



AGRICULTURAL PRODUCTIVITY IN THE COUNTRY WILL HAVE A GOOD FUTURE

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ABSTRACT: In relation to food security, there are some vital elements that have maximal impact on the food supply such as the obtainability, right to use and stability. It is one of the major tasks to reduce the issues linked with it and in the existing paper, the information is gathered about agricultural productivity, a set of various tools for measuring productivity in the agricultural sector and also the importance of agricultural productivity.

KEYWORDS: Measuring agricultural productivity, Total factor productivity, Technical Efficiency, Farm productivity.



INTRODUCTION

The concept of agriculture productivity is bigger with the global impact but it begins with well-organised farm management. The future and well-being of people is highly dependent on the global food production system. In the agricultural system, the high level of productivity ensures affordable and abundant food and fosters economic development, food security and prevention of scarce resources such as water and land. It is critically due to the expansion of population and climatic change extremes projected to tax on the existing food production system. Meanwhile, as the agriculture productivity growth has planetary repercussions, far-reaching and increasing agriculture efficiency always has and further will pursue to be accomplished at the farm level by exploring technology innovation to increase efficient farm management. In simple words, agricultural productivity can be understood as the ratio of agricultural exports to imports (Chen, Fu & Wang, 2022). Productivity can be calculated at different level such as the production system of a single farm, a region, a multi-farm cooperative or even the planet can all be calculated based on the agricultural productivity. On a national level, agricultural productivity growth calculates exports of agriculture versus imports. A government that can sustain a greater level of agricultural exports helps a more robust economic growth rate, maintains more sustainable food prices for its population and becomes more competitive worldwide. Agricultural productivity plays a significant role in the growth of an economy. In the UK, in 2021, agriculture supported the economy by 0.5%. Agriculture facilitates half of the food that people consume, employs around half a million of the population and is a major part of the food and drink industry. In 2021, the land managers and farmers tackled 71% of the land in the UK and through them the population can protect the natural environment and ensure the greatest standards of plant health and animal health (*Agriculture in the UK Evidence Pack September 2022 Update*, 2023). In the UK, the agricultural evidence pack brings together present figures on agriculture to briefly summarise the current state of the agriculture sector.

BACKGROUND

Measuring Agricultural Productivity

Getting a true sense of agriculture growth and productivity in food production is more complex at the business level than measuring yield increases or selecting the best crops appropriate for the particular region. Most of the farm companies produce several products with several inputs. Perhaps those crop production systems help each other in the whole farm ecosystem, for instance corn planting following soybean to lessen nutrient demands on soil health or to break up disease cycles or grazing animals through harvested crops and to mitigate harvest residue. Such kind of operational complexities are difficult in most farming organisations whether smallholder farms or bigger firms making calculating farm productivity even more complex. Apart from that, different regional places and individual farms have different degrees of attainable agricultural productivity that relies on soil types, climate and other variables along with farmers and cooperative farm companies must be conscious about the market economy of their productivity levels (Rambe & Khaola, 2022). A crop that evolves significantly without putting much inputs but sales for a low price due to the low demand or increased competition may not attain profitability but if the farm can enhance its efficiency metrics with the adoption of new technology, then it may provide positive economic benefits.



Tools for Measuring Productivity in the Agricultural Sector

Total factor productivity: Total factor productivity measures the total agricultural output in comparison with a combination of labour, capital, land along with material resources such as chemicals, fertiliser and seeds used to generate that output. Total number of output is evolving faster than the total imports.

Technical efficiency: Accomplishing technical efficiency refers to a farm creating a high level as allowed by the advanced tool and technology. It covers inputs such as human capital, soil quality, variable costs, labour availability, age and education of the farmer capital expenses can be calculated as the impending elements of the technical efficiency (Chandwani & Amaresan, 2022). The measurement of technical efficiency is how farm management practices are efficient based on the inputs at its disposal.

Importance of Agricultural Productivity

Food security refers to reliable access to a sufficient quantity of nutritious and affordable food. Maintenance of high agricultural productivity is a main part of food security. Unless the output of agriculture is high, food prices will increase and poorer people will likely face difficulties in affording a nutritious and adequate diet. Whereas, farmers may face difficulty growing sufficient food for themselves and their family members.

Income which means that a farmer's profit is corresponding to its revenue, minus its costs. When agricultural productivity increases, it improves the revenue without raising the cost. It will make more profit for the farmers.

Environmental benefits: Advanced agriculture is unfavourable to the environment. It is associated with deforestation, pollution, green and gas emissions. Rising productivity decreases the energy and land requirements of agriculture (*Agricultural Productivity, 2023*). This can result in reduced deforestation, less environmental degradation and lesser greenhouse gas emission.

LITERATURE REVIEW

Reviews of the literature are concise reviews of scholarly works that have already been published. Information about the subject of the study is included in the literature review (Barreiro et al., 2021). It provides the reader with a thorough comprehension of the subject being discussed by summarising the most crucial information from the most recent sources. It provides a succinct summary of information that has been made public in relation to the study's topic. Synthesis and summarization are components of an organised literature review.

Measuring Agricultural Productivity

As said by Chavas and Nauge (2020), agriculture has played a significant role in daily living for thousands of years. Hunting and gathering allowed humanity to subsist before agriculture was developed. For humans to start thriving, planned crop sowing and harvesting had to be adopted. In order to increase agricultural output and provide more effective ways of self-sufficiency, humans developed tools and practices. Modern times were ushered in by inventions that gave rise to industry. The significance of agriculture to modern civilization



cannot be overstated. Cleaning the house and getting ready for work would not be possible without the agricultural industry. Further, it is more difficult to follow yield increases or select the best crops for a particular region than it is to gain a true sense of agricultural growth and productivity in food production. Most farming enterprises employ a number of inputs to create a range of products. It is probable that these crop production methods work best together in a larger farm setting. For instance, planting maize following soybeans may lower the demand for nutrients on the health of the soil, disrupt the spread of disease, or cut down on harvest residue. Assessment of farm productivity is made more difficult by the fact that the majority of agricultural operations, whether they are small family farms or larger corporations, suffer from operational complexity.

Tools for Measuring Productivity in the Agricultural Sector

In the opinion of Wedig and Azadi (2019), resource endowments, technology, productivity, product qualities, fiscal and monetary management, and trade policy are the most crucial variables that affect an industry's level of competitiveness. Exchange rates, global economic conditions, the price of foreign travel, and the preferences and conditions of many countries are the most crucial elements on the global stage. Productivity is therefore considered to be one of the domestic factors of competitiveness. A measure that separates agricultural inputs from agricultural outputs. The output of all agricultural operations is compared to the manpower, land, and material resources, for instance fertiliser, chemicals, and seeds which are used to produce that production. Farm productivity is increasing as a result of the overall quantity of production growing faster than the total amount of imports.

Importance of Agricultural Productivity

In the opinion of Joshi et al. (2022), when the global supply networks are disrupted then the information technology sector draws a lot of attention. For instance, a scarcity of computer chips, which are made from silicon, a non-agricultural raw material, limits a manufacturer's ability to produce computers, cars and other things. This has an impact on many sectors of society and business. So, it can be said that agriculture is essential to supplying consumer and commercial market demand in a world of interconnected economies. Fruits and vegetables are essential sources of fibre, protein and carbohydrates in human diets. Numerous fruits and vegetables naturally include vitamins A, C, and E as well as minerals like magnesium, zinc, and phosphorus. In addition to this, food security is the consistent availability of a sufficient supply of healthy, reasonably priced food. One of the key components of food security is maintaining strong agricultural productivity. Food prices will rise in the absence of considerable agricultural production, making it harder for those living in poverty to afford a nutritious diet. On the other hand, it might be challenging for current farmers to adequately feed their family. Also, a farmer's profit is calculated by subtracting costs from revenue. Growth in agricultural productivity boosts revenue without increasing costs. The farmers will profit more as a result and modern agriculture is not environmentally friendly. It has to do with gasoline emissions, deforestation, and greenhouse gas emissions. Agriculture requires less energy and land as productivity rises. This may lead to reduced environmental damage, less deforestation, and lower greenhouse gas emissions.

METHODOLOGY

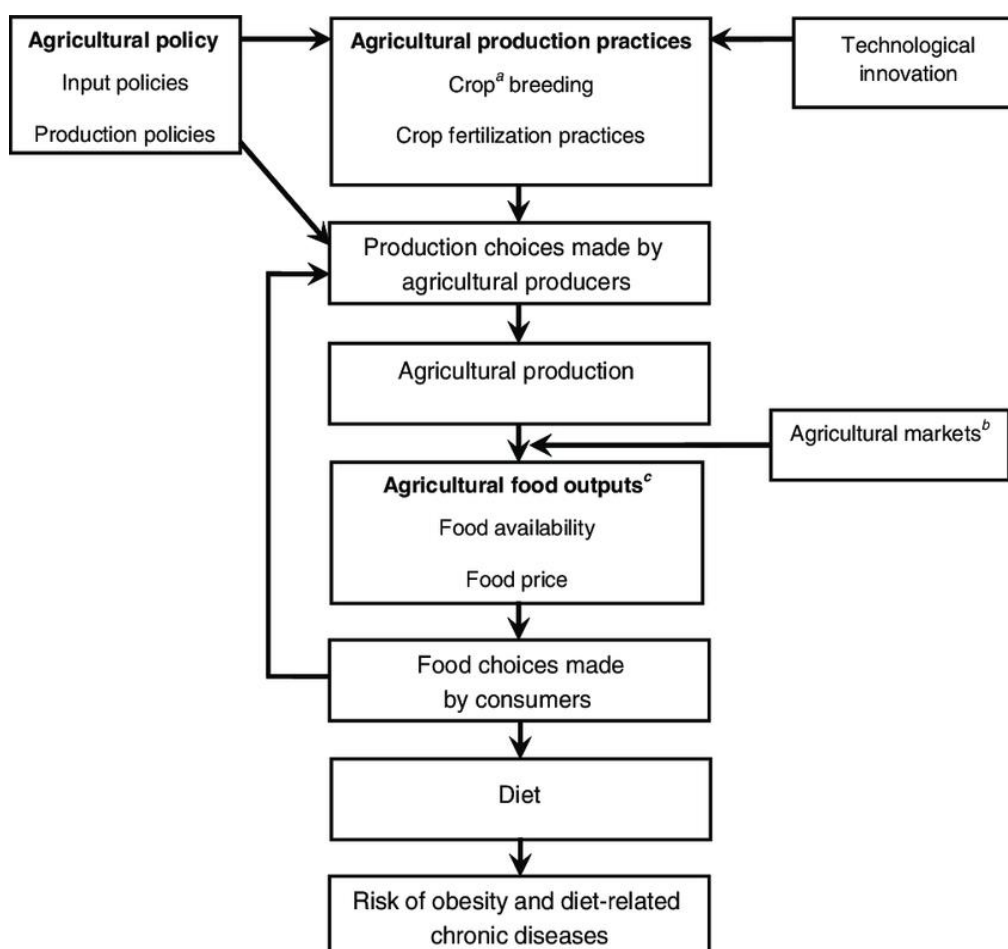


Figure 1: The relationship between agricultural policies and production practices and diet

In this chapter, the researcher provides recommendations for conducting research. To ensure accurate outcomes, they will fully justify the strategy used. The research approach is praised for its ability to concisely outline numerous heads, including choices, strategies, techniques, and plans. It is simpler to understand why the study was required in the first place when the benefits and drawbacks of each technique are used to support the research's findings. To conduct this investigation, a number of technological goals must be satisfied. The goals and objectives of the research must be achieved with the existing approach. It is essential to create the study methodology in a way that it may be used in future research. When you choose various study techniques and strategies, keep your intended goal in mind. In order to guarantee the project's dependability and accuracy, the researcher must adhere to a specified procedure for collecting data for the study (Trivelli et al., 2019).

Research Philosophy

It is viewed as a viewpoint that deals with obtaining, assessing, and applying knowledge about phenomena. The researcher's data gathering is aided by this technique, which blends values and hypotheses. It is described as having a source-related nature and as the process through which knowledge is created. The strategy allegedly makes it easier to choose the necessary



new data and research comprehension. The framework serves as a roadmap for conducting the research enquiry (Chen et al., 2020). The research philosophy is heavily taken into account because it helps to develop concepts and problems that are both clear and objective, as well as ideas and proposals. This research approach component is connected to learning everything there is to know about the subject. In order to complete the project's objectives, the researcher in this case is probably going to make certain assumptions about the chosen issue. This plays a significant role in the whole study process. Two significant views that are frequently supported by researchers are positivism and interpretivism. In the current situation, the project is based on the positivism philosophy because it has the advantage of speeding up the examination of various situations. Positivism regards experience as a trustworthy source of knowledge.

Research Approach

The research approach refers to the procedures and approaches used in the study that lay the groundwork for more complex methods of collecting, assessing, and analysing data from broad hypotheses. The researchers chose the research approach method because it makes it simpler to collect, assess, and comprehend the research's data. It is the best technique for generating trustworthy scientific results and bolstering research. The study strategy also gives a full explanation of the plan, which makes it easier to follow along and keeps researchers concentrated on their objectives. Having the latest information on a crucial study topic is advantageous. It is acknowledged as the researcher's top choice for collecting, interpreting, and assessing data. The collection of strategies and plans facilitates choosing the overall course of the research. It has to do with putting the plans into action in order to accomplish the earlier stated research objectives. Deductive and inductive methods of inquiry are the two most widely used types (Singh, Handa & Manchanda, 2021). The current research has chosen the deductive approach as it provides the opportunity to discuss the causes, effects and interactions of many ideas and factors.

Sampling

Sampling is a technique for selecting survey respondents that enables researchers to get data in the form of numbers. Both probabilistic and non-probabilistic sampling techniques are available. In order to reduce participant bias in the current study, the researcher used the probabilistic sampling method and randomly selected 30 participants to complete the questionnaire.

Data Analysis

Data analysis is the process of evaluating study data to get the most relevant findings for the subject. A few examples of data analysis methods include frequency distribution, thematic analysis, data mining, content analysis, and many others. Frequency distribution is used in the current study's framework to collect all the necessary data as they deliver raw data in a clear, readable manner. It is easy to identify the most frequent scores, score ranges, unusual cases, outliers and the total number of observations separating any two scores (Van Kooten, 2021).

Data Collection

Data collection is the process of compiling and evaluating information for a study. The two types of sources used in research are primary and secondary sources. Primary data can be



gathered using focus groups, surveys, polls, in-depth interviews and other methods. In this sort of data collection, recent data are employed, as such data are not available from earlier resources. Primary data collection yields more accurate and trustworthy results. Secondary data, however, is not gathered; instead, it is acquired from both published and unpublished sources. Publications including books, journal papers, governmental websites, and online information are examples of these sources. These kinds of data give comprehensive information about the research's subject. For the initial investigation that formed the basis of the current study, the researcher used a questionnaire to gather fresh data. In the current investigation, the researcher will utilise a frequency distribution table to analyse the data, and pie charts and graphs will be used to assess and analyse the information acquired from the selected respondents (Loizou et al., 2019).

Ethics

Maintaining moral and just standards is ultimately what it comes down to in order to achieve set academic objectives. It is crucial to abide by the applicable ethical guidelines when working on a project in order to protect interests such as data security, privacy, and others. A code of conduct must be followed by the researcher that protects the right to free speech, conforms with data protection laws, makes the study's goal crystal apparent and guarantees that all information and data outputs are accurately recorded in the study. These ethical guidelines primarily seek to foster academic or scientific integrity, safeguard the rights of research participants, and increase study validity. The researcher followed a number of ethical guidelines when carrying out the current study, including voluntary involvement, result communication, anonymity, confidentiality, credibility and risk of damage. The rights, welfare, and dignity of study participants are safeguarded by these ethical principles.

**DATA ANALYSIS**

QUESTIONNAIRE	Frequencies
Name:	
Gender:	
Age:	
Q1. What are the main forces influencing agricultural transformation in the 21st century?	Frequency
(a) Struggle for natural resources is intensifying	11
(b) Climate change	9
(c) Population growth, urbanization and ageing	10
Q2. What are the global issues affecting agriculture and food?	Frequency
(a) Increasing agricultural productivity to meet demand	10
(b) A sustainable natural resource base	1
(c) Increased risk from natural disasters	19
Q3. What is the outlook for agriculture and food?	Frequency
(a) Demand will be very strong	5
(b) Technology is advancing quickly	25
Q4. How important is agriculture?	Frequency
(a) Building a Robust Supply Chain	20
(b) Making Available Raw Materials	4
(c) Promote Economic Development	6
Q5. As per your opinion, finding a true sense of agricultural growth and productivity in the food production is more difficult from a business perspective than evaluating yield gains or selecting the best crops fit for the particular region?	Frequency
(a) Yes	25
(b) No	2
(c) Can't say	3

Table 1: Main forces influencing agricultural transformation in the 21st century

Q1. What are the main forces influencing agricultural transformation in the 21st century?	Frequency
(a) Struggle for natural resources is intensifying	11
(b) Climate change	9
(c) Population growth, urbanization and ageing	10

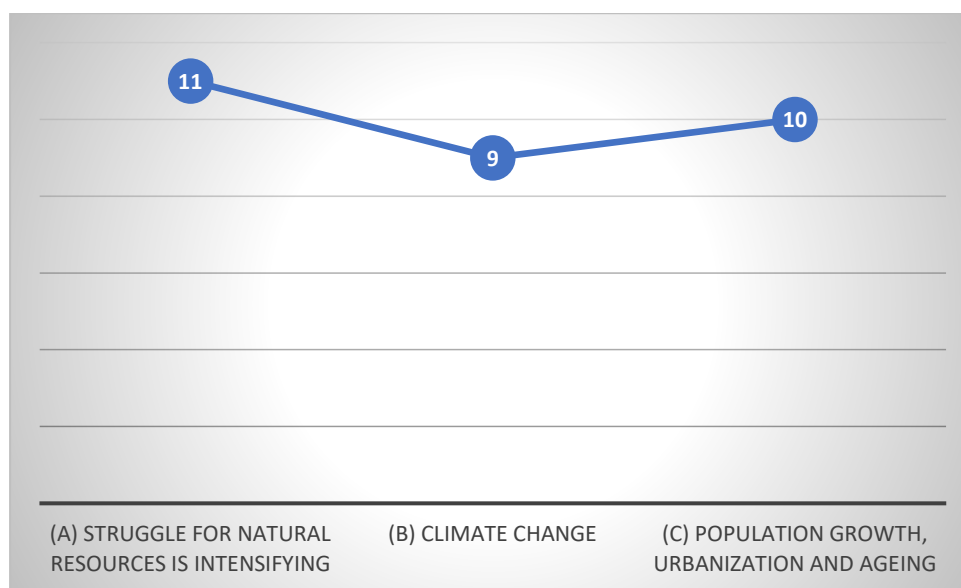


Figure 2: Main forces influencing agricultural transformation in the 21st century

Interpretation

Based on the line chart above, it can be inferred that there are primary factors affecting agricultural change in the 21st century. 11 out of 30 think that struggling for natural resources is intensifying and it is the main force while about 9 think that climate change is the main. Also, another force is population growth, urbanisation and ageing is chosen by the rest of 10 participants. The trends and issues that the research points out are both hope and alarm. Along with improving nutrition and food security, reducing hunger and poverty have seen substantial progress. The efficiency of resources and the safety of food have increased thanks to productivity gains and technological breakthroughs.

Table 2: The global issues affecting agriculture and food

Q2. What are the global issues affecting agriculture and food?	Frequency
(a) Increasing agricultural productivity to meet demand	10
(b) A sustainable natural resource base	1
(c) Increased risk from natural disasters	19

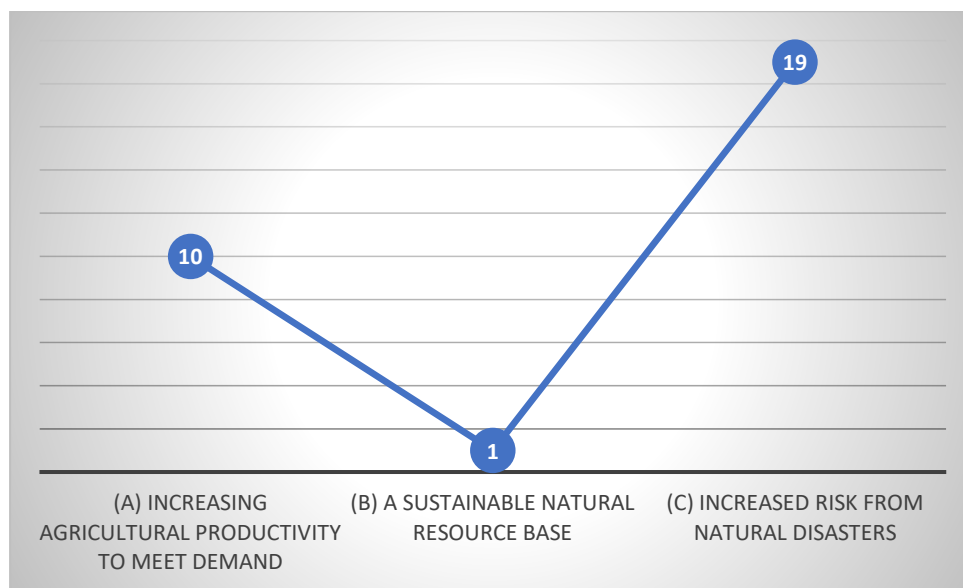


Figure 3: The global issues affecting agriculture and food

Interpretation

From the above line chart, it can be seen that global challenges have an impact on agriculture and food. About 19 feel that the main issue revolves around the increased risk from natural disasters while another 10 think that increasing agricultural productivity to meet demand is the main concern.

Table 3: Outlook for agriculture and food

Q3. What is the outlook for agriculture and food?	Frequency
(a) Demand will be very strong	5
(b) Technology is advancing quickly	25

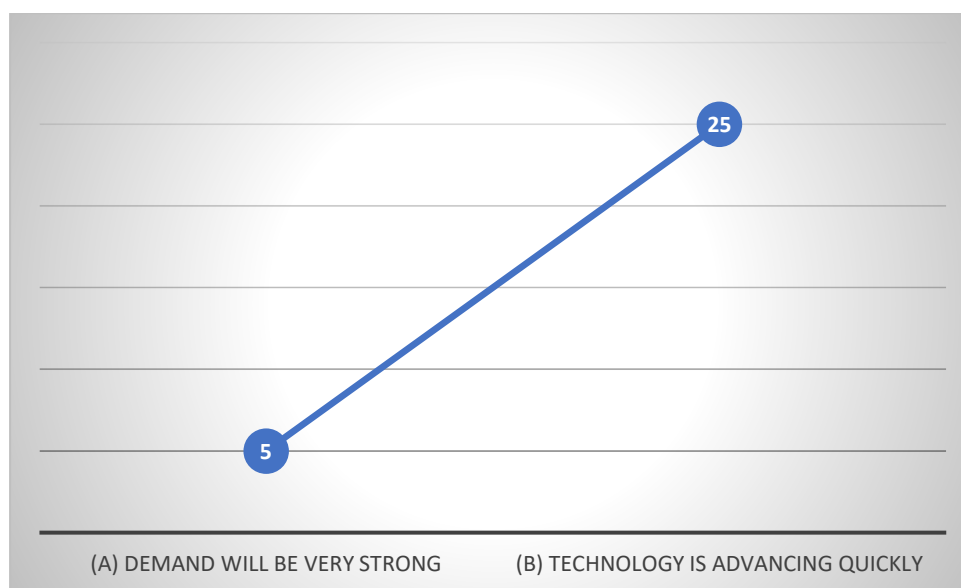


Figure 4: Outlook for agriculture and food

Interpretation

It can be outlined from the above line chart that 25% feel that technology is advancing quickly while only 5% feel that demand will be very strong. There is still work to be done at the farm level to improve agricultural efficiency by looking at technological innovation for better farm management because the growth in agricultural production has global repercussions. The ratio of agricultural exports to agricultural imports may be utilised to determine agricultural productivity. Agricultural productivity can be used to calculate the production systems of individual farms, regions, multi-farm cooperatives, and even the entire planet.

Table 4: Agriculture is important

Q4. How important is agriculture?	Frequency
(a) Building a Robust Supply Chain	20
(b) Making Available Raw Materials	4
(c) Promote Economic Development	6

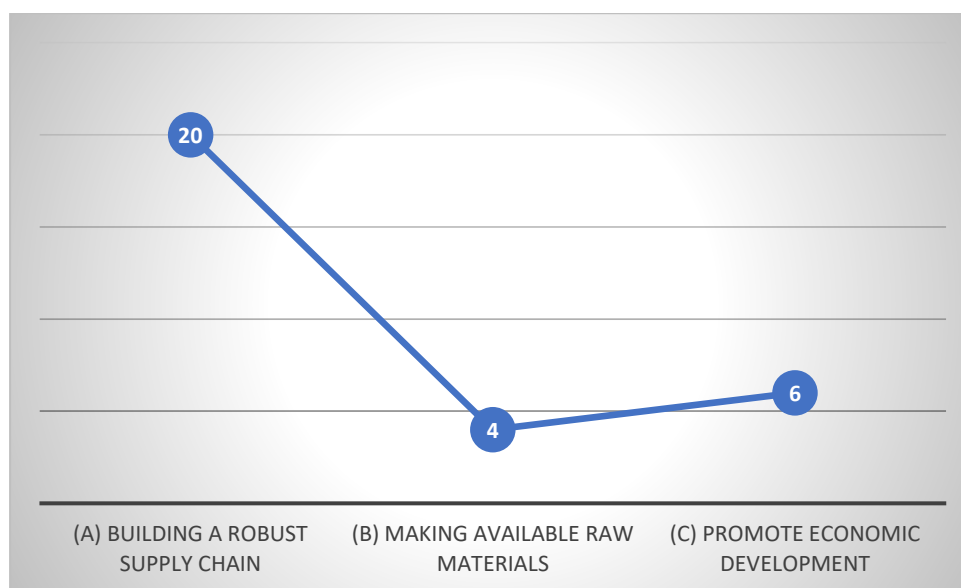


Figure 5: Agriculture is important

Interpretation

It can be understood from the above line chart that agriculture is considered as an essential sector. 20 participants think that agriculture supports building a robust supply chain while 4 of them think that raw materials can be made available with the proper management of agriculture. Also, 6 think that economic development can be promoted with the presence of proper management of agriculture. Government and public policy, the dissemination of infrastructure, and the interchange of knowledge are crucial change agents for ensuring that agriculture has larger and more equitable benefits. A rise in the volatility of agricultural product prices could harm industry revenues and discourage hiring. Modern technology is being used by British farmers to reduce costs and increase yield. The UK government is assisting farmers in expanding their enterprises outside agriculture.

Table 5: Finding a true sense of agricultural growth and productivity in the food production is more difficult from a business perspective than evaluating yield gains or selecting the best crops fit for the particular region

Q5. As per your opinion, finding a true sense of agricultural growth and productivity in the food production is more difficult from a business perspective than evaluating yield gains or selecting the best crops fit for the particular region?	Frequency
(a) Yes	25
(b) No	2
(c) Can't say	3

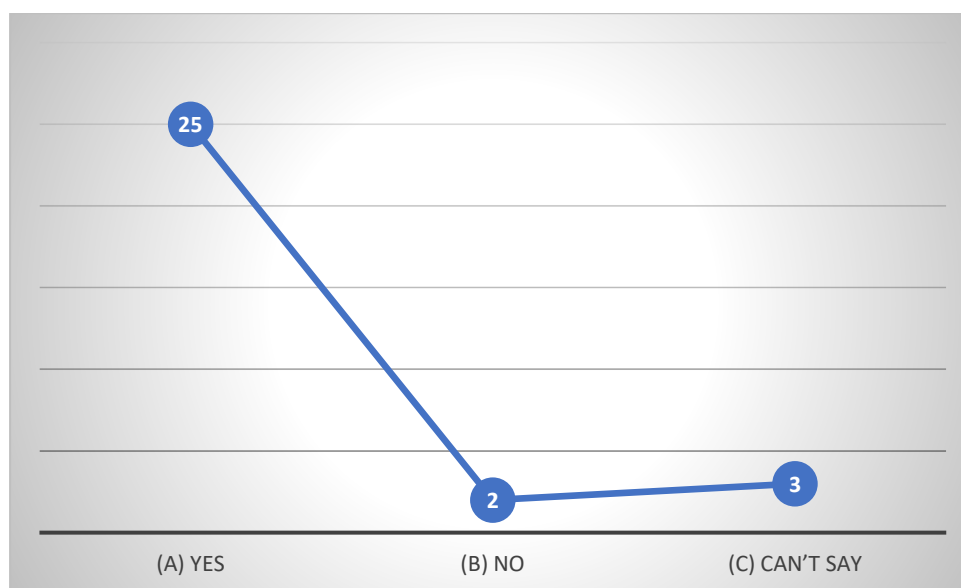


Figure 6: Finding a true sense of agricultural growth and productivity in the food production is more difficult from a business perspective

Interpretation

From the chart and the data, it can be interpreted that from a business standpoint, it is more challenging to find a true sense of agricultural growth and productivity. In the food production than analysing yield improvements or choosing the best crops for the specific region. That is why the majority of participants, 28 agreed with the abovementioned statement while only 2 did not agree.

CONCLUSION AND RECOMMENDATIONS

From the above data, it is being concluded that the agricultural sector is considered important for the region which is undergoing a process of transition to a market economy. Agricultural productivity measures the quantity of output produced within a given quantity of inputs. The improvement in productivity on farms has contributed to profitability and competitiveness as it allows farmers to produce more output using fewer inputs. The agricultural sector adapts and responds to climate change and new challenges facing global food systems as people depend on agriculture for having healthy, safe and nutritious food. The innovations helped in agricultural productivity as process innovation supported in improving production techniques whereas product innovation was created by downstream industries involving new and improved products like healthier foods. The innovation can offer opportunities for agriculture producers to increase productivity by managing the natural resources. Agriculture productivity is an important factor in the global food production system, as it ensures affordable and abundant food and fosters economic development and food security. It can be calculated at different levels, such as the production system, region, multiform cooperative, or even the planet. In the UK, in 2021, agriculture supported the economy by 0.5%, employing around half a million people and being a major part of the food and drink industry. Measuring agricultural



productivity is more complex at the business level than measuring yield increases or selecting the best crops appropriate for a particular region.

The most important details in this text are the tools used to measure farm productivity in the agricultural sector. Total factor productivity measures the total agricultural output in comparison to the labour, capital, land, and material resources used to generate it. Technical efficiency refers to a farm's ability to create a high level of output as allowed by advanced tools and technology. Technical efficiency is the measure of how efficient a farm's management practices are based on the inputs at its disposal. It is important for food security, income, and environmental benefits. Higher productivity decreases energy and land requirements, leading to reduced deforestation, less environmental degradation, and fewer greenhouse gas emissions. Further, it is concluded that agricultural productivity can support economic growth, competitiveness, and sustainable food prices. Large farm operations and cooperatives have advantages in improving agricultural productivity, such as purchasing power, capital, and the ability to aggregate data. These advantages can be used to improve farm efficiency, output, and productivity measures. Government and public policy, knowledge transfer and exchange, and infrastructural development are key drivers of change in agriculture to ensure its wider and more equitable impacts. Increased price volatility for agricultural products has the potential to negatively affect agricultural revenues and discourage recruitment. UK farmers are using new technology to reduce costs and increase productivity. The UK government is trying to help farmers diversify away from food production. Price volatility can disrupt international market prices, but stable food prices can prevent poverty and promote farm-level investment, helping social stability. The Agriculture Bill has been adapted to recognise the importance of food production and introduce a requirement for the Secretary of State to provide a regular report to Parliament on food security in the UK. This is part of the government's commitment to ensuring a high level of food security in the UK.

RECOMMENDATIONS

There are several ways recommended to the farmers for improving the agricultural productivity such as precision farming practices as technology like variable rate seeding and fertilising allowing farmers to seed automatically along with applying nutrient at the exact amount required at precise spot to optimise the best yields for needed inputs depending on soil types and other data inputs. Increased agricultural productivity is essential for growth, labour migration, and income, and new methods and techniques have given farmers a chance to improve production. The other way is to adopt soil health practices such as optimising natural soil fertility and water-holding capacity. There can be use of soil building practices such as crop quality and cover cropping to support high yields. Vigorous seeds, climate-specific seeds, and genetically-appropriate livestock can increase yields which is an effective way to increase agricultural productivity. Technical efficiency (TE) is how efficient a farm's management practices are based on the inputs it has access to. The Production Frontier is the farm's maximum attainable output potential, based on its unique set of circumstances and inputs. Farmers can adopt AGRIVI's farm management software that helps farmers, large farm agrobusinesses, farm cooperatives, and food producers take the next step in efficient farm management practises. It tracks activities at the field level, collecting and managing data on inputs and combining it with financial reports for farm analysis. IoT solutions automate farm tasks.



It is recommended to implement land reforms for improving the production which requires machines, tractors and implements that do land reforms. The use of machines has the qualities which make a rugged farming area in order to make the work smooth on the field efficiently which leads to improved productivity and increased production. The other way recommended is interplant, where practices in different crops are growing together at the same time, which is considered the best way to maximise the productivity of growing space. In order to improve agricultural productivity, it is required to have smart water management as water is an essential need for planting crops and through management of water production can be enhanced as water management is considered the best way for improving production. Through the use of a sprinkler irrigation system, there can be an increase of 50% output along with manufacturing canals; the tube also helps in providing better irrigation for the crops' safety. It is considered that sustainable methods are important in increased agricultural productivity for reducing the amount of land required for farming and to slow down environmental degradation and climate change. The other way to improve agricultural production is through agricultural development as increased productivity arises from innovative farming techniques and innovations like improved seed and nutrient management along with best practices for animal health. Through focusing on ecosystem services like preventing pollination and erosion leads to increase and maintain productive benefits over time. To plant more densely is another most effective way for increasing the productivity of agriculture as the crops come close to each other. In this several farmers keep their vegetables leaving large areas to grow well. Manuring is another effective way as nutrients are required for crops to grow and produce which is important to supply nutrients with regular intervals. It is the stage where dietary supplements are offered and are of natural or chemical compounds. The manure is a decomposition product of plant and animal waste and in addition to offering nutrients to the crop, fertiliser also replenishes soil fertility whereas other methods of soil filling are crop rotation, vermicompost and planting of legumes. Adopting new technologies in agriculture can increase productivity by preventing soil degradation, using water efficiently, and reducing the use of chemicals. Irrigation augmentation and management are needed to achieve a synergy in consumption on a multi-sectoral basis. Agri-credit and crop insurance reform are keys to enhancing small farm productivity. Policymakers must create innovative solutions that balance the financial system with farmers' needs.

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APPENDIX

Q1. What are the main forces influencing agricultural transformation in the 21st century?
(a) Struggle for natural resources is intensifying
(b) Climate change
(c) Population growth, urbanization and ageing
Q2. What are the global issues affecting agriculture and food?
(a) Increasing agricultural productivity to meet demand
(b) A sustainable natural resource base
(c) Increased risk from natural disasters
Q3. What is the outlook for agriculture and food?
(a) Demand will be very strong
(b) Technology is advancing quickly
Q4. How important is agriculture?
(a) Building a Robust Supply Chain
(b) Making Available Raw Materials
(c) Promote Economic Development
Q5. As per your opinion, finding a true sense of agricultural growth and productivity in the food production is more difficult from a business perspective than evaluating yield gains or selecting the best crops fit for the particular region?
(a) Yes
(b) No
(c) Can't say