

An Analysis of Dissemination of Technology and Growth in Agriculture of Jammu & Kashmir

Altaf Hussain Padder

PhD. Research Scholar, Department of Economics, Annamalai University Chidambaram.

Abstract

The present paper analyses the dissemination of technology and growth in agriculture in Jammu & Kashmir. It focuses on technological growth and its impact on agricultural production and productivity during the period from 2002-03 to 2011-12. The agricultural sector ironically supports more than 60% of employment, which is now transforming into other crops and un-agricultural purposes resulting in the rapid growth of unemployment. The paper also tried to analyse the growth pattern of the area, production and productivity of agriculture crops, changing pattern of modernization of agriculture and the relationship between technology and production in agriculture.

Keywords: Agricultural Production and Productivity, Agricultural Growth, Technology.

Introduction

In many ways, the state of Jammu and Kashmir faces the problem of isolation, backwardness, lack of industrial base and employment opportunities. However, the state possesses important water resources and a mineral base and is known worldwide for its horticultural products, tourism and handicraft industries. The insufficient geographical situation and infrastructure in Jammu and Kashmir restricted the development of agriculture. Agricultural production does not increase in proportion to the cost of agriculture; therefore, agricultural productivity is low. In the absence of employment opportunities in other sectors, the workforce is forced to rely mainly on agricultural activities.

Agriculture is the dominant sector of the Jammu and Kashmir economy directly or indirectly, it supports about 80 percent of the population in addition to contributing about 60 percent of state revenue, which sufficiently explains the population's excessive dependence on agriculture. The overall economic growth of the country depends to a large extent on the progress of the agricultural sector, whose development becomes more important in the context of the nominal progress it has made in the secondary sectors.

Jammu & Kashmir is an agricultural state with 80 percent of people devoted to farming for their livelihood. The state is divided into two parts: Jammu 40% of the area and Kashmir 60% of the total area for agricultural purposes. The economy of J&K is largely agricultural, with 70 percent of the population dependent on it and about 49 percent of the active population involved. J&K rice production is mostly monogamous and is cultivated in both blocks, with yields of 41 quintals/ha the highest in the country. Rice production increased from 4327 in 1965 to 5001 (000qtls.) In 2010-11, versus the region from 212.00 to 261.35 (000ha) respectively. Over time, rice production has shown a declining trend as the area of rice is used for other commercial purposes, as increased demand for apples and increased awards shift labour to this crop. Forced rice producers. To go to apple production. As a result, a large area was diverted for commercial and other purposes disclosed by the Ministry of Agriculture, despite the existence of a sealed law on rice lands by the government. To turn it into some other activity that caused a food shortage in J&K which has already reached 40 percent. J&K is not enough to feed its people, and as a result, a large amount of rice (an average of 4.97 tons of lakh) is extracted in one year from the central group to meet the requirements of the poor state. At the same time, the silver line in this scenario is the change that occurs from traditional farming practices to the use of modern technology and sowing high-yielding seed species that guarantees good production.

Objectives:

- 1) To analyze the growth pattern of the area, production and productivity of agriculture crops.
- 2) To analyze the changing pattern of modernization of agriculture.
- 3) To analyze the relationship between technology and production in agriculture.

Database and Methodology:

To justify the objectives of the study, the secondary data is collected from various departments and different published sources like Directorate of Economics and Statistics Jammu and Kashmir, Directorate of Agriculture Jammu and Kashmir, Directorate of General Transport Jammu and Kashmir and the Central Statistical Organization. The tools and techniques which are employed here to analyse the dissemination of Technology and Growth in Agriculture are the growth rate which shows the changing pattern of production and productivity of agriculture crops and modernization of agriculture. To analyse the relationship between the variables Karl Pearson's coefficient of correlation has been used.

Trends in Agriculture:

The majority of the population of Jammu and Kashmir state live around agriculture and allied sectors. These sectors constitute the pillar of the country's economy and contribute about 50 percent to the GSDP program. Over 1.25 million rupees depends directly or indirectly on agriculture and its related sectors. The diversity of physical characteristics and climate diversity at the macro and micro levels, which includes the cold, arid, moderate, medium and subtropical regions, within a small geographical area of 2.22 square kilometres, indicates the potential agricultural potential of the country. The net cultivated area (NSA) of 7.35 lakh hectares (2009-10) is 35 per cent of the registered area compared to the national average of 46 per cent. Nearly 70 per cent of the area planted with nets is under food crops. The average farm size is very small (0.67 hectares/farm) compared to 1.66 hectares. Across the country with over 93 percent of owners of these farms live on agricultural and allied activities.

Over the years, farmers have adopted various farming practices specific to regions and times to meet the requirements of their basic food crops. Rice, corn, wheat, legumes, fodder, oilseeds, potatoes and barley are the main crops of the country. The state and the central government have emphasized the agricultural development growth strategy, and there are ongoing initiatives to make the J&K economy progressive agriculture.

At present, the agricultural sector (including livestock) contributes 14% of GDP at the national level and 20.59% with the sustainable development plan (at current prices) but remains the main source of livelihood for most of the rural population. Therefore, the rapid growth of agriculture is indispensable for faster, more inclusive and sustainable growth.

Table 1. Total Area under Main Crops

Table 1, Percentage share of the total area under main crops				
Year	Rice	Maize	Wheat	Other
2002-03	24.61	34.31	25.86	15.22
2003-04	26.4	26.4	25.89	21.3
2004-05	25.51	25.51	25.71	23.27
2005-06	26.43	26.43	25.82	21.33
2006-07	25.15	25.15	26.55	23.15
2007-08	26.14	26.14	27.63	20.08
2008-09	25.35	25.35	27.51	21.79
2009-10	25.32	25.32	28.15	21.21
2010-11	25.64	25.64	28.49	20.24
2011-12	25.27	25.27	28.54	20.93

Table 2, Growth rate of Area Sown Under Main Crops of J&K

Year	Rice	Maize	Wheat	Other
2002-03	0	0	0	0
2003-04	9.75	-21.28	2.42	43.15
2004-05	-3.47	-3.47	-0.79	9.09
2005-06	3.6	3.6	0.4	-8.33
2006-07	-2.7	-2.7	5.14	11
2007-08	4.37	4.37	4.51	-12.93
2008-09	-2.28	-2.28	0.36	9.41
2009-10	0.78	0.78	3.23	-1.81
2010-11	0.77	0.77	0.69	-5.07
2011-12	0.38	0.38	2.07	5.34

Growth Rate of Area Sown under Main Crops

Table 1 given below shows the percentage of the total area under the main crops of Jammu and Kashmir, calculated from 2002-03 to 2011-12. The percentage share of total area sown under rice during 2002-03 was 24.61 per cent and it increased to 25.27 per cent during 2011-12. The percentage share of total area sown under maize was 34.31 per cent during 2002-03 and it drastically falls to 25.27 per cent during 2011-12. During the same period, the percentage share of total area sown under wheat had been somehow increased. There is an incredible enlargement of total area sown under the other crops i.e. apple orchards and other crops, this shows there is a transformation of crops and for other purposes. Table 2 shows the growth rate of area sown under the main crops of J&K. During the period from 2002-03 to 2011-12, the growth rate of crops under rice and maize had decreased rapidly, under the main crops maize show the highest negative growth during the initial years of transformation of crops. Comparing the growth rates of mentioned crops,

all the crops except other crops had been declining during the study period from 2002-03 to 2011-12. In the year 2003-04, the growth rate of other crops is showing highest rate 43.15 among the all crops which starts declining to 5.34 that means there is marginal inter transformation of agricultural land, the land is used for other purposes like constructions of houses, roads, railway etc.

Growth Rate of productivity of Main crops

Table 3 shows the productivity growth rate of major crops in Jammu and Kashmir during the period 2002-03 to 2011-12. It analyses that there are large fluctuations in terms of productivity kg/ha. Among the declared crops, only wheat productivity showed an increasing trend from 2003 to 2011, and then there was a significant decrease in wheat productivity in the coming year 2011-2012. In terms of rice and maize productivity, both show a negative result. The trend during the same study period is on average.

Agriculture in the hills and mountains of the country suffers from inherent limitations in dimension and inaccessibility, margin and fragility in terms of stress, moisture, poor soil conditions and a short growing season. Added to this are social and economic constraints that mainly include small land characteristics, low productivity, poor production management, labour shortages, poor post-harvest management, poor market networks, and a lack of entrepreneurship.

All of these factors have led to the underutilization of the available resource base that leads to a limited generation of surpluses. Arable land represents about 18 per cent of the total geographical area, while the net cultivated area is only 7 per cent. More than half of the arable land is irrigated. Although the area, yield and yield of different crops increased over time, the rate of development was very slow.

The inaccessible mountainous terrain in the country limits the introduction of mechanized agriculture and transport without the complexities of inputs and products. In its wake, accelerated agricultural growth has caused the degradation of natural resources, especially land, water and biodiversity. The erosion of genetic diversity has also resulted in the emergence of HIV in various crops. Many crops that enjoyed this status in the region are no longer in the production chain.

Over time, agriculture has become a relatively less profession due to lower returns, despite the steady increase in the use of a set of inputs, a disadvantaged price system and a low-value addition.

Inadequate capital, and the lack of adequate support for infrastructure and agriculture that is implemented as a livelihood option, has also affected the economic viability of the agricultural sector, causing a new generation of young people. Farmers are turning away from farming and looking for occupations that focus on urban areas.

Table 3, Growth Rate of Productivity of Main crops

Year	Rice	Maize	Wheat
2002-03	0	0	0
2003-04	8.91	17.15	10.47
2004-05	9.18	-7.74	4.88
2005-06	9.18	-7.34	-4.33
2006-07	2.04	6.51	3.43
2007-08	-2.78	4.25	-4.81
2008-09	2.48	27.79	-2.64
2009-10	-11.88	-21.9	-42.19
2010-11	0.73	9.32	53.04
2011-12	7	-6.07	10.03

Changing Pattern in Agriculture Technology

It is a fact that the pace of progress in society is largely driven by cumulative technological development. Technology is not a single tool alone, but it includes irreparably the human skills and ideas needed to create and use tools for useful purposes. In his most famous speech, Clarence Iris says in his famous book "The Theory of Economic Progress" (1962): "Thus, what happens to any society is determined jointly by the urgency of its technology and the backpressure of its festive system."

Technological change in agriculture began at least 10,000 years ago when the first farmers chose wild plants and experimented with different farming environments. From that start, the artistic performance of agriculture in the great civilizations remained fairly equal for centuries until the mid-nineteenth century, introducing mainly European and North American sources of energy and machinery (Grigg, 1974).), The rediscovery of Mendel's experiments that led to the development of scientific plant breeding and the development of artificial fertilizers, led to a rapid increase in agricultural productivity.

Rapid technological change, which has led to a marked increase in productivity, has occurred in parts of the developing world, especially during the past half-century. This was especially evident during the Green Revolution, a term originally applied to spread new types of rice and wheat from short and effective straw in fertilizers, especially in Asia, although not exclusively.

The spread of modern technologies has been influential, especially the "modern types" (MV) of cereals. By 1990, modern varieties accounted for about 74 per cent of rice, 70 per cent of wheat and 57 per cent of maize grown in the developing world (Byerlee, 1994). Although these figures partially reflect the collection of seeds, fertilizers, and irrigation in the Green Revolution, a large proportion of these modern varieties are cultivated with little or no external input (Byerlee and Lopez-Pereira, 1994).

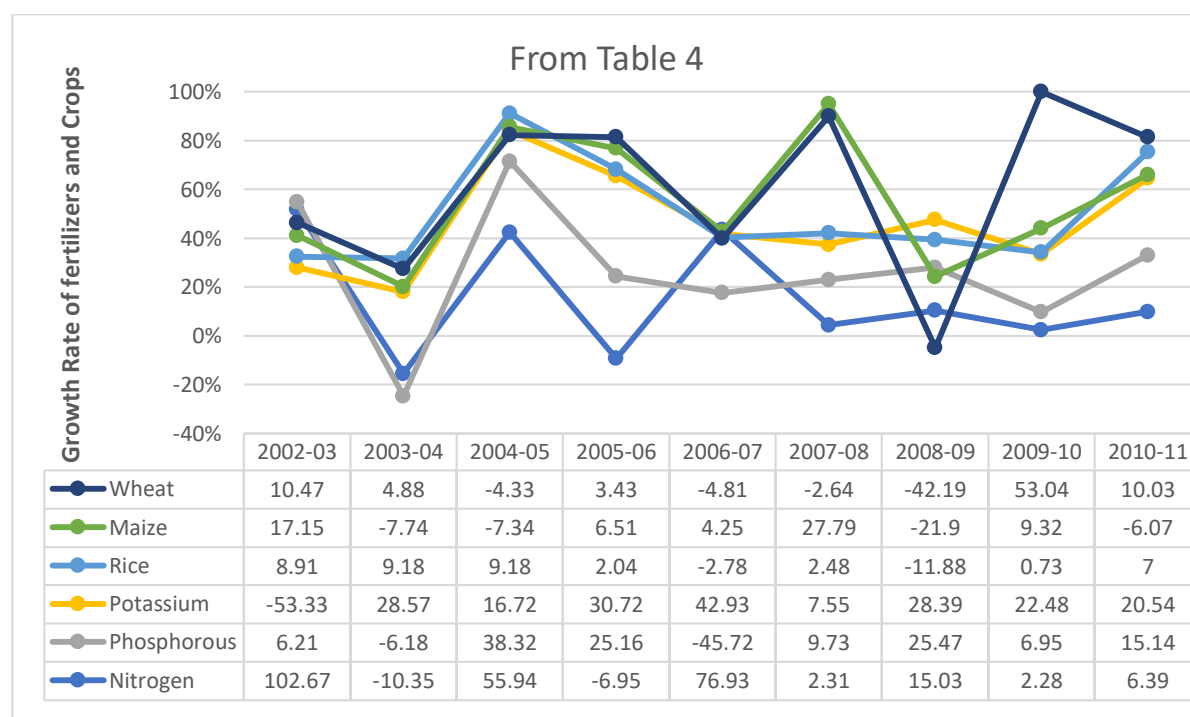
Greater productivity has been achieved in agriculture in different parts of the world, especially through the use of technology. This technology consists largely of the use of improved seeds and modern agricultural machinery such as tractors, combine harvesters, threshers, etc., and chemical fertilizers and pesticides in an ideal combination with water. Through the use of technology in the agricultural sector, most of the developed countries today got their industrial revolution, especially England, in 1770. It opens the doors to growth in other sectors and improves the country's economy.

The agricultural sector has expanded the doors of industrial development in Jammu and Kashmir since 1999-00. The production and crops of various crops increased dramatically with the use of technology. Technology, such as mechanized equipment such as tractors, fertilizers, and high-yielding and irrigation seed varieties, increased at a rapid pace, which in turn increased the production of various Jammu and Kashmir crops. The old farming techniques are shrinking in the country, which leads to the growth of agriculture as well. Therefore, with the use of modern industrial tools in the cultivation of Jammu and Kashmir, there is potential to improve the links between agriculture and industry in the economy of Jammu and Kashmir.

Table 4, Growth Rate of Fertilizers

Year	Nitrogen	Phosphorous	Potassium
2002-03			
2003-04	102.67	6.21	-53.33
2004-05	-10.35	-6.18	28.57
2005-06	55.94	38.32	1672.22
2006-07	-6.95	25.16	30.72
2007-08	76.93	-45.72	42.93
2008-09	2.31	9.73	7.55
2009-10	15.03	25.47	28.39
2010-11	2.28	6.95	22.48
2011-12	6.39	15.14	20.54

Table 4 indicates the annual growth rate of fertilizers during the period 2002-03 to 2011-12. Comparing the annual growth of fertilizers to the annual growth rate productivity of crops, on average both the growth rates shows a declining marginal trend during the study period. Below the chart shows the clear picture when plotted all the observations in a single diagram.



Year	Growth Rate
2002-03	-
2003-04	8.07
2004-05	8.31
2005-06	7.88
2006-07	3.58
2007-08	17.6
2008-09	6.56
2009-10	8.32
2010-11	10.52
2011-12	10.21

In Table No. 5 here we can analyse the growth rate of tractors, which shows an increasing trend during this period, it's because tractors are used for other purposes also not only for agricultural purposes.

Growth Rate of Area under High Yielding Varieties of Seeds and irrigated area under different crops;

Table 6 indicates the growth rate of the area under a high yielding variety of seeds. We can easily analyse the fluctuations of high yielding varieties of seeds. There is not so much improvement in HYVS during this period, it's because people are migrated crops like Rice, Wheat and Maize to Apple orchards and construction purposes. The irrigation facility is also not too developed so that crop cultivators can get enough irrigation for their crops. Table 7 indicates the growth rate of irrigated areas under different crops.

Year	Rice	Wheat	Maize
2002-03			
2003-04	9.75	2.42	-2.43
2004-05	-3.47	-0.79	0.31
2005-06	3.6	0	-0.62
2006-07	-2.7	5.56	0.94
2007-08	4.37	4.51	-6.5
2008-09	0.38	-2.16	-0.66
2009-10	0.76	6.25	0.33
2010-11	6.02	1.04	5.65
2011-12	-4.26	0	-4.72

Table 7, Growth rate of irrigated area under different crops

Year	Rice	Wheat	Maize
2002-03			
2003-04	1.36	0	-14.81
2004-05	1.79	2.9	13.04
2005-06	3.08	2.82	3.85
2006-07	-1.28	1.37	-18.52
2007-08	-0.87	4.05	0
2008-09	1.31	3.9	9.09
2009-10	12.07	2.5	-4.17
2010-11	8.46	4.88	-30.43
2011-12	-4.26	1.16	0

Although the agricultural structure of Jammu and Kashmir on the eve of the introduction of new technologies was much less inclined than the rest of India, the distribution of land in Jammu and Kashmir was more favourable since the country's agricultural reforms were more extreme. Then it was elsewhere in India, however, the impact of new technological changes in the country was not as innovative as in other states of India, especially in Punjab. Many factors to know. Shortage of site-specific HYV seeds, low level of fertilizer consumption, lack of awareness of the farmer regarding new seed requirements, etc. They were responsible for the slow success rate of new technologies. Despite these limitations, new technologies have had an impact on government agriculture.

It is widely accepted that technological changes in agriculture have resulted in more deviant income distribution in most states of India, especially in Punjab. The technology of the green revolution, which was capital intensive, was more suitable for wealthy farmers than small and marginal farmers because only the rich peasant had sufficient resources to pay for production technology, and the inputs were very expensive at hand. One of the richest farms; therefore, the latter was in a better position to obtain its benefits. However, due to the transformation of regional relations through agrarian reforms and other institutional changes, income distribution was not biased in Jammu and Kashmir state. Although the degree of acceptance of new technologies varies from farmer to farmer, depending on the level of exposure, and access to other satisfied products, especially fertilizers and credit facilities, but in the case of Kashmir, neutral/large scale technologies played an important role. A major role in disseminating technologies to all categories of farmers: small, marginal, and large. However, the total yield rates, as well as the productivity per acre, were not positively correlated with the size of the farm. Discover that the profits of the new agricultural strategy were neutral in size. It was observed that new technology rather than increasing inequality resulted in a general decline among progressive farmers. Inequality in the distribution of agricultural income, if any, was in line with the unequal distribution of farm size. Because technological changes made agricultural capital dense, farms had to grow lucrative crops. The more cultivated area was brought under crops such as apples, saffron, and vegetables, and more recently, under Black Zira. It is important to mention that the new technology helped create favourable conditions for doubling the cultivation, but the rotation of traditional crops in which the overall soil cultivation followed was followed by rich soil cultivation.

Impact of Technology on Agriculture

Karl Pearson's coefficient of correlation was used to analyse the impact of technology and growth on agricultural productivity of prescribed crops in table 8. There is a strong significant positive relationship between the production of rice and technology except for the area under irrigation which shows a low degree of correlation. Wheat and technology show an insignificant negative correlation, which means there is no impact of technology on wheat production. In terms of Maize production and technology only two variables show a positive relationship and are insignificant, there is no impact of HYS and Irrigation on the production of Maize.

Rice	Fertilizers	Tractors	HYS	Irrigation
r	0.62	0.52	0.66	0.31
t	2.28	2.01	3.29	0.96
Wheat	Fertilizers	Tractors	HYS	Irrigation
r	-0.08	-0.03	-0.15	-0.05
t	-0.18	-0.06	-0.43	-0.14
Maize	Fertilizers	Tractors	HYS	Irrigation
r	0.18	0.16	-0.34	-0.09
t	0.52	0.46	-1.08	-0.26

Discussions and Suggestions

It has been found from the analysis that the production of agriculture crops analysed here are declining. So, based on the analyses certain concrete suggestions are made for the improvement of agriculture productivity in Jammu and Kashmir.

- In the state of Jammu and Kashmir, land reform measures should be implemented and construction of residential buildings and other establishments on agriculture should be banned, reform policies should be supported by strict laws and regulations.
- The Government of the state should provide improved seeds and other inputs to the farmers at the village level at subsidized prices. awareness camps should be propagated so that it should bring interest in the minds of farmers.
- The Government should provide active support for the promotion of cooperative farms of enterprise, by this institutional reform would be pursued to channelize their energies for achieving greater productivity and production.
- For the growth of agriculture of Jammu and Kashmir, the fragmentation of landholdings should be prohibited by the government of the state.
- The Government of Jammu and Kashmir should provide suitable farm machinery for small and marginal farmers at a subsidized rate since the majority of farmers are small, it becomes the main hurdle in the adoption of new agriculture technology.
- Prosecution of agricultural research at state agricultural universities based on identifying agro-climatic zone should be accorded high priority, application of frontier sciences like biotechnology remote sensing technologies etc. should be encouraged to harness the tangible benefits for farmers.

- The Government of Jammu and Kashmir should make efforts to give a fillip to varietal research and plant breeding and protection of plant varieties and farmers rights to stimulate investment and initiative both in public and private sectors for the development of new plant varieties that require fewer inputs.
- Integrated packages of measures should be implemented by the Government of the state to increase farm productivity and profitability without any ecological harm. Greater congruence between productivity and sustainability should be ensured through integrated soil-water-nutrient management to bridge the existing yield gap.
- Human Resource Development programs for farmers as well as resource persons should be given renewed thrust for knowledge, skill and technology up-gradation and adoption, which would help them, make better decisions.
- The Government should replace the interdependence of rain for different crops with a permanent irrigation system. Since irrigation is an important determinant for the growth of different crops, so low gestation irrigation projects should fund to expand irrigation facilities and the existing facilities of irrigation should be made functional.
- The Government should supply the inputs like fertilizers, pesticides and all other essential nutrients in time so that it will enrich the soil to increase the production and productivity of different crops.
- The Government of Jammu and Kashmir should improve the quality of farmers by general and technical education. Adequate public health measures should be taken in rural areas, which would lead to an increase in the production of crops.
- To improve the agriculture sector of the state, farm support services such as credit services should be easily provided to the farmers for the purchase of motorized equipment and other products.
- The Government should encourage research on seed varieties that are drought-tolerant, resistant to high temperature, anti-water logging diseases, etc.
- The Government should develop infrastructure like roads in rural and hilly areas so that the new technologies in agriculture should be easily used for the production of different crops in these areas.
- For agriculture growth in Jammu and Kashmir, rainwater harvesting and management is required for upgrading rainfed agriculture in the Kandi regions of the state.

References

- Alston, J.M, (2010). The benefits from agricultural research and development, innovation and productivity growth. *OECD Food, agricultural and fisheries papers*.
- Agbam, J.U, (2000) Agricultural research extension linkage systems: an international perspective. *Agricultural research and extension network*
- Bell, C., Rich, R (1994). Rural poverty and agricultural performance in post-independence India. *Oxford bulletin of economics and statistics*.56:111-133.
- Chand, R., Ramus's. (2009). Instability in Indian agriculture during different phases of technology and policy. *Indian journal of agricultural economics*.64.
- Chand, Ramesh (2001), Emerging Trends and Issues in Public and Private Investments in Indian Agriculture: A State-wise Analysis, *Indian Journal of Agricultural Economics*, Vol. 56, No.2, April-June.
- Chand, Ramesh and Pratap Birthal (1997), Pesticides Use in Indian Agriculture concerning Growth in Area and Production and Technological Change, *Indian Journal of Agricultural Economics*, Vol. 52, No.3, July-September.
- Ghosh, Kumar, A., Kumar, D. (2002) Landuse pattern in Bakura district-a factor analysis approach. *Indian journal of regional science*. xxxiv:98-102.

- Gulati, A., Kumar, A.G., Shreendhar, G., Nandakum T. (2012) Agriculture and malnutrition in India. *Food and nutrition, the United States university*.33.
- Headey, D., Chiu, A., Kadiyala,S. (2011)International food policy research institute.
- Herforth, A., Jones, A., Anderson, P. P. (2012), Prioritizing nutrition in agriculture and rural development: Guiding principles for operational investments. *Health, nutrition and population discussion papers*.
- Hobbs, P. R.Conservation agriculture: what is it and why is it important for future sustainable food production. *Department crops and soil science, Cornell University*.
- Padder, A. H., & Mathavan, B. (2021). The Relationship between Unemployment and Economic Growth in India: Granger Causality Approach. *NVEO-NATURAL VOLATILES & ESSENTIAL OILS Journal/ NVEO*, 1265-1271.