Exploring Innovation Research Methodologies in a Variety of Multidisciplinary Fields and Their Prospective Future Impact
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AN ANALYSIS ON THE PARADIGM SHIFT IN CROP PRODUCTION MANAGEMENT FOR MODERN SUSTAINABILITY

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ABSTRACT

Developing management structures that guarantee the essential activities and plans are done to get an attractive result from the movement of the undertaking functioning system is the fundamental errand of production management in cultivating tries. The issue of overseeing crop production is incredibly pertinent today on the grounds that most provincial undertaking that attention just on crop production dismiss suggested headways for crop advancement and abuse science-based agricultural practices. These issues are connected to the absence of modern hardware and specific materials, the unstable monetary circumstances looked by most farmsteads, and the deficiency of regulatory work in the field of crop production. Huge mechanical headways in cultivating production have been made conceivable by modern varieties, transgenic crops, and the green revolution (GR) (GM crops). Albeit the reception of GR expanded the area's general adequacy internationally, it is additionally remembered to be adding to resource debasement in nations like India, for the most part because of the development pack itself and somewhat to the impossible execution of its partner. Nonetheless, plants with hereditarily changed groupings are helpless against long haul medical problems and ecological results. Understanding the parts of imaginative shifts toward sustainability that are reasonable for agricultural production accordingly requires cautious idea.

Keywords: *Paradigm Shift, Crop Production Management, Modern Sustainability, Green Revolution, Precision Agriculture, Precision Conservation*

1. INTRODUCTION

One of the essential parts of agriculture is crop production. The explanation populace has food and the creature's business feed is a direct result of crop yield. Besides, crop items are utilized in many undertakings as unrefined substances got from plants, like food, fuel, materials, and medications. Agriculture incorporates the development of crops for field advancement,

vegetable turn of events, natural item improvement, etc. This area gives fundamental food. Unrefined components are provided to food and item gathering organizations. Thus, the trained creature area utilizes extras like straw, silage, and food industry squander.

Notwithstanding the difficult production conditions brought about by high production resource costs, bad quality of life in rustic regions, and challenges getting credit, cultivating tries offer a high potential for production. Under troublesome circumstances, homegrown agricultural drives are compelled to incorporate headways with endeavours to work on the productivity of production affiliation. Preparing shows that the results of homegrown agricultural undertakings are popular with people in general notwithstanding their greater costs because of the significant expenses brought about contrasted with those of unfamiliar makers.

This is principally made sense of by the way that homegrown makers make items that are ok for the climate, in any event, when the most common way of creating them includes the utilization of fundamental added substances. The interest in cultivating items is fuelled by these conditions. Besides, the market for farm style agricultural items, those made under average circumstances is as of now developing. The economy should guarantee both the development of production and independence in the quickly evolving socio-political and monetary scene of today. In this manner, without expanding the utilization of research, advancement, and developments, the shift to pragmatic money related improvement and further improvement of the relationship of crop production is impossible. An inside and out investigation of the thing's actual assembling cycles, including its slant, course, and parts, is essential for a solitary assurance of the important executions.

Systems for crop production that produce more food with more healthy benefit are essential, however they likewise need to affect the climate. The 20th century saw an enormous development in country regions because of the broad utilization of pesticides, manure, and water systems, all at a critical biological expense. The Green Revolution, which accomplished food security for billions of individuals, benefited enormously from these innovations. Be that as it may, the difficulties confronting the twenty-first century are unmistakable. To guarantee food security, conservation of soil and water will be fundamental, and common sense precision agriculture and environment (SPAE) will be expected to guarantee that serious agriculture and a changing climate don't have unexpected impacts that could rush natural change. Bleeding edge cropping structures that join natural advancements (plant-helpful microorganisms, cover crops) with precision agriculture (Father) and precision conservation (PC) ought to be created

as a feature of practical agriculture to lessen how much compost, pesticide, and water inputs while expanding the feasibility of conservation to keep up with supportable agriculture at the field level and all through a watershed.

1.1. Objective of the study

- To know which kind of soil is good for what kind of crop.

2. LITERATURE REVIEW

Bhalla and Singh's (2010) The report, requested by the Indian Orchestrating Commission, centers around the areas of agriculture advancement in India at the neighbourhood level. This exhaustive research gives a reasonable examination of elements impacting cultivation efficiency, sustainability, and monetary profit in various pieces of the country. The discoveries introduced in this research probably envelop different parts of cultivating activities, like crop development strategies, resource usage, market parts, methodology techniques, and the effect of mechanical interventions. Bhalla and Singh give significant experiences to policymakers, specialists, and colleagues associated with advancing cultivation development and provincial advancement in India by looking at the perplexing connections among agriculture, funds, and methodology.

Choudhary and Gaur's (2010) The ISAAA Series of Biotech Crop Profiles remembers a national profile for Bt cotton in India that gives an itemized outline of the improvement of hereditarily changed (GM) cotton in the country and its effect. This dissemination no doubt gives goodies of information about the agronomic show, monetary advantages, ecological worries, and managerial cycles related with the reception of Bt cotton in India. The creators probably look at the monetary ramifications for farmers, the climate, and the bigger agricultural locale notwithstanding the technique's conversation of GM crop advancement. Choudhary and Gaur add to the worldwide talk on biotechnology in agriculture by looking at India's encounters with Bt cotton. Their examination gives huge contextual analyses and viewpoints for partners, experts, and policymakers intrigued by the globalization of hereditarily changed agriculture.

Evenson and Gollin (2003) give an intensive examination of the effect of the Green Revolution more than a forty-year time span. The presentation of high-yielding crop assortments, water system systems, and pesticide inputs, once in a while alluded to as the "Green Revolution," essentially expanded cultivation efficiency and created unmistakable outcomes in different regions of the planet. This original work assesses the monetary, social, and ecological effects of the Green Revolution, featuring its job in diminishing neediness, improving food security,

and prodding financial development. The creators stress the significance of proceeding to be keen on country research and improvement to resolve arising issues like changing dietary inclinations, resource weariness, and ecological change.

Gómez-Limón and Sanchez-Fernandez (2010) add to the discussion on manageable cultivating rehearses by putting out a system for observational assessment that utilizes composite pointers. Perceiving the intricacy of sustainability, its fashioners advance composite pointers that synchronize monetary, natural, and social aspects. They evaluate the sustainability of cultivating systems' execution by observational investigation, representing components including social worth, normal impact, and resource use viability. This paper accentuates the need of taking on sweeping systems to address the present status of cultivating, offsetting financial development with natural assurance and social guide from the public authority.

3. TECHNOLOGY PARADIGMS AND TECHNOLOGY TRANSITIONS - TOWARDS AN ANALYTICAL FRAMEWORK

Ordinary models make sense of the construction and wellsprings of agricultural improvement in a straight style. As per the immediate model, developments stream from worldwide research offices to national research workplaces prior to growing to arrive at farmers. This clarification isn't completely erroneous in light of the fact that it validated in numerous non-industrialized nations during the green revolution. Nonetheless, for the reasons recorded beneath, the materialness of this immediate paradigm in contemporary agriculture is raised doubt about. To start with, the development of the confidential area in agricultural research and improvement; second, the significant changes to the precepts of the authorized development opportunities (UPOV1) that guide the progression of knowledge. The National Agricultural Research Systems (NARS), which stress co-arrangement among schools and research affiliations, Agricultural Knowledge and Information Systems (AKIS), and most as of late the National Agricultural Improvement Systems, are among the elective viewpoints to the straight model that have developed after some time. A couple of scholastics propose supplanting the immediate model with a clever diversion improvement system structure. In their battle for a systems approach, these researchers likewise incorporate breaking point improvement.

Subsequent to accomplishing extraordinary steps, it is pivotal to determine that the use of progression systems structure settle three significant disturbances in overhauling the development age and scattering. They are responsible for the information/knowledge stream and co-arrangement in the general execution (quantifiable outcomes). Co-arrangement is one

of the primary subjects that progression systems welcome and are prepared for conversation. Chats on open classified affiliations, international co-action, industry joint effort in advanced education, and creative non-state performer help are all important for the co-arrangement. Setting the standards of the game (inspirations) accurately is one method for overseeing co-arrangement frustration. Also, the information streams inside the structure can be improved by dealing with the bottlenecks and hindrances by utilizing the performer network strategy. A legitimate methodology like this is vital for understanding the issues of non-industrialized countries with respect to information irregular characteristics and co-arrangement disillusionment in the development of agriculture.

3.1. Technology paradigms and the global technological landscape

It is essential to initially comprehend what a development paradigm and is a paradigm shift prior to diving into the conversation of the rise of development paradigms. "An illustration of common decisive reasoning activity on the grounds of such an imaginative paradigm," is the manner by which he portrays mechanical course. By the by, this material covers a truly enormous measure of ground with regards to separating a complex mechanical space into four fundamental parts that are valuable for describing a development paradigm. These are the accompanying: the issues, the regular fields of coherent examination, the prevailing game plan model (or model for further developing courses of action), and the game plan group (or the reason for course of action conveyance). Thusly, mechanical courses of action fall under the classification of paradigms that arise, create, and (occasionally match) over the long run, as well as those that contrast as far as the issues being tended to, the chose sensible fields that act as rules and their transcendent game plan plans, and the reason for plan transport (materials and advancements).

With these center components of a development paradigm as a main priority, we are right now attempting to work on this whole documentation. In the first place, the issue set is where we start. Consider a few mechanical difficulties that might emerge during production. Z issues might exist, demonstrating production hardships at a particular second in time.

Expect that the issue space is W = {1,2, p, z, … Z}.

Let T = {t1, t2, … ti … … ,tn } address the setup of all current mechanical answers for the issues in W.

Let S = {s1, s2, … si … … , sn } be a foreordained game plan of legitimate fields where answers for the difficulties in W may be found.

Allow us to think about an issue p from the assortment W. As of this moment, let n conceivable mechanical designs for a representative issue p be addressed by the set Tp = {tp1,tp2, … tpi … ,tpn }. In the impossible occasion that no open development plans are accessible at a specific time, this might be an unfilled set. We just feature issues for which the set Tp is non-void for convenience.

Besides, any mechanical game plan tpp could be laid out on m conceivable coherent fields; among these, let spp be one head consistent field in Sp = {$sp1$, $sp2$, … spp … , spp }, where the set Sp alludes to the m conceivable legitimate fields that help the essential creative course of action tpp. This proposes that for an issue p in the issue space, there might be n related effective fixes that rely essentially upon a specific sensible field however are connected with one of m conceivable legitimate fields.

How about we examine one such imaginative design tpp and the pivotal consistent field spp that upholds it in the touple (tpp, spp).

Like Dosi, we currently characterize a development paradigm as an assortment of "mechanical plan" triplets comprising of a few issues, proper game plans for each issue, and various coherent fields (related to a current game plan) that act as the essential starting point for the game plans.

Deciphering this form according to the viewpoint of development improvement isn't hard. Since a predominant plan design arises inside an alternate sensible discipline and co-develops with it, the space of legitimate spaces is likewise deciphered, for effortlessness, as illustrative of the prevailing course of action plan that is deserted in our origination.

Therefore, we examine a Gw development paradigm in such detail that:

$$G_W = \{w, T_w, S_w\} where\ w \in W; T_w \in T; S_w \in S \qquad (1)$$

Toward the finish of the a paradigm for development Gw is an assortment of 3D-centered regions that take care of a specific arrangement of issues. w inside an issue region W, an assortment of imaginative arrangements Tw for those issues that depend on various consistent spaces of thought Sw, a subset of all coherent fields that are proper, S. We may now show an advancement scene utilizing this meaning of a development paradigm (Gw).

Allow Lp to address the development scene 7 for a specific issue set p, and allow p to be a plane of all mechanical designs that are possible and sensible, as well as the essential consistent fields that contrast with the issue set p. For this situation, the issues are firmly connected with each other. This recommends that the development scene, Lp= {(tpi, spi) ∈ R2}, where tpi ∈ Tp ; spi ∈ Sp, is provided in contrast with a given arrangement of immovably related concerns, p.

At the end of the day, a mechanical arrangement tpi and the standard coherent field spi for an issue The establishment (building block) of a development scene is pi. For this situation, the clever fix can likewise be viewed as tending to "a particular issue" of a bigger moderate framework. As such, the tuple (tpi, spi) addresses the plan and the hid standard sensible field that the game plan relies upon, assuming that a decisive reasoning strategy (computation) involves different free progressions.

In Figures 1, we dole out the issues to the X-center, each conceivable setup to the Z-center point, and each consistent field to the Y-turn to delineate these ideas. The "balls" address the "development game plan triplet," which comprises of a particular issue, a mechanical plan that is equivalent, and the vitally legitimate field that frames the premise of the course of action, since we are managing a three-layered space. In this manner, the entirety of the current "creative paradigms" and "development plan threesomes" are broadly organized in a worldwide mechanical scene.

In this specific circumstance, a development paradigm ought to be evident as a build encasing the three sets (or "balls" as displayed in Figures 1) for various related issues including plans got from a standard course of action of coherent principles (that stick to a current course of action plan). Essentially, a headway in the planar plans of mechanical scenes for a specific issue set is viewed as a mechanical course inside a paradigm considering a few coherent fields that describe the development paradigm.

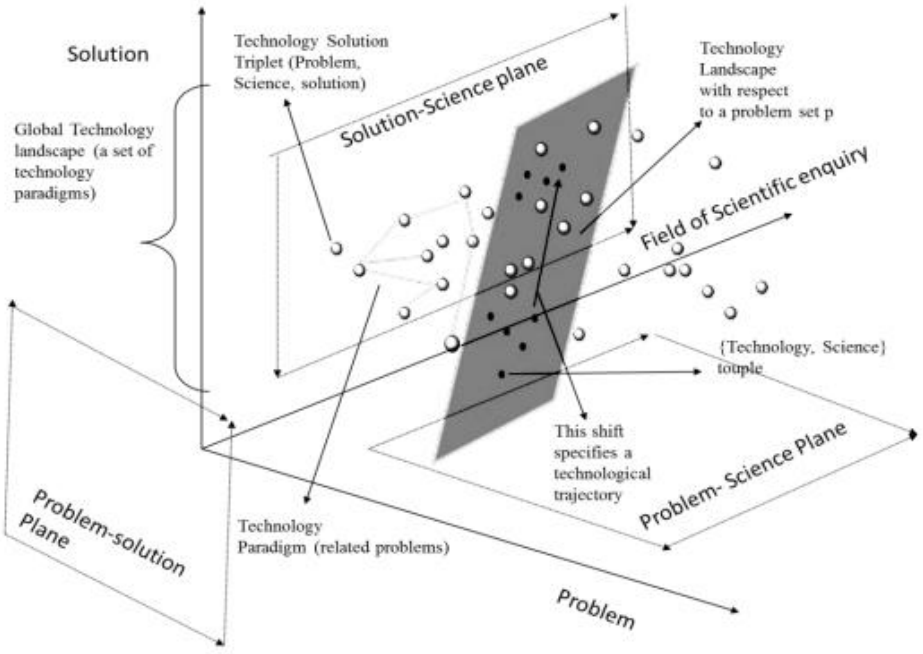

Figure 1: Global technological landscape

There might be an answer accessible on *Lp* for a particular issue at a particular second for an issue pi. Be that as it may, an issue pi requires an answer; in this way, a logical examination concerning an overarching development scene Tp (expecting to be the as of late existing) for a connected issue set starts. That is, researchers and engineers apply methods appropriate to the prevailing plan models of the scene while the pursuit happens inside the scene's locales of consistent request. In the far-fetched occasion that an answer can't be recognized inside the current scene, the pursuit extends to incorporate consistently related areas outside the scene's limits while remaining inside the boundaries of the paradigm. In the far-fetched occasion that an answer is found in consistent regions beyond the scene however inside the paradigm, new scenes may consequently show up. The paradigm slowly extends toward the scenes.

3.2. Emergence and Selection

At the point when 'assortment' leads to an effective and extremist turn of events, the rise of a paradigm should be clear as the improvement of a few predictable progressions on top of that extreme turn of events. The to and fro powers in the money related structure — that is, the business areas' solicitations and the science — can be utilized to make sense of how an advancement paradigm creates. Here, intelligent research regions are viewed as fundamentally subject to supply and intensely impacted by the group of existing knowledge. The probability of one more paradigm arising is expanded by any eminent headway around here. Nonetheless,

the market's interest decides the way that broadly a specific development is taken on. Because of market influences, pioneers are compelled to zero in their endeavors on making reliable upgrades in light of previous ones, while ineffectual developments at last disappear and mechanical headway continues thusly.

As recently referenced, the extraordinary clarification of money related factors requires resolve. There is a determinant part that penetrates an improvement structure to where, for each plan of a gathering of troubles, a predominant development at last arises through the performers' exercises and coordinated efforts as well as unambiguous system perspectives (made sense of later). Subsequently, its decision gives a pathway to various gradual headways to expand upon, in the end leading to an entire paradigm. Choices are thusly both genuine and deadly simultaneously, contingent upon your perspective. It will let loose space for wasteful innovations and clear the entryway for new, productive turns of events. Thusly, direction is a continuous cycle that influences the rise, strength, and progress of paradigms inside a worldwide mechanical climate.

Certifiable occasions and technique constancy are helpful contentions to grasp the consistency (or deficiency in that department) of progress inside an emanant paradigm. Strength can likewise prompt a circumstance known as "secure," in which an imaginative thought that was effective in the end neglects to rival an inefficient one because of developing criticism circles, great analysis, and hierarchical externalities. The force of a prevailing development and, subsequently, the idleness of the advancement scene are expanded by growing returns and way dependence. This makes the paradigm change trying for that specific arrangement of issues. Comparable powers additionally block the progression of monetary advances. To end the lock-in, an express way to deal with intervention that considers specialization might be vital.

3.3. Response

Not at all like Agricultural production, which happens on the shop floor of a handling plant as opposed to in common natural surroundings, agricultural production happens in a typical region. Thus, production at assembling plants happens in a controlled climate with very little connection with the normal world. Since organic limits are not piece of production, it has little effect whether the making of assembling plants makes normal externalities like water and ecological defilement; the impact on (not entirely set in stone by the idea of information sources) is immaterial. In this way, the general trait of agricultural production is the climate's

capacity to respond, which decides the sort of information sources and eventually impacts the result.

Albeit a response capacity's development and nature are fairly complicated, perceiving such a capacity and its part in the change elements is significant. Subsequently, in the improvement paradigm, "Nature" (or "Climate") is a non-monetary performer whose reactions are vital since its activities are reflected by generally acknowledged bi-genuine standards. Accomplishing a bio-genuine equilibrium is a part of the climate's outcome capacity.

Biophysical changing cycles at the same time decide Characteristics' reaction to intervention (human and specialized intercession). 10 They are composed to gain feeling of the headway viewpoints since conceptualizing such non-market components in the creation and progression of advancement paradigms in writing is testing.

Allow F to address Nature's response capacity to the degree that it is impacted by various difficulties p (t) over the course of time t and the development scene Tp cutting through the ruling paradigm Gw. One more game plan of issues p (t+1) with a probability β in time t+1 is the result. That is:

$$p(t+1) = F(p(t), T_p) \qquad (2)$$

For this situation, n is limited, p (t+1) has an area with {P; 0<=P<=n}, and p (t+1) has a few issues that could seriously risk the production later on.

All in all, the development of a not so great (normally substandard) paradigm as the prevailing one sets off a response capacity by the climate, which without a doubt makes new difficulties as unidentified (or, as of not long ago, dark) issues or issues that subvert genuine production. That is, a natural reaction could sabotage the structure's capacity to bring in cash. In this way, it is vital to evaluate the sustainability of development paradigms in agriculture as far as both a. the secret concentrated change's monetary viability and b. the development's negative normal externalities, which affect the production structure's drawn out sustainability.

3.4. Transition or paradigm shift

A predominant paradigm might contain the best method for imparting the answer for the issue. For this situation, the examination might dive into a subdominant or drowsy development paradigm that coincides close by the prevailing paradigm. The simultaneousness can be acknowledged as given at this intersection since there is sufficient proof to acknowledge that such dormant paradigms containing less productive (monetarily), locally knowledge driven or

culture driven, or appropriate emerge after some time, despite the fact that examination of the beginning stages for such combination is basic. In agriculture, models consolidate the agro-normal paradigm, which depends on traditional knowledge (sustenance and bug management utilizing locally available natural resources), as well as the paradigm of elective medication (homeopathy, needle treatment, and standard prescriptions) for illnesses connected with wellbeing. The traditional interpretations could possibly make sense of a portion of the parts of such a languid paradigm.

In the event that a lethargic paradigm ends up having a more effective game plan, trading is a more affordable choice than beginning without any preparation while searching for new thoughts. This fundamentally intends that on the off chance that a reaction from a predominant paradigm brings about negative normal externalities (nonmarket), changing to an alternate, more useful plan could be represented by the monetary performers' activities. Considering the extraordinary abilities that impact the determination and support of development paradigms, this probably won't be possible.

In the far-fetched occasion when neither the predominant paradigm nor the languid paradigm offers a naturally useful plan, development search might continue in new coherent locales that might prompt an extraordinary development. In the event that this uncommon improvement is chosen, it might prompt an unpreventable paradigm shift or development change for a specific gathering of issues.

Figure 2 represents the development of advancement in a worldwide mechanical scene, including quest for advancement, rise of issues, determination and rise of development paradigms, and reaction of the climate. In the worldwide mechanical scene, the development of an issue starts a mechanical pursue. Over the long run, because of the improvement structure's activities, a predominant paradigm arises. After the conveyance is finished, an overall paradigm might lead to new issues that subvert the production cycle considering the natural response. To resolve the new issue, sharing thoughts is considered looking through the current climate (directing the possible improvement of a bearing), on the other hand looking through the momentum paradigm (or winning paradigm), and looking through a drowsy paradigm. In the case of exchanging isn't thought of, then an entirely different mechanical hunt starts in the worldwide mechanical scene, prompting a remarkable headway in development.

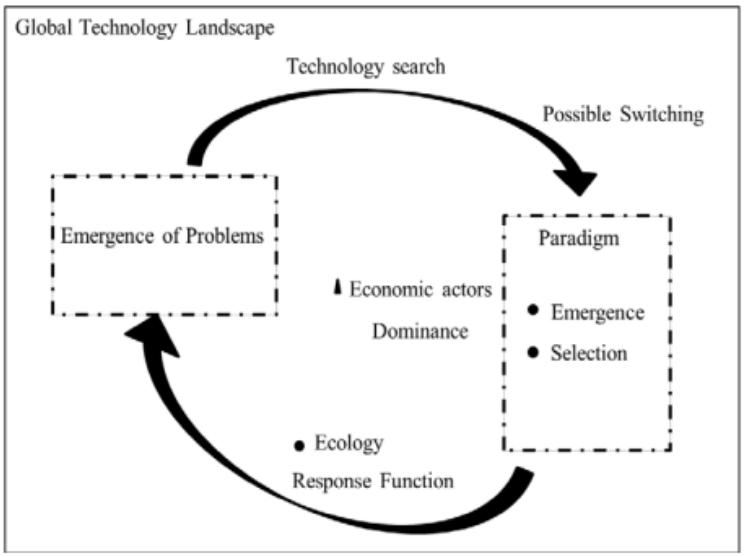

Figure 2: Technology paradigm shift

4. APPLICATION OF THE CONCEPTUAL FRAMEWORK TO AGRICULTURAL PRODUCTION

Being developed focuses, paradigmatic portrayal of contemporary advancements is ordinary; in agriculture, it is less considered normal. This could be ascribed to the multiplication of both non-modern (regular) and modern (compound and mechanical) mechanical systems in agricultural result. Few researchers really immensely affect the paradigm-shifting ideas of development and agricultural headings. Nonetheless, there is restricted start to finish investigation of changing variables utilizing agricultural production.

As indicated by our own portrayal, biotechnologies (GM crops and biotech-upheld raising techniques), agro-organic methods (customary, uninformed, normal developing practices), early and late green revolution progresses (MVs), and biotechnologies (Half and Parts) describe agricultural production. Notwithstanding, we can comprehend the conscious contrasts in the person and style of the mechanical plans being presented by every one of these paradigms in the event that the early and late green revolution paradigms are joined to address a typical paradigm of headways before the appearance of biotechnology.

- **Problems:** Any inventive arrangement that seems OK for agriculture can save work or land. Since there is a lot of work in a non-modern culture, land-saving developments have been generally fitting, as was featured in the past segments. We should now inspect the attributes of the land effectiveness issue (yield) from the back to front. The yield issue, most importantly, is muddled. It's actually an assortment of related and periodically

expansive issues, for example, poor germplasm, failure to battle off sicknesses and vermin, absence of flexibility to a specific agro-climate, and powerlessness to deliver more because of poor morphological qualities, (for example, feeble stalks in field crops).

- **Areas of scientific enquiry:** Researchers are persistently pushing the limits of the essential sciences, which is changing the way that even significant points are organized and conveyed. The solution to higher agricultural yields came from basic plant sciences, which over not entirely settled and duplicated short diminutive groupings involving the best neighbourhood cultivars as per Mendelian hereditary qualities standards17. In any case, progresses in numerous coherent fields ultimately bring about mechanical game plans, and sensible norms engaged with course of action transport commonly cross-over.

Fundamental plant sciences like inherent science, plant science, plant physiology (shape and size), plant pathology (vulnerability to diseases), and entomology (to break down bug populaces and their approach to acting towards a host plant creature gatherings) stayed the area of focal point of sensible enquiry during the start of decisive reasoning for additional created yields. By the by, as plant hereditary attributes have advanced over the course of time, nuclear science and bioinformatics have been applied to the improvement of novel agricultural assortments. Elements, for example, resistance to herbicides and bug blockage were accomplished through the joining of unfamiliar hereditary material. Genetically changed plants was the term given to these plants. Utilizing contemporary biotechnology procedures to lay out duplicating, transgenic or GM crops18 were created. Improvements in bioinformatics have at the same time expanded research viability and given a makeover to the regular strategies utilized in research and advancement.

- **The solution design:** From the beginning in the green revolution, new plant assortments were fostered that could answer the utilization of fertilizers without lodging, empowering the plant to deliver more grains per tail. Thus, the plants' morphological and physiological qualities were adjusted to all the more likely suit agroecology. The ongoing cultivars were painstakingly crossed with short dwarf and worked on yielding combinations to refresh the morphological elements and improve the probability of a more prominent return for each plant by forestalling lodging. One of the principal objectives was additionally to cause the crops to answer the use of fertilizers, particularly in the beginning phases of the green revolution. To oblige expansions in flexibility, crop reactions to photograph responsiveness, thermoresponsiveness, and a scope of ecological limits were explored. All the more explicitly, endeavors were made to develop combinations with further developed

germination, predictable improvement qualities, and a quicker production cycle. Joining different techniques for plant reproduction brought about a typical organizing plan. Afterward, as biotechnology progressed, it was feasible to complete plant raising with expanded exactness and productivity, prompting sensational changes in the course of action design.

- **Solution delivery/package:** Lower yields might have solutions for the sub-gives that are all hidden, like high-yielding plant assortments, insect sprays, fertilizers, herbicides, or hereditarily modified blended seeds (that address weeds, bugs, and greater yields). As a rule, plan pack is joined by a bunch of practices that guide its execution in the field for ideal outcomes.

	Conventional	Biotech	Agro-ecological
Solution package	Modern varieties, chemical fertilizers, pesticides + package of practices	GM seeds, chemical fertilizers + package of practices	Bio-fertilizers, bio-pesticides, integrated pest management, zero-tillage.
Solution model	Natural selection for desired traits	Marker assisted selection (DNA based) of genes for desired traits	Self-regenerative and eco-friendly models
Selected principles	Plant breeding	Transgenic or non-transgenic methods to achieve desired trait + Plant breeding	Minimizing the resource usage
Area of scientific enquiry	Plant Sciences (biology, plant physiology, botany, entomology) Chemistry	Modern biotechnology (micro-biology, bio-chemistry, genetic engineering) + traditional plant Sciences	Agro-ecological and environmental sciences

Figure 3: Agricultural production technology paradigm classification

Figure 3 shows that while certain difficulties are normal to every one of the three mechanical advancement paradigms, every development paradigm has unmistakable parts, like consistent request districts, chose rule legitimate fields, and their overwhelming course of action arrangements. Moreover, there are contrasts in the course of action transportation. Subatomic science and hereditary designing show an exceptional jump from the prior spaces of traditional plant sciences, despite the fact that the spaces of coherent request for the green revolution (standard) and inherited designing (Agri-biotechnology) paradigms cross-over. The field of intelligent request is the innate sciences, and agroecology is reliant upon the key standards of agronomy and climate. In agro-normal spaces, decisive reasoning frequently includes information sources and exercises that keep up with balance between the estate and its environmental factors.

5. CONCLUSION

The examination causes to notice the significant paradigm shift toward contemporary sustainability rehearses that is happening in agricultural production management. The research discoveries approve the gather pattern up from customary methodologies and toward widely inclusive methodologies that focus on resource efficiency, monetary reasonability, and ecological stewardship. Accomplices in the agricultural range are understanding the need to embrace methods like precision agriculture, agroecology, and coordinated bother management to moderate natural corruption, adjust to difficulties presented by ecological change, and guarantee long haul food security. Besides, this change stretches out past direct cultivating works on, enveloping more significant essential changes in system structures, market parts, and customer conduct. As we research the intricacies of really focusing on a developing worldwide populace while safeguarding the planet's limited assets, this shift recommends a crucial point in time in shifting agriculture's future course toward an extra feasible and hearty paradigm. It will be fundamental for embrace progress, joint effort, and knowledge partaking to prepare these arising paradigms to the furthest reaches conceivable to handle the difficulties representing things to come.

REFERENCES

1. *A.M. Petrov, M.A. Kanaev, Yu.A. Savelev, S.A. Vasilev, E.S. Kanaeva, Research J. of Pharmaceutical, Biological and Chemical Sciences 5, 925-934 (2018)*
2. *Bhalla, G. S., & Gurmail, Singh. (2010). Final Report on Planning Commission Project Growth of Indian Agriculture: A District Level Study. Planning Commission of India Project Report.*
3. *Choudhary, Bhagirath, & Gaur, Kadambini. (2010). Bt cotton in India: A country profile. ISAAA Series of Biotech Crop Profiles. ISAAA: Ithaca, NY.*
4. *Dhiman, S., Yadav, A., Debnath, N., & Das, S. (2021). Application of core/shell nanoparticles in smart farming: A paradigm shift for making the agriculture sector more sustainable. Journal of Agricultural and Food Chemistry, 69(11), 3267-3283.*
5. *Edwards, A. R. (2005). The sustainability revolution: Portrait of a paradigm shift. New Society Publishers.*
6. *Evenson, Robert E, & Gollin, Douglas. (2003). Assessing the impact of the Green Revolution, 1960 to 2000. Science, 300(5620), 758-762.*

7. *Fausti, S. W. (2015). The causes and unintended consequences of a paradigm shift in corn production practices. Environmental Science & Policy, 52, 41-50.*

8. *Gómez-Limón, José A., & Sanchez-Fernandez, Gabriela. (2010). Empirical evaluation of agricultural sustainability using composite indicators. Ecological Economics, 69(5), 1062-1075. doi: 10.1016/j.ecolecon.2009.11.027*

9. *Hall, Andy, Dijkman, Jeroen, & Sulaiman, Rasheed. (2010). Research into Use: investigating the relationship between agricultural research and innovation: United nations university (UNU). Maastricht economic and social research and training centre on innovation and technology (MERIT)*

10. *Jacquet, F., Jeuffroy, M. H., Jouan, J., Le Cadre, E., Litrico, I., Malausa, T., ... & Huyghe, C. (2022). Pesticide-free agriculture as a new paradigm for research. Agronomy for Sustainable Development, 42(1), 8.*

11. *Kathage, Jonas, & Qaim, Matin. (2012). Economic impacts and impact dynamics of Bt (Bacillus thuringiensis) cotton in India. Proceedings of the National Academy of Sciences, 109(29), 11652-11656.*

12. *Kundu, D., Dutta, D., Samanta, P., Dey, S., Sherpa, K. C., Kumar, S., & Dubey, B. K. (2022). Valorization of wastewater: A paradigm shift towards circular bioeconomy and sustainability. Science of The Total Environment, 848, 157709.*

13. *Loganathan, R., Balasubramanian, R., Mani, K., & Gurunathan, S. (2009). Productivity and Profitability Impact of Genetically Modified Crops – An Economic Analysis of Bt Cotton Cultivation in Tamil Nadu. Agricultural Economics Research Review, 22, 331-340.*

14. *M.A. Mastepanenko, S.Z. Gabriyelyan, I.N. Vorotnikov, S.V. Mashkov, E.V. Kulaev, Research J. of Pharmaceutical, Biological and Chemical Sciences 6, 1846-1851 (2018)*

15. *Nair, P. R. (2008). Agroecosystem management in the 21st century: it is time for a paradigm shift. Journal of Tropical Agriculture, 46, 1-12.*

16. *Narayanamoorthy, A., & Kalamkar, S. S. (2006). Is Bt cotton cultivation economically viable for Indian farmers? An empirical analysis. Economic and Political Weekly, 2716-2724.*

17. *O. Mamai, R. Nekrasov, V. Parsova, Proc. of the 19 th Int. Scientific Conf. "Economic Science for Rural Development 2018" 47, 189-195 (Jelgava, LLU ESAF, 2018)*

18. *P.A. Chekmarev, S.V. Obushhenko, V.B. Trocz, N.M. Trocz, The achievements of science and technology APK 8, 28-31 (2018) (In Russ.)*

19. *Ray, P., Lakshmanan, V., Labbé, J. L., & Craven, K. D. (2020). Microbe to microbiome: a paradigm shift in the application of microorganisms for sustainable agriculture. Frontiers in Microbiology, 11, 622926.*

20. *Sadashivappa, Prakash, & Qaim, Matin. (2009). Bt cotton in India: development of benefits and the role of government seed price interventions. Agbioforum, 12(2), 172-183.*

21. *Shankarnarayan, V. K., & Ramakrishna, H. (2020). Paradigm change in Indian agricultural practices using Big Data: Challenges and opportunities from field to plate. Information Processing in Agriculture, 7(3), 355-368.*

22. *Sharma, A. R. (Ed.). (2022). Conservation Agriculture in India: A Paradigm Shift for Sustainable Production. Taylor & Francis.*

23. *Sharma, K. P., & Dahal, K. R. (2017). Sustainable agriculture development in Nepal: a need for paradigm shift in theory and practice. Selected Essays on Nepali Economy, 50, 50.*

24. *Upadhyay, R. K. (2014, July-Sept). Socio-Cultural Impact of Globalization in India. The Discussant Journal of Centre for Reforms, Development and Justice, 65-72.*

25. *V.A. Milyutkin, V.E. Buksman, Machinery and equipment for the village 7, 10-12 (2018) (In Russ.)*

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