculture. The 5G communications network, an Internet-based networking infrastructure, as well as the Cloud-based Service System should preserve backing for such technologies in order to enable them to incorporate effortlessly into the agriculture industry. If research and development assists the merger between varied technologies and varied industries as well as the agricultural industrial environment enables the innovative skills to freely practice their capabilities, the Fourth IR can happen. In this manner, Agricultural technology will increase to new levels and jump to new opportunities.

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