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# Contents

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**Editorial Office**
Sardar Patel Institute of Economic and Social Research (SPIESR) Thaltej Road, Near Doordarshan Kendra, Ahmedabad-380 054. Gujarat, India.
Phone: +91-079-26850598, 26851428 | Fax: +91-79-26851714
e-mail: anvesak@spiesr.ac.in | website: www.spiesr.ac.in

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**Prof. D.T. Lakdawala Memorial Lecture[1]**
**on**

# POVERTY, INEQUALITY AND GROWTH: REVIEWING THE PAST AND LOOKING AHEAD

MONTEK SINGH AHLUWALIA*
*Centre for Social and Economic Progress, New Delhi, India*

It is an honour to be invited to deliver the D.T. Lakdawala Memorial Lecture. Prof. Lakdawala founded the Sardar Patel Institute of Economic and Social Research and he was one of the most distinguished economists of his generation. He had deep interest in the measurement of poverty and made important contributions to the national debate in this area. Since it is in this context that I first met him, allow me to begin by recalling that occasion.

It was in 1978 when I was working in the World Bank in Washington DC and visiting Delhi on holidays. I called on Yoginder K. Alagh, another stalwart from the Sardar Patel Institute, who was then the Advisor for the Perspective Planning Division, Planning Commission of India. In the course of the meeting, I mentioned that I was doing some empirical work on trends in rural poverty in India arising out of Pranab Bardhan's 1971 paper which showed that rural poverty had increased between 1960-61 and 1967-68 (Ahluwalia, 1978). Bardhan's result was contrary to the findings of B.S. Minhas who found a steady decline and the Bardhan paper was often quoted as demonstrating the failure of our growth strategy. I had a different view. I felt rural poverty was affected by the level of agricultural production per head of the rural population in the same year and also with one year lag and on this basis I felt the high poverty in 1967-68 did not reflect a trend increase but could be explained by the fact that agricultural production per head of the rural population was very low in 1967-68 and also in the previous year.

Since rural poverty was of particular importance at the time, Yoginder invited me to make a presentation in the Commission. I readily accepted, viewing it as a privilege. Imagine my surprise when I arrived for the presentation and found that Prof. Lakdawala himself—who was then the Deputy Chairman of the Planning Commission—on hearing of the subject, decided to preside over the lecture! I was deeply impressed that his interest in the subject, and his intellectually democratic

[1]Dr. Montek Singh Ahluwalia delivered Prof. D.T. Lakdawala Memorial Lecture which was held on February 22, 2025 at the Sardar Patel Institute of Economic and Social Research, Ahmedabad.

*Montek Singh Ahluwalia is former Deputy Chairman of the erstwhile Planning Commission of India. Currently, he is a Distinguished Fellow at the Centre for Social and Economic Progress, New Delhi, India. Email: monteksingh.ahluwalia@gmail.com

personality, had persuaded him to depart from protocol and preside over a lecture by a mid level visiting official of the World Bank!

Prof. Lakdawala remained involved in the measurement of poverty even after he moved out of the Planning Commission. In fact, the first official poverty lines for different states were based on the recommendations of a Committee he chaired in 1993. In recognition of his seminal contributions in this area, I thought I would use this lecture to review how our approach to poverty reduction has evolved over the years, and consider the policy challenges we face in achieving these objectives in the years ahead.

## Poverty Reduction in India: A Long History

The first serious work on poverty in India was Dadabhai Naoroji's famous work "Poverty and Un-British Rule in India", which was published in 1901. Naoroji argued that the British had a vested interest in romanticising the prosperity of India under British rule, implicitly attributing this to the stability and peace brought about by the Empire. This deliberately misleading picture was designed to justify heavy taxes imposed on India to pay for the cost of the Empire, and also to hide the damaging effects of unfair trade practices, which impoverished the country. This led to excessive projection of the wealth of the Maharajas, and the prosperity of a thin associated landed class, while the country at large suffered from severe poverty.

The removal of poverty was recognised as a key objective of policy during the Freedom Movement and this was reflected in the work of the National Development Committee, set up by Congress President Subhash Chandra Bose with Jawaharlal Nehru as the Chairman. The Committee never submitted its report because the Second World War intervened, but it is known that it was working on a strategy which would ensure a "minimum level of living" to each citizen, defined as Rs. 15-25 per person per month in 1938 prices, with the state additionally providing access to education and health. This definition of a minimum level of living in terms of a minimum level of expenditure on private goods, with a minimum assured access to public goods, is a formula that remains valid today.

As it happened, the early Plans adopted after independence contained no specific provisions for achieving minimum levels. The focus was on expanding GDP and it was assumed that the rest would follow. The Mahalanobis model, which became the analytical basis for Indian Planning, made no mention of poverty or minimum levels of living. It focussed entirely on how to achieve a target rate of growth of GDP. However, the assumption that growth of GDP would lead to a better standard of living for the poor was soon questioned. Interestingly, the questioning came not from economists or technocrats, but from a young socialist MP Ram Manohar Lohia. In his maiden speech in the Lok Sabha in 1963, Lohia criticised the government for focusing on GDP growth and ignoring the fact that the benefits of growth were not reaching the poor. He dramatized the issue by saying that Prime Minister Jawaharlal Nehru was probably unaware that the majority of the Indian population lived on less per day than it cost to feed the Prime Minister's dog!

The Planning Commission was directed to work out a development strategy that would end poverty in fifteen years. The Perspective Planning Division of the Commission prepared a paper entitled "Perspectives on Development: Planning for a Minimum Level of Living". The paper made the very important point that poverty in India could not be removed by simply redistributing income from the rich to the poor as that would involve a level of taxation that would severely reduce the incentive and capacity to invest. It therefore proposed a two track approach. First, we would need to increase the size of the pie by targeting growth of GDP at 7 percent per year, much higher than the 5 percent that was then being targeted. Noting that income distribution did not seem to differ much

between countries at different levels of development, the paper assumed that it would not change if growth was targeted at 7 percent and on this assumption all except the lowest 20 percent of the population would go above the minimum level in 15 years. However, the lowest 20 percent would not benefit sufficiently from the higher growth to get above the poverty line, and for this group it would be necessary have a second supplementary approach i.e. designing targeted policies aimed at raising the incomes of the lowest income groups.

This "growth plus targeted programmes strategy" made eminent sense, but the Commission never outlined the policy changes that would be necessary to achieve 7 percent growth. Had they done so, they might have identified the many policy weaknesses which hindered growth such as relying on the public sector to occupy the "commanding heights of the economy", excessive controls on the private sector, and deliberate insulation of the economy from foreign trade and foreign investment. These issues were ignored and the Commission simply assumed that a strengthening of the policies being followed, with higher levels of investment, would produce the higher growth.

In fact, growth actually slowed down after the mid-1960s. This has been explained in retrospect by the effect of the Indo Pakistan War of 1965 and two successive droughts in 1966 and 1967. While these were important factors, political developments in those years also shifted policy towards the Left. Lal Bahadur Shastri died unexpectedly in January 1966 and the Congress made Indira Gandhi the Prime Minister, with the expectation that she would be a plaything. She was made of stronger stuff than they thought and challenged them by splitting the Congress at the end of 1969 into an Indira Gandhi faction (Congress I) and the right wing (the Syndicate) called the Congress (O). She characterised her fight against the Syndicate as "*Woh kehte hain Indira hatao: hum kehte hain Garibi Hatao*". The Garibi hatao slogan was effectively used in the election held in January 1971, which she won handsomely.

Interestingly, eliminating poverty was also the political flavour of the times across the border in Pakistan where Zulfikar Ali Bhutto campaigned on a similar slogan "*Roti, kapda, aur makan*". The subject also gained popularity in the international development community as Robert McNamara, President of the World Bank, used the Annual meetings of Bank in 1973 to signal that the bank would focus its efforts on helping the poor, especially small farmers.

The focus on removing poverty was indeed undoubtedly the right priority, but most economists in India missed the point that we would have removed poverty much more effectively if we had focussed on achieving high growth as many other countries in East Asia did. Our failure to achieve high growth should have led to serious questioning of why we were doing so much worse than other countries. This did not happen. In fact, left leaning economists even took to deriding what one of them called "the chimera of high growth". They called instead for much stronger targeted interventions to help the poor get out of poverty. These were nested in an overall policy environment that favoured increased government control over the private sector.

To be fair, it was not just the left that favoured targeted interventions. Non-leftists also glorified the direct approach by drawing inspiration from Mahatma Gandhi's much quoted talisman statement:

> *I will give you a talisman. Whenever you are in doubt or when the self becomes too much with you, apply the following test. Recall the face of the poorest and weakest man [woman] whom you may have seen, and ask yourself if the step you contemplate is going to be of any use to him [her]. Will he [she] gain anything by it? Will it restore him [her] to a control over his [her] own life and destiny? In other words, will it lead to swaraj for the hungry and spiritually starving millions? Then you will find your doubts and yourself melt away.*

A framed copy of this statement used to hang in the outer office of the Prime Minister in Parliament House. I recall several occasions when I was arguing in favour of liberalisation which would foster higher growth and thereby also achieve poverty reduction, someone would point to the framed statement to justify the direct approach. I would respond by saying what I was recommending was not inconsistent with the Mahatma's "talisman". All that he had said was that we should think hard about whether the policies we are considering would help the poor and my whole point was that if we were to think about what liberalisation would do to the growth of employment and the incomes of lower income groups, it would amply justify the change I was advocating. Of course, there was a role for supplementary direct action, but we were missing out on large potential benefits on the growth font.

There were two reasons why the direct intervention approach had greater appeal than focussing on the indirect effects via growth. For one thing, politicians were not convinced that it would actually work, or at least not in a near enough time horizon. Another reason was that they would find it difficult to claim credit for a strategy which benefited the poor only indirectly. One can easily see that a poor person is more likely to get a well-paid job if the economy is growing rapidly creating many such jobs, and public education has given him the training to get these jobs. The problem is that he does not credit the government for this outcome. He credits his own capacity. In contrast, those who benefit from targeted programmes are much more likely to give credit to the politicians behind the programmes.

The trend towards directly targeted programmes intensified in the 1970s. Following her victory in 1971, Mrs Gandhi announced a Twenty Point programme which contained a mix of publicly funded programmes aimed at benefiting the poor. They included rural employment programmes, programmes for increasing productivity in small farms, providing toilets, strengthening education and health etc. Such targeted anti-poverty programmes became a part of the armoury of politicians seeking votes in successive elections. The programmes are renamed when governments change, and also perhaps expanded and strengthened, but they remain the main basis for appealing for votes.

Mrs Gandhi lost the election in 1977 and the Janata Government came into office under the prime ministership of Morarji Desai. Mrs Gandhi's defeat was not due to economic performance. It was a comprehensive rejection of the authoritarian rule introduced in the Emergency in 1975. The new government under Morarji Desai which came into office in 1977 had an opportunity to take corrective steps to liberalise the economy, but Morarjibhai did no such thing. If anything, the only new initiative his government is remembered for is the Antyodaya Programme, which it introduced in 1978, which was aimed at helping the "poorest of the poor", i.e., targeting within targeting.

Mrs Gandhi came back as Prime Minister after the election of 1980. She initiated some liberalization of controls over the private sector, but these changes were very limited. She was assassinated in 1984 and the general election at the end of 1984 brought the Congress back to power with a massive majority.

Rajiv Gandhi as the new Prime Minister raised hopes of change in many quarters. He was a young man and tech savvy and had none of the "socialist mind set" that was woven into the Congress Party. He talked of preparing the country for the next century, which appealed to the youth. He also pointed out in Parliament that India could not possibly compete with other countries if we continued to work with systems that were twenty years out of date. This in my view was a very important statement. Previous Prime Ministers had noted the inadequacy of our performance in many areas, but this was always blamed on some external factors, monsoon failures, or wars, or even just plain poor implementation. Rajiv Gandhi was the first Prime Minister to say the fault lay with the system.

The acknowledgement that a system change was needed enthused Jagdish Bhagwati, another distinguished son of Gujarat who was then a Professor in Columbia University. Bhagwati wrote in the New York Times that he had high hopes of what Rajiv might do, provided he could overcome resistance from the bureaucracy. Rajiv Gandhi did initiate some liberalization, but not enough. He was soon overwhelmed by other political developments, including the Bofors scandal.

It was only in 1991, when the Narasimha Rao government took office, with Dr. Manmohan Singh as Finance Minister, that we saw a programme of genuine structural reform. I will not go into the details of that story as I have dealt with it extensively in my book "*Backstage: The Story of India's High Growth Years*". I urge those of you who are interested to read it. For the purpose of this lecture, let me just say that the reforms initiated in 1991, were much more systemic than anything that had been done before. They dismantled most of the controls over private investment and also opened up the country to foreign trade and FDI. The process of change was not of the big bang variety. It was a gradualist process, and that was a reflection of the political constraints on the government. Gradualism has the advantage that it allows resistance to be moderated, but it also has the disadvantage that the change is stretched out, and benefits take time to surface.

The initiation of reforms in 1991 meant that the focus of policy debates in the 1990s shifted from poverty reduction to whether the reforms would bring the economy on to a higher rate of growth. As it happened, a consensus of sorts did evolve, after the Narasimha Rao government, in favour of gradualist reforms and successive governments continued the process albeit at a gradualist pace. By the end of the Vajpayee government it was clear that the reforms were having a positive effect on the economy. In fact, the Vajpayee government was sufficiently confident about its economic performance that it went into the election of 2004 on the slogan "India Shining".

The results of the 2004 election were a surprise with the BJP losing the election. The results were widely read as indicating that urban focussed faster growth was not an election winner. I became the Deputy Chairman of the Planning Commission in the succeeding UPA government and I was concerned that the failure of the "shining India" slogan should not lead to a loss of focus on growth. I was concerned that we should continue to emphasise the importance of growth while also emphasising the need to ensure that the benefits of growth were more equitably distributed, especially in rural areas. The Eleventh Five Year Plan, which was approved in 2007, was therefore titled "Towards Faster and More Inclusive Growth". It also set an explicit target of reducing the percentage of the population in poverty by ten percentage points over the Plan period.

With poverty reduction back on the agenda, the first opportunity to evaluate the success of our performance in this dimension came when the National Sample Survey data on Household Consumption for 2009-10 became available. The Lakdawala Poverty line, which was set in 1993, had been used to measure poverty in subsequent years after adjusting for inflation. We felt it was time to update it. We appointed a new Committee under Suresh Tendulkar to recommend a new poverty line. Using the new poverty line, the survey results showed that poverty had fallen from 37.2 percent in 2004-05 to 29.8 percent in 2009-10. This picture was further endorsed when the data for 2011-12 became available and the percentage in poverty dropped to 22 percent. The percentages in poverty had fallen in earlier years also, but the declines were small and since the population also grew, the absolute number of the poor actually increased. The results of the 2011-12 survey were particularly impressive because they showed a big decline in absolute numbers. Since these were also years of high growth, we could reasonably argue that we were achieving the objective of combining faster growth with poverty reduction.

I was ready for criticism of our estimates from the Opposition—after all it is the job of the

opposition to criticise—and they did. Many argued that the poverty line we were using was too low. This was a reasonable point of view since the fixation of a poverty line is inherently arbitrary, although we pointed out that the new Tendulkar poverty line was aligned with the then prevailing international poverty line. We also pointed out that a higher poverty line would raise the number of the poor in the terminal year, but it would also raise it in the base year so the conclusion that the extent of poverty had declined would not be altered. There were other criticisms that were less easy to counter such as the view that Planning Commission experts sat in "air conditioned offices in Yojana Bhavan" and, therefore, had no idea of what poverty was like on the ground.

While criticism from the opposition was expected, what really surprised me was that even the MPs in the ruling coalition were unhappy! They worried that any assertion that poverty had declined might be viewed as a prelude to justifying withdrawal of benefits from these individuals! We had unwittingly created a situation where there were strong vested interests in perpetuating the extent of poverty!

Subsequent data suggest that the decline in poverty has continued over the past ten years. Surjit Bhalla and Karan Bhasin have reported that extreme poverty (which is what the Tendulkar Line amounted to) had fallen to 1% by 2023-24 (Bhalla and Bhasin, 2025; Bhalla et al., 2022). An estimate by the World Bank on the same basis came to a similar conclusion. More recently, it has become fashionable to use multi-dimensional measures of poverty, whereby a household can be deemed to be poor even the per capita consumption level of the household is above the poverty line, if it falls below some other minimum requirement, e.g., quality of house or educational standards. The NITI Ayog has produced such a measure for India, but even on this basis, the percentage of the population in poverty is only about 11 percent.

## Peering into the Future

Let me now consider what is likely to happen to poverty in future. The growth rate of the economy at present is around 6.5 percent per year. With population growing at about 1 percent, this implies a growth in per capita income of more than 5 percent per year. At this rate we can expect a further decline in the percentage of the population in poverty. The government has set an ambitious target of reaching "developed country status" by 2047 and it is generally agreed that this calls for an acceleration in GDP growth to around 8 percent per year. There can be little doubt that if we actually achieve that objective, or even something close to it, poverty as defined today will disappear in another decade.

This raises the issue, whether poverty should be defined independent of the general standard of living. Bhalla and Bhasin have suggested that we should shift to using a higher poverty line which would yield a poverty percentage of between 25 and 30 percent. Another way of achieving the same effect would be to set the poverty line as some percentage of average income or average consumption. Several OECD countries today define the poverty line as 50 or 60 percent of the median income or consumption. Using the median rather than the mean has an important advantage because the mean income can be skewed upwards because of high levels of income at the top. In this formula, the poverty line moves up with the median income and the percentage in poverty is simply the number of people below this level. Thus far, the government has not notified any new poverty line. I think it is time to do so, using one of the methods suggested above.

Whatever method we choose, it is relevant to consider whether the instruments for helping the poor should remain the same as income levels rise. Consider, for example, the distribution of highly subsidised or free food. This made sense in earlier days, when poverty was defined in terms of

levels of consumption at which households could achieve the minimum levels of calories needed. That was when the percentage in poverty was as high as 55 percent. However, once poverty based on these minimal standards has declined to around 1 or 2 percent according to the official poverty line, it makes little sense to provide 5 kg of grain (rice or wheat) per person free to approximately two-thirds of the population.

It would make sense to scale down the provision of free rations to a much smaller percent of the population and use the resources thus saved to improve the quality of mid-day meals in schools, or increase the level of old age pensions, or improve maternity benefits. In fact, once we recognise that the number that should remain eligible for free food distribution is reduced, we should also consider whether the physical distribution of free food to this group should not be replaced by a cash transfer? Reconfiguring the anti poverty schemes we have inherited from the past should therefore be an important area for action as per capita incomes rise. This will also require reconsideration of several structures that have existed for a long time. The present system of centralised procurement of foodgrains through the Food Corporation of India (FCI) feeding an extensive structure of PDS (Public Distribution System) shops is one example of a system that may have become outdated. But there are many vested interests—the *arthiyas* (commission agents or middlemen in the agricultural marketing system) in wheat surplus areas for example. There is considerable research on the need for reforming this part of the system but thus far the vested interests may have prevailed. It should be possible to shift to a more efficient system of distribution, including a larger role for the private sector.

More broadly, as the economy develops, we need to recognise that inclusiveness cannot be restricted to reducing poverty alone. A discussion of inclusiveness must inevitably include considerations of income inequality (which is different from consumption inequality), gender inequality, inequality between states and also between different social groups such as different religious groups, and even different castes within the same religion. This raises issues that go well beyond the scope of this lecture. I mention it at this point only to mark it as an issue, and then leave it for others to consider separately.

I should emphasise that the extent of income inequality is now an issue all over the world, including in developed countries. India is one of the few countries that has no official income distribution data. There are private data-bases which purport to measure inequality in India by combining consumer survey data with tax data, but these are of untested and untestable quality. Some studies based on these data-bases have claimed that India has one of the most unequal income distributions in the world. This issue can only be resolved by looking at official data and, in that context, it is commendable that the government has recently set up a Technical Expert Group under Surjit Bhalla to come up with a methodology for measuring income, and its distribution. This will be incorporated in the household survey due to be held in 2026. We will then have a base line to evaluate the correctness of the informal private measures that are currently floating around. More importantly, it will enable us several years later to judge how distribution is changing.

## New Challenges

Let me now comment briefly on some of the challenges we will face to achieve Viksit Bharat by 2047. It is generally recognised that raising the growth rate from around 6.5 percent today to 8 percent or a little more over the next 22 years will call for extensive reforms. The Prime Minister himself has acknowledged this by popularising the slogan "reform, perform and transform". It is beyond the scope of this lecture to spell out in detail the reform agenda we need to achieve Viksit Bharat. But I would like to touch on three areas which are relevant for ensuring that our growth remains inclusive

and to indicate the kind of reforms we need and why they will pose special challenges. The areas are (i) climate change, (ii) technological change, and (iii) the changing patterns of world trade.

***Challenges in Tackling Climate Change***

It is clear that climate change is taking place and India will be one of the countries most adversely affected. Large parts of the country will experience higher temperatures. Rainfall patterns will also change in ways that will create serious problems. Total precipitation may not be affected, but the distribution of rainfall will change which means many more "extreme events" i.e. droughts and floods. Concentration of precipitation will increase the rate of water run off reducing the extent of groundwater recharge and thus contributing to greater water scarcity.

Growing water scarcity combined with higher temperatures could reduce agricultural productivity by as much as 16 percent. The brunt of this decline in agricultural productivity will be borne by the rural poor. We will obviously have to devise systems of relief that can cope with the much larger and more frequent relief measures that may become necessary, but it it is actually more important to take corrective steps to adapt to these changes. This includes increased investments in afforestation and also land development to increase the rate of ground water recharge. This in turn will call for substantially larger public investment which will have to be fitted within the overall budget constraints of the central and state governments.

Simultaneously, we need to bring about a shift towards more water saving agriculture. That requires steps to move away from long established policies such as free or highly subsidised power in agriculture, which encourages profligate use of ground water. Reducing the extent of subsidy for power for agriculture is a politically explosive subject and thus far no state government is willing to take it up.

Similar problems arise with the fertiliser subsidy. At present, urea is heavily subsidised leading to excessive application of urea (N) compared to potassic (P) and phosphatic (K) fertiliser, and the imbalance actually damages soil health. Reducing the subsidy on urea makes eminent sense but it has no political traction. The case for reducing this subsidy should not be made on the grounds of saving expenditure. On the contrary, the objective should be to ensure that the resources released by reducing these subsidies should be ploughed back into agriculture in other ways that would be much more effective in raising agricultural incomes especially of the poorer farmers.

Many economists have pointed out that the subsidy for fertiliser is less a subsidy for farmers and more a subsidy for the fertiliser industry. I had at one time suggested that the budget provision for subsidising fertilisers should be shifted to the Ministry of Agriculture. If the Ministry believes that this is the best way of supporting agriculture, we will have to live with it, but my guess is that if that is ever done, the scale of the subsidy will be rationalised very quickly in order to provide more resources for other agricultural production support schemes.

Climate change also highlights the need to increase investment in agricultural R&D. Agricultural economists have established that additional resources devoted to agricultural research would be much more effective in raising total farm incomes than many other agricultural programmes. India was ahead of China in agricultural research in the 1960s, but today China has eight agricultural research institutes in the world's top ten, whereas India has only one in the top 200! This short coming cannot be overcome without providing more resources and also freeing the research institutes from bureaucratic restrictions. The ability to devote more resources runs into the budget constraint issue I have already mentioned.

Another potential source of controversy is whether we can use GM techniques to develop new

varieties that could be more resistant to the stresses of climate change. At one stage, the objection to GM seeds was because they were controlled by multinational corporations, but things have changed. We now have an example of Indian developed GM mustard which was cleared by the Genetic Engineering Approval Committee (the technical body responsible for giving such clearance), but has not yet been released because of public interest litigation by NGOs. It was cleared by the High Court, but the matter was appealed to the Supreme Court and in July 2024 a two-judge bench of the Supreme Court was split on this issue. The matter was referred to the Chief Justice of India (CJI) to set up a three judge bench which has been done but the matter has yet to be listed. Interestingly, the judgment also directed the Government to formulate a clear National Policy on GM crops, suggesting that the present policy was not sufficiently clear. This is an extremely important area. Farmer organisations have appealed to the government to allow GM technology but NGOs are opposed. The government would be well advised to consult top scientific opinion and promulgate a clear policy based on the best scientific evidence available.

***Changing Technology***

The impact of technological change will also pose a major challenge in the years ahead affecting the extent to which growth is sufficiently inclusive. Technological change is a continuous process and all economies have adjusted to it. However, what is happening now is different. We are at a point where a combination of developments in IT, robotics, artificial intelligence, and data analytics are making foundational changes and these changes are taking place at a much faster pace than earlier. It took 75 years for telephones to reach 100 million users. It took 22 years for TV, 7 for the internet, and only 2 months for Chat GPT! All change is disruptive, but when the change takes place over a long period, it is obviously easier to adapt to it. When it takes place very rapidly—as it is likely to do in the years ahead—it can be highly disruptive.

The most obvious area where change could be disruptive is in its effects on total employment. Artificial intelligence will make many low end jobs obsolete. Remote customer service, which led to many jobs being created in developing countries, is likely to be displaced by chat bots. Trained large language models are now able to write code much more effectively than first level code writers and this is already leading to layoffs and reduced intake in most top level IT firms. Similarly, much of what was done by first level analysts in consulting firms may be done by AI leading to a significant decline in what were earlier called attractive jobs. AI will not replace higher end analysts and coders who will still be necessary to review what AI has produced, but the total number of jobs will clearly shrink. We are seeing this today as large IT firms are announcing cuts in jobs both in India and abroad.

Those who disapprove of these changes may be tempted to urge slowing down the adoption of this technology, but if the change is taking place globally, we may not have the option if we want to remain connected with the world. Refusing to accept or allow new technology is a lot like saying "Stop the world I want to get off!"

What this means is that if we want to provide our increasingly educated and aspirational young entrants into the labour force with the kind of jobs they expect, we need to work towards a much higher rate of growth than the current 6.5 percent. We will need to accelerate the pace of growth if we want to see an adequate expansion in employment. This highlights the importance of accelerating the reforms needed for high growth.

Simultaneously, we have to work on upgrading the skills of those graduating out of our educational system to make them suitable for the kind of jobs that will exist in future. This calls

for a major modernisation of the curriculum both in school and higher education. More generally, education and skilling must no longer be viewed as a stage completed in high schools and universities. It will have to be a continuous process, with skilled workers taking breaks to upskill themselves in critical areas. Employers will have to be actively involved in this kind of upskilling and skill upgradation.

The new digital technology will also create a growing number of gig workers who find employment through platforms, e.g., Uber drivers, delivery workers, and ride hailers. This will create flexibility in the labour force but at the expense of what is called "precarity". China is also experiencing this problem, with some estimates claiming that China has 200 million gig workers. New forms of social security will have to be evolved for such workers with some method of forcing the platforms to deduct a portion of what is paid to the workers plus an additional amount representing the "employer's share". This will not be easy because the platforms will not agree that these workers are employees.

The new digital technologies also have another feature which is relevant for inclusiveness and that is the tendency to create "winner takes all" situations. This generates a tendency towards a few large organisations exerting a disproportionate degree of market power. This phenomenon is also associated with rising inequality, which as I have noted earlier, is a growing problem all over the world.

***Changing Patterns of Trade***

The third area that I feel will pose special challenges in the years ahead relates to the changing pattern and structure of global trade. Until relatively recently, there was general agreement on what developing countries need to do to generate high growth and high employment. It was to ensure macro economic balance—i.e., maintain fiscal deficits at reasonable levels—and to have an open economy and hope to achieve a rapid increase in exports thus emulating the success story of East Asia. India too hoped to achieve this result. Over the past twenty years or so, the reforms introduced since 1991 have produced many positive outcomes. We have been very successful in expanding our export of services, thanks to the software industry. We have also had some success on the goods export front, but our performance in this area has weakened over the last several years.

Right now, the prospects for global trade are highly uncertain because the United States under President Trump has adopted a very different approach to world trade, arbitrarily imposing so called "reciprocal tariffs" on countries which it deems to be unfair traders. India has faced among the highest tariffs in this process. I will not attempt to suggest what we should do, since negotiations are currently under way with the US, and it is best to hope that much of the unfair reciprocal tariffs are reversed. Whatever happens in the currently on going Indo-US trade negotiations I would argue that it is definitely not in our interest to retreat from integration with world trade. The United States may have embarked on a different course, but the US accounts for only 15 percent of world imports. The rest of the world is not taking the same line, although China has weaponised trade in somewhat different ways.

In my view, we should not react to US protectionism by raising protective walls ourselves. Instead, we should aggressively seek to tie up free trade agreements with other groups of countries. The recently agreed FTA with the UK is an excellent start. It is to be hoped that a similar arrangement being negotiated with the EU will be successfully concluded. The next step should be to enter into an agreement with the major East Asian countries. If Indian industry has reservations about entering an FTA with China, it may not be possible to reopen entry into RCEP. But we should apply

to join the Comprehensive and Progressive Agreement for Trans Pacific Partnership which does not include China. This will send a clear signal that India is not turning back on global integration but is keen to join global value chains as these are restructured to take account of geo-political concerns.

To summarise, the growth rate of 6.5 percent that we have achieved is good, but it is not good enough to create the inclusive growth environment we need. We will certainly be able to reduce severe poverty at this level of growth but we will not be able to achieve Viksit Bharat by 2047. Most importantly we will not be able to provide employment of the quality needed to meet the aspirations of our youthful population. For that we need faster growth and that will call for much stronger reforms.

I have indicated some of the areas where reforms are needed. In fact, there are many more. The issue arises how can we achieve a sufficient understanding on the part of the public of the need for such reforms, many of which will be politically difficult. Rohini Nilekani, a well-known philanthropist based in Bangalore, has written a book where she discusses "Sarkar, Bazaar and Samaj". Her view is that economists focus too much on the role of the Sarkar (i.e., the government) and also Bazaar (i.e., market forces) but not enough on the role of the Samaj, i.e., society, or civil society. Civil society can play an important role as we try and build a broader consensus on policy. It will contribute to a better understanding of the need for difficult reforms while also highlighting the areas where the concerns of the marginalised need to be protected. Hopefully, wider engagement with civil society can also create an environment where political leaders can get a basis for pushing for much needed reforms.

I would also point out that sarkar and bazaar are not monolithic entities. As far as the sarkar is concerned, there is the central government and state governments, and below them the municipal governments and panchayats. Half of the actions necessary for reforms must be taken at the state level or lower. Yet, today, virtually everyone who wants to discuss policy wants to do so in New Delhi. Frankly, it would be a great help if more people and groups decided that they were going to concentrate their efforts on state and local level governments.

A positive development in this respect is that there is now a growing focus on state level governance. Comparative rankings are often prepared by different organisations comparing performance across states. State governments are now well aware of this dimension and I have seen hundreds of advertisements by state governments advertising what they are doing for development. These advertisements typically emphasise investment in infrastructure which is indeed important. However, the advertisements typically highlight the budget allocations for one or the other scheme, or the number of houses they intend to build. Very few advertisements focus on what the state governments propose to do to improve the "ease of doing business" which would attract private investment. We need to do much more in this area.

The bazaar too is not a homogeneous entity reflecting "business interest". For products where there is a genuinely competitive environment, market forces can be relied upon to deliver results. But where it is characterised by monopolistic competition, suitable regulation is necessary, but that regulation must not be heavy handed. How we handle these issues will determine how we are judged in terms of improving the ease of doing business.

Let me conclude by thanking the organisers for inviting me to deliver this lecture in Ahmedabad. Ahmedabad was one of the early cities to see industrialisation. It is reasonable to expect that it will rise to the challenge of getting the sarkar and the bazaar and the samaj to work together in a way that could provide a lead for other states and cities to follow. I sincerely hope it will live up to that

expectation.

## About the author

**Montek Singh Ahluwalia** is former Deputy Chairman of the erstwhile Planning Commission of India. Currently, he is a Distinguished Fellow at the Centre for Social and Economic Progress, New Delhi, India.

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# CALORIE UNDERNOURISHMENT, HEALTH INFRASTRUCTURE AND LEVEL OF INCOME AMONG MAJOR INDIAN STATES: AN EMPIRICAL EXPLORATION OF INTERLINKAGES

AMARJIT SINGH SETHI[1]* AND RITU PANDHI[2]

[1]*Guru Nanak Dev University, Amritsar, Punjab, India*
[2]*Baring Union College, Batala, Punjab, India*

**Abstract:** In this paper, an attempt has been made to probe as to how health infrastructure and income influence the extent of calorie undernourishment among major Indian states. The extent was measured through Foster-Greer-Thorbecke (FGT) index with $\alpha = 2$. Primary dimensions of health infrastructure were identified through exploratory factor analysis taking into consideration different indicators that were used in three rounds of surveys carried out by the National Sample Survey Office (NSSO). Within each of urban and rural regions, mean levels of calorie undernourishment were observed to be grossly different, both temporally and cross-sectionally. Further, the states have undergone major temporal reshuffling with respect to the status of health infrastructure. Interlinkages between calorie undernourishment, health infrastructure and per capita income were examined through panel data regression analysis. Diagrammatical exposition of strength of the interlinkages was obtained via path analysis. Analytical findings are suggestive of a dire need for strengthening of health infrastructure, particularly in respect of primary and community health centres.

**Key Words:** Calorie undernourishment, Health infrastructure, FGT index, Time series factor analysis, Panel regression analysis, Path analysis

## 1. Introduction

Adequate nutritional intake is widely recognized as an important indicator for success story of development policies of a given region. Nutritional well-being is determined primarily by the extent of calorie intake which, in turn, is influenced by socio-economic factors like income and health infrastructure. In low- and middle-income countries (including India), a large chunk of the population has to strive to meet its calorie requirements owing to financial constraints and inadequate health

*Correspondence to: Amarjit Singh Sethi, Former Professor, Punjab School of Economics, Guru Nanak Dev University, Amritsar 143 005, India. E-mail: ajss.gndu@gmail.com

infrastructure. The calorie deficiency results in malnutrition, thus leading to a vicious circle of poor health, low productivity, reduced income, increased poverty, and so on. Despite a fairly high rate of economic growth since mid-nineties, a large segment of India's population is still faced with the deprivation of calorie nourishment. Accordingly, quality of growth story of the country becomes questionable, particularly from the perspective of inclusiveness.

India is known to be infested with severe inter-state inequalities in the extent of hunger and malnutrition. Over a period of time, economic inequalities have tended to increase, thereby suppressing poverty reduction (Sen and Himanshu, 2004a, 2004b). In spite of a steady decline in the percentage of people living below the poverty line, India has remained a home to nearly one-third of the world's poor (Rao, 2009). Nutritional status of the Indian population which, as per Deaton and Drèze (2009), is full of 'puzzles', depends not merely on food production and availability, but all the more on quantity and quality of food consumption.

Nutritional requirements necessary for keeping good health are known to vary across individuals and over time due to a multiplicity of reasons, generally not known to us (Ravallion, 1992). Numerous studies are available on linkages of differential nature between calorie malnutrition, income and health infrastructure, particularly in the Indian context. For instance, higher incomes are directly associated with improvements in undernourishment (Joe et al., 2009; Gaiha et al., 2010; Kiruba et al., 2013; Nie et al., 2019). There exists a strong poverty-nutritional inequality linkage among Indian states (Mazumdar and Mazumdar, 2009; Mazumdar, 2010; Sendhil et al., 2020); an increase in poverty deepens inequality in malnutrition. Rate of growth in India's income unidirectionally Granger-causes calorie intake (Ghosh, 2018). However, a bi-directional causal linkage exists between malnutrition and poverty (Siddiqui et al., 2020), whereas a feeble association exists between increases in per capita income and reduction in childhood undernutrition, thus requiring direct health investments to improve nutritional status of children in low- and middle-income countries (Vollmer et al., 2014).

As per Subramanian et al. (2007), the Indian states with high income inequalities had a higher risk of both under- and over-nutrition. Similarly, improved health infrastructure has a direct bearing with better child nutrition outcomes in India (Kanjilal et al., 2010; Singh et al., 2023). Wagstaff et al. (2001) have examined the incidence of health and malnutrition inequalities in Vietnam. Further, a direct linkage has been observed between health infrastructure and income (Swaminathan, et al., 2019; Varkey et al., 2020). Paul (2020) has detected an inverse association between income inequality and individual health in India. Certain studies (Strauss and Thomas, 1998; Bloom et al., 2001) have reported positive and significant linkage between health infrastructure and economic growth. Ramachandran (2007) has explored interdependence between economic status, dietary intake and health status among Indian school-going children. Further, Mukherjee et al. (2020) have opined that adequate health expenditure coupled with collaborative efforts of national and sub-national bodies could help achieving better health outcomes.

The above studies reveal the prevalence of a rather complex interplay between income level, health infrastructure, and caloric inequalities, thus pointing toward the need for a multidimensional approach to address the problem of calorie undernourishment. This paper aims at probing into the complex interrelationships among the three phenomena, so as to come out with meaningful policy perspectives to address the challenging issue of healthcare among the major Indian states.

We have divided rest of the paper into five sections. A brief review of the related studies has been made in the second section. Data base has been mentioned in the third section, while the analytical techniques have been outlined in the fourth section. Relevant discussion on the analytical findings (first on inequalities in calorie undernourishment, followed by those on health infrastructure

and, then, on the nexus between calorie undernourishment, health infrastructure and income) has been made in the fifth section. And the sixth section is allocated to concluding remarks and policy implications.

## 2. Reviewed Literature

On the issue of 'Some Nutritional Puzzles', Rao (1981) advocated for the intake of balanced diet so as to maintain good health. Dasgupta (1984) found that although nutritional inequality was more evident in rural areas, yet the problem was not only of distribution but also of availability. Nair (2007) observed a temporal increase in inter-state differentials in malnourishment among children in India. As per Ramachandran (2013), body size and physical activity levels are two major determinants of human nutrient requirements. Sahu et al. (2015) have reviewed the assessment of the burden of both under- and over-nutrition, their determinants, and strategies for tackling the ill-effects of malnutrition among under-five children in India. As per Shah et al. (2017), nearly 39% of India's population remains under-nourished in respect of calorie intake.

According to Sethi (2003), social sector strengthening (through increased government expenditure on health and education) tends to suppress the incidence of poverty. Roy et al. (2004) opined that health services in India did not reach the deprived people adequately. As per Kathuria and Sankar (2005), health outcomes of Indian states in rural areas were directly related to the level of health infrastructure. Gwatkin et al. (2007) have observed the prevalence of an exceptionally high degree of disparities in both health conditions and health service use among a sample of 56 developing nations. In his gender-related study, Gupta (2009) observed the presence of a strong interrelationship between economic well-being, health and education, human development index, and social opportunities of women. As per Cash-Gibson et al. (2018), avoidable systematic differences in the health status exist between and within societies, at various levels.

Sethi and Pandhi (2012a) estimated the extent of inequalities in calorie intake among the Indian states, and also identified chief determinants of the inequalities. Sethi and Pandhi (2012b) observed the presence of very wide gaps among states and UTs with respect to per capita per diem intake of calories, protein, and fat, separately for rural and urban regions. In another study, Sethi and Pandhi (2014) have identified clusters of the Indian states at similar levels of consumption expenditure on food items. Preliminary attempts were made by Sethi and Pandhi (2016, 2017) to examine nexus between calorie inequalities and health among major Indian states. An extensive analysis has been performed in this paper to probe the complex nature and extent of interlinkages among inequalities in calorie undernourishment, health infrastructure and level of income among the Indian states. Analytical findings from such an elaborated empirical study for countries like India having wide diversity and voluminous social inequalities would expectedly provide us with valuable input for framing adequate policies at regional level (as has also been remarked by Bhan et al., 2016).

It may not be out of place to mention here that although a convenient measure for nutritional status, yet calorie intake has a serious drawback in the sense that it ignores composition of the intake of ingredients. Credibility of the official estimates (as based on the fixed per capita per day norm of 2400 kcal for rural and 2100 kcal for urban people) is doubtful (Dev, 2005; Sen, 2005; Bhasin, 2009). Moreover, what really matters is the intake of 'good calories' compared to 'bad calories', rather than 'total calorie' (Taubes, 2007; Bray, 2008; Deaton and Drèze, 2009). Nevertheless, calorie intake has been adopted as a unidimensional summary measure of nutritional status by many (like Gopalan, 1970; Sukhatme, 1970; Dandekar and Rath, 1971; Gopalan et al., 1971; Ghassemi, 1972; Ray, 2007; Deaton and Drèze, 2009; Gupta and Kumar, 2015; Shah et al., 2017; Thakur, 2017). In this paper, too, we have made use of this particular measure of nutritional status.

## 3. Data Base

For measuring calorie inequalities, data on the distribution of households by calorie intake level for different MPCE (i.e., Monthly Per Capita Expenditure) classes of each of the states under study (separately for rural and urban regions), were culled out of the Reports of 55th round (Government of India, 2001), 61st round (Government of India, 2007), and 68th round (Government of India, 2014) of surveys that were carried out by the National Sample Survey Office (NSSO) on nutritional intake in respect of seventeen major Indian states.[1] As mentioned earlier also (Sethi and Pandhi, 2012a), the available information is in the form of two-way tables on distribution of households by MPCE classes and calorie intake level as percent of normative level of 2700 kcal, separately for rural and urban regions. The states considered in the investigation were: Punjab (PNJB), Haryana (HRYN), Himachal Pradesh (HMPR), Jammu & Kashmir (JMKS), Uttar Pradesh (UTPD), Bihar (BIHR), Odisha (ODSH), West Bengal (WBNG), Assam (ASSM), Madhya Pradesh (MDPD), Andhra Pradesh (ANPD), Karnataka (KNTK), Tamil Nadu (TMND), Kerala (KRLA), Rajasthan (RJST), Gujarat (GJRT) and Maharashtra (MHRS).

For determining health status, data compilation was made on 11 indicators of health infrastructure at three points in time, *viz.*, 1999-2000, 2004-05, and 2011-12. These points in time had a close bearing with the three rounds of NSSO (on Nutritional Intake in India): 55th Round (from July, 1999 to June, 2000), 61st Round (from July, 2004 to June, 2005) and 68th Round (from July, 2011 to June, 2012). The chosen indicators were: Number of hospitals per 100 sq km (NHPK); Number of hospital beds per lakh of population (NBPL); Number of sub-centers per 100 sq km (SBPK); Number of primary health centers per 100 sq km (PHPK); Number of community health centers per 100 sq km (CHPK); Number of doctors per lakh of population (DCPL); Number of pharmacists per lakh of population (PRPL); Number of auxiliary nursing midwives per lakh of population (ANPL); Number of lady health visitors per lakh of population (LVPL); Number of nurses per doctor (NRPD); and Number of assistants per doctor (NAPD)]. Data were also compiled on level of living [*viz.* Per Capita Income (PCIN, in Rs. '000)]. Compilation of the information was made through official sources, like Reserve Bank of India (RBI) Bulletins, National Family Health Survey (NFHS) and National Health Profile of Central Bureau of Health Intelligence (various issues).[2, 3]

## 4. Analytical Techniques

For accomplishing the task, we have applied suitable analytical techniques, as briefly outlined below.

### *4.1. Measurement of Calorie Undernourishment*

For making a measurement of nutritional inequalities, we have adopted Foster-Greer-Thorbecke (FGT) index, as proposed by Foster et al. (1984, 2010). In its general form, the index is expressible as

$$FGT(\alpha) = \frac{1}{N}\sum_{i=1}^{K} f_i\left[\frac{Z - Y_i}{Z}\right]^{\alpha};\ \alpha \geq 0 \qquad (1)$$

[1] We could not go beyond this point in time due to unavailability of comparable data owing to discontinuance of the usual NSSO Rounds.

[2] For ensuring comparability, the study variables were suitably expressed in terms of either per unit population or per unit area.

[3] Appropriately transformed data on each of the study variables were duly standardized for their mean (μ) and standard deviation (σ).

where N represents size of the population; K is the number of categories below the minimum level of calorie requirement Z; $f_i$ is frequency for the $i^{th}$ category below Z; and $Y_i$ is the mean calorie intake in the $i^{th}$ category below the level Z.

With $\alpha = 2$, the index takes into account three aspects, *viz.*, (a) the number of undernourished in the population, (b) severity of their undernourishment, and (c) their relative deprivation (Osberg and Xu, 2008). Accordingly, we have used the computed values of FGT (2) as a measure of the level of calorie undernourishment.

### *4.2. Exploratory Factor Analysis (EFA)*

This analysis was performed to examine temporal shifts, if any, in relative positioning of the Indian states with respect to health infrastructure. We may mention, this dimensionality-reduction approach aimed at skimming out a few prime latent factors (from the observed indicators), which expectedly determine a region's performance. By following Lindemann et al. (1980), and Tabachnick and Fidell (1989), the underlying EFA model can be put as:

$$X_i = \sum_{j=1}^{m} \lambda_{ij} F_j + \epsilon_i \qquad (2)$$

where $F_1, \ldots, F_m$ are the m factors extracted from the observed set of p standardized indicators $X_1, \ldots, X_p (m<p)$; $\lambda_{ij}$ is loading of the observed indicator $X_i$ on the extracted factor $F_j$; and $\varepsilon_i$ is error term ($i = 1, \ldots, p; j = 1, \ldots, m$). The loading $\lambda_{ij}$ is, in fact, a measure of the extent to which the indicator $X_i$ is linked with the latent factor $F_j$. Such loadings were estimated by adopting the standard analytical methodology, which ensured orthogonality (i.e., independence) among the factors. Consequently, variance in the observed set of indicators becomes expressible as:

$$V(X_i) = h_i^2 + \psi_i \quad (i = 1, \cdots, p) \qquad (3)$$

where $h_i^2 \left(= \sum_{j=1}^{m} \lambda_{ij}^2\right)$ represents communality—a measure of the extent of variance ($\leq 1$) in $X_i$ explained jointly by the m factors. Residual part of the variance ($= \psi_i$) in $X_i$ is uniqueness term. For a conspicuous extraction of the factors, we have applied promax rotation of the axes. The optimum number (m) of factors extracted was facilitated via scree plot.

From the estimated factor loadings, composite index for each of the states was constructed by following the methodology as outlined in OECD (2008). At different points in time, relative positioning of the states on their health infrastructure was then gauged through the so-obtained values of the index.

### *4.3. Panel Data Regression Analysis*

Interlinkages, if any, between calorie undernourishment, heath infrastructure and the level of income were examined through panel-data regression modeling (Baltagi, 2001), specified as

$$Y_{it} = \alpha + \beta^T X_{it} + \mu_i + \varepsilon_{it} \qquad (4)$$

where i stands for the index for states; t for the rounds; for the explained variable; for the vector of explanatory variables; for the state-specific disturbance term; and for the well-behaved idiosyncratic disturbance term with zero mean. Estimation of model (4) was carried out through both fixed effects (FE) and random effects (RE, with Nerlove, 1971 transformation). Judicious choice between FE and RE specifications was made after applying Hausman's (1978) test.

### *4.4. Path Analysis*

This analytical approach was adopted to explore both the magnitude and significance of causal connections between the available set of explained (*viz.*, calorie undernourishment) and explanatory variables (*viz.*, health infrastructure and level of income). The analysis provides us with a path diagram in which relationships between all the variables and the causal direction is indicated.

A multiplicity of R-codes were used for carrying out different types of analyses. For factor analysis, we have made use of two different packages, *viz.*, 'nFactors' (Raiche and Magis, 2022), and 'psych' (Revelle, 2024). Panel regression analysis was carried out through 'plm' package (Croissant et al., 2025), whereas path analysis was taken up with the help of 'lavaan' package (Rosseel et al., 2024).

## 5. Results and Discussion

Analytical findings from the study have been discussed briefly as under:

### *5.1. Level of Calorie Undernourishment among the Major Indian States*

As indicated earlier, level of calorie undernourishment was measured through the FGT(2) index (Equation 1). For each of the 17 Indian states and at 3 points in time, the index was calculated from bi-variate distributions of households (with respect to calorie intake level for different MPCE categories), for rural as well as urban regions. As per the measurements (Table 1), wide inequalities in calorie undernourishment were observed amongst each of states, rounds and regions. For example, during 55$^{th}$ round, the extent of rural inequalities ranged from as low as 0.0085 (in Himachal Pradesh) to as high as 0.0550 (in Tamil Nadu). In Maharashtra, the urban inequalities were fairly high at a level of 0.0506 during 61$^{st}$ round, but declined to just 0.0094 during 68$^{th}$ round. Similarly, during 68$^{th}$ round, the extent of rural inequalities (0.0025) in Uttar Pradesh was far lower in comparison to urban inequalities (0.0129) in the state.

**Table 1: FGT Measure of Calorie Undernourishment among the Major Indian States**

| State | Rural | | | | Urban | | | | Combined | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round | | | Mean | Round | | | Mean | Round | | | Mean |
| | 55$^{th}$ | 61$^{st}$ | 68$^{st}$ | | 55$^{th}$ | 61$^{st}$ | 68$^{st}$ | | 55$^{th}$ | 61$^{st}$ | 68$^{st}$ | |
| PNJB | 0.0157 | 0.0184 | 0.0075 | 0.0139 | 0.0252 | 0.0310 | 0.0084 | 0.0215 | 0.0204 | 0.0247 | 0.0079 | 0.0177 |
| HRYN | 0.0158 | 0.0222 | 0.0106 | 0.0162 | 0.0295 | 0.0407 | 0.0075 | 0.0259 | 0.0226 | 0.0314 | 0.0090 | 0.0210 |
| HMPR | 0.0085 | 0.0095 | 0.0018 | 0.0066 | 0.0092 | 0.0154 | 0.0028 | 0.0091 | 0.0088 | 0.0124 | 0.0023 | 0.0079 |
| JMKS | 0.0088 | 0.0102 | 0.0073 | 0.0088 | 0.0082 | 0.0091 | 0.0035 | 0.0069 | 0.0085 | 0.0096 | 0.0054 | 0.0079 |
| UTPD | 0.0197 | 0.0159 | 0.0025 | 0.0127 | 0.0326 | 0.0356 | 0.0129 | 0.0270 | 0.0262 | 0.0258 | 0.0077 | 0.0199 |
| BIHR | 0.0283 | 0.0249 | 0.0220 | 0.0251 | 0.0263 | 0.0304 | 0.0103 | 0.0223 | 0.0273 | 0.0276 | 0.0161 | 0.0237 |
| ODSH | 0.0232 | 0.0357 | 0.0139 | 0.0243 | 0.0168 | 0.0370 | 0.0081 | 0.0206 | 0.0200 | 0.0364 | 0.0110 | 0.0224 |
| WBNG | 0.0284 | 0.0222 | 0.0179 | 0.0228 | 0.0313 | 0.0395 | 0.0113 | 0.0274 | 0.0298 | 0.0308 | 0.0146 | 0.0251 |
| ASSM | 0.0461 | 0.0253 | 0.0252 | 0.0322 | 0.0298 | 0.0284 | 0.0105 | 0.0229 | 0.0380 | 0.0268 | 0.0178 | 0.0276 |
| MDPD | 0.0351 | 0.0389 | 0.0209 | 0.0316 | 0.0338 | 0.0400 | 0.0112 | 0.0283 | 0.0344 | 0.0394 | 0.0160 | 0.0300 |
| ANPD | 0.0326 | 0.0328 | 0.0158 | 0.0271 | 0.0369 | 0.0468 | 0.0089 | 0.0309 | 0.0348 | 0.0398 | 0.0124 | 0.0290 |
| KNTK | 0.0418 | 0.0461 | 0.0170 | 0.0350 | 0.0394 | 0.0466 | 0.0111 | 0.0324 | 0.0406 | 0.0464 | 0.0140 | 0.0337 |
| TMND | 0.0550 | 0.0456 | 0.0259 | 0.0422 | 0.0472 | 0.0504 | 0.0124 | 0.0367 | 0.0511 | 0.0480 | 0.0192 | 0.0394 |
| KRLA | 0.0399 | 0.0391 | 0.0222 | 0.0337 | 0.0393 | 0.0516 | 0.0126 | 0.0345 | 0.0396 | 0.0454 | 0.0174 | 0.0341 |

Contd...

Table 1 contd...

| State | Rural | | | | Urban | | | | Combined | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round | | | Mean | Round | | | Mean | Round | | | Mean |
| | 55th | 61st | 68st | | 55th | 61st | 68st | | 55th | 61st | 68st | |
| RJST | 0.0120 | 0.0187 | 0.0101 | 0.0136 | 0.0205 | 0.0285 | 0.0079 | 0.0190 | 0.0162 | 0.0236 | 0.0090 | 0.0163 |
| GJRT | 0.0337 | 0.0399 | 0.0273 | 0.0336 | 0.0328 | 0.0416 | 0.0110 | 0.0285 | 0.0332 | 0.0407 | 0.0192 | 0.0310 |
| MHRS | 0.0337 | 0.0416 | 0.0139 | 0.0297 | 0.0344 | 0.0506 | 0.0094 | 0.0315 | 0.0340 | 0.0461 | 0.0116 | 0.0306 |
| Mean | 0.0281 | 0.0286 | 0.0154 | 0.0241 | 0.0290 | 0.0367 | 0.0094 | 0.0250 | 0.0286 | 0.0326 | 0.0124 | 0.0245 |

In order to draw concrete conclusions about differentials in the inequalities, the measurements (Table 1) were subjected to three-way ANOVA technique (with rounds, states and regions as factors). Through the analysis, we have observed that within rural as well as urban regions, the averaged inequalities were grossly different among the states ($F_{16, 32\ d.f.} = 9.894$ for rural regions and 6.057 for urban regions, each associated with $p < 0.001$), as also among the three rounds ($F_{2,32\ d.f.} = 28.998$ for rural regions and 103.628 for urban regions, each associated with $p < 0.001$ again). However, the averaged inequalities in rural and urban regions were statistically at par with each other ($F_{1, 32\ d.f.} = 2.839$; $p = 0.102$). Temporally, the inequalities were observed to have portrayed an inverted-U pattern. Notably, gravity of the situation on the inequalities in calorie undernourishment in south Indian states (like Tamil Nadu, Kerala and Karnataka) was alarming whereas, on the other hand, the same in certain north-Indian hilly states (like Himachal Pradesh and Jammu & Kashmir) was quite manageable.

### *5.2. Identification of the Major Dimensions of Health Infrastructure among the Indian States*

As already indicated, prime dimensions of health infrastructure were identified through exploratory factor analysis (EFA) as carried out with 11 indicators. Relatively more flexible weighted least squares method of estimation was adopted in the analysis.

As per the scree plot (Figure 1) obtained from the analysis, optimum number of factors to be extracted was four. Accordingly, the EFA was carried with this number. Through the analysis, we obtained (apart from other statistics) communalities, which measure the extent of variance in a given indicator $X_i$ that stands explained jointly by the extracted factors. In the present analysis, threshold value of communalities was taken to be 0.3 (in line with Osborne et al., 2008). Accordingly, one of the indicators, *viz.*, number of assistants per doctor (NAPD) with a communality of 0.233 was discarded. The EFA was re-carried out with the curtailed list of 10 indicators and, the computations on loadings of the indicators as other useful measures in respect of the extracted factors were also carried out (Table 2). The table provides us with the composition of the four factors extracted. The first factor was composed of 3 indicators, *viz.*, PHPK (number of primary health centers per 100 sq km), SBPK (number of sub-centers per 100 sq km) and CHPK (number of community health centers per 100 sq km). The second factor was constituted by 2 indicators, *viz.*, ANPL (number of auxiliary nursing midwives per lakh of population) and LVPL (number of lady health visitors per lakh of population).[4] Another cohort of 3 indictors, *viz.*, PRPL (number of pharmacists per lakh of population), NRPD (number of nurses per doctor) and DCPL (number of doctors per lakh of population) constituted the third factor. And, the fourth factor was composed of 2 indicators, *viz.*, NBPL (number of hospital beds per lakh of population) and NHPK (number of hospitals per 100 sq km).

[4] 1 lakh = 100,000

As regards arbitrary naming of the latent factors extracted (on the basis of their nature), the three indicators constituting the first factor pertained to the physical infrastructure (per unit area) of relatively low level. Therefore, we have named the factor as Density of Lower-Level Physical Infrastructure (DLPI). Next, the indicators included in the second factor represented the human resource of relatively low level. Consequently, the factor has been named as Density of Lower-Level Human Resource (DLHR). On similar grounds, the third factor was named as Density of Higher-Level Human Resource (DHHR). And, the fourth factor was named as Density of Higher-Level Physical Infrastructure (DHPI).

**Figure 1: Parallel Analysis Scree Plots**

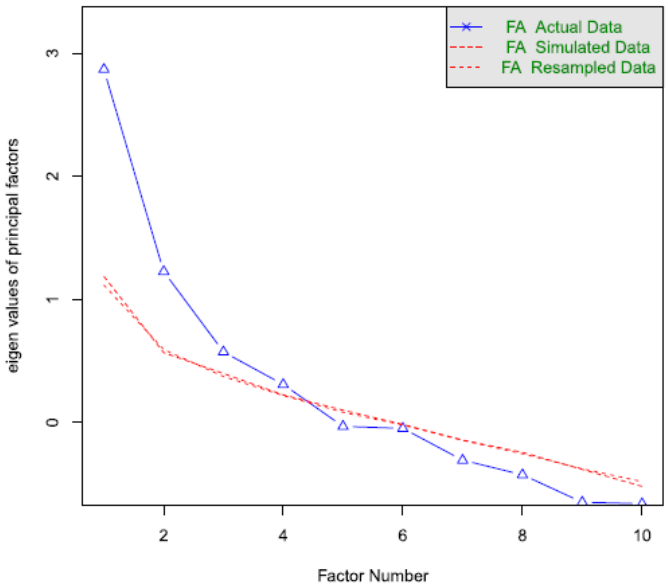



**Table 2: Loadings of the Study Indicators on the Extracted Factors**

| Indicator | FCT1 | FCT2 | FCT3 | FCT4 | Communality | Uniqueness |
|---|---|---|---|---|---|---|
| PHPK | **0.930** | -0.155 | 0.017 | 0.153 | 0.912 | 0.088 |
| SBPK | **0.917** | -0.093 | 0.013 | -0.010 | 0.850 | 0.150 |
| CHPK | **0.837** | -0.024 | 0.171 | 0.070 | 0.735 | 0.265 |
| ANPL | -0.014 | **1.134** | -0.039 | -0.075 | 1.294 | -0.294 |
| LVPL | -0.372 | **0.513** | 0.112 | 0.236 | 0.470 | 0.530 |
| PRPL | 0.213 | -0.027 | **1.002** | 0.020 | 1.051 | -0.051 |
| NRPD | -0.075 | 0.093 | **0.573** | -0.034 | 0.343 | 0.657 |
| DCPL | 0.111 | -0.070 | **0.553** | 0.351 | 0.446 | 0.554 |
| NBPL | -0.142 | 0.332 | 0.129 | **0.643** | 0.560 | 0.440 |
| NHPK | 0.262 | -0.141 | -0.012 | **0.526** | 0.365 | 0.635 |

The four factors taken together were capable of explaining 73.3 percent of the total variance present in the available data set (Table 3). The computed value of Tucker-Lewis Index of Reliability was fairly high (0.863), while the Residual Mean-Squared Error Index was fairly low (0.098). Accordingly, the factors extracted might be accepted to represent the available data set adequately.

For making an assessment of comparative standing of the Indian states, as also to examine temporal changes, if any, in the standing, composite index of health infrastructure was constructed (Table 4) through the already indicated methodology (Section 4.2).

During the year 1999-2000, Punjab (associated with a value of 0.319 for the index) occupied the top-most position, followed next by Himachal Pradesh (0.242) and then by Kerala (0.204). On the other extreme, the bottom position was occupied by Jammu & Kashmir (0.076), preceded by Uttar Pradesh (0.112) and then by Bihar (0.114). During 2004-05, Punjab (0.390) continued to remain at the top, followed next by Tamil Nadu (0.293) and then by Karnataka (0.280). Uttar Pradesh (0.056) and Jammu & Kashmir (0.111) swapped their positions, followed next by Bihar again (0.116). During 2011-12, Kerala (0.628) jumped to the top-slot, whereas Punjab (409) slipped to the fourth position. Apart from that, there occurred a drastic reshuffling in the relative positioning of a number of other states. West Bengal (0.449), which happened to be at tenth position during 1999-00 jumped to the third position during 2011-12. Similarly, Tamil Nadu and Bihar were the other states which have undergone glaring improvement in their rankings. On the contrary, states like Madhya Pradesh, Gujarat and Himachal Pradesh have witnessed a drastic temporal deterioration in their relative positioning (Table 4).

**Table 3: Extent of Variance Explained by the Extracted Factors**

| Computation | DLPI | DLHR | DHHR | DHPI |
|---|---|---|---|---|
| SS of Loadings | 2.731 | 1.968 | 1.703 | 0.924 |
| Proportion of Variance Explained | 0.273 | 0.197 | 0.170 | 0.092 |
| Cumulative Variance Explained | 0.273 | 0.470 | 0.640 | 0.733 |

**Table 4: Computed Values of the Composite Index of Health Infrastructure for the Major Indian States**

| State | 1999-2000 | | 2004-05 | | 2011-12 | | Overall | |
|---|---|---|---|---|---|---|---|---|
| | Composite Index | Rank | Composite Index | Rank | Composite Index | Rank | Composite Index | Rank |
| PNJB | 0.319 | 1 | 0.390 | 1 | 0.409 | 4 | 0.373 | 1 |
| HRYN | 0.196 | 4 | 0.204 | 7 | 0.406 | 5 | 0.269 | 6 |
| HMPR | 0.242 | 2 | 0.271 | 4 | 0.322 | 9 | 0.278 | 5 |
| JMKS | 0.076 | 17 | 0.111 | 16 | 0.195 | 16 | 0.127 | 17 |
| UTPD | 0.112 | 16 | 0.056 | 17 | 0.299 | 12 | 0.155 | 16 |
| BIHR | 0.114 | 15 | 0.116 | 15 | 0.351 | 7 | 0.194 | 10 |
| ODSH | 0.138 | 11 | 0.206 | 6 | 0.310 | 10 | 0.218 | 9 |
| WBNG | 0.144 | 10 | 0.184 | 9 | 0.449 | 3 | 0.259 | 7 |
| ASSM | 0.127 | 13 | 0.128 | 14 | 0.309 | 11 | 0.188 | 13 |
| MDPD | 0.182 | 5 | 0.149 | 12 | 0.176 | 17 | 0.169 | 14 |
| ANPD | 0.128 | 12 | 0.155 | 11 | 0.294 | 13 | 0.192 | 12 |
| KNTK | 0.177 | 6 | 0.280 | 3 | 0.405 | 6 | 0.287 | 4 |
| TMND | 0.154 | 8 | 0.293 | 2 | 0.489 | 2 | 0.312 | 3 |
| KRLA | 0.204 | 3 | 0.230 | 5 | 0.628 | 1 | 0.354 | 2 |
| RJST | 0.120 | 14 | 0.134 | 13 | 0.234 | 15 | 0.163 | 15 |
| GJRT | 0.164 | 7 | 0.165 | 10 | 0.251 | 14 | 0.193 | 11 |
| MHRS | 0.145 | 9 | 0.188 | 8 | 0.337 | 8 | 0.223 | 8 |

Nevertheless, application of Kendall's Concordance Analysis indicated that rankings of the states did not change during the three rounds in a random manner but, instead, showed a very strong temporal harmony ($\chi^2_{16\ d.f.} = 36.967$; $p = 0.0021$). We are thus provided with a justification to talk in terms of relative ranking of the states for the overall period. On the whole, the top three positions (on the status of health infrastructure), were enjoyed by Punjab (0.373), Kerala (0.354) and Tamil Nadu (0.312). Whereas, the bottom three positions were occupied by Jammu & Kashmir (0.127), Uttar Pradesh (0.155) and Rajasthan (0.163).

### *5.3. Examining Interlinkages among Calorie Undernourishment, Health Infrastructure and the Level of Income*

In order to examine the nature and extent of interlinkages, if any, among the extent of calorie undernourishment (as measured through the FGT2 index), health infrastructure (as measured through the overall composite index, CPIN) and the level of income (as gauged through PCIN) among the major Indian states, we have sought the help of correlation analysis, duly followed by panel data regression analysis. In fact, the correlation coefficients were obtained indirectly through the pair-wise regression analysis among FGT2, CPIN and PCIN in the panel data framework, with due application of Hausman's test (Table 5).

Non-significant values of $\chi^2$-statistic for each of the three pairs pointed towards relative superiority of random effects modelling. As per the modelling, association between FGT2 measure and CPIN was indirect and statistically highly significant ($r = -0.7301$; $p < 0.0001$), which is in agreement with the observations made by Kanjilal et al. (2010) and Singh et al. (2023). There also existed a very strong and an indirect association between FGT2 and PCIN ($r = -0.5374$; $p < 0.0001$), which is in harmony with the findings of Joe et al. (2009), Gaiha et al. (2010), Kiruba et al. (2013), and Nie et al. (2019). However, in line with Thomas (1998) and Bloom et al. (2001), the association between CPIN and PCIN was direct and very robust ($r = 0.7373$; $p < 0.0001$). Accordingly, the states having better health infrastructure depicted a very strong tendency to be associated with higher level of income and, that, the prevalence of calorie undernourishment was less severe in such states.

**Table 5: Correlation Analysis among the Measures of Calorie Undernourishment, Health Infrastructure and Level of Income**

| Pair of Measures | Hausman's Test | | Correlation Coefficient | | |
|---|---|---|---|---|---|
| | $\chi^2$-statistic | p-value | r | d.f. | p-value |
| FGT2 & CPIN | 1.0647NS | 0.3021 | -0.7301*** | 49 | < 0.0001 |
| FGT2 & PCIN | 3.0028NS | 0.0831 | -0.5374*** | 49 | < 0.0001 |
| CPIN & PCIN | 3.1444NS | 0.0762 | 0.7373*** | 49 | < 0.0001 |

*Notes:*** Significant at 0.1% probability level; NS: Non-significant.

In order to get an extensive information on the manner through which the level of calorie undernourishment gets influenced by income and health infrastructure, values of composite index were computed separately for the four latent factors extracted (*viz.*, DLPI, DLHR, DHHR and DHPI). The inequality measure FGT2 of calorie undernourishment was then regressed upon the four composite indexes (abbreviated, respectively, as CPI1, CPI2, CPI3 and CPI4) along with PCIN under the panel data frame work. Hausman's test again pointed towards suitability of random effects modeling ($\chi^2 = 1.7964$; $p = 0.8765$). The resulting estimated regression equation was expressible as:

$FGT2_{it} = 0.0383^{***} - 0.0894CPI1^{***} - 0.0522CPI2^{NS} - 0.0031CPI3^{NS} + 0.0015CPI4^{NS} - 0.0001PCIN^{NS}$ (5)

Overall predictability of the estimated Equation (5) was fairly high ($R^2 = 0.5875$; $\bar{R}^2 = 0.5417$; $p<0.0001$). However, only CPI1 was detected to be statistically significant (at 0.1 percent probability level). Each of CPI2, CPI3 and PCIN was observed to have induced indirect (but non-significant) effect on FGT2, whereas CPI4 induced a negligible direct effect on FGT2. We may thus say that consolidation of overall health infrastructure, in general, and density of lower-level physical infrastructure (DLPI, based on Primary Health Centers, Community Health Centers, and Sub-Centers), coupled with an improvement in the level of income could play a vital role in mitigating the severity of calorie undernourishment. Adequate low-level health infrastructure could be instrumental (via community awareness and contact programmes) to help masses at the grass-root level in checking the menace of undernourishment.

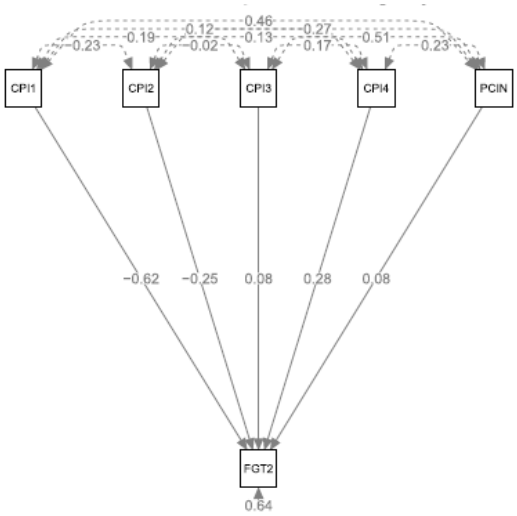
As per the path analysis carried out for specification of the above-mentioned type (Equation 5), the resulting figure portrays the mode of interlinkage of the level of calorie undernourishment with the status of health infrastructure and level of income among the major Indian states, as presented in Figure 2.

Finally, the major Indian states were stratified (into low, medium and high categories through cumulative $\sqrt[3]{\text{frequency}}$ method; Singh, 1971) with respect to each of FGT2, CPIN and PCIN. Accordingly, the states were distributed multi-categorically, as in Table 6. As per the table, three adjoining states, *viz.*, Punjab, Haryana and Himachal Pradesh portrayed encouraging signs of being 'high' on health infrastructure, 'high' on income level, and 'low' on severity of calorie undernourishment. Although Kerala too was high on each of health and income parameters, the state was associated with voluminous inequalities in calories undernourishment. Despite fairly high calorie inequalities, Kerala's comparatively better health status could largely be attributed to conducive policies and a better state patronage regarding health and other social sector consolidation (Thresia, 2013, 2018). Moreover, people of the state appear to be relatively more health conscious. Evidence suggests that, in India, the 'out-of-pocket' expenditure has been estimated to be to the tune of 5% of total household expenditure, ranging from as low as 2% in Assam to as high as 7% in Kerala (Garg and Karan, 2009).

**Table 6: Multi-categorical Distribution of the Major Indian States**

| Extent of Calorie Undernourishment (FGT2) | Measure of Health Infrastructure (CPIN) | Level of Income (PCIN) | | |
|---|---|---|---|---|
| | | Low (8.54 - 16.54) | Medium (16.54 - 28.69) | High (28.69 - 37.35) |
| Low (0.0079 - 0.0210) | Low (0.127 to 0.192) | JMKS, UTPD | RJST | – |
| | Medium (0.192 to 0.259) | – | – | – |
| | High (0.259 to 0.373) | – | – | HRYN, HMPR, PNJB |
| Medium (0.0210 - 0.0300) | Low (0.127 to 0.192) | ASSM, MDPD | ANPD | – |
| | Medium (0.192 to 0.259) | BIHR, ODSH | WBNG | – |
| | High (0.259 to 0.373) | – | – | – |
| High (0.0300 - 0.0394) | Low (0.127 to 0.192) | – | – | – |
| | Medium (0.192 to 0.259) | – | – | GUJT, MHRS |
| | High (0.259 to 0.373) | – | KNTK, TMND | KRLA |

**Figure 2: Path Coefficients for the Impact of Health Infrastructure and Income on Calorie Inequalities among Major Indian States**




Experience of the states like Karnataka and Tamil Nadu (just medium on per capita income, but high on health infrastructure) is in a fair agreement with what was observed earlier by Kurian (2000), according to whom a state can be at a higher level of social development even if it is associated with a relatively low level of per capita income. Nevertheless, the two states were infested with the problem of high nutritional inequalities. Notably, certain 'BIMARU' states like Assam, Madhya Pradesh, Bihar and Odisha showed adverse signs of being low in health and income, but comparatively high in calorie undernourishment.

## 6. Conclusions and Policy Implications

In respect of the status of health infrastructure, the major Indian states have undergone gross reshuffling during the study period. The states enjoying better health infrastructure showed a robust tendency to be comparatively richer and associated with less severe extent of calorie undernourishment. Consequently, there is an urgent need to shift priorities in favour of public investment on overall health infrastructure, in general, and low-level health infrastructure (like consolidation of primary health centers, community health centers, and sub-centers), in particular. More emphasis needs to be laid on this aspect in the laggard states like Assam, Madhya Pradesh, Bihar and Odisha. Robust health infrastructure would expectedly pull-down the incidence of undernourishment, thus leading to a virtuous cycle of improved health outcome, productivity, and economic growth. Further, people need be motivated (through general awareness and contact programmes) to go in for positive changes in their physical activity and eating habits (away from the consumption of unhealthy, low-fiber junk food and snacks), so that the intake results in adequate nutritional requirements and better health conditions.

## About the authors

**Amarjit Singh Sethi** is former Professor at the Punjab School of Economics, Guru Nanak Dev University, Amritsar, Punjab, India. **Ritu Pandhi** is an Assistant Professor at the Baring Union College, Batala, Punjab, India.

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# ECONOMIC INTERDEPENDENCE OF BORDER COMMUNITIES AT ASSAM-BHUTAN BORDER: DYNAMICS AND OPPORTUNITIES

SANGITA GOGOI* AND ABANI KUMAR BHAGABATI
*Gauhati University, Guwahati, Assam, India*

**Abstract:** Borderlands function as dynamic arenas or spaces where the tangible everyday realities of the border people are played out, shaping human interactions and economic activities. The Assam-Bhutan border is one of the oldest in Indian history, dating back to Ahom rule in 1228 AD. Owing to spatial proximity and shared socio-cultural ties, the economic activities of the border people and their interdependency have naturally evolved, fostering mutual benefits for the people residing on both sides of the border. The border communities have long relied on each other to sustain their livelihoods. This paper is an attempt to explore the economic interdependency of the border people across the Assam-Bhutan border through primary and secondary data, semi-structured interviews, and open-ended discussions. It offers insights into the resilience of traditional trade networks in border regions and their potential to promote regional economic integration. The findings of the study show the importance of the border *haats*, the promotion of local economies, and flow of labour to Bhutan, exhibiting the interdependency of the border communities of Assam and Bhutan.

**Keywords:** Assam-Bhutan border, Border communities, Livelihood, Formal trade, Border *haats*, Labour flow

## 1. Defining the Border

The lines or boundaries that delineate geographical territories are referred to as "borders". According to the International State-Centric System, borders are acknowledged as the dividing lines between countries and serve to define sovereign entities (Majaw, 2021). The concept of borderland pertains to the regions that serve as a transitional space between two distinct regions. These regions are characterized by a blend of cultural, social, political and economic traits from both sides of the border, fostering a dynamic space for interaction (Baud and Van Schendel, 1997; Prescott, 2014). One of the 'paradoxes of borders' is that borders embody varying circumstances and political

*Correspondence to: Sangita Gogoi, Ph.D. Student, Department of Geography, Gauhati University, Guwahati 781014, Assam, India. Email: gogoisangitab885@gmail.com

dynamics between nations that simultaneously divide and unite people at the same time (Pinzon and Mantilla, 2021). Nations use border control mechanisms to specify and regulate individuals and products that seek for legitimate access to their territories. They validate a set of rules for cross-border human actions and interactions, thereby setting a cross-border relationship. A cross-border relationship is defined by social, political, economic and geographic proximity between two nations sharing a common border. This cross-border relationship can take various forms depending on the nature of the border shared between the nations. Borders representing a porous, more neutral and permeable line of contact foster opportunities for cooperation, encouraging economic ties, socio-cultural exchanges and political interactions (Van Schendel, 2005). On the other hand, some borders are marked by barbed wire with armed guards, indicating a tense atmosphere between nations that discourages socio-economic interaction between the border countries.

The effects of the border extend beyond the actual line and into the areas whose characteristics are influenced by the border itself (Zartman, 2010). Understanding the multifaceted nature of the border is crucial, as it not only shapes national identities and influences regional stability and development but also plays a major fundamental role in the lives of the border communities living on both sides of the immediate borderline areas. It impacts the lives of those who inhabit these transitional zones. The existence of a state border may help create transitory and vibrant areas, where everyday activities and daily life experiences take place across the border (Szytniewski et al., 2020). People who make use of the border are referred to as 'regionauts', which means people who develop skills of using the world of both sides of the border by exploring livelihood opportunities. Let us now take a look at our study areas.

## 2. Assam-Bhutan Border: The Study Areas and the Objectives

Bhutan, the smallest neighbour of North-East India, shares a common border of 699 km with India. Among the Northeastern states, Assam-Bhutan has the longest shared border. Kokrajhar, Chirang, Baksha and Udalguri are the districts of Assam forming the boundary with Bhutan. Known as the "no-conflict border", the Indo-Bhutan border is characterized by a mutually interdependent relationship and the absence of competing interests (Tripathi, 2019). This has fostered a strong foundation of trust, relationships and a place where people and goods can transit freely across the border. The prevailing Assam-Bhutan cross-border relation is older than a century dating back to the arrival of *Ahoms* in Assam during the medieval period. Due to a lack of substantial progress in the Bhutan hills, the hill societies exhibited a strong interest in the inhabitants of the region situated between the Bhutan foothills and the extremities of the plain in Assam traversed by several *duars* or passes that facilitate hill tribe connection with the plains. This belt is rich in fertile alluvial soil conducive to the cultivation of crops. The lack of production and scarcity of food supply in the Bhutan hills drove the Bhutias to migrate to the plain during the summer season and engage in trade with the inhabitants of the plain. The Bhutias bring with them the goods found in the hill to barter with the plainmen. This is how the interaction happened through the *duars* and the relationship grew over time. When people of two different socio-cultural and economic levels live juxtaposed under two different physical environments, they do develop some sort of socio-economic interaction over time.

The historical relationship between India and Bhutan led to the foundation of the contemporary Indo-Bhutan friendship. The Bhutanese carried out uninterrupted trade with Assam for a very long period, shaping the path of cross-border transactions between the two regions (Markham, 1879). This reflects the values of trust and equality embedded in their relationship, close understanding and cooperation. The "Treaty of Friendship", which was signed in 1949, provided for free trade and

movement between the two nations (Taneja, et al., 2018). This bilateral trade and cooperation in economic development further strengthened the long-standing cordial relationship that has grown over time (Rai, 2015). The 1949 treaty has been renewed since 1972 and essential decisions are made on the development and maintenance of the friendly ties between the Government of India and the Government of Bhutan (Taneja, et al., 2018). Since then, the Assam government has worked on developing the ties for the benefit of the border places and people.

The thriving local economy of the Assam-Bhutan border regions and its growing commercial significance have opened up ample scope for both formal and informal economies (Sharma et al., 2020). Moreover, the cultural ties between the two nations are profound, with shared traditions, languages and festivals. The annual celebration of *Tshechu* festival in Bhutan draws a large number of visitors from Assam, fostering people-to-people connections that strengthen their relationships. The Assam-Bhutan border has been functioning as a dynamic space of interaction rather than a rigid divide, thereby the border people utilizing the porous nature of the boundary to access resources and maintain their livelihoods (Majaw, 2021)

In this context the objectives of the paper are:

1. To examine the nature of the Assam-Bhutan border and the resultant impact on the lives of the border communities.
2. To provide an insight into whether the border is a barrier or a source of opportunities to the regionauts.

## 3. Data and Methods

The research was carried out in 3 villages of Assam located along the Assam-Bhutan border, namely Saralpara Forest Village (F.V.) in the Kokrajhar district, Dadgari in the Chirang district and Nonke Darranga in the Baksa district of Assam, India (see Map 1). Quantitative data on formal trade between India and Bhutan were obtained from the secondary source of the Directorate General of Foreign Trade, Ministry of Commerce and Industry, Government of India and Ministry of Development, NER. To understand the informal and regional cross-border trade economies, a purposive sampling method was applied to collect primary data from the vendors and the labour working in Bhutan through a scheduled survey. An open-ended discussion was conducted with the market committee to understand the governing dynamics of the weekly markets and the Bhutanese marketing tendencies. The convenience sampling method was adopted to interact with the Bhutanese customers to understand why they are attracted to the market. Qualitative Narrative Analysis has been applied in the study by recording the stories and voices of the respondents. The responses of the respondents were translated from the local language to English. Secondary data were also collected from different sources, like census data and journal publications.

Geographically, Saralpara F.V. is located in the Kokrajhar district of Assam, connecting with Sarpang of Bhutan. It is the westernmost gateway to Bhutan. Dadgari village is located in Sidli tehsil of Chirang district in Assam. It links to Gelephu in the Sarphang district of Bhutan. The Dadgari-Gelephu route is the gateway to south-central Bhutan. Nonke Darranga is located in the Baksa district of Assam, connecting with Samdrup Zongkhar of Bhutan. Darranga-Samdrup Jonkhar is the gateway to south-eastern Bhutan. The area's geographical location has made it a crucial point of economic exchange between the neighboring communities.

## 4. Formal Trade

Bhutan had a well-established commercial relationship with Assam that dates back to the arrival

of *Ahoms* in Assam during the medieval period (Mohan et al., 2017). The Bhutanese carried out uninterrupted trade with Assam for a very long period, which influenced the trajectory of cross-border transactions between the two regions (Markham, 1876). The Indo-Bhutan gate located over Kokrajhar, Chirang, Baksa and Udalguri districts in Assam and Jaigaon in West Bengal formed the most important primary gateway for formal economic exchanges between the two countries. Bhutan, being the immediate neighbour of India, holds a very crucial position in India's two key foreign policies, namely, 'Neighborhood First Policy' and 'Act East Policy', which emphasize on building peaceful bilateral relations, collaborative co-development and mutually beneficial economic interlinkages. Notably, India is one of the largest destinations for Bhutan's exports and one of the prominent sources of its imports, establishing India as the leading trade partner of Bhutan. Bhutan is a landlocked country, where most of its third-country exports transit through India, making it even more crucial for Bhutan to be a peaceful ally of India.

**Map 1: Location Map of Study Areas**

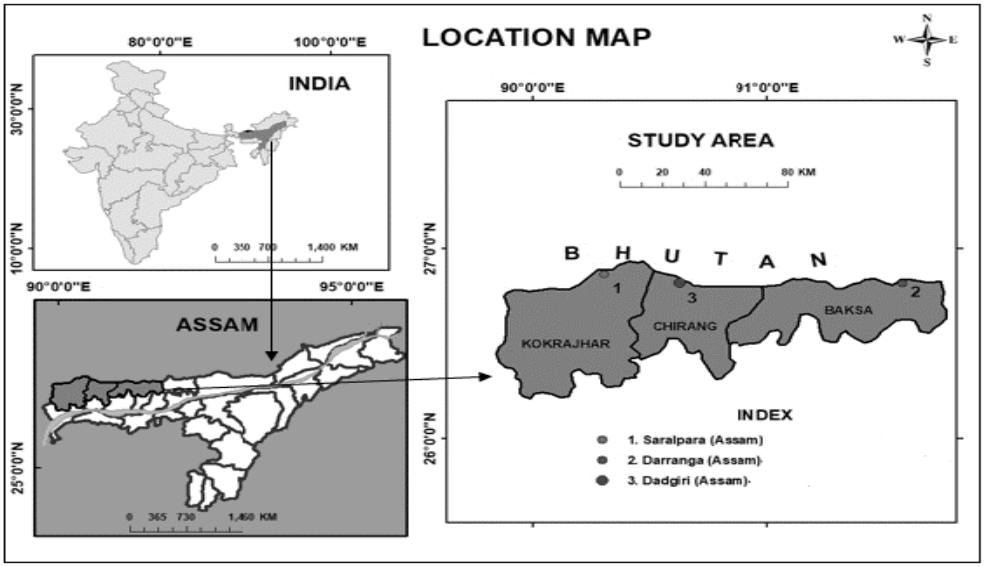


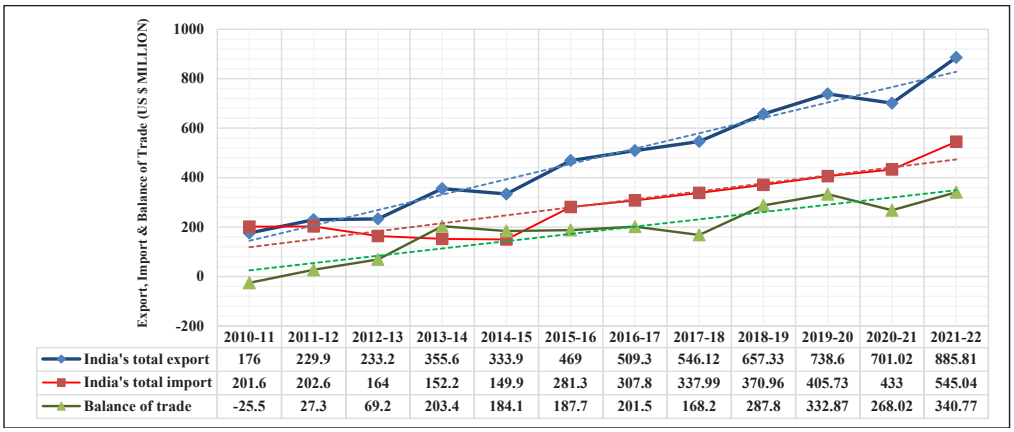

**Table 1: List of Assam-Bhutan Border Land Custom Stations (LCS)**

| State | Name of the LCS | Status | Connectivity |
|---|---|---|---|
| Assam | Nonke Darranga (Baksa District) | Functional | Rangia-Tamulpur motorable Road from Darranga (Assam) to Samdrup-Jhonkar in Bhutan |
| | Dadgari (Chirang District) | Functional | The motorable road from Samthiabari in Kokrajhar district via Runikhata, Deosiri and Dadgari to Gelephu in Bhutan |
| | Ultapani (Kokrajhar District) | Non-functional | Forest road from Bismury via Naharali Forest Beat office (Assam) to Sarphang in Bhutan |
| | Khamardwisa (Rangapani in Baksa District) | Functional | The road connecting Kamardwisa (Assam) to Nganglam in Bhutan |

*Source*: Ministry of Development, NER.

The Indo-Bhutan trading is facilitated by the Land Customs Stations (LCS) located along the international border, which are notified under Section 7 of the Customs Act, 1962, by the Department of Revenue, Ministry of Finance. Under the Agreement on Trade, Commerce, and Transit, there are a total of 10 entry and exit trade points with LCS along the Indo-Bhutan border. Of these, 4 LCS are situated on the Assam-Bhutan border, while the remaining 6 LCS are located along the West Bengal-Bhutan border (Table 1). All the LCS are functional, except the Ultapani LCS in the Kokrajhar district of Assam.

**Figure 1: Indo-Bhutan's Trade Trend, 2010-2022 (Values in US $ Millions)**




| | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India's total export | 176 | 229.9 | 233.2 | 355.6 | 333.9 | 469 | 509.3 | 546.12 | 657.33 | 738.6 | 701.02 | 885.81 |
| India's total import | 201.6 | 202.6 | 164 | 152.2 | 149.9 | 281.3 | 307.8 | 337.99 | 370.96 | 405.73 | 433 | 545.04 |
| Balance of trade | -25.5 | 27.3 | 69.2 | 203.4 | 184.1 | 187.7 | 201.5 | 168.2 | 287.8 | 332.87 | 268.02 | 340.77 |

*Source*: Directorate General of Foreign Trade, Ministry of Commerce and Industry, Government of India

Figure 1 presents the trend of India's export to Bhutan and import of goods from Bhutan. The rapid growth of trade between the two countries is attributed to the Free Trade Agreement (FTA), allowing the unrestricted and free flow of commodities across their borders. Notably, India's exports to Bhutan have consistently exceeded the imports from Bhutan. However, during 2010-11, India experienced a trade deficit due to the surge in the import of wires of refined copper (HS 740811) and refined palm oil (HS 151190), which exceeded its export to Bhutan. In 2020-21, Bhutan's imports from India declined by 37.58 million US dollars compared to 2019-2020, largely due to the COVID-19 pandemic that caused severe disruption in the economy and the trade sector (Figure 1). Fortunately, in 2021-22, following the end of the pandemic, the trade again hit its peak in exports and imports.

## 5. Informal Trade: Weekly Market

In addition to the formal economy, an informal economy has also developed in the immediate bordering areas of Assam and Bhutan. Two types of markets developed in the regions: a permanent market consisting of shops and stalls that remain open every day, and a weekly market that operates on a specific day of the week. *Haats*, called weekly markets, hold significance from an economic perspective as they cater to a diverse spectrum of Bhutanese customers. Culturally, these markets facilitate interaction among people, fostering the assimilation of different cultures, languages, religions and customs (Datta, 2002). The markets encourage the seasonal trade between the bordering villages, benefiting the local population. *Haats* are integral to the economy of border villages. Each of the three villages—Saralpara, Dadgari and Nonke Darranga—engages in informal trade through

daily and weekly markets. In addition to the daily markets, Saralpara F.V. and Dadgari also have weekly markets. However, Nonke Darranga, which once had a weekly market, now operates a daily market that attracts a significant number of Bhutanese customers. Currently, the weekly markets are held in Parkijuli on Saturdays and Kumarikata on Sundays, both located 2 km from Nonke Darranga. Saralpara *haat* operate on Saturdays, while the Dadgari *haats* operate on Thursdays.

The daily crossing of the international border is part of the daily transit lives of the Bhutanese. Bhutanese dependency on the border *haats* and the daily markets of the Assam border is largely governed by the lack of production in Bhutan. Most of the items are imported from other countries. The prices of goods sold in the markets of Bhutan are very high. Secondly, the availability of goods is limited. The red soil, dense forest and undulating topography of the South Bhutan foothills make farming a difficult task. For the Bhutanese, it is simpler to purchase than to grow. The absence of border *haats* would make the daily life of Bhutanese expensive. These markets, serving as sources of essential goods, compensate for Bhutan's limited domestic production, restricted availability of goods and high market prices. The bustling *haats* are one of the most awaited days for sellers and buyers. Bhutanese do the weekly stock for their homes, ensuring a steady supply of essential items (Plate 1). The small retailers purchase goods in bulk and resell them at a much higher price in Bhutan. Thus, *haats* not only sustain the households but also support the local businesses. For the Bhutanese, the border *haats* are a lifeline. During the survey, when asked to the Bhutanese customers on the importance of local *haats*, they responded with joy and excitement.

A 42-year-old Bhutanese man stated: "*You know Bhutan and India … we are like brothers. You see… we do not feel like we come to a different country to buy our things. I live nearby, the nearest town… Gelephu… just 2km away. It is just that I come out of my home, do the shopping and go back home… just like everyone else. But yes, the Bhutia who come from the north have to travel a long distance. Therefore, when they come, they purchase in bulk. For us (laughs) it is a daily routine to come.*"

Another female respondent at Dadgari said: "*When we cross the gate…the Indo-Bhutan gate, we don't produce any document. We are free to cross. See… so easy (smiles). No checking of goods… which we purchased… at the gate by the Bhutan police unless there is some ban on some items like pork, chicken and spread of flu… like swine flu in Bhutan.*"

The stories of the Bhutanese reflect their happiness with Indo-Bhutan policies on the movement of people. The 'Indo-Bhutan Friendship Treaty', signed in 1949, allows for the free movement of people across the border, which acknowledges the deep-rooted historical ties between the hillmen of Bhutan and the plainsmen of India and also the geographical condition of Bhutan. Bhutan is a landlocked nation with rugged mountainous terrain that challenges the cultivation and production of goods. Therefore, it becomes paramount for Bhutan to come to an agreement with the neighboring countries for the benefit of the communities. India has always maintained a harmonious and friendly relationship with Bhutan, and such cooperation has mutually benefited both countries.

Dadgari weekly market (*haat*) is one of the largest *haats* on the Assam-Bhutan border, spanning a total area of 30.35 acres. On Thursday, the Dadgari *haat* transforms into a shoppers' paradise for the Bhutanese who come down the highlands to the plains of Assam. Rows of private and public cars, taxis, buses and other forms of transport filled with Bhutias enter Dadgari village after crossing the International Border Line. On Thursday, the number of Bhutanese customers crossing the border increases remarkably. The Bhutanese customers come mostly from Gelephu, Sarpang,

Tsirang, Zhemgang, Nganglam, Punakha and Wangdu from Central and Western Bhutan (Map 2). Dadgari *haat* has a strong Bhutanese consumer base. Gelephu is the nearest border town of Dadgari and therefore, the *haat* witnesses the highest influx of Bhutanese customers from Gelephu.

The Garage Line Market and the Shiv Line Market are the two primary daily markets of Nonke Darranga. These markets witness approximately 180-200 Bhutanese and 120-150 Indian customers daily. However, the number of Bhutanese customers surges beyond 1000 on the weekly market days in Parkijuli and Kumarikata. It receives the highest number of customers from Samdrup-Jhonkar, the nearest Bhutan border town. The other regions are Deothang, Trasigang, Khaling and Bumthang (Map 2). The Indian customers mainly hail from nearby areas of Tamulpur, Rangia, Parkijuli and Kumarikata. There is a clear distinction between the two daily markets concerning the goods sold and the physical structure of the markets. Shiv line market mostly flourishes with perishable goods such as vegetables, different grocery items, dried fish and meat. Conversely, the Garage line market has a plethora of shops selling non-perishable goods such as clothes, hardware shops, utensils, and many more. The Shiv line market does not have a concrete structure of separate shops but operates in an open space with a horizontal alignment of sheds. This market is predominantly run by Muslim traders while the Garage line market has traders from different castes and religions such as Muslims, Nepali, Bodo, Bihari, etc.

Saralpara is rural and not developed facing significant infrastructural and security challenges compared to Dadgari and Nonke Darranga. The vendors travelling from NH27 must cover a distance of 40 km taking the Bismuri-Saralpara-Sarbhang road through the Ultapani Reserve forest to reach Saralpara. The rural road through the midst of the forest, particularly for about 20 km from the Ultapani forest range office to the Saralpara, is in a state of disrepair. The vendors often fear getting stranded in the forest if they encounter any issue with their transport. Additionally, the presence of wild elephants along the road heightens their fear. The forest was once the hiding place for local extremists and many still believe the extremists seeking refuge in the forest. Extremists established camps along the Assam-Bhutan border, creating an unsafe environment for the border people. Although the Royal Bhutan Army's Operation All Clear dismantled extremist camps, the area continues to experience terror. Saralpara has records of incidents of ambushment between BSF and NDFB outfits in September 2021, where two ULB militants were killed in a fierce gunfight with the police in the Ultapani reserve forest area, further cementing the region's image as a tense and unsafe zone. This ongoing tense environment instills terror among the vendors and restrains them from doing business in Saralpara.

Local interaction reveals that before the formation of local extremists in the BTAD area, the Bishmuri-Saralpara-Sarbhang road was used as a major connectivity road between Sarpang/ Sarbhang *dzongkhag* (Bhutan) and NH27 (Assam) via Saralpara. This was the shortest route for the Bhutanese travellers from Sarpang district (Bhutan) to reach Jaigaon (West Bengal), which served as a gateway to Phuentsholing town of Chukha District in Bhutan. Since the early 1990s, the fear of extremists has led to the complete abandonment of this road by the Bhutanese. Presently, they only cross the border to purchase goods from Saralpara and return home, resulting in a significant decline in the local market economy of Saralpara. Nevertheless, one cannot deny that such an operation has significantly reduced terrorism, leading to a more peaceful space in the region.

Likewise, the *haats* also serve as an economic lifeline sustaining the local economy of the villagers whereby the sellers sustain their livelihood by catering to the needs of the customers of both Bhutan and Assam (Sinha, 1998). The weekly markets of Saralpara and Dadgari witness different types of vendors. The mobile vendors, also called *hatua*, keep moving throughout the week from

one weekly market to another, taking one day off. Most mobile vendors are males due to the nature of their work. Among those 'without a permanent shed', there are two types of vendors found. One is 'occasional vendors' who do not sell in the market regularly. The number of occasional vendors is not fixed since they sell depending upon the availability of products for sale in the market. The other is the 'regular vendors', who sell consistently but do not have a permanent designated place in the market. Additionally, some vendors have a permanently assigned place for which they need to pay rent to the market committee.

Women's participation could be found as 'vendors with no permanent shed' and 'vendors with permanent shed'. Their involvement is primarily as occasional vendors rather than as permanent ones. While traversing through the *haats*, one can find local women from Bodo, Santhal, and Gorkha community running their stalls and selling fresh homegrown vegetables. These women set up different eatery stalls, with momo being the most popular dish sold alongside delicious delicacies like pork, fish, chicken and sweets. The *haats* have flat and concrete pavement for the permanent vendors to set up their shops, allowing them to have their own assigned place for their stalls. Whereas, the vendors whose frequency of selling is less do not have any permanent space. They would instead occupy any available space along the street. These vendors are primarily the residents from the village and the nearby villages who would bring whatever they have cultivated at their homestead or gathered from the forest, aiming for minimal sale and income. The *haats* attract vendors not only from nearby villages but also from far-off regions such as West Bengal, Bihar and Rajasthan. Many items are largely sourced from Alipore, Cooch Behar, Siliguri (West Bengal), Delhi, Punjab, Guwahati and Kashmir with the help of distributor dealers. Medicine retailers are also seen in the *haats*. With limited healthcare facilities, both the local customers and Bhutanese customers rely heavily on Ayurvedic medicines for curing ailments like stomach aches, high blood pressure, diabetes and body pain. These medicine retailers face stiff competition from traditional healers known as *ojhas* or *kabirajs*, who assure the customers of fast recovery from various health issues. The markets are the amalgamation of necessity and luxury items, attracting Bhutanese customers (Plate 1). The *haats* reflect a dynamic economic ecosystem with local producers, distant traders and traditional healers coexisting together, ensuring the circulation of goods and services.

**Plate 1: Bhutias Purchasing Goods from Border Weekly Market**

*Source*: Authors

The arrival of the rainy season brings significant challenges for the vendors. Heavy rainfall makes it difficult for the 'vendors without a permanent shed' to open their shops in the open areas, forcing many sellers to stay away. Some of them make their arrangement, often resorting to makeshift shops on raised wooden platforms. The market ground, bustling with customers,

turns into muddy ground, making movement difficult. Many vendors are unable to afford proper waterproof covering, damaging their products. Despite these hardships, the border *haats* remain a lifeline to the villagers and a shopping stop for the Bhutias. Because of the border regulations, the Bhutanese refrain from selling goods in the market as they need to go through the hassle of multiple checks. They would rather opt for bulk purchases and resell them in their homeland with minimum restrictions on border patrolling. Similarly, when the vendors in the *haats* were asked why they do not cross the border and sell goods in Bhutan's market, they responded with dismay.

One of the respondents of Saralpara said: "*The Bhutias are allowed to cross the border. But here in the Saralpara Indo-Bhutan gate, we are not allowed. The Bhutan Government does not permit us. We see Bhutias only when they cross the border.*"

Another female vendor in Dadgari responded: "*The Bhutan king is very strict, but our Government is not. There are no checks for the Bhutanese. But if we go, we have to submit our documents. Our goods will be checked. We do not want to go through the hassles. The market is at the border. The Bhutanese will come. We don't find the need to go there to sell.*"

The restriction imposed by the Bhutan government reflects the geopolitical situation of the country. At Saralpara, the crossing of the border by Indian nationals is prohibited. The Royal Bhutan Police and the SSB of India tighten the security at the border. There have been incidents of infiltration by local extremists like the United Liberation Front of Assam (ULFA), the National Democratic Front of Bodoland (NDFB), and the Kamtapur Liberation Organization (KLO) into Bhutan through the dense forest. In 2003, with the combined effort of the Bodoland Territorial Council (BTC) and the Royal Bhutan Army (RBA), "Operation All Clear" was announced, which succeeded in dismantling these extremist groups. Since then, Bhutan has remained vigilant and does not want to repeat history.

Another key issue that concerns the Bhutan government is the illegal settlement of immigrants in Southern Bhutan near the border, specifically the Hindu Nepali-speaking from Nepal and India. Southern Bhutan is composed of Nepali-speaking Hindus and others from Nepal, Sikkim and the North-Eastern states. Following the enactment of the Citizenship Act of 1958, there has been a large-scale outmigration of Nepalis from Southern Bhutan after being classified as illegal immigrants by the Bhutan Government. According to the Act, a person who has permanently settled or was born in Bhutan on or before 1958 could be considered a Bhutanese citizen and those who could not prove their citizenship will be regarded as illegal settlers. This came in response to the growing number of Nepalis in Southern Bhutan, which was perceived as a threat to the *Ngalong Drukpa* ethnic majority group in Bhutan. This demographic concern compels the Bhutan government to enforce strict rules for Indians crossing the border. The Indians must submit their document such as Aadhar Card and PAN Card and are permitted to stay in Bhutan only for 24 hours. On returning back, the documents were handed over by the authorities. However, the tourist who visits Bhutan via the immigration office submitting their passport is permitted to stay depending upon the duration of the tour.

The market witnesses a seasonal trend in the influx of Bhutanese customers. There is a significant increase in customers during the winter season, particularly from November to April. However, the peak season is December-January period. The dry winter is perfect for traveling through the Bhutan hills. As the rainy season begins, the number of Bhutanese customers declines significantly due to the challenging road conditions in Bhutan, prone to landslides and accidents. Before the onset of the

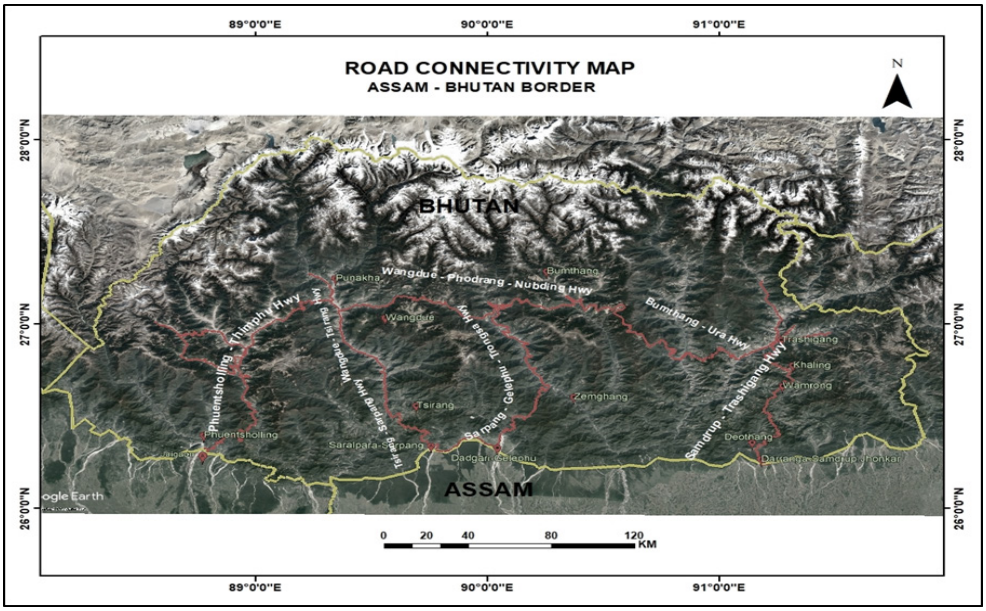
rainy season, the customers purchase non-perishable goods in bulk for the entire rainy season. The vendors in the *haats* eagerly await the retreat of the rainy season and the return of their customers because the decline in the number of Bhutanese customers hampers their trading activity. This surge is also driven by schools and college vacations of their children. Additionally, in February as the new admission to school or colleges starts, there is another wave of Bhutanese customers who purchase different essential items like blankets, bed sheets, mattresses, clothes and other necessary items for their children staying in rented accommodations or hostels. The annual celebration of the *Tshechu* festival in Bhutan draws the Bhutanese to purchase necessary items from the markets on the border of Assam. The exact month of celebration of the *Tshechu* festival varies depending on the *dzong* and the Tibetan lunar calendar. Mostly it is observed in spring (late March) and autumn (September-October). Thus, Bhutanese's purchasing patterns vary with seasons. However, the *haats* and the daily market receive Bhutanese customers from the nearest border town throughout the year because of its proximity, ensuring steady cross-border transactions.

The open and porous nature of the Indo-Bhutan border has significantly benefited the functioning of the border markets, facilitating a large and steady influx of Bhutanese customers to the market. The market flourishes with diverse products with no definite segregation of items. The Indians and the Bhutanese customers make it a vibrant hub of commerce and social interaction. The turnover of the Dadgari *haat* on Thursday of around 40-50 lakhs is mainly attributed to the high number of Bhutanese customers visiting the market. It has the advantage of geographical convenience and improved connectivity which is the key factor in attracting the Bhutanese customers, particularly from the nearest border town. The provision of public transport facilitates the movement of both vendors and customers. Regular traveler cars, winger and line buses are available for commuting to Dadgari. Daily shuttle services from Gelephu (Bhutan) and nearby towns of Bhutan to Assam via Dadgari costs Rs. 70/80 per person and the fare changes depending upon the distance. Additionally, public transport services from Kajalgaon (Assam) to Dadgari, Jaigaon (West Bengal) to Gelephu (via Dadgari), Kokrajhar (Assam) to Gelephu (via Dadgari), and Bongaigaon/Kajalgaon (Assam) to Gelephu facilitate easy and fast mobility of vendors and customers.

Gelephu, located in Bhutan's Sarphang district, is the nearest border town to Dadgari and is also a key economic and administrative hub of Sarphang district. The Bhutias cater to this region daily for different purposes such as education, marketing, banking and healthcare. Recognizing this, the government of Bodoland Territorial Council (BTC) has strategically developed this market to cater to Bhutanese customers, where the Bhutanese, after completing their work, cannot restrain themselves from visiting the market. The proximity of the market to Gelephu is one of the major advantages for Bhutanese customers.

Saralpara F.V. receives Bhutanese customers from Sarpang, Tsirang, Wangdue, Punakha and Gelephu. Originally, the highest number of customers came from Sarpang due to its proximity to Saralpara. But, in recent years, Saralpara, which initially received a steady influx of Bhutanese customers, has witnessed a decline. The key factors are the construction of the Sarpang-Gelephu-Trongsa Highway connecting Sarpang with Gelephu and the development of the Dadgari market into a major commercial hub (Map 2). This highway, also linking the other regions of western Bhutan like Wangdue, Punakha and Tsirang, has succeeded in redirecting the Bhutanese customers of western Bhutan towards Dadagari. Therefore, the number of Bhutanese customers relying on the Saralpara market has fallen remarkably, affecting the local economy.

**Map 2: Road Connectivity Map**




Nonke Darranga receives customers from Samdrup Jhonkar, Deothang, Wamrong, Khaling and Trashigang in Bhutan (Map 2). The highest number of customers is received from Samdrup Jhongkar. The Nonke Darranga-Samdrup Jhonkar is the gateway to eastern Bhutan. Upgrading Darranga (Assam) and Samdrup Jhonkar (Bhutan) as the Immigration Check Posts (ICP) on the Indo-Bhutan border has facilitated entry and exit of third-country nationals by land route and has further strengthened the connection and enhanced the local economic activity in Nonke Darranga.

## 6. Occupational Structure and Flow of Labour to Bhutan

An individual's occupation essentially refers to the economic activity in which he or she is engaged. Occupation is a means of earning one's living and is important in determining an individual's earning capacity and associated quality of living. Without referring to the occupational composition of its working population, an analysis of the economic character of the population of any area is incomplete. Occupational structure and economic development of an area are closely related and therefore, the proportion of workers in different categories of activities is important in planning for economic growth and development. The most accurate way to identify the dominant activities of a place is to look at the percentage of the labour force employed in different occupations. The more the labour force in an activity is concentrated in an area, the more that activity becomes the principal function dominating its economic life. Most notably, the occupational structure of a place is the result of various interconnected factors, thereby every region exhibits a different picture of an occupational composition. Bhutan's proximity to the Assam border and the free movement of people across the border play a pivotal role in determining people's engagement in different economic activities, along with other various factors affecting the involvement of the proportion of workers in different occupations on the Assam-Bhutan border.

**Table 2: Occupational Structure of the Workers in the Study Areas**

| Places | Total working population | Labour under GREF - LG | Regular Labour - RL | Migrant Labour (Contract) - ML | Daily Wage labour + petty trade in the weekly market -DLPT | Agricultural cultivator + petty trade in the weekly market - ACPT | Daily Wage labour + petty trade in the weekly market + Animal Husbandry - DLPTAH | Daily Wage labour + petty trade in the weekly market + Gatherer - DLPTG | Business - B | Government Employees - GE | Transport Services - TS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Saralpara F.V. | 1311 | 0 | 279 | 52 | 393 | 327 | 39 | 18 | 172 | 7 | 25 |
| | | | (21.3) | (3.9) | (30) | (24.9) | (3) | (1.3) | (13.1) | (0.5) | (1.9) |
| Dadgari | 1622 | 0 | 640 | 106 | 313 | 65 | 39 | 102 | 324 | 6 | 27 |
| | | | (39.5) | (6.5) | (19.3) | (4) | (2.4) | (6.3) | (19.9) | (0.4) | (1.6) |
| Nonke Darranga | 1792 | 290 (16.2) | 659 (36.7) | 53 (3) | 216 (12) | 42 (2.3) | 113 (6.3) | 16 (0.9) | 347 (19.4) | 8 (0.5) | 48 (2.7) |

*Note:* Figures within the brackets indicate the percentage of workers
*Source*: Field Survey, 2024

Table 2 shows the proportion of workers engaged in different occupations. The data depicts that individuals are engaged in multiple sources of income. This indicates uncertainty about economic activity and the people's need to rely on different occupations for sustenance (Kumar and Das, 2019). The border communities of Assam face significant economic vulnerability stemming from geographical remoteness, limited infrastructure, and poor soil quality, restricting agricultural production. Due to these constraints, it becomes necessary for people to choose a livelihood strategy and rely on multiple sources of income to fight economic vulnerability (Kundu and Das, 2021). Despite these drawbacks, they have managed to sustain their life, with Bhutan serving as a crucial support and influencing their economic engagements. Their economic engagements cater to the needs of the Bhutanese, creating an essential source of income for them. The highest percentage of workers are engaged as regular labourers in the two areas—Dadgari (39.5 percent) and Nonke Darranga (36.7 percent), making it the dominant economic activity. These regular workers not only contribute to the local economy but also cross the border daily to work as regular laborers in Bhutan. Free movement of people across the border and the lack of workers in Bhutan act as a pull factor, attracting a large workforce from Assam. In contrast, Saralpara exhibits a different scenario, where the highest proportion of workers are engaged as daily wage labourers and vendors in the market (30 percent), followed by agricultural cultivators and vendors (24.9 percent). The proportion of regular labour is significantly lower (21.3 percent) in Saralpara compared to Dadgari and Nonke Darranga because of the restriction imposed on the movement of individuals through the Saralpara-Sarpang Indo-Bhutan gateway to Bhutan for security purposes.

The strict vigilance and tight security with restricted movement can be attributed to the history of extremist activity in the dense forests of these areas. Ultapani Reserve forest, where Saralpara F.V. is located, had once been the hiding place for the insurgent groups from where they infiltrated the deep forest of Bhutan via Saralpara F.V. For security purposes, the Bhutan government imposed restrictions on the movement of Indian workers and other individuals, restricting their access to work in Bhutan. These restrictions have an adverse effect on the locals, increasing their hardship and economic vulnerability, while on the other hand, the Indian Government does not impose any restrictions on border crossing and the Bhutanese are allowed to cross the border freely into Indian towns. They visit Saralpara F.V. to purchase essential goods or get other work done like car repair, haircuts, stitching clothes, herbal dental cures and many more.

The dominant economic activities in Saralpara include working as daily wage labourer and vendor in the market, which accounts for 30 percent of the total workforce in Saralpara. The engagement of villagers as agricultural cultivators is significantly high in Saralpara (24.9 percent), in contrast to Dadgari (4 percent) and Nonke Darranga (2.3 percent). This is supported by the well-developed traditional water supply called the *dong* system for agricultural activities. Villagers are primarily involved in the commercial cultivation of betelnuts and bananas. Dadgari and Nonke Darranga are commercially and economically developed, where people have largely shifted from agriculture to business as well as other commercial activities. This transition is driven by the shortage of water and poor soil quality that make agriculture difficult. The proportion of workers in business is high in Dadgari (19.9 percent) and Nonke Darranga (19.4 percent) compared to Saralpara (13.2 percent). These two regions receive the highest number of customers from Bhutan, making business in retail and wholesale trade one of the dominant activities. The regions witness a new trend in the online shopping business. Since e-commerce platforms like Myntra, Flipkart, and Amazon do not directly deliver in Bhutan, the local business community takes the advantage of the situation and orders the product on their behalf. Upon dispensing the product to the Bhutanese, local businessmen charge a commission to the Bhutanese for the service provided.

Another notable disparity that could be found is the presence of the General Reserve Engineering Force (GREF). The GREF office in Nonke Darranga employs labourers for various infrastructure projects in Bhutan. Daily, the GREF officials transport the workers from the gate to the designated site in Bhutan and by the evening, the workers return to Assam. Such combined initiative of the Indo-Bhutan Government ensures a structured, regulated workforce movement and organized labour force. The absence of the GREF office in Saralpara and Dadgari is a disappointment for the local people. Another sector of employment is Migrant Labour, who are employed on a contractual basis for a while, which could be for months and years. Their nature of work is temporary and they migrate from one work to another based on the availability of work. They work in Bhutan and different parts of India like Assam, Kerala, Tamil Nadu, and West Bengal.

The real labour force engaged in a service has a far greater direct impact on the local economy than the amount or value of goods and services rendered, or the volume of locally produced commodities (Nelson, 1995). According to Nelson, the proportion of the labour force engaged in various economic activities in different places is an indicator for assessing that place's dominance in various activities and the specialization to varying degrees relative to other places. This helps in the relative economic strength and specialization of each area. This can be worked out from the percentage of workers in different occupations in each place:

$$Proportion\ of\ workers\ in\ an\ activity\ of\ a\ place = \frac{Number\ of\ workers\ in\ an\ activity\ of\ a\ place}{Total\ Number\ of\ workers\ in\ an\ activity\ in\ all\ places}\ X\ 100$$

This is followed by calculating the mean and standard deviation (SD) of these percentages of the proportion of workers among all the places for each occupation. Accordingly, the places are categorized into several specialized groups based on their mean + SD, mean + 2 SD, and mean + 3 SD.

$$SD\ of\ a\ particular\ activity = \sqrt{\frac{\sum(X - \bar{X})^2}{N}}$$

X = Percentage of workers in a particular activity of a place

$\bar{X}$ = Average of workers in a particular activity of all places

N = Total number of places

**Table 3: Degree of Specialization in Economic Activities in the Study Areas**

| Places | Total working population | Labour under GREF-LG | Regular Labour - RL | Migrant Labour (Contract) - ML | Daily Wage labour + petty trade in the weekly market - DLPT | Agricultural cultivator + petty trade in the weekly market-ACPT | Daily Wage labour + petty trade in the weekly market + Animal Husbandry - DLPTAH | Daily Wage labour + petty trade in the weekly market + Gatherer - DLPTG | Business - B | Government Employees - GE | Transport Services - TS | Specialization/ Distinctive function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Saralpara F.V. | 1311 | 0 | 279 | 52 | 393 | 327 | 39 | 18 | 172 | 7 | 25 | DLPT1 |
| | | | (21.3) | (3.9) | (30) | (24.9) | (3) | (1.3) | (13.1) | (0.5) | (1.9) | ACPT1 |
| Dadgari | 1622 | 0 | 640 | 106 | 313 | 65 | 39 | 102 | 324 | 6 | 27 | ML1 |
| | | | (39.5) | (6.5) | (19.3) | (4) | (2.4) | (6.3) | (19.9) | (0.4) | (1.6) | DLPTG1 |
| | | | | | | | | | | | | B1 |
| Nonke Darranga | 1792 | 290 | 659 | 53 | 216 | 42 | 113 | 16 | 347 | 8 | 48 | LG1 TS1 |
| | | (16.2) | (36.7) | (3) | (12) | (2.3) | (6.3) | (0.9) | (19.4) | (0.5) | (2.7) | |
| Mean of Percentages | | 5.07 | 34.85 | 3.7 | 22 | 8.95 | 5.57 | 2.12 | 15.62 | 0.35 | 1.7 | |
| SD | | 6.63 | 8.03 | 1.85 | 6.95 | 9.24 | 3.25 | 2.45 | 4.16 | 0.2 | 0.74 | |
| m+SD | | 11.7 | 42.88 | 5.55 | 28.95 | 18.19 | 8.82 | 4.57 | 19.78 | 0.55 | 2.44 | |
| m+2SD | | 18.33 | 50.91 | 7.4 | 35.9 | 27.43 | 12.07 | 7.02 | 23.94 | 0.75 | 3.18 | |
| m+3SD | | 24.96 | 58.94 | 9.25 | 42.85 | 36.67 | 15.32 | 9.47 | 28.1 | 0.95 | 3.92 | |

*Note:* Figures within the brackets represent the percentage of workers to the total working population.
*Source*: Field Survey, 2024

Percentage of workers greater than mean+1SD is considered as the benchmark for classifying a place's distinctive function or specialization of a place in relative to other places. The higher the variation from the average, the greater the specialization. Therefore mean+1SD, mean+2SD and mean+3SD are categorically categorized into varying degrees as having less specialization, medium specialization and high specialization.

Standard deviations from the mean were calculated for each of the categories of occupation as shown in Table 3 and Table 4. The places were grouped in their appropriate categories of specialization. Places over +1 SD from the average in regular labour were given an RL1 rating, over +2 SD an RL2 rating, and +3 or more SDs an RL3 rating. A similar procedure is followed for each occupational type. Since all the places are located along the Assam-Bhutan border, they have more or less the same type of occupational structure with not much variation. Sometimes, a place may have more than one specialization to varying degrees.

Labour under GREF could be found only in Nonke Darranga (16.2 percent). Therefore, Nonke Darranga (LG1) is specialized and distinctive in this particular activity. Nonke Darranga has 2.7 percent of its workforce in transport services (TS1) which falls in the first category. Dadgari falls under ML1 and DLPTG1 categories where the numbers employed in these activities are above +1 SD. Saralpara falls under the DLPT1 and ACPT1 categories where the proportions of workers working as daily wage labourers and traders in the weekly market (30 percent), and agricultural cultivators and petty traders in the weekly market (24.9 percent) are higher compared to Dadgari and Nonke Darranga. All the places categorized fall under mean+1 SD.

**Table 4: Distinctive Function of the Study Areas**

| Occupation | Scale of distinctiveness | | Name of the place |
|---|---|---|---|
| Labour under GREF | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 11.7 - 18.33 | Nonke Darranga1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 18.33 - 24.96 | |
| | $>(\bar{X}+3\sigma)$ | >24.96 | |
| Regular Labour | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 42.88 - 50.91 | |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 50.91 - 58.94 | |
| | $>(\bar{X}+3\sigma)$ | >58.94 | |
| Migrant Labour (Contract) | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 5.55 - 7.4 | Dadgari1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 7.4 - 9.25 | |
| | $>(\bar{X}+3\sigma)$ | >9.25 | |
| Daily Wage labour + petty trade in the weekly market | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 28.95 - 35.9 | Saralpara1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 35.9 - 42.85 | |
| | $>(\bar{X}+3\sigma)$ | >42.85 | |
| Agricultural cultivator + petty trade in the weekly market | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 18.19 - 27.43 | Saralpara1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 27.43 - 36.67 | |
| | $>(\bar{X}+3\sigma)$ | >36.67 | |
| Daily Wage labour + petty trade in the weekly market + Animal Husbandary | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 8.82 - 12.07 | |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 12.07 - 15.32 | |
| | $>(\bar{X}+3\sigma)$ | >15.32 | |
| Daily Wage labour + petty trade in the weekly market + Gatherer | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 4.57 - 7.02 | Dadgari1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 7.02 - 9.47 | |
| | $>(\bar{X}+3\sigma)$ | >9.47 | |

Contd...

Table 4 contd...

| Occupation | Scale of distinctiveness | | Name of the place |
|---|---|---|---|
| Business | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 19.78 - 23.94 | Dadgari1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 23.94 - 28.1 | |
| | $>(\bar{X}+3\sigma)$ | >28.1 | |
| Government Employees | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 0.55 - 0.75 | |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 0.75 - 0.95 | |
| | $>(\bar{X}+3\sigma)$ | >0.95 | |
| Transport Services | $(\bar{X}+1\sigma)$ to $(\bar{X}+2\sigma)$ | 2.44 - 3.18 | Nonke Darranga1 |
| | $(\bar{X}+2\sigma)$ to $(\bar{X}+3\sigma)$ | 3.18 - 3.92 | |
| | $>(\bar{X}+3\sigma)$ | >3.92 | |

*Source*: Compiled by Authors

Table 4 presents the categories of specialization. The degree of specialization is divided into three categories. Category 1 denotes less specialization (mean+1SD); category 2 denotes medium specialization (mean+2SD); and category 3 denotes high degree of specialization (mean+3SD); and so on. Based on the degree of specialization, a place can be denoted as Dadgari1, Dadgari2, and Dadgari3 representing category 1, category 2 and category 3, respectively. Similar process is followed for the other places. Notably, though all three places are specialized in different economic activities, their degree of specialization in different activities falls within the first category (mean+1SD) signifying a low degree of specialization relative to the other. Nonke Darranga1 signifies that the degree of specialization in LG and TS falls in the first category (mean+1SD). Dadgari1 specialized in ML, DLPTG and B also falls in the first category of specialization. Similarly, Saralpara1 is also entitled to the first category.

Hence, the degree of specialization of Nonke Darranga in transport services is low relative to Saralpara F.V. and Dadgari. Similarly, Dadgari falls within the less specialized category in ML and DLPTG economic activities. This determines that the Assam-Bhutan border region exhibits the same type of economic activities with minimum variation in the proportion of workers involved. Some of the activities like regular labour (RL), daily wage labour + petty trade in the weekly market + animal husbandry (DLPTAH), and government services (GS) do not fall within any of the categories and could be determined as specialized activities of any of the places because all the places have more or less the equal engagement of workers. A combination of geographical factors, proximity to Bhutan, economic constraints and socio-political factors drive the similarity in the engagement of economic activities of the border people of Assam in the Assam-Bhutan border regions.

## 7. Flow of Labour

Assam's proximity to the Bhutan border and the free movement of people across the border play a pivotal role in determining people's engagement in different economic activities. In the late 1980s, Bhutan's need for non-agricultural labourers to work in infrastructural-related works like road construction and hydro projects led to the country's large influx of labourers from India, especially from the border areas of Assam and West Bengal. Dantak, an overseas project of BRO under the Ministry of Defence (India) established in 1961 has been involved in the development and modernization of Bhutan, thereby employing the labourers from India. With the increased regional tourism and growing urbanization, the country has experienced a boom in house construction for rental apartments, shops, hotels and office space. These private enterprises and the numerous ongoing government construction projects contribute to a significant proportion of the workforce in the Bhutanese economy from the Assam border.

While unemployment remains a persistent issue in Bhutan, the demand for labour is still high, particularly the migrant labourers in the construction industry. The Bhutanese nationals are reluctant to work as labourers due to low wages and a negative stigma attached to these types of work. This resulted in labour shortage, creating opportunities for the workers from India. Additionally, Indian workers are seen as more skilled and experienced than Bhutanese workers in the labour market. Therefore, most Bhutanese employers find it more economical to employ the Indian migrant construction workers, who are willing to work at lower wages. The people of Assam border villages are mostly landless or possess minimal land, with limited economic activities in the villages, something which drives them to seek work in Bhutan. Due to the proximity and ample availability of labour in the Assam border, the Bhutanese have easy recruitment of labour.

The people of Saralpara F.V., Dadgari and Nonke Darranga are not self-sufficient and face significant economic challenges. Therefore, the people are dependent on more than one source of income, reflecting uncertainty about the activity and the people's need for dependency in different occupations for sustenance. They are mostly landless and school dropouts, limiting their access to stable jobs. Since there is hardly any economic activity in the villages even during normal times, they go to Bhutan seeking work. However, the restricted movement of Indians to Bhutan through the Saralpara-Sarpang Indo-Bhutan gateway exacerbates the economic hardship in the daily life of the villagers, as they cannot go to Bhutan to seek jobs. In contrast, the Dadgari-Gelephu Indo-Bhutan gateway and Darranga-Samdrup Jhongkar Indo-Bhutan gateway permit unrestricted movement, for which the labourers can easily cross the border to Bhutan for work in the morning and return by dusk.

**Table 5: Flow of Labour to Bhutan**

| Place | Total working population | Total workers working as labourer | Total number of labourers working in Bhutan |
|---|---|---|---|
| Saralpara | 1311 | 781 | 8 (1) |
| Dadgari | 1622 | 1200 | 1070 (89.1) |
| Nonke Darranga | 1792 | 1347 | 1268 (94.1) |

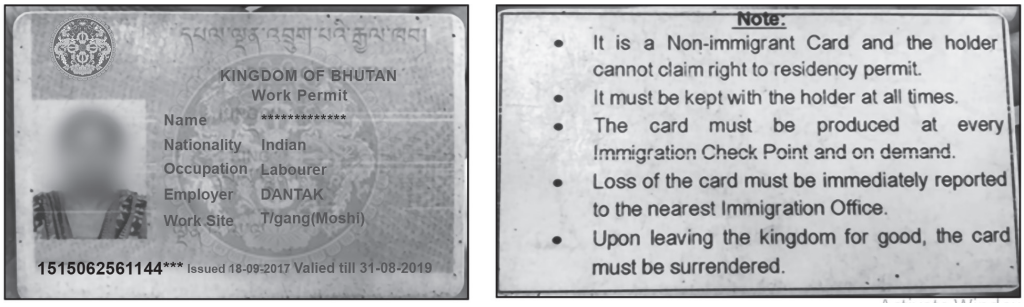
*Note*: Figures within the brackets represent the percentage of labourers working in Bhutan.
*Source*: Field Survey, 2024

Table 5 shows the engagement of villagers as labourers in Bhutan. A significant portion of the working population is engaged as regular labour, GREF labourers, migrant labour and daily wage labour in Saralpara F.V., Dadgari and Nonke Darranga. However, along with daily wage work, they would also sell goods in the weekly market, practice animal husbandry and gather products from the forest like timber and vegetables. Saralpara F.V. has the lowest proportion of workers (1 percent) working in Bhutan. The reason is the restricted crossing of the border entrusted by the Bhutan authority on the Indian citizens via the Saralpara-Sarpang Indo-Bhutan gateway. Dadgari and Nonke Darranga has the highest proportion of workers engaged as labourers in Bhutan. Of the total labourers, Dadgari represents 89.1 percent of labour working in Bhutan, while Nonke Darranga represents 94.1 percent. This exhibits the dependency of villagers on Bhutan for work and at the same the dependency of Bhutan on the Assam border for the supply of labourers. The daily wage and regular labourers would cross the border daily to work from 9 AM to 4 PM in Bhutan and return home by evening. The daily wage laborers collect their wages daily, whereas the regular laborers would collect them by the end of the month. However, the work of a daily wage worker

is uncertain. The workers are issued a daily token as a permit to work by the Royal Bhutan Police (RBP) at the border checkpoints to enter the country (Plate 2). They submit their identity (ID) proof like Voter ID or Adhaar card, on receiving the token and must return the token to reclaim their ID. No fees are charged to enter the country.

In Bhutan, the workers are employed in various sectors, from construction work to domestic chores. The workers are engaged as porters, masons, plumbers, welders, construction laborers, etc. in the activities like cutting boulders to gravel-sized pebbles, moving heavy materials using make-shift carriages, loading and unloading, transport services and cleaning drains. In the Himalayan kingdom, others make a living by selling fruit, vegetables, and timber. Female laborers help the Bhutanese in the household chores like cleaning, cooking, washing clothes, etc. They work in hotels, hospitals, restaurants and shops. The laborers are also recruited on a contractual basis by the contractors of public or private enterprises. The Ground Reserve Engineering Force (GREF) and its projects under DANTAK, which is a state-owned Indian enterprise, responsible for road maintenance and building Bhutan's road network and other services in Bhutan, have been contributing to the employment of labourers from the Assam border and also from different parts of the country.

**Plate 2: Work Permit to Work in Bhutan**




*Source*: Authors

**Plate 3: Circulation of Indian Rupees and Bhutanese Ngultrum**

*Source*: Authors

Thus, Bhutan's economy has always been a source of livelihood for the people of border villages of Assam and the labour sector in Bhutan serves as a crucial backbone in the economic development of Bhutan and also ensures services to the Bhutanese nationals. This reflects the cross-border economic exchange fostering a relationship built on necessity and cooperation.

## 8. Exchange System

A dual currency system exists in the market where both the Bhutanese Ngultrum and the Indian rupee are circulated and both currencies flow at 1:1 fixed exchange rate making it convenient for the sellers and buyers to transact (Sharma, 2019). Further exchange counters were formed by both the countries India and Bhutan for the easy conversion of INR and BTN (Lamsang, 2016). Circulation of Indian and Bhutanese currency is a day-to-day matter for the people living in the border villages, and since the exchange rate is 1:1, it is completely easier for them to make the transaction (Plate 3). When purchasing the goods, they mostly use the BTN as it forms the dominant currency they hold and therefore, there is more circulation or influx of Bhutanese currency to the border markets of Assam. Most of the traders, especially the small traders, who are the residents of the village or the nearby villages do not go through the process of exchanging the currency from BTN to INR because they transact with the Bhutanese on daily basis and these keep on circulating among them in the local villages.

## 9. Conclusions

The economic interdependence of Assam-Bhutan border communities is a testament to their long-standing socio-economic relationship. This mutual reliance has fostered a dynamic ecosystem of cross-border exchange, benefiting both sides of the border. Such interdependence strengthens regional integration, ensures livelihood security for border people and promotes peaceful coexistence. Understanding labour-force engagement is necessary for identifying the potential areas for economic diversification and development. The economic activities of the villagers are closely tied to the needs and demands of the Bhutanese. Therefore, it is necessary to develop and strengthen the economic relations with Bhutan, focusing on the border communities. Local bodies such as ABSU of Bodoland Territorial Region (BTR) and the Bhutan-India Friendship Association (BIFA) of Bhutan should initiate the policies at the local level that would benefit both Bhutan and the border communities of Assam. Formalizing and legalizing the existing local *haats* can enhance the expansion and growth of cross-border local trade. This also requires the development of currency exchange facilities to boost and ease cross-border trade and transactions. Additionally, the development of cold storage facilities is vital for storing perishable goods. The labour markets can be formalized at the micro level between *Dzonghags* (locally meant district) and border districts of Assam by signing the Memorandums of Understanding (MoUs) for structured recruitment of local workers across the border for Bhutan's various infrastructural development projects, which can create sustainable employment opportunities for the border people. By nurturing collaborative policies and fostering inclusive growth, the economic interdependence of the people living along the Assam-Bhutan border can continue to thrive, helping to secure their livelihoods.

## About the authors

**Sangita Gogoi** is a Ph.D. student at the Department of Geography, Gauhati University, Assam, India and also an Assistant Professor at the Department of Geography, MDKG College, Assam, India. **Abani Kumar Bhagabati** is former Professor at the Department of Geography, Gauhati University, Assam, India.

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# ROLE OF AGRARIAN DISTRESS IN POVERTY DISPARITIES BETWEEN ST AND NON-ST IN RURAL INDIA: PANEL ANALYSIS WITH STATE LEVEL INFORMATION

SNEHASIS MONDAL*
*Vidyasagar College, Kolkata, India*

**Abstract:** This paper elaborates on the determinants of poverty disparity between STs (Scheduled Tribes) and non-STs. STs are the most deprived social group in rural India. It is argued that the alienation of the ST people from their land and territorial resources contributes to their deprivation. However, empirical evidence on the role of land dispossession, irrigation, changes in occupation structure, etc., on poverty disparities between STs and non-STs is still limited. Using a state-level panel data set from rural India from 1983 to 2017-18, this study tries to capture the effect of land dispossession, irrigation and occupation structure changes on poverty disparities between ST and non-ST communities. This study reveals that poverty disparities between ST and non-ST/SC (SC stands for Scheduled Castes) rose because of occupational choices and disparities in land and education between ST and non-SC/ST.

**Keywords:** Poverty disparity, Scheduled Tribe, Agrarian distress, Displacement, State-level data, Panel regression, Indian social groups

## 1. Introduction

India has experienced neoliberal reforms associated with liberalisation, privatisation and globalisation since the early 1990s. Since the reform was initiated, ST areas have experienced significant social unrest and protests. Gandhian economic development model, which prioritises the self-development of the rural regions, had never been discussed in India either by the mainstream economists or its left-wing critics (Chakravarty, 1987). The development path initiated by Indian policymakers has not differed significantly from that of the Western economies, where a commodity-centred approach has been prioritised. The higher value of capital per worker has always been considered essential for improving the standard of living. The construction of dams for irrigation and power generation, and different industrial projects financed by the government, were established predominantly in the

*Correspondence to: Snehasis Mondal, Assistant Professor, Vidyasagar College, Kolkata 700 006, India. Email: snehasis.research@gmail.com

ST areas in the pre-reform era (Behera and Padhi, 2022; Fernandes, 2001). Thus, in the name of modernisation, STs were being dispossessed of their lands and livelihoods.

The post-reform era continued a similar legacy. However, the role of the government changed significantly. In earlier cases, where the government acted as an investor to maximise social welfare, it now appeared as the agent of private investors, whose objective is to maximise their profit by preparing Special Economic Zones (SEZs). The rising land hunt and diversification of forest land for non-forest purposes shrank the land base among ST people relative to non-STs. Consequently, there is an increasing tendency towards landlessness among the STs. Additionally, the cut in government agricultural subsidies and quantitative trade restrictions on all agrarian products substantially increased production costs.

Studies argued that the deceleration of agricultural growth due to increasing agrarian distress has also led to a lack of decent jobs in the agricultural sector, thus severely impacting the occupational structure of the tribes, particularly women, who largely depended on neighbourhood work for paid employment (Behera and Padhi, 2022; Prasad, 2016, 2022). It is evident that poverty among ST people reduced at a rate lower than that among non-ST people in rural India in the post-reform era. Consequently, the period witnessed an increasing poverty disparity between ST and non-ST people in rural India (Mondal, 2018; Mondal and Das, 2021, 2023).

Against this backdrop, this study examines the effect of agrarian distress on the poverty disparity between the ST and non-ST. STs are the most deprived social group in rural India. It is being argued that the alienation of ST people from their land and territorial resources is attributed to the deprivation among STs. This study makes an effort to capture the role of land dispossession, irrigation and changes in occupation structure in poverty disparities between STs and non-STs. This study employs static panel analysis at the state level to capture the required coefficients.

## 2. Land Dispossession, Agrarian Distress and Poverty

Poverty is generally defined as the deprivation of some normative well-being among households in India. Household well-being largely depends on their endowment, production, exchange, and consumption. Thus, poverty results from the failure of endowment, production, exchange, and consumption or a combination of the above (Sen, 1981). Endowment failure refers to deprivation in land ownership, capital assets, etc. In rural India, land is considered one of the essential endowments. It is the major source of livelihood for those who are engaged in agriculture. Thus, poverty in rural India is strongly linked with poor access to land, specifically irrigated land. Poor access to land refers to landlessness, insecurity and contested land rights. In the communities where agriculture is the major source of economic activity, access to land is the fundamental means through which food security and income for the poor can be ensured. In an interview in 2017, Sainath pointed out that the agricultural sector generally experiences two distinct types of crisis—agricultural crisis and agrarian crisis. Agricultural crisis refers to the decline in agricultural productivity and the share of agricultural income in the National Income, whereas the agrarian crisis is associated with the declining situation of farmers' income, which most often forces the farmers either to migrate or commit suicide. Although the two may sometimes have some links between themselves, agrarian distress, however, may evolve not as the result of the agricultural crisis, but rather due to the agrarian crisis. Evidently, agrarian distress is not new in rural India. Historically, it was an inevitable part of rural India. Even after the independent introduction of priority sector lending, land reform, etc., the situation did not change much due to half-hearted implementation of these strategies. However, during the post-reform era, agricultural distress rose substantially, which includes low farm income,

unfavourable terms of trade, higher incidence of indebtedness, farmer suicides, etc.

During the post-reform era, India experienced a spurt in economic growth fueled by the service sector growth. However, the performance of the agricultural sector relative to the other sectors was significantly poor (Chand et al., 2007). Consequently, the situation of the landless agricultural labourers and marginal and small farmers is worse. Further, increasing land dispossession and the implementation of neo-liberal economic reform agendas worsened the situation. The dispossession of (and displacement from) land for the construction of development projects such as dams, irrigation projects, etc. was not new in India. However, during the post-reform era, it rose substantially. The post-reform era is characterised by a paradigm shift in natural resource and land management. Large, privately funded projects are invited into the tribal regions. Forest lands have been diverted to non-forest purposes. This predominantly affected the tribals adversely. Evidently, the tribal ownership pattern of land is different from that among non-tribals. Several tribal communities shared the ownership of common land (Mahana, 2019). Estimates reveal that more than half of the land acquired in the post-independence era is part of common land and forest land (Mahana, 2019; Kasturi, 2012). The tribals who are dependent on these resources traditionally are sometimes seen to have been evicted or displaced from their livelihood. This displacement causes agrarian distress and exacerbates the distress among the tribals, reducing their scope of livelihood. Thus, the dispossession can be seen as the major cause of increasing landlessness among the project-affected people. Consequently, it causes endowment failure among the affected people.

Implementation of neo-liberal reform agendas is associated with declining priority sector lending, reduction in input subsidies, unfavourable terms of trade due to deregulation in price control, etc. Researchers argued that declines in priority sector lending forced farmers to move to the non-institutional sources of lending, and consequently, the share of non-institutional sources of lending started increasing since 2002-03 after independence. Consequently, the declining priority sector lending causes a lack of credit availability to marginal and small farmers, resulting in the failure of their endowment. Similarly, the reduction of input subsidies enhanced the cost of production, which ensured the production failure, reducing the profitability of farm production among the small and marginal farmers. The unfavourable terms of trade due to deregulation in price control, on the other hand, cause the exchange failure.

Thus, the combined effect of dispossession of land and implementation of neo-liberal reform in the agrarian economy affected the project-affected people on one hand and landless, small and marginal farmers on the other. These people faced multiple failures such as endowment, production, exchange and consumption or the combined effect of these. Faced with these multiple failures, these people did not earn enough income to meet their social responsibilities, such as education and health. Poor education further limits the occupational choices of the next generation of this community. On the contrary, the people engaged in non-agricultural skilled activities were less affected by such agrarian distress. Further, even the people engaged in agriculture such as medium and large farmers, were also less affected by the agrarian distress as they operated a large-scale production and were creditworthy. Consequently, the disparity of endowment and poverty rose substantially between the people who experienced the distress and those who did not.

The agrarian distress affected all social groups in rural India in general and the tribals in particular for the following reasons. Firstly, it was the STs who faced the highest dispossession of land relative to the non-STs. The Expert Group on Prevention of Alienation of ST Land and its Restoration, set up by the Government of India, estimates that the total displacement due to

development projects was 47 per cent of the ST population (Government of India, 2014). Now, regarding the effect of this displacement, the devastation of the lives of ST people caused by loss of access to forest and involuntary displacement from their land is apparent (Behera and Padhi, 2022; Fernandes and Paranjpye, 1997; Fernandes and Thukral, 1989). Thus, dispossession occurs directly by depriving ST communities of their land, habitat, livelihood, political system, culture, values and identity and indirectly by denying development benefits and their rights. Further, these marginalised people are not partners in the decision-making process regarding the construction of dams, submerged areas, environmental impact, allocation of resources, allocation of benefits and adverse effects of development.

Secondly, although the land base among the STs for agriculture was not lower. However, the proportion of irrigated land is not distributed among the STs much. Thus, production failure, which refers to low productivity and lack of improved quality inputs, skills, capabilities, etc., occurred for the ST. Thirdly, as profitability in farm income reduced, the people who were engaged in agriculture earlier started to shift to non-agricultural activities. However, the shift of the workforce from agriculture to non-agriculture was much lower among the STs relative to the non-STs. Consequently, the log difference in the proportion of the workforce engaged in self-employed agriculture between ST and non-ST rose during the post-reform era, as has been revealed in Table 2.

### *2.1 Disparity in Endowment between ST and Non-ST*

Land holding among the STs is not lower relative to the non-STs. Evidently, the average land holding is lowest among the SCs, followed by the STs. The non-SC/STs accounted for the highest average land holding among the different social groups in rural India. Average land holding among the SCs is much lower relative to the STs and non-SC/STs. However, the majority of the STs' land lacks irrigation facilities. In contrast, the proportion of irrigated land relative to their land ownership is higher among the SCs and non-SC/STs. Furthermore, apart from the land ownership, the STs used to assume customary rights on several common lands and forest lands (Behera and Padhi, 2022; Fernandes, 2001; Fernandes and Thukral, 1989). The statistics of land ownership patterns since 1987-88 reveal that the proportion of landlessness is highest among the SCs, followed by the STs. It further reveals that the proportion of landlessness declined among all the social groups over time. Thus, this could be the result of the migration from rural to urban areas, mainly among the landless. The proportion of landless was much higher among the STs relative to the non-STs, as the migration rate was much higher among the STs relative to the non-ST social groups (Prasad, 2016).

Combining the landless and marginal holdings, it has been found that the share of the landless and marginal landowners increased from 67 per cent in 1987-88 to nearly 80 per cent in 2019. In contrast, all the other forms of landowners decelerated in this time span in rural India. Further, Table 1 reveals that the share of landlessness is the highest among the Scheduled Caste and the least among the Scheduled Tribe in all the National Sample Survey Office (NSSO) rounds used in this analysis. Further, clubbing the share of landless and marginal landowners and small landowners, it was found that households that owned less than 2 hectares of land were the highest among the SC and the lowest among the non-SC/ST. Further, looking at another dimension of land holding, it can be stated that per-capita land ownership decreased for both social groups, but decreased more for ST than for non-SC/ST. The informal land holding, which may be common land, forest land, or other, decreased massively for ST people relative to the non-SC/ST.[1] This could be the impact of

[1] NSSO provides land holding data in the manner that Land Possessed is the sum of Land Owned, Land Leased in and land neither owned nor leased in. The category of land, namely, 'land neither owned nor leased in' is the informally owned land, which may be common land or anything else.

the implementation of SEZ and several development projects that used common land and forest land. It would be worth mentioning that the holding structure among the Tribes is significantly different from that among the non-Tribes. Land ownership among the non-Tribe is well-defined. It is evident that since 1973, a significant share of common property resources and forest lands has been acquired for development (Behera and Padhi, 2022; Fernandes, 2001; Fernandes and Thukral, 1989).

**Table 1: Land Ownership Share among Different Social Groups in Rural India**

| Land Ownership Classes | Year | Social Groups | | |
|---|---|---|---|---|
| | | ST | SC | Non-ST/SC |
| Landless | 1987-88 | 16.2 | 23.4 | 14.8 |
| | 2004-05 | 10.1 | 10 | 8 |
| | 2011-12 | 9.67 | 7.18 | 7.4 |
| | 2019 | 10.6 | 8.97 | 7.6 |
| Marginal | 1987-88 | 45.2 | 62.16 | 48.57 |
| | 2004-05 | 68.52 | 89.79 | 72.46 |
| | 2011-12 | 64.21 | 82.9 | 68.94 |
| | 2019 | 70.2 | 84.83 | 72.9 |
| Small | 1987-88 | 19.44 | 8.42 | 16.30 |
| | 2004-05 | 17.57 | 6.49 | 13.79 |
| | 2011-12 | 15.22 | 5.69 | 12.62 |
| | 2019 | 13.5 | 4.2 | 10.8 |
| Semi-Medium | 1987-88 | 12.69 | 4.06 | 11.43 |
| | 2004-05 | 11.03 | 2.65 | 9.15 |
| | 2011-12 | 8.72 | 2.96 | 7.66 |
| | 2019 | 4.6 | 1.7 | 5.8 |
| Medium | 1987-88 | 5.63 | 1.74 | 7.19 |
| | 2004-05 | 2.66 | 0.94 | 3.95 |
| | 2011-12 | 1.97 | 1.19 | 2.87 |
| | 2019 | 1 | 0.3 | 2.1 |
| Large | 1987-88 | 0.85 | 0.21 | 1.71 |
| | 2004-05 | 0.21 | 0.13 | 0.64 |
| | 2011-12 | 0.21 | 0.08 | 0.51 |
| | 2019 | 0.1 | 0 | 0.2 |

*Source:* Author's calculation from National Sample Survey Office (NSSO) and Land & Livestock unit-level data

Looking at the occupation status of the households, it has been found that the share of households engaged in agriculture or elementary work, although highly significant, such as 85 per cent in 1987-88, decelerated over the years and reached 72 per cent in 2011-12. Further, the percentage of households engaged in agriculture did not decrease between 1987-88 and 2011-12. Still, the percentage of households among the non-SC/ST decreased during the same period. Thus, on the one hand, it has been found that the per capita land owned among the Tribes is declining at a faster rate than that of the non-SC/ST. On the other hand, the percentage of households engaged in agriculture is unchanged among the ST, whereas it decreased among the non-SC/ST. Hence, it can be argued from the above reasoning that per capita land available to cultivators decreased faster among STs than among non-SC/STs, and faster than the decline in per capita land owned. Further, considering the occupation groups—agriculture and elementary occupation together, it has

been found that the percentage of households engaged in agriculture and elementary occupation is much higher among ST than among non-SC/ST. Further, over time, the percentage of households reduced among ST at a lower rate than that of the non-SC/ST. As the National Code of Occupation (NCO) declared, it is a fact that an elementary occupation has a skill level of zero. Hence, this is the most unskilled occupation. Now, merging the two occupations—agriculture and elementary occupation—it has been found that the proportion of households engaged in agriculture or elementary occupation is the highest among the ST, and the share has been reduced at a lower rate than the non-ST (Mondal, 2018). This finding supports the view that landlessness is increasing among the STs, and along with the change in the occupational structure of the landless, the share of elementary- and semi-elementary level occupations has increased significantly. It is also worth noting that among the STs, the share of households engaged in high-skilled jobs also increased. Thus, the situation of ST can be assessed as follows: on the one side, the share of unskilled or semi-unskilled jobs increase along with the increase in the share of high-skilled jobs, i.e., the white-collar job holders are increasing.

Earlier studies found that educational attainment improved among all social groups over time in India (Kijima, 2006). Table 2 reveals that the proportion of adult members of households who completed the secondary level of education rose for all social groups between 1983 and 2011-12. Nevertheless, the hierarchy remains the same. The proportion of adult members who completed secondary education is the lowest among STs, followed by SC households. The proportion of secondary-educated labour is the highest among non-SC/ST. Further, this proportion rose to a higher level among non-SC/ST than among SCs and STs between 1983 and 2011-12. Although the proportion of people who completed secondary education cannot capture actual educational attainment among the labour force, it can be used as a proxy for educational attainment among the labour force. The trend reveals that the ST labour force has lower education than non-STs. Further, ST labour experienced a rise in educational attainment over time, but at a lower rate than non-ST labour. Reservation policies in education have been implemented for a long time. However, it did not significantly change the rural picture of disparities in educational attainment.

As stated earlier, a higher education level helps the individual engage in more skilled occupations. At the macro level, development is associated with a reduced proportion of workers related to the traditional sector, often called the agricultural sector. To some extent, it is valid at the micro level and, in most cases, in rural India. Studies revealed that off-farm employment provides higher income to workers (Lanjouw and Shariff, 2004). Further, increasing landlessness forced the farmers to act as agricultural labourers or engage in elementary occupations, often called zero-skilled, as their agricultural skills are not used in other occupations. The shift from agriculture to non-agriculture is not necessarily intentional. It has often been seen as "forced shift" because of increasing landlessness. Statistics reveal that the proportion of farmers is significantly higher among ST and non-SC/ST than among SC. Over time, this proportion was reduced for all social groups during the analysis period. However, it was reduced at lower rate among STs, followed by SCs. The proportion of farmers rose among STs between 1999-00 and 2011-12. The proportion of the workforce engaged in elementary occupations is also an indicator of underdevelopment. This proportion is the highest among SCs, followed by STs. It declined for all social groups, mainly between 1999-00 and 2011-12. It declined more among STs and SCs than among non-SC/ST. Summing these two proportions across the social groups, the proportion of workers engaged in agriculture or elementary occupation is the highest among STs, followed by SCs. The hierarchy remains the same across social groups over time. Although this proportion declined for all social groups over time, it declined more among non-SC/ST than among STs. This enhanced the disparities between tribes and non-tribes. The casualisation

of the labour force has been an essential phenomenon in recent decades. The proportion of casual labour rose sharply for all social groups in the post-reform era. Recently, there has been a fall in the proportion of casual labour, mainly among STs. Nevertheless, this fall is mainly attributed to the increasing proportion of self-employment.

**Table 2: Endowment Disparities between Social Groups**

| Endowment | Social Groups | 1987-88 | 1993-94 | 2004-05 | 2011-12 | 2017-18 |
|---|---|---|---|---|---|---|
| Per-Capita Land Possessed Informal | ST & Non-SC/ST | 0.65 | 0.54 | 0.90 | 0.48 | 0.00 |
| | SC & Non-SC/ST | 0.00 | -0.30 | 0.00 | 0.00 | 0.00 |
| | ST & SC | 0.65 | 0.85 | 0.90 | 0.48 | 0.00 |
| Per-Capita Land Irrigated | ST & Non-SC/ST | -0.37 | -0.48 | -0.38 | -0.27 | -0.34 |
| | SC & Non-SC/ST | -0.25 | -0.46 | -0.44 | -0.36 | -0.41 |
| | ST & SC | -0.12 | -0.01 | 0.06 | 0.09 | 0.07 |
| Primary | ST & Non-SC/ST | -0.22 | -0.16 | -0.09 | 0.03 | 0.02 |
| | SC & Non-SC/ST | -0.22 | -0.16 | -0.09 | 0.03 | 0.03 |
| | ST & SC | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Middle | ST & Non-SC/ST | -0.35 | -0.26 | -0.20 | -0.12 | -0.10 |
| | SC & Non-SC/ST | -0.26 | -0.26 | -0.12 | -0.09 | -0.06 |
| | ST & SC | -0.10 | 0.00 | -0.08 | -0.03 | -0.02 |
| Secondary | ST & Non-SC/ST | -0.54 | -0.30 | -0.48 | -0.30 | -0.20 |
| | SC & Non-SC/ST | -0.37 | -0.30 | -0.26 | -0.23 | -0.13 |
| | ST & SC | -0.18 | 0.00 | -0.22 | -0.07 | -0.03 |
| Self-Employed in Non-Agriculture | ST & Non-SC/ST | -0.37 | -0.37 | -0.41 | -0.35 | -0.36 |
| | SC & Non-SC/ST | -0.10 | -0.10 | -0.11 | -0.11 | -0.12 |
| | ST & SC | -0.26 | -0.26 | -0.30 | -0.24 | -0.23 |
| Agricultural Labourer | ST & Non-SC/ST | 0.22 | 0.23 | 0.22 | 0.18 | 0.19 |
| | SC & Non-SC/ST | 0.35 | 0.35 | 0.31 | 0.29 | 0.32 |
| | ST & SC | -0.14 | -0.12 | -0.09 | -0.10 | -0.13 |
| Other Labourer | ST & Non-SC/ST | 0.18 | 0.15 | 0.09 | 0.10 | 0.07 |
| | SC & Non-SC/ST | 0.18 | 0.20 | 0.22 | 0.28 | 0.26 |
| | ST & SC | 0.00 | -0.04 | -0.13 | -0.18 | -0.19 |
| Self-Employed in Agriculture | ST & Non-SC/ST | -0.06 | -0.06 | -0.02 | 0.01 | 0.08 |
| | SC & Non-SC/ST | -0.36 | -0.34 | -0.32 | -0.28 | -0.17 |
| | ST & SC | 0.30 | 0.28 | 0.30 | 0.29 | 0.25 |
| Other | ST & Non-SC/ST | -0.23 | -0.26 | -0.12 | -0.12 | -0.20 |
| | SC & Non-SC/ST | -0.23 | -0.20 | -0.12 | -0.12 | -0.09 |
| | ST & SC | 0.00 | -0.07 | 0.00 | 0.00 | -0.11 |

*Source:* Author's calculation from several rounds of NSSO CES and Land and Livestock unit level data

### *2.2 Poverty Disparity between ST and Non-ST*

To estimate poverty, household-level data are used from the 38$^{th}$, 43$^{rd}$, 50$^{th}$, 55$^{th}$, 61$^{st}$ and 68$^{th}$ rounds of quinquennial surveys titled 'Consumer Expenditure Survey' (CES) and 'Periodic Labour Force Survey' (PLFS) conducted by the NSSO (National Sample Survey Office) for the years 1983, 1987-88, 1993-94, 1999-2000, 2004-05, 2011-12 and 2017-18, respectively. This research used the Monthly Per-Capita Consumption Expenditure (MPCE) of 2017-18 NSSO-PLFS as the proxy of NSSO-CES for 2017-18.

Table 3 reveals that poverty in rural India declined steadily between 1983 and 2011-12 among all social groups in both poverty measures such as Head Count Ratio (HCR) and Poverty Gap Ratio (PGR). Squared Poverty Gap (SPG). However, poverty statistics have risen significantly recently between 2011-12 and 2017-18. The HCR among rural Indians has declined from 63 per cent in 1983 to 40 per cent in 2017-18, with an annual rate of decline of 1.07 per cent. The SPG also declined from 0.094 to 0.022 at 4.9 per cent annually for the same period. Thus, the rate of decrease is much higher in the case of SPG compared to the HCR of poverty. From the poverty trend among various social groups, it has been found that the HCR of poverty among all the social groups faced a declining trend between 1983 and 2011-12. The trends of absolute poverty reveal that, besides the declines in poverty indices among the social groups, there is no change in the prevalent hierarchy. The STs were the poorest social group for the entire analysis period, followed by the SCs. Table 3 reveals a decline in poverty indices. HCR, PGR and SPG are the highest among the non-SC/ST groups, followed by SCs. Furthermore, the declining rates are the lowest among STs.

**Table 3: Change of Absolute Poverty among Social Groups in Rural India**

| Year | HCR | | | PGR | | | SPG | | |
|---|---|---|---|---|---|---|---|---|---|
| | ST | SC | Non-SC/ST | ST | SC | Non-SC/ST | ST | SC | Non-SC/ST |
| 1983 | 0.79 | 0.74 | 0.58 | 0.31 | 0.27 | 0.18 | 0.15 | 0.13 | 0.08 |
| 1987-88 | 0.74 | 0.68 | 0.52 | 0.25 | 0.21 | 0.14 | 0.11 | 0.09 | 0.05 |
| 1993-94 | 0.71 | 0.67 | 0.49 | 0.21 | 0.20 | 0.13 | 0.08 | 0.08 | 0.05 |
| 1999-00 | 0.69 | 0.60 | 0.42 | 0.20 | 0.15 | 0.09 | 0.08 | 0.05 | 0.03 |
| 2004-05 | 0.68 | 0.60 | 0.42 | 0.20 | 0.16 | 0.10 | 0.08 | 0.05 | 0.03 |
| 2011-12 | 0.49 | 0.36 | 0.25 | 0.12 | 0.07 | 0.04 | 0.04 | 0.02 | 0.01 |
| 2017-18 | 0.56 | 0.46 | 0.35 | 0.16 | 0.11 | 0.08 | 0.07 | 0.04 | 0.03 |
| Rate of Decline between 1983 and 2017-18 | -0.89 | -1.12 | -1.19 | -1.38 | -1.71 | -1.60 | -1.65 | -1.98 | -1.82 |
| Rate of Decline between 1983 and 2011-12 | -1.39 | -1.81 | -2.06 | -2.19 | -2.58 | -2.70 | -2.58 | -2.95 | -3.01 |

*Source:* Author's calculation from several rounds of NSSO CES and LFS unit-level data

The annual rate of decline in PGR is 1.38 per cent, 1.71 per cent and 1.60 per cent among STs, SCs and non-SC/ST, respectively. SPG rates are 1.65 per cent, 1.98 per cent and 1.82 per cent, respectively, among STs, SCs, and non-SC/ST. Thus, there is a convergence between SCs and non-SC/ST, but there is a clear sign of divergence between ST and non-SC/ST. Further, there is increasing divergence between two marginalised social groups, ST and SC, in rural India. The PGR and SPG trend indicates a convergence between SCs and non-SC/ST groups, but there is a sign of divergence between ST and non-ST groups. Further, the PGR and SPG show a steady declining trend among SCs and non-SC/ST between 1983 and 2011-12. More specifically, for STs, the SPG declined at a higher rate between 1983 and 1993-94 than for the SCs and non-SC/ST, but thereafter, this declining rate diminished.

Thus, findings reveal that absolute poverty among all the social groups declined between 1983 and 2011-12. However, the rate of poverty reduction was lower among the STs than among the SC and non-SC/ST. Thus, poverty disparities between ST and SC and between ST and non-SC/ST rose over time. It went against the nation's noble objective to eliminate economic disparity between social groups. Despite having several affirmative government actions targeted at the socially marginalised

section, the disparity in poverty between the upper castes and tribes has increased significantly. There is a widespread belief that the benefits of the affirmative actions initiated and implemented by the government have been appropriated mainly by the relatively well-off households within the marginalised groups like STs or SCs. Also, it might be possible that the people in the lower strata of the socially marginalised section cannot afford the affirmative measures provided to them. However, the study observes that poverty disparity between STs and upper castes is increasing mainly because the rate of decline in poverty is higher among the non-SC/ST than among the ST people, and the growth effect of poverty reduction was significantly higher for the economically privileged groups (Mondal and Das, 2021). Faster growth, as experienced in India during the post-reform period, had little effect on those who are in the significantly lower tail of the income distribution. Further study reveals that regional disparity effects appeared significant and adversely affected STs in reducing poverty relative to the SCs and non-SC/ST (Mondal and Das, 2023).

## 3. Methodology and Results

### *3.1 Panel Regression*

The main objective of this study is to explore the reasons for increasing poverty disparities between ST and non-ST. This study uses state-level panel information on rural India to examine the explicative power of land-holding disparities and occupational status disparities between social groups on poverty disparities. The panel model has been specified in the following manner.

$$PD_{it} = a_0 + \beta_1 LD + \beta_2 ED + \beta_3 RPAL + \beta_4 x_{it} + u_{it} \quad \text{... 1}$$

Here, $a_0$ is a constant term. $PD_{it}$, $LD_{it}$, $ED_{it}$ and $RPAL_{it}$, respectively, stand for poverty disparity, land holding disparities, educational disparities, and the relative proportion of agricultural labour between social groups. $\beta_i$ are slope coefficients. $x_{it}$ measures an array of covariates such as MPCE averages, the proportion of the population of different social groups, etc., whereas $u_{it}$ represents the unobserved disturbance. Under the Fixed Effect (FE) model of panel analysis, the unobserved disturbance can be decomposed into cross-section-specific error, time-specific error and idiosyncratic error. Thus, FE estimation, by eliminating the effect of unobserved factors on the dependent variable, can capture the net effect of controlled variables on the dependent variable. FE estimation is used when an error is assumed to be non-stochastic. Alternatively, Random Effect (RE) estimation is used when this error component is allowed to be random. Using FE or RE as appropriate for analysis is generally done by carrying out the Hausman Test. Hausman Test is carried out with the null hypothesis that individual effect is uncorrelated with any regressor in the model (Hausman, 1978). If it appears rejected, then the test suggests that individual impact is not uncorrelated with regressors. Hence, GLS will be inconsistent and FE will be consistent (Greene, 2008). If test statistic cannot be rejected, then RE would be considered a more suitable estimation than FE. Hausman tests showed that the test statistic cannot reject the null hypothesis. Hence, RE would be more appropriate to use here.

#### *3.1.1 Empirical Model*

As specified earlier, this analysis used RE estimation to capture the predictor's impact on the outcome variable. Here, we employ panel regression models to explain poverty disparities between ST and non-SC/ST and between ST and SC.

$$PD_{it} = a_0 + \beta_1 LD_{it} + \beta_2 ED_{it} + \beta_3 RPAL_{it} + \beta_4 RPNAL_{it} + \beta_5 x_{it} + r_i + e_{it} \quad \text{... 2a}$$

$e_{it}$ stands for idiosyncratic error. $r_i$ represents region-specific effects. Both are assumed to be independent and identically distributed. $PD_{it}$, $LD_{it}$, $ED_{it}$, $RPAL_{it}$ and $RPNAL_{it}$, respectively, stand

for poverty disparity, land holding disparities, educational disparities, the relative proportion (or disparity in proportion) of agricultural labour and the relative proportion (or disparity in proportion) of non-agricultural labour between ST and non-SC/ST.

$$PD_{it} = a_0 + \beta_1 LD_{it} + \beta_2 ED_{it} + \beta_3 RPAL_{it} + \beta_4 RPNAL_{it} + \beta_5 x_{it} + r_i + e_{it} \quad \text{... 2b}$$

Here, $PD_{it}$, $LD_{it}$, $ED_{it}$, $RPAL_{it}$ and $RPNAL_{it}$, respectively, stand for poverty disparity, land holding disparities, educational disparities, the relative proportion (or disparity in proportion) of agricultural labour and the relative proportion (or disparity in proportion) of non-agricultural labour between ST and SC.

### *3.2 Data*

The household level data used in this study comes from 43rd, 50th, 55th, 61st and 68th rounds of quinquennial surveys on 'Employment and Unemployment' conducted by the NSSO for the years 1983, 1987-88, 1993-94, 1999-2000, 2004-05 and 2011-12, respectively. The 68th round of household consumer expenditure survey is the most recent quinquennial round. The Labour Force Survey of 2017-18 has also been used to capture household-level information. These are the cross-section surveys of a geographically distributed random sample of households. The survey period is one year (generally, from July to June) for most of the quinquennial surveys.

**Table 4: Summary Statistics of Variables Pooled**

| Variable | | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| ***PD between ST and Non-SC/ST*** | Overall | 0.51 | 0.57 | -1.60 | 2.16 |
| | between | | 0.39 | -0.35 | 1.22 |
| | Within | | 0.43 | -1.11 | 1.63 |
| ***PD between ST and SC*** | Overall | 0.17 | 0.60 | -1.96 | 2.34 |
| | between | | 0.38 | -0.85 | 0.64 |
| | within | | 0.47 | -2.04 | 1.40 |
| **Between ST and Non-SC/ST** | Overall | -0.22 | 0.73 | -4.52 | 1.62 |
| Disparity in Land Cultivation | between | | 0.61 | -1.98 | 0.83 |
| | within | | 0.43 | -2.76 | 1.78 |
| Disparity in Land Irrigation | Overall | -0.64 | 1.00 | -4.45 | 2.96 |
| | between | | 0.68 | -1.70 | 1.01 |
| | within | | 0.76 | -3.44 | 1.77 |
| Disparity in Education | Overall | -0.58 | 0.57 | -2.71 | 2.47 |
| | between | | 0.44 | -1.20 | 0.94 |
| | within | | 0.41 | -2.61 | 0.95 |
| Disparity in Proportion of AL | Overall | 0.13 | 0.55 | -1.97 | 2.83 |
| | between | | 0.29 | -0.81 | 0.43 |
| | within | | 0.48 | -1.46 | 1.94 |
| Disparity in Proportion of NAL | Overall | -0.29 | 0.53 | -1.78 | 0.89 |
| | between | | 0.35 | -0.82 | 0.34 |
| | within | | 0.40 | -2.17 | 0.48 |
| **Between ST and SC** | Overall | 0.52 | 0.71 | -2.85 | 2.53 |
| Disparity in Land Cultivation | between | | 0.37 | -0.19 | 1.27 |
| | within | | 0.61 | -2.91 | 2.44 |

Contd...

Table 4 contd...

| Variable | | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Disparity in Land Irrigation | Overall | -0.26 | 1.16 | -6.00 | 4.78 |
| | between | | 1.41 | -6.00 | 1.52 |
| | within | | 0.88 | -2.18 | 4.54 |
| Disparity in Education | Overall | -0.11 | 0.62 | -1.92 | 3.67 |
| | between | | 0.35 | -0.71 | 0.54 |
| | within | | 0.52 | -2.03 | 3.25 |
| Disparity in Proportion of AL | Overall | 0.47 | 0.59 | -1.40 | 2.33 |
| | between | | 0.32 | -0.22 | 1.23 |
| | within | | 0.50 | -1.34 | 1.71 |
| Disparity in Proportion of NAL | Overall | -0.44 | 0.61 | -2.58 | 1.17 |
| | between | | 0.42 | -1.56 | 0.23 |
| | within | | 0.48 | -2.38 | 0.71 |

*Notes:* AL - Agricultural Labour, NAL - Non-Agricultural Labour
*Source:* Author's calculation from several quinquennial surveys of NSS-CES, land livestock and PLFS data

### *3.3 Results*

Table 4 reveals the basic statistics for the key variables of the balanced panel of 26 states with seven distinct time points from 1987-88 to 2018-19. The table represents the wide range of poverty disparities between social groups, along with disparities in land characteristics, educational attainment and occupational status. It reveals that the mean poverty disparity between ST and non-SC/ST is much higher and associated with lower variation than that between ST and SC. Further, poverty disparities vary across the states over time.

**Table 5: Regression Results of Poverty Disparity between ST and Non-SC/ST**

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| Disparity in Land Cultivation | -0.223** | -0.230* | -0.133 | -0.206* | -0.177* |
| Disparity in Irrigated Land | | -0.00631 | -0.0518 | -0.0474 | -0.0525 |
| Disparity in Education | | | -0.12 | -0.132 | -0.211* |
| Disparity in Proportion of Agricultural Labour | | | | 0.188* | 0.156* |
| Disparity in Proportion of Non-Agricultural Labour | | | | -0.121* | -0.123* |
| Proportion of ST Population | | | | | -1.731* |
| Proportion of Non-SC/ST Population | | | | | -2.465* |
| log Mean MPCE | | | | | 0.674** |
| Cons | 0.453*** | 0.434*** | 0.341*** | 0.307** | 1.965* |

*Notes:* * p<0.05, ** p<0.01, *** p<0.001
*Source:* Author's calculation from several quinquennial surveys of NSS-CES, land and Livestock and PLFS data

Table 5 depicts the relationship of poverty disparities in land characteristics, education and occupation choices between ST and non-SC/ST. The result reveals that estimated coefficients of disparities in land holding, education, proportion of agricultural labour, and non-agricultural labour are statistically significant in explaining the variation of poverty disparity between ST and non-SC/ST across the states and over time. As anticipated, the disparity in education and land cultivation negatively affected the poverty disparity between ST and non-SC/ST. Further, the

disparity in the coefficient of land cultivation is much lower than that of education. However, the coefficient of educational disparity remains statistically insignificant until model 5, where variables like the proportion of ST and mean MCPE have been incorporated. The positive coefficient of the disparity in the proportion of agricultural labour and the negative coefficient of the disparity in the proportion of agricultural labour reveal that the variation in the proportional shift of the workforce from agriculture to non-agriculture between the ST and non-SC/ST affected the poverty disparity between them.

**Table 6: Regression Results of Poverty Disparity between ST and SC**

| Variables | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
|---|---|---|---|---|---|
| Disparity in Land Cultivation | -0.173** | -0.0567 | -0.0013 | -0.0112 | -0.00131 |
| Disparity in Irrigated Land | | -0.0755 | -0.101 | -0.110* | -0.112* |
| Disparity in Education | | | -0.40*** | -0.41*** | -0.39*** |
| Disparity in Proportion of Agricultural Labour | | | | -0.083 | -0.0551 |
| Disparity in Proportion of non-Agricultural Labour | | | | -0.152 | -0.156* |
| Proportion of ST Population | | | | | 1.886** |
| Proportion of SC Population | | | | | 1.902 |
| log Mean MPCE | | | | | 0.0814 |
| Cons | 0.156 | 0.12 | 0.0299 | 0.0288 | -0.641* |

*Notes:* * p<0.05, ** p<0.01, *** p<0.001
*Source:* Author's calculation from several quinquennial surveys of NSS CES, land and Livestock and PLFS data

Similarly, Table 6 represents the poverty disparity between ST and SC based on the disparities in land characteristics, education and occupation choices. It reveals that estimated coefficients of disparities of irrigated land holding, education, proportion of agricultural labour, and non-agricultural labour are statistically significant in explaining the variation of poverty disparity between ST and non-SC across the cross-section and over time. As anticipated, the disparity in education and land irrigation negatively affected the poverty disparity between ST and SC. Landholding among the STs is much higher than among the SCs. However, the majority of the lands possessed by the STs are non-irrigated. Consequently, holdings of irrigated land are higher among the SCs than among the STs. The positive coefficient of the disparity in the proportion of agricultural labour and the negative coefficient of the disparity in the proportion of agricultural labour reveal that the variation in the proportional shift of the workforce from agriculture to non-agriculture among the ST and among the SC affected the poverty disparity between them.

## 4. Discussion

Landlessness rose substantially in rural India. It is a natural impact of increasing population pressure and the modernisation of society. However, landlessness did not rise evenly among all social groups. Evidently, landlessness is the highest among the SCs. However, dispossession and displacement from their habitats have been found the highest among the STs. Further, the workforce shift from agriculture to non-agriculture is more rapid among the non-SC/ST and among the SC than among the ST. The logarithmic gap in the proportion of agricultural labourers between ST and non-SC/ST rose substantially. A similar transition has also been found between SCs and STs. However, the proportion of farming labourers is higher among the SCs than among the STs. Still, workforce shifts

from agriculture to non-agriculture are more common among the SCs than among the STs. Further, the SEA share among SCs remains constant over time, whereas among STs, it keeps increasing during the same period. Thus, the difference in the proportion of SEA between ST and SC widens over time.

Linking with the above scenario, with increasing poverty disparities between the STs and non-STs, this study investigated the primary reasons for increasing poverty disparities between ST and non-ST. A panel regression analysis was carried out to capture the determinants of poverty disparities between ST and non-ST. Estimates suggest that poverty disparities between ST and non-ST/SC rose because of occupational choices, inequality in education and land-holding inequalities. Results reveal that disparities in terms of irrigated land holding, education, proportion of agricultural labour, and proportion of non-agricultural labour are statistically significant in explaining the variation of poverty disparity between ST and SC.

Thus, the agrarian distress caused by the dispossesion of land and livelihood, reduction of input subsidies, priority sector lending, etc., adversely affected the poverty disparities between STs and non-STs. Evidently, in rural India, the distress adversely affected those who are the marginalised section, mainly engaged in agriculture. Further, occupational choices among the STs and the lack of irrigation facilities in their land were revealed as prime factors of the increasing poverty disparities between the STs and non-STs. Evidently, there is a significant rate of migration from rural to urban areas among the STs in recent decades. In fact, the rate of migration among the STs is far higher than among non-STs. In contrast, sectoral shift, i.e., from agricultural activities to non-agricultural activities within rural areas, is much less among the STs. Considering the fact that the tribals were geographically delinked from mainstream society and the tribal population is disproportionately distributed across India, it seems that the lack of opportunities for non-agricultural activities in the tribal areas is responsible for the limited choices of activities among the STs. The policymakers should consider the development of the ST populated regions and enhance employment opportunities to eliminate poverty disparities between social groups, in general, and between ST and non-SC/ST, in particular.

## About the author

**Snehasis Mondal** is an Assistant Professor at the Department of Economics, Vidyasagar College, Kolkata, India.

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# ANALYSING GROUP DISPARITIES IN MEAN YEARS OF SCHOOLING ACROSS INDIAN STATES: EVIDENCE FROM THE NSS 79TH ROUND SURVEY

VACHASPATI SHUKLA*

*Sardar Patel Institute of Economic and Social Research, Ahmedabad, India*

**Abstract**: This article analyses group disparities in educational development measured by Mean Years of Schooling (MYS), using the 79th round survey data of the National Sample Survey Office (NSSO). The analysis reveals significant state-wise variations in MYS and group disparities, suggesting that higher inequality hampers overall improvements in MYS. Additionally, MYS is closely correlated with income levels across Indian states. Therefore, addressing educational divides, beginning with reducing group inequality in MYS, is crucial for bridging economic disparities among states.

**Keywords:** Educational development, Mean years of schooling, Group inequality, Gender inequality, Rural-urban inequality, Regional inequality

## 1. Introduction

Education as a fundamental capability attribute is widely regarded as a vital instrument in shaping the social and economic development of a nation (Hannum and Buchmann, 2005; Tilak, 2006). The role of education in enhancing individual earnings and promoting economic growth, as a form of human capital, has long been recognized by scholars such as Becker (1962), Mincer (1974), and Schultz (1963). The differences in educational development help to explain variations in living standards across countries (Mankiw et al., 1992). Education plays an instrumental role in expanding human capabilities, as emphasized by Sen (1999).

The concept of education is usually defined by the development of knowledge and understanding—whether acquired through formal learning institutions or other means. Since much of the learning process occurs in educational institutions and can be easily measured in terms of schooling, formal education is typically used as the key indicator of educational development or attainment for policy-making and empirical analysis. The mean years of schooling is defined as the average number of years of education received by an individual. The mean years of schooling is a widely used educational indicator for cross-country comparisons (Barro and Lee, 2013; Ram, 1990;

*Correspondence to: Vachaspati Shukla, Assistant Professor, Sardar Patel Institute of Economic and Social Research, Ahmedabad 380054, Gujarat, India. Email: vachaspatishukla@gmail.com

Park, 1996; Gregorio and Lee, 2002; Meschi and Scervini, 2014; Permanyer and Boertien, 2021).

The Human Development Report (HDR) recognizes the Mean Years of Schooling (MYS) as a key indicator of educational development in the construction of the Human Development Index (HDI). According to the Human Development Report 2023/2024, India's MYS stands at 6.6 years, compared to the global average which stands at 8.7 years. India's underperformance in MYS is evident when compared to the developing countries' average which stands at 7.6 years. Furthermore, India lags behind neighbouring countries such as Sri Lanka (11.2 years) and Bangladesh (7.4 years).

Though India performs poorly in terms of educational development as measured by mean years of schooling, an aggregate assessment that does not consider disparities across rural-urban and male-female divides masks the true picture of educational performance. Given that disparities in these dimensions vary widely across states, comparisons based on mean years of schooling without accounting for the vast group disparities might be misleading. In fact, the analysis of inter-state inequality in mean years of schooling requires two fundamental approaches: first, comparing the mean years of schooling across states, and second, comparing the distribution of mean years of schooling across rural-urban and male-female differences both within and across states.

The second section of the paper discusses the data used and the approach to estimating MYS, highlighting the significance of the study. The third section analyses inter-state differences in MYS, as well as rural-urban and gender disparities, and how these vary across states. The fourth section presents a consolidated picture of group disparities across Indian states and examines their relationship with the overall level of MYS. The fifth section explores the relationship between MYS and income levels across states. Finally, the sixth section concludes the findings and discusses policy implications

## 2. Data and Analytics

The importance of the present study lies in the data source and approach used to estimate the years of schooling. The earlier studies (Agrawal, 2014; Shukla and Mishra, 2019; Aneesh et al., 2024; Garg et al., 2022) use educational attainment data provided by the Census and National Sample Survey Office (NSSO) household surveys, where the highest level of education for each individual is recorded. Using this information, scholars generally compute the mean years of schooling. In this approach, the number of years required to complete the highest level of education is considered the years of schooling for an individual. An illiterate person is considered to have 0 years of schooling, and a postgraduate is assigned 17 years. However, none of the surveys records information related to pre-schooling and doctoral education. Therefore, this method provides an underestimate of the years of schooling.

The NSSO 79th Round 'Comprehensive Annual Modular Survey', conducted from July 2022 to June 2023, provided direct information on years of schooling. It records the number of years spent in formal schooling, excluding repeated years, ranging from preschool to doctorate and post-doctorate degrees. In the dataset, the maximum years of schooling recorded for any individual is 30 years, much higher than the maximum years of schooling recorded in earlier surveys. The survey covers 302,086 households (173,096 in rural areas and 128,990 in urban areas).

## 3. Inter-state Variation in the Mean Years of Schooling (MYS)

According to the NSS 79th round estimates, the mean years of schooling (MYS) for India's population aged 25-and-above is 7.5 years (Table 1). Several states have an MYS lower than the national average, including Andhra Pradesh (6.1 years), Rajasthan (6.1 years), Bihar (6.3 years), Jharkhand (6.5 years),

Odisha (6.5 years), Uttar Pradesh (6.6 years), Madhya Pradesh (6.7 years), Chhattisgarh (7.0 years) and West Bengal (7.2 years). Conversely, states with an MYS above the national average include Kerala (10.1 years), Maharashtra (9.2 years), Uttarakhand (9.1 years), Himachal Pradesh (8.9 years), Tamil Nadu (8.3 years), Karnataka (8.3 years), Haryana (8.3 years), Punjab (7.8 years), Gujarat (7.6 years) and Assam (7.6 years). Telangana's MYS is equal to the national average (7.5 years). Comparing the states with the highest and the lowest MYS, Kerala ranks highest at 10.1 years, while both Andhra Pradesh and Rajasthan have the lowest at 6.1 years. This reflects a four-year schooling gap between the most and the least educationally developed states.

### *3.1 Rural-Urban Disparities in Mean Years of Schooling (MYS) across States*

Educational development in India faces significant rural-urban disparities. The MYS for the rural population is 6.4 years, compared to 9.9 years for the urban. Among rural areas, Kerala leads with the highest MYS at 9.5 years, while Andhra Pradesh has the lowest at 5.1 years. In urban areas, Maharashtra has the highest MYS at 11.2 years, while Andhra Pradesh again records the lowest at 8.6 years (Table 1).

Urban areas consistently show higher MYS compared to rural areas across all states. However, the extent of the rural-urban disparity varies significantly between states. This disparity is measured by the difference in MYS between urban and rural populations. Kerala has the smallest rural-urban gap, with a difference of only 1.2 years, while Chhattisgarh exhibits the largest disparity at 4.7 years. Kerala's relatively small gap indicates a more equitable distribution of educational progress between rural and urban sectors compared to other states. Several states exhibit substantial rural-urban disparities, with gaps exceeding 4 years. These states include Chhattisgarh (4.7 years), Madhya Pradesh (4.4 years), Jharkhand (4.3 years) and Telangana (4.2 years).

An estimated Pearson correlation coefficient reveals a negative relationship between rural-urban disparity and overall MYS. The correlation coefficient is -0.599, and this result is statistically significant at the 1% level. This suggests that, with the increase in overall MYS, the rural-urban disparity decreases. Spearman's rank correlation too shows the negative correlation with a value of -0.448 which is statistically significant at the 5% level. Both these show moderate correlation.

**Table 1: Mean Years of Schooling (MYS) for the Population Aged 25-and-Above across States**

| State | Rural | Urban | Male | Female | All |
|---|---|---|---|---|---|
| Andhra Pradesh | 5.1 | 8.6 | 7.3 | 5.0 | 6.1 |
| Assam | 7.1 | 10.5 | 8.1 | 7.0 | 7.6 |
| Bihar | 6.0 | 9.1 | 7.7 | 4.8 | 6.3 |
| Chhattisgarh | 6.0 | 10.7 | 8.1 | 5.8 | 7.0 |
| Gujarat | 6.0 | 9.7 | 8.8 | 6.3 | 7.6 |
| Haryana | 7.6 | 9.4 | 9.6 | 6.9 | 8.3 |
| Himachal Pradesh | 8.6 | 11.4 | 10.1 | 7.9 | 8.9 |
| Jharkhand | 5.5 | 9.8 | 7.9 | 5.1 | 6.5 |
| Karnataka | 6.9 | 10.7 | 9.4 | 7.2 | 8.3 |
| Kerala | 9.5 | 10.7 | 10.2 | 10.0 | 10.1 |
| Madhya Pradesh | 5.5 | 9.9 | 8.0 | 5.2 | 6.7 |
| Maharashtra | 7.6 | 11.2 | 10.4 | 8.0 | 9.2 |
| Odisha | 6.0 | 9.2 | 7.5 | 5.5 | 6.5 |

Contd...

Table 1 contd...

| State | Rural | Urban | Male | Female | All |
|---|---|---|---|---|---|
| Punjab | 6.9 | 9.0 | 8.3 | 7.2 | 7.8 |
| Rajasthan | 5.1 | 8.7 | 8.0 | 4.2 | 6.1 |
| Tamil Nadu | 7.1 | 9.7 | 9.1 | 7.5 | 8.3 |
| Telangana | 5.8 | 10.0 | 8.9 | 6.1 | 7.5 |
| Uttar Pradesh | 5.8 | 9.3 | 8.0 | 5.1 | 6.6 |
| Uttarakhand | 8.5 | 10.9 | 10.2 | 8.0 | 9.1 |
| West Bengal | 6.2 | 9.4 | 7.9 | 6.4 | 7.2 |
| India | 6.4 | 9.9 | 8.6 | 6.3 | 7.5 |

*Source:* NSSO Report No. 590, Ministry of Statistics and Programme Implementation, Government of India.

### *3.2 Rural-Urban Disparities in Mean Years of Schooling (MYS) across States*

The MYS for males is 8.6 years, while for females it is 6.3 years, indicating a clear gender disparity in education. Males generally have more years of schooling than females. The highest MYS for males is found in Kerala, with 10.4 years, and the lowest in Andhra Pradesh, with 7.3 years. For females, the highest MYS is also found in Kerala (10 years), while the lowest is in Rajasthan (4.2 years). There are significant inter-state variations in MYS for both males and females. However, as presented in Table 1, male groups in all states have higher MYS than females. This gender disparity also varies across states. When measured by the difference in MYS between males and females, the gap is lowest in Kerala, where MYS for both genders is nearly equal, and highest in Rajasthan, with a difference of 3.8 years. An estimated Pearson correlation coefficient reveals a negative relationship between gender disparity and overall MYS. The correlation coefficient is -0.564, and this result is statistically significant at the 1% level. This suggests that as overall MYS increases, the gender disparity decreases. Spearman's rank correlation too shows the negative correlation with a value of -0.542 which is statistically significant at the 5% level. Both these show moderate correlation.

## 4. Consolidated Overview of Group Disparities in Mean Years of Schooling (MYS) across States

Educational development in India faces significant disparities based on rural-urban divides and gender differences. Across various Indian states, the urban sector exhibits higher educational levels compared to the rural sector. Similarly, males generally have higher educational attainment than females. As a result, males represent the advantaged sub-group in the population, while females represent the disadvantaged sub-group. On the other hand, the urban sector is positioned as the advantaged group, while the rural sector constitutes the disadvantaged group.

By combining these two dichotomous classifications, we can identify four distinct groups: Urban Male, Urban Female, Rural Male and Rural Female. The Urban Male group enjoys two advantages—being urban and being male while the Rural Female group experiences two disadvantages—being rural and being female.

When comparing the MYS across these four groups such as urban males (10.8 years), urban females (9.0 years), rural males (7.6 years) and rural females (5.1 years), it is evident that urban males are the most advantaged, with an MYS more than twice that of rural females, the most disadvantaged group. Thus the group disparity in MYS becomes even more pronounced when examining these four sub-groups rather than focusing solely on the rural-urban or male-female divides.

It is well established that the urban population generally achieves higher educational attainment

than the rural population (Agrawal, 2014; Aneesh et al., 2024), as also evidenced in the present study by the lower MYS of both the rural sub-groups compared to their urban counterparts. Interestingly, the same pattern does not hold in the male-female comparison; urban females have a significantly higher MYS than rural males.

This pattern of dominance in MYS, where Urban Male has the highest MYS, followed by Urban Female, Rural Male, and Rural Female, holds for every state presented in Table 2, except for Haryana and Rajasthan, where Rural Males have a higher MYS than Urban Females. The gap in MYS between the Urban Male and Rural Female is too high in some states. In the states of Rajasthan and Jharkhand it is as high as more than 7 years. While in the states of Telangana, Chhattisgarh, Gujarat and Andhra Pradesh it is more than 6 years. This indicates a high level of inequality within the states. In the state of Kerala, it is as low as 1.3 years, reflecting the fact that educational opportunities in Kerala is more equally distributed among these sub-groups of the population.

Inequality in MYS among these four sub-groups of the population is measured by employing the statistical measures Standard Deviation (SD). It shows that group inequality is lowest in the state of Kerala and Highest in the state of Madhya Pradesh. The group inequality is also measured in terms of taking the ratio of MYS of most advantage sub-group (urban male) and most disadvantaged sub-group (rural female). This ratio also shows the group inequality in MYS is lowest in Kerala and highest in Rajasthan while Madhya Pradesh is the second highest.

In order to analyse whether group inequality is associated with the overall performance, Pearson correlation coefficient and Spearman's rank correlation are estimated (Table 3). The correlation results indicate a strong positive relationship between the two inequality measures: SD and Urban Male/Rural Female Ratio. Additionally, both inequality measures exhibit a negative relationship with MYS. This means that higher levels of MYS is associated with lower level of inequality, implying that as MYS increases, educational inequality tends to decline. Table 4 provides regression estimates of inequality on MYS for both measures of inequality. In both the models, MYS is negatively correlated with group inequality in MYS. However, the relationship between MYS and inequality is stronger in the case of the Urban Male/Rural Female Ratio compared to the SD, as it has a higher $R^2$ value. The coefficients are significant at the 1% significance level. This suggests that as MYS increases, group inequality in education is likely to decline. However, this reduction may not occur automatically without targeted policies to include disadvantaged groups. If inequality remains high and certain groups are denied educational opportunities, it could impede overall educational development.

**Table 2: Mean Years of Schooling (MYS) across Sub-groups of the Population Aged 25+ and Group Inequality in MYS for Indian States**

| | Rural Male | Rural Female | Urban Male | Urban Female | S.D. | Urban Male / Rural Female |
|---|---|---|---|---|---|---|
| Andhra Pradesh | 6.2 | 4.0 | 10.0 | 7.2 | 2.49 | 2.5 |
| Assam | 7.7 | 6.5 | 10.9 | 10.1 | 2.05 | 1.7 |
| Bihar | 7.4 | 4.5 | 10.3 | 7.7 | 2.37 | 2.3 |
| Chhattisgarh | 7.2 | 4.8 | 11.6 | 9.7 | 2.96 | 2.4 |
| Gujarat | 7.4 | 4.5 | 10.6 | 8.7 | 2.56 | 2.4 |
| Haryana | 9.1 | 6.1 | 10.3 | 8.4 | 1.77 | 1.7 |
| Himachal Pradesh | 9.8 | 7.6 | 11.9 | 10.8 | 1.83 | 1.6 |
| Jharkhand | 6.9 | 4.1 | 11.1 | 8.5 | 2.93 | 2.7 |
| Karnataka | 8.1 | 5.8 | 11.7 | 9.7 | 2.50 | 2.0 |

Contd...

Table 2 contd...

| | Rural Male | Rural Female | Urban Male | Urban Female | S.D. | Urban Male / Rural Female |
|---|---|---|---|---|---|---|
| Kerala | 9.7 | 9.4 | 10.7 | 10.6 | 0.65 | 1.1 |
| Madhya Pradesh | 7.0 | 3.9 | 11.0 | 8.8 | 3.00 | 2.8 |
| Maharashtra | 9.0 | 6.2 | 12.0 | 10.2 | 2.44 | 1.9 |
| Odisha | 7.0 | 5.0 | 10.1 | 8.2 | 2.14 | 2.0 |
| Punjab | 7.6 | 6.3 | 9.4 | 8.5 | 1.32 | 1.5 |
| Rajasthan | 7.1 | 3.1 | 10.2 | 7.0 | 2.91 | 3.3 |
| Tamil Nadu | 8.1 | 6.3 | 10.4 | 8.9 | 1.71 | 1.7 |
| Telangana | 7.1 | 4.5 | 11.3 | 8.5 | 2.83 | 2.5 |
| Uttar Pradesh | 7.4 | 4.3 | 10.2 | 8.2 | 2.45 | 2.4 |
| Uttarakhand | 9.7 | 7.2 | 11.7 | 10.1 | 1.86 | 1.6 |
| West Bengal | 7.0 | 5.4 | 10.0 | 8.8 | 2.02 | 1.9 |
| India | 7.6 | 5.1 | 10.8 | 9.0 | 2.40 | 2.1 |

*Source:* NSS Report No. 590, Ministry of Statistics and Programme Implementation, Government of India.

Although the statistical measures presented indicate a negative relationship between the MYS and group inequality in MYS, it is essential to understand how the states perform in terms of both MYS and group inequality. The state with the highest MYS is ranked 1, and so on. Similarly, the state with the lowest inequality in terms of the Urban Male/Rural Female ratio is ranked 1 and onwards. The states such as Chhattisgarh, Kerala, Rajasthan, Tamil Nadu and Uttar Pradesh have the same ranking for both MYS and inequality, indicating that they hold the same position in terms of MYS and group inequality in MYS. They are precisely following the relationship between MYS and group inequality in MYS. Haryana, Himachal Pradesh and Uttarakhand have experienced only a one-position change in their rankings. They are almost following the relationship between MYS and group inequality in MYS. On the other hand, the states like West Bengal, Punjab, Odisha, Bihar, Assam and Andhra Pradesh have better rankings in inequality than in MYS, indicating that educational progress in these states is relatively more equitable. Conversely, Maharashtra, Telangana, Madhya Pradesh, Gujarat, Karnataka and Jharkhand have lower rankings in terms of inequality, suggesting that educational progress in these states is relatively more unequal.

**Table 3: Correlation between the MYS and Group Inequality**

| | SD | Ratio | MYS |
|---|---|---|---|
| Pearson Correlation Coefficient | | | |
| SD | 1 | 0.897** | -0.675** |
| Ratio | 0.897** | 1 | -0.796** |
| MYS | -0.675** | -0.796** | 1 |
| Spearman's Rank Correlation | | | |
| SD | 1 | 0.921** | -0.594** |
| Ratio | 0.921** | 1 | -0.785** |
| MYS | -0.594** | -0.785** | 1 |
| N = 20 | | | |

*Note:* ** Correlation is significant at the 0.01 level.
Source: Estimates are based on data presented in Table 2.

**Table 4: Results of Linear Regressions of Inequality on MYS**

| Dependent Variable (Measures of Inequality) | Intercept | Slope Coefficient (MYS) | $R^2$ |
|---|---|---|---|
| Standard Deviation (SD) | 4.934 | -0.355** | 0.455 |
| | (0.702) | (0.092) | |
| Ratio | 4.884 | -0.367** | 0.633 |
| | (0.505) | (0.066) | |
| N = 20 | | | |

*Note:* ** Significant at the 0.01 level. Standard errors are reported in parentheses.
*Source:* Estimates are based on data presented in Table 2

## 5. Educational Divide as a Reason for Economic Disparities

The impact of educational development on various aspects of socio-economic development is well recognized in social science research (Hannum and Buchmann, 2005). Sanyal and Arora (2024) analyse the relative economic performance of Indian states by computing a relative index of per capita income in comparison to the national average. A comparison of this relative index with MYS across the states reveals that, except for Andhra Pradesh, states with lower MYS consistently have lower per capita income compared to the national average, while states with higher MYS have a higher per capita income relative to the national average. UNESCO (2010) states that an additional year of schooling can increase an individual's earnings by up to 10%. Each extra year of schooling contributes to an increase in average annual gross domestic product (GDP) growth of 0.37%.

**Table 5: Results of Linear Regression of Income on MYS**

| Dependent Variable | Intercept | Slope Coefficient (MYS) | $R^2$ |
|---|---|---|---|
| Log Per Capita GSDP | 4.04 | 0.129** | 0.444 |
| | (0.261) | (.034) | |
| N = 20 | | | |

*Note:* ** Significant at the 0.01 level. Standard errors are reported in parentheses
*Source:* MYS is from Table 2 and GSDP data is obtained from Ministry of Statistics and Programme Implementation (MOSPI website), Government of India.

Table 5 presents the results of a simple linear regression analysis, where per capita Gross State Domestic Product (GSDP) for the year 2022-23 is the dependent variable, and MYS is the explanatory variable. The estimated results indicate that higher MYS is associated with higher per capita GSDP. Specifically, this single explanatory variable accounts for 44.4% of the variation in per capita GSDP, demonstrating a relatively high explanatory power. Furthermore, the estimate is statistically significant at the 1% level, indicating a strong relationship between MYS and per capita GSDP.

## 6. Conclusions

The present article attempts to analyze group disparities in educational development, measured in terms of mean years of schooling (MYS), using the most recent data from the NSS 79$^{th}$ round survey. The analysis reveals not only inter-state disparities in MYS but also significant disparities across sub-groups of the population within states. The level of MYS and group disparities in MYS vary widely across states. Statistical analysis suggests that group disparities are negatively associated

with MYS, indicating that higher inequality hinders the overall improvement in MYS. Therefore, to enhance MYS, it is essential to ensure that educational opportunities are equally accessible to various sub-groups of the population. Moreover, lower educational attainment is also linked to lower income levels across Indian states. The argument follows that higher inequality in education leads to lower educational development, which, in turn, results in lower economic development. Thus, to bridge the economic divides among states, addressing educational divides is critical, with reducing group inequality in educational development being the first step.

The National Education Policy formulated by the Government of India (2020) aims to universalize secondary education, thereby improving the average years of schooling. However, achieving this goal requires substantial public investment in infrastructure, including the construction of new schools and the hiring of teachers to reduce the student-teacher ratio. This necessitates increasing educational allocations in both Union and state budgets to 6% of GDP, as recommended by the Kothari Commission (1966). Special attention must be given to rural areas, where educational attainment remains significantly lower and where two-thirds of the population reside. Chronic shortages of qualified teachers in rural schools continue to be a major obstacle to progress. Beyond increasing funding, ensuring timely and transparent recruitment of competent teachers is crucial. Addressing this shortage is key to improving enrolment rates and educational standards across all levels of learning. Therefore, prioritizing quality education and equitable access is essential for India to harness the benefits of its fading demographic dividend and transform its human capital into a powerful driver of sustained economic growth.

## About the author

**Vachaspati Shukla** is an Assistant Professor at Sardar Patel Institute of Economic and Social Research, Ahmedabad, India.

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# THE RWANDA POULTRY INNOVATION CENTRE: LEVERAGING THE TRIPLE HELIX APPROACH TO DRIVE FRUGAL INNOVATIONS AND BUILD A POULTRY CLUSTER

MEINE PIETER VAN DIJK* AND JULIUS GATUNE
*Maastricht School of Management, Maastricht University, The Netherlands*

**Abstract:** A Poultry Innovation Centre initiated by the Rwandan government with a donor country produces frugal innovations using a Triple Helix approach, where research organizations work with both the government and the private sector to develop and implement the innovations. The governance structure involves a public-private partnership, with educational institution as one of the partners. The mechanism is supposed to generate education, research and innovation platforms. Thus, in this regard, the crucial questions are: Did the sectoral innovation centre work? Was the governance structure successful and did it create dynamic education, research and innovation platforms? This research shows that the Innovation Centre was successful; key partners are on board; and a win-win situation was created. The Innovation Centre developed education, research, and innovation platforms. The Triple Helix approach guarantees involvement of all stakeholders, and the Innovation Centre generates frugal innovations and drives local economic development, although improvements are possible and necessary to build a real poultry cluster.

**Key words:** Innovation centre; Public private partnership; Triple Helix approach; Frugal innovations; Poultry; Rwanda

## Introduction

The poultry sector is important for Rwanda because of its potential to provide additional income to poor families, contribute to food security (proteins), and export or diminish imports of chicken and eggs. The challenges in the poultry sector include low productivity, fluctuating feed prices, vaccine availability and market volatility. Mazimpaka et al. (2018) noted in a field survey that half of the poultry farmers were in dire need of veterinary assistance and financial support to improve their poultry enterprises.

* Correspondence to: Meine Pieter van Dijk, Professor Emeritus in Economics, Maastricht School of Management, Maastricht University, Tapijnkazerne 11, 6211 ME Maastricht, The Netherlands. Email: DijkM@msm.nl

To make the poultry sector more dynamic the Rwandan government decided to create an Innovation Centre with support of a donor. Together they opted for creating the Innovation Centre as a public private partnership (PPP) between two educational institutions and a private company, using the Triple Helix approach, combining research institutions, government services, and the private sector (Ranga and Etzkowitz, 2015). The results will be analyzed to answer the following questions: Did the sectoral Innovation Centre work? Was the governance structure successful. And did it create dynamic education, research and innovation platforms? Platforms are defined as collaborative spaces to foster interaction and knowledge exchange among different stakeholders to drive agricultural development.

There is a need for a cheap source of protein in Rwanda, and the quality of the eggs that are currently available needs to be improved, especially with regard to high levels of antibiotics, which are often found as residues in modern layers. Poultry is a highly competitive sector, where only the most efficient producers will survive. A partnership was created to invigorate the poultry sector in Rwanda by creating an Innovation Centre.

After providing the context, the research approach is presented, and the theoretical framework is summarized, before establishing the success of the Innovation Centre. After the analysis of the research questions, the findings are related to the theory in the discussion section. At the end, relevant conclusions are drawn, and recommendations are formulated for the development of the poultry sector in Rwanda.

## The Rwanda Poultry Sector

The total number of chickens reared in Rwanda is estimated to be six million, of which only one million are raised for commercial purposes (Cochini and Ter Steeg, 2019). Poultry farming in Rwanda is predominantly family based and rural in nature. In Rwanda, 69% of all poultry farmers rear only a few chickens. Mbuza et al. (2017) described the production system of what they call village poultry (versus industrial poultry). The poultry value chain in Rwanda consists of two parallel chains: (1) the traditional village poultry farmers who are raising mostly highly appreciated Rwandese indigenous chicken species (Mahoro et al., 2017), and (2) the modern poultry farmers that are selling imported chicken species, or exotic chicken, which can be raised quickly and in large-scale facilities (Cochini and Ter Steeg, 2019). Competition is based on taste, price and availability. Upgrading parallel chains requires different policies and promotional activities.

The Rwandan government aimed to establish poultry as the flagship programme of Rwanda's livestock industry, with a particular focus on improving production and marketing. Rwanda had the ambition to triple poultry production between 2016 and 2021 under its Strategic Plan for the Transformation of Agriculture (SPTA4, 2017). However, Table 1 and Figure 1 provide a different picture.

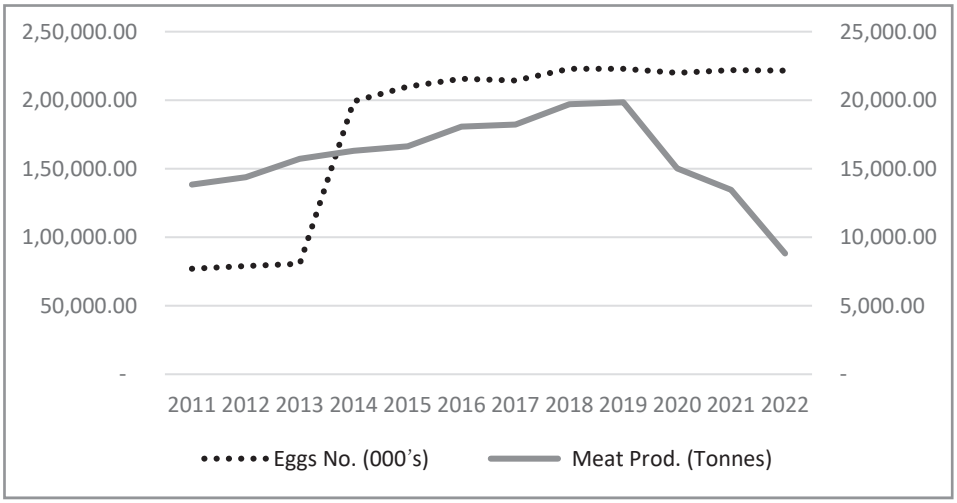
**Table 1: Rwanda's Production of Chicken Eggs and Meat during 2017-2023**

| Year | Eggs (in Metric Tons) | Number of Eggs (000) | Chicken Meat (in Metric Tons) |
|---|---|---|---|
| 2017 | 7500 | 214,600 | 18,215 |
| 2018 | 7700 | 220,000 | 15,027 |
| 2019 | 7800 | 220,900 | 19,845 |
| 2020 | 7700 | 220,000 | 15,027 |
| 2021 | 7767 | 221,587 | 13,458 |
| 2022 | 7756 | 222,905 | 8,814 |
| 2023 | 7741 | 211,164 | 11,351 |

*Source:* FAOSTAT (2025)

According to FAO data, the production of eggs has increased in the past seven years, while the production of chicken meat has declined. Figure 1 shows two distinct trends over the 12 year period. Egg production (see dotted line) increased significantly between 2011 and 2023, growing from 77 million eggs to 221 million eggs. However, chicken meat production has shown a significant drop of 36%, from 18,215 metric tons (MT) in 2017 to less than 11,350 MT in 2023—after a steady rise to almost 20,000 MT between 2011 and 2019. This decline can be partially explained by COVID and the resulting decline in purchasing power. Opportunities to export to neighbouring countries have diminished, mainly because of political conflicts.

**Figure 1: Poultry Production Trends in Rwanda**




*Source:* FAOSTAT (2025)

There are now more large-scale poultry farms (Table 2), but the number of small-scale poultry farmers also increased. In Rwanda, indigenous chickens contribute 3,000 tons of eggs (40% of the total production) and 2,144 tons (12% of the total production) of chicken meat annually (ECIV, 2016). Indigenous chickens are raised in rural households and on small poultry farms. They are mostly consumed in the rural areas, while in towns they are considered a delicacy.

Larger poultry farmers often use imported chicken species and modern production methods. Table 2 summarizes this situation. A distinction needs to be made between the number of broilers (Mbuza et al., 2016), producing one day chicken, and the number of layers focusing on the production of eggs (Mbuza et al., 2017).

**Table 2: Three Categories of Chicken Farmers in Rwanda**

| Type of chicken farmer | Size of the farms | Number of poultry farmers 2010 | Number of poultry farmers 2015 |
|---|---|---|---|
| Household & small poultry farming | < 5000 | Almost all small farmers keeping some chicken | Same, but 265 small commercial farmers |
| Modern small-scale poultry farming | 5000 - 20,000 | 108 | 258 |
| Large-scale poultry farming in Rwanda | > 20,000 | Maximum of 15 | 27 |

*Source*: Poultry Africa 2022 (https://www.minagri.gov.rw)

Large chicken farmers in Rwanda, such as Mr. Chicken Rwanda Ltd, have a maximum of 100,000 chickens (Kingdom of the Netherlands, 2016). Some large-scale poultry farms have been initiated through foreign direct investment. In 2010, Rwanda had a total of 15 large commercial poultry farmers with layers between 20,000 and 100,000 each and 108 medium-scale farms with layers between 5,000 and 20,000. Since 2010, their number has increased. There are now 27 large commercial poultry farmers, 258 modern small-scale poultry farmers, and 265 small commercial poultry farmers.[1]

Some chicken farmers producing chicken feed and a number of restaurants buying their products were interviewed in a survey of small and medium enterprises in the Western Province of Rwanda (Van Dijk, 2025). A group of women, who had started selling fruits and vegetables, and then decided to invest in poultry farming, was interviewed These actors in the poultry sector display passion and zeal to grow their businesses, although they face several challenges. They complained about the high cost of production. A woman with university training, who had set up a chicken farm for 900 chickens to leverage her academic skills, was also interviewed. She wanted to double the farm in the near future and had the skills. She showed entrepreneurship when she started the farm. She had no problems selling her chicken, and hence, wanted to increase the production. However, her farm is next to her house in a densely populated neighbourhood, which limits the possibility of expansion. A man interviewed had a substantial number of pigs and chickens. He sells from his home or through traders. He complained about diseases, and also said that animal feed was too expensive. The interviewed poultry farmers mentioned that one of their main problems was to access finance to improve their businesses. When they obtain loans, farmers face very high interest rates that can reach between 20 to 30% (see also Cochini and Ter Steeg, 2019).

## Actors and Issues in the Poultry Value Chains

Specific characteristics of the chickens and eggs, the organization of the production and the market, and the price of the final products play a role in determining the extent to which the parallel indigenous and modern chicken value chains compete with each other. Consumers of indigenous chicken live mainly in villages and small towns. Only a few indigenous chickens are sold in larger towns and cities. Box 1 summarizes the actors in the indigenous chicken chain.

**Box 1: The Actors in the Indigenous Chicken Chain**

a. Rural households raising indigenous chicken and small poultry farms
b. Traders coming to the villages to buy these chicken
c. Cooperatives play a role in production, training and marketing
d. Rwanda Agriculture Board (RAB) does research and provides extension services
e. The government provides subsidies and formulates policies

Competition between two parallel poultry chains is currently limited. Consumers in towns and cities who prefer indigenous varieties have learned that they are more expensive, less tender, and not everywhere available. The markets are separated geographically and by the quality standards they are used in supermarkets, hotels, and restaurants, but not in the informal supply networks operating in local markets. Urban-based supermarkets and restaurants favour imported species over local species because the meat is more tender and traditional chicken is relatively expensive. The issues mentioned by indigenous chicken farmers are listed in Box 2.

[1]Rwanda hosted an event titled "Poultry Africa 2022". See: https://www.minagri.gov.rw/updates/news-details/rwanda-hosts-poultry-africa-2022#:~:text=The%20growth%20has%20translated%20into,eggs%20per%20year%20by%20

**Box 2: Major Issues Mentioned by Indigenous Chicken Farmers**

1. Lack of entrepreneurship, the families raise them without a business mindset
2. Diseases are caused by inadequate bio-security and limited knowledge on how to handle diseases or how to protect birds from an outbreak.
3. No real support from the cooperatives
4. High cost of feed, if bought in the commercial sector
5. No skills to determine the optimal mix for feed
6. The prices of eggs and meat do not reflect the production cost

Notwithstanding these challenges, the government observes significant potential to upgrade the indigenous poultry value chain. The Ministry of Agriculture and Animal Resources plans to introduce farmers' schools that will train farmers in different ways to make small livestock farming profitable. The Ministry initiated the Partnership for Resilient and Inclusive Small Livestock Markets (PRISM) project to make chicken farming a profitable venture.[2] The Ministry recognized the need for more skills and knowledge. The actors in the modern chicken value chain using imported species are listed in Box 3. Customers include individuals, supermarkets, hotels and restaurants.

**Box 3: Actors in the Modern Chicken Value Chain, Using often Imported Species**

a. Input suppliers: broilers, chicken feed, medicines, etc.
b. Suppliers of the building and equipment
c. Modern and large scale poultry farmers, some also run processing units
d. Chicken processing firms (some units that produce chicken sausages)
e. The Rwanda Poultry Industry Association (RPIA), for the bigger poultry farmers, lobbying for their interests
f. The Rwanda Biomedical Centre helping with diseases

For the modern chicken raising sector, the key challenges identified are listed in Box 4.

**Box 4: Issues of Modern Chicken Raising Farmers**

1. Demand has gone down because of the lower number of visitors to Rwanda since COVID-19
2. Many eggs have high levels of antibiotics, which may also be present in chicken meat
3. Inputs of this chain have to be imported, for example, concentrated feed from India, soybeans from Brazil
4. It is difficult to obtain one-day-old chickens
5. Imports from Uganda or Turkey are uncertain and expensive
6. Issues of bio-security

Despite the challenges that lead to higher production costs, there are untapped opportunities. The economics of raising poultry shows significant potential. Miklyaev et al. (2017) have done a cost benefit analysis, concluding: "The financial and economic analysis of poultry farming activities as well as feed production has revealed that investments into poultry value chain are financially and economically feasible. Financial rates of return range from 19 to 53 percent, while economic rates of return range from 30 to 73 percent".

The Rwandan market for chickens and healthy eggs has not yet been saturated. There is also the

[2] *Rwanda Today*, 29 May, 2021, p.1

potential for replacing chicken meat and eggs from Kenya and South Africa, the main competitors. Productivity in Rwanda is low. Chicken meat is more expensive than beef. It costs approximately 10,000 Rwandan Francs (7.4 US$) per kg versus 6,000 RF per kg for beef. This is a good argument for upgrading the poultry value chain, as chicken meat tends to be much cheaper than beef globally. Adopting best practices can help chicken farmers capture a larger share of the protein market.

Export opportunities also exist. Before COVID-19, Rwanda exported chicken and eggs to neighbouring countries (particularly, the Congo). According to *Rwanda Today* (29 May, 2021), there was a regular demand from local hotels and Congo, but producers opine: "we can't get an order of around 300 chicken now". The market is large and can be addressed with appropriate policies.

The calculation of the margins for the indigenous chicken value chain is complicated because farmers sell their whole flog once a year. Their price is not determined by weight but rather by the number of chickens. Our calculations show that indigenous chicken farmers do not cover their labour costs. Indigenous chicken farmers are not competitive and may be marginalized over time if they are not assisted in making the next step to a more commercial approach to poultry farming.

## Upgrading the Poultry Value Chain

The foregoing discussion points to an untapped opportunity in Rwanda. The poultry value chain can be upgraded and provide jobs and improved food security. In this regard, the SEAD and SEAD West projects, implemented by the NUFFIC (the Dutch organization for capacity building), covering the periods from 2015 to 2023, sought to unlock the poultry value chain potential. To upgrade the poultry value chain the projects supported the creation of the Innovation Centre for poultry sector development, located in the eastern region. The focus was on developing economically and financially sustainable poultry-related activities by catalyzing innovations that are affordable and utilize local skills and materials, i.e., frugal innovations.

The Innovation Centre is structured as a public private partnership involving the Integrated Polytechnic Regional College (IPRC) Gishari and the IPRC Ngoma. The private sector partner, Abusol, operates facilities at these two polytechnics. IPRC Ngoma produces one-day old chicks. The chickens are subsequently transferred to the IPRC Gishari and nurtured to produce eggs. The installation in which the hatching of poultry eggs takes place is electronically controlled.

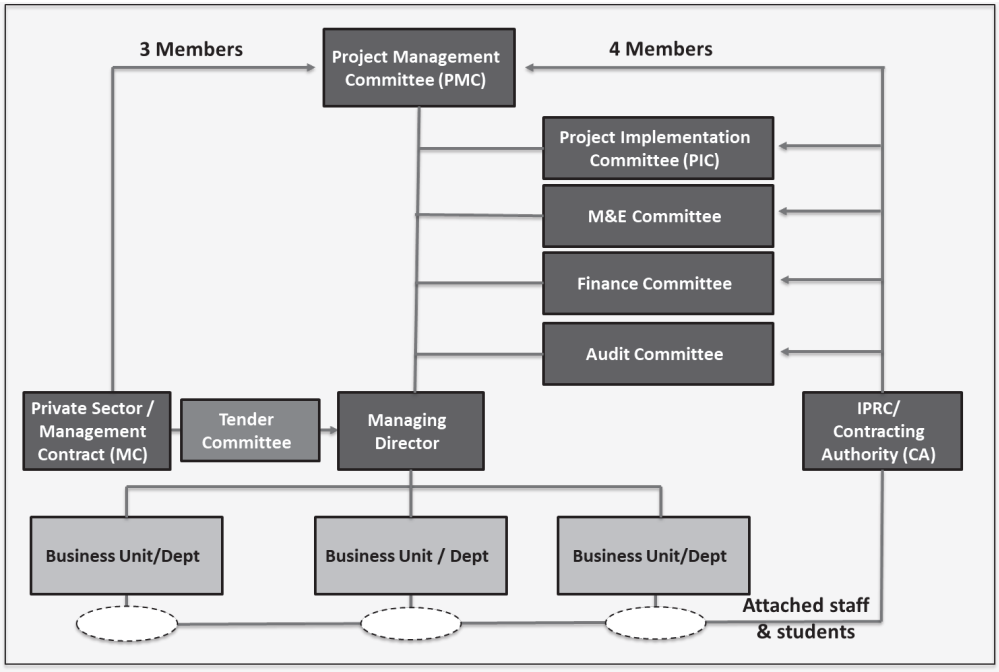
The PPP combines the use of facilities on campus with the experience of a private company. Broilers are produced and brought up at one location, and the hatchery is located close to the second IPRC. The partnership agreement specifies that students can learn from these units. Beyond the production of layers and eggs, the partnership seeks to drive the transformation of education and achieve rural transformation.

Abusol pays a fixed fee for the use of facilities financed by the SEAD project and owned by the public partner. The four-year lease contract can be dissolved before the end of the contract period only in the case of a breach. It has been renewed in 2024 for another four years term, which is the payback period for investment. In this period, no profit is distributed. Thereafter, the contract specifies that each party receives 40%; and 20% is retained by the Innovation Centre for re-investment. The infrastructure is complete and operational. Abusol produces layers, eggs and products based on eggs. Interviews with partners indicated that everyone was satisfied with the progress. The core business of the partnership involves growing chicks and selling pullets, eggs and off-layers. Furthermore, the Innovation Centre provides short courses to farmers on poultry farming; conducts applied research on innovation in poultry housing and hygiene; and disseminates research findings via the different platforms.

The key tool for engagement between the private sector actor (or the management company) and the public sector (IPRC and by extension the Rwanda Polytechnique, the contracting authority) is a management contract in the form of an extended lease contract. It defines the objectives of collaboration, the roles of each party, the governance structure, and revenue sharing. The Rwanda Development Board (RDB) plays the supervisory role.

The collaboration between the partners has been intense across the three phases of the SEAD project: the establishment of an Innovation Centre, including feasibility studies; the building of facilities and operationalization of the Innovation Centre; and the actual functioning of the Innovation Centre. The Innovation Centre is run based on a business plan developed by the management company and approved by the contracting authority. The business plan is a key tool for operationalizing the Innovation Centre. The governance of the Innovation Centre is depicted in Figure 2.

**Figure 2: Governance Structure of the PFTIC**




## Research Design: Assessing the Innovation Platform

First, the characteristics of the Innovation Centre will be determined to analyze whether this Centre really focuses its efforts on upgrading the poultry value chain. The Innovation Centre was created by the SEAD project; started functioning in 2022; and is called Poultry Farming, Training and Innovation Centre (PFTIC). It has broiler chickens and hatcheries. Originally, one-day chickens were imported and brought-up to provide eggs. The Innovation Centre must contribute to a cheaper and healthier source of protein by driving innovation and entrepreneurship needed to unlock the poultry value chain. The Innovation Centre was structured as Triple Helix partnership. Dudin et al. (2015) consider the Triple Helix approach as a mechanism for a partnership between the government,

business sector, and research community, leading to the construction of self-organizing and self-developing innovation systems.

To study the success of the Innovation Centre created to develop the poultry sector, the second research question is: was the partnership creating the Innovation Centre successful? The final research question is: is the Innovation Centre successful in stimulating an education platform, a research platform and an innovation platform? We will also explore whether this Innovation Centre can help to develop a dynamic poultry cluster.

The question of whether the Innovation Centre develops into a dynamic and sustainable poultry cluster is analyzed by examining the Triple Helix approach to develop innovations. Mixed methods were used in the present study. Qualitative information from stakeholders was collected through in-depth interviews and an evaluation study (Gatune, 2023). Quantitative data were obtained from a survey of small and medium enterprises (Van Dijk, 2025).

## Theoretical Framework

Innovation is necessary to bring the poultry sector to a higher level of productivity in Rwanda. Adolwa et al. (2025) concluded that current innovation systems in Africa have contributed to enhancing co-learning processes and have enabled the partial adoption of improved agronomic practices. However, the current agricultural innovation systems remain ineffective in supporting sustainable agricultural transformation. This leads to a question: what is the optimal model for generating and diffusing innovations to maximize farm income (Nain et al., 2024).

To understand this, it is important to know the sources of information used by farmers (Narain et al., 2016). They conclude that mass media exposure does not do this trick. 43% of their sample was well-known with the media, but only about a quarter of the farmers used this source of information to manage their farms. Subrahmanyeswari (2022) points to the important role of intermediary organizations—in his case, a Commodity Board—and the importance of personal factors for adoption such as information access, training received, and social participation. In many countries, agricultural Innovation Centres are used as intermediary, to achieve not only the involvement of stakeholders in the development of innovations, but also to link research to the needs of the population. There are several interesting examples in India and the Global South and some are listed in Box 5.

**Box 5: Some Agricultural Innovation Centres in India and the Global South**

1. The Pragati Accelerator in Uttar Pradesh (India) with targeted innovations promoting the digital revolution in agriculture
2. The Green Innovation Centres for the agriculture and food sector in India under the Global programme Innovation Centres for agriculture and the food sector
3. Centre for Agricultural Innovations and Technology Transfer (CAITT) in Kerala Agricultural University (KAU), India, focuses on climate, water, and nutritional security for sustainable development and technology transfer to farmers
4. Agricultural Innovation and Technology Centres (AITEC), various locations in Africa: self-sustainable farms acting as regional hubs for agricultural research and training
5. CIITTA (International Centre for Innovation and Agricultural Technology Transfer), a non-profit organization that supports agricultural technology transfer in Brazil
6. Agricultural Technology and Innovation Centre, University of Nairobi in Kenya focuses on collaboration with industry, private sector and government to scale up activities and training
7. Agricultural Innovation and Technology Transfer Centre (AITTC), Mohammed VI Polytechnic University, Morocco: A network of experimental farms across Africa

Agricultural innovation centres are defined as facilities that focus on developing and disseminating new technologies and practices to improve agricultural productivity and sustainable production. These centres are a bridge between research institutions, farmers, and other stakeholders in rural value chains. They are involved in activities such as research, testing, adaptation of existing technologies, farmer training and extension services. However, this definition does not mention the importance of a governance structure, which is considered in this study an essential element of Innovation Centres. Hence, in our research, in addition to the governance dimension, the following key functions are identified:

i. Innovation: technology adoption and transfer
ii. Promote sustainable agricultural practices
iii. Training and extension activities to achieve skill development and entrepreneurship
iv. On farm trials and demonstrations
v. Identify needs of local farmers and stimulate relevant research and technology development

Innovation usually means frugal innovation in Rwanda. Introducing improved certified seed potatoes is a good example of frugal innovation in Rwanda. The certified seed potatoes were a frugal innovation, in the sense of combining a number of existing technologies to produce more seed potatoes in Rwanda (Weyrauch and Herstatt, 2017). The relevant technologies were invitro cultivation of potato plantlets, the use of aeroponics to grow mini tubers and supervised multiplication. They were adapted in another Innovation Centre launched by the SEAD project (Van Dijk, 2023).

After checking the governance structure and whether the Innovation Centre studied carries out these functions, we will analyze whether the chosen governance structure (a public-private partnership) was successful. Theories concerning the success of partnerships are used (Partnership Resource Centre, 2016; Van Dijk, 2012). The factors determining the success of partnerships mentioned in the literature:

a. An agreement on who should do what,
b. A clear role for the different partners,
c. A win-win situation for the different partners,
d. A sharing of resources and risks, and
e. Working in a clear regulatory framework?

The third research question concerns the evaluation of an educational partnership in the agricultural sector from an educational perspective. This involves us to look at the key objectives of the Innovation Centre and investigate whether they have been achieved. Gatune (2023) developed a framework to evaluate the educational success of the partnership. The following aspects of the Innovation Centre were studied: does it function as a teaching platform, as a research platform, and as an innovation platform?

## Successful Functioning of the Poultry Innovation Centre?

### *Research Question 1: Does the PFTIC have the characteristics of an Innovation Centre?*

The key to a successful Innovation Centre is a proper governance structure that engenders trust and a shared vision. The governance model in the Poultry Innovation Centre needs to be looked into. The governance model is illustrated in Figure 2. The Project Management Committee (PMC) is the

key structure that oversees the running of the Poultry Innovation Centre. The Managing Director, appointed by the management company, is in charge of running the Innovation Centre. The PMC has seven members: four from the contracting authority and three from the managing company. The Board is further supported by four committees: Project implementation, Finance, Audit and Monitoring and evaluation.

The contracting authority is also connected to the management company at the operational level through staff and students attached to the Innovation Centre. Currently, this linkage has not been fully articulated. More work is needed to fully clarify this relationship, including the development of a research agenda, mentorship, and coaching programmes. There are potential challenges to the governance structure. First, management committees tend to have more members from the contracting authority than from the private sector, providing contracting authority with significant oversight. There is a challenge that the managing director could be too constrained if the public sector perspective dominates the way the Innovation Centre is run. The objective of bringing the private sector on board is to achieve better utilization of the facilities and bring in private-sector methods and approaches. Given that the committees meet every quarter, there is a lot of leeway for managing directors from the private sector.

There may be a need to review certain aspects of lease contracts. It risks micromanagement, which may impact the operation of the Innovation Centre. For example, although the managing director is independent, he or she cannot make decisions to spend more than 200,000 RWF (200 US$). This does not seem to make sense, especially if the management company provides the working capital. This means that once the management company brings money to the account, it no longer has full access. Such a clause is not needed, as there are other functions of oversight (the Audit and Finance Committees).

### *Building Skills and Entrepreneurship*

The Innovation Centre promotes sustainable agricultural practices, provide training and extension activities to develop poultry raising skills, and promote women and young people to become poultry entrepreneurs. The Innovation Centre is focusing on producing one-day old chickens and eggs without antibiotics, by financing the investments, providing training, organizing outreach activities, and stimulating applied research (Mazimpaka et al., 2018). Some of the layers were sold to development-oriented organizations or provided to the villagers. Nadège (2024) describes how women and youth, organized in different poultry cooperatives, received 1000 egg-laying hens to start their businesses.

The PFTIC functions as a social enterprise. It sold layers to other organizations and gave them to the villagers. The Innovation Centre is executing projects for different donors to promote raising of chickens by poor people and to produce chicken food locally.

### *Driving Applied Research*

Some farm trials and demonstrations have been organized, and the Triple Helix approach used assures the identification of the needs of local farmers and stimulates relevant research and technology development. Knowledge about the technology of building cages and producing animal feed locally is not widespread, and its use is currently very limited among traditional farmers despite high losses in terms of animals and eggs in cultivation without cages and complementary inputs. Research undertaken in the framework of the SEAD project showed the usefulness of raising indigenous in cages, which is currently not the case. Different possibilities for determining the optimal feed for caged chicken were also tested, and making a distinction between different indigenous chicken

types allowed the project to identify a superior indigenous type for eggs and one growing very fast, suggesting that these species could be used for egg and poultry meat production. Optimal species can be achieved by crossbreeding different indigenous species. Indigenous chickens will benefit from improved varieties and the availability of more information about cages, additional feeding and medical treatment.

Abusol envisages the production of animal feed in a commercial way and is currently developing local equipment and testing the use of black soldier flies as a source of protein. If successful, this would contribute to the development of a local poultry cluster.

***Driving Frugal Innovations***

The Innovation Centre created for the poultry sector is involved in technology adoption and transfer. Research within the framework of the SEAD project concluded that cages are a step forward in the development of indigenous chicken rearing. The IPRC Musanze came with a prototype that can be produced locally and sold in rural areas. The Innovation Centre is currently developing machines to make chicken feed.

According to the literature of this organisation, the PFTIC has all the characteristics of an Innovation Centre, but is unique in three respects: it is only for one sub-sector, poultry raising, and much attention has been paid to creating a governance structure that allows participation and involvement of all major stakeholders. Finally, it combines the inputs from research institutions, government services, and the private sector (the Triple Helix approach) to develop and introduce the frugal innovations.

***Research Question 2: Was the partnership governing the Innovation Centre successful?***

How did the Poultry Innovation Centre score on factors contributing to the success of partnerships? We examine the factors determining the success of a partnership, following our theoretical framework. The partnership was based on an agreement on who should do what. The lease contract between partners defines a clear role for each partner. The division of labour is clearly specified. The Innovation Centre has created a win-win situation for the partners by making available the necessary equipment financed by the donor and the upgraded facilities provided through the IPRCs. They have benefited from new opportunities for their students and staff. The partners also share their resources, where the private partner uses the facilities for production and the public partner used them for training, research and outreach activities. For short, the conditions were in place to make this Innovation Centre a success. Its PPP governance structure provides a framework for cooperation between partners. The cooperation embodying a Triple Helix approach worked out well, and trust between partners was developed. Additionally, a shared vision was developed in the form of a strategic plan. Partners have a strong drive to carry out community development activities and to make the project successful.

***Building Partnerships***

Does the Innovation Centre contribute to local economic development and is it an example of a Triple Helix partnership that can become the nucleus of a poultry-related cluster? The key pre-requisite is to build an ecosystem of actors that provide various services. This is happening. Local farmers who are keen to start the poultry business are being trained via tailor-made training by the Innovation Centre. As part of the course, they visited the facilities to complement their learning. Farmers expressed their desire for a platform that could bring them together to share their experiences. The Innovation Centre has worked with the KILIMO Trust (a local NGO) and the

Ministry of Agriculture to train communities. The motivation of the partnership was to help the youth become entrepreneurs or be productive employees at established companies because they have the required skills. The initiative recorded some success, and some companies provided jobs to the trained youth. Youths were also supported in developing viable business plans and received collateral from the Business Development Fund (BDF) to secure financing (Ntirenganya, 2022). This experience can be extended to leverage the Innovation Centre as an innovation platform.

### *Improving the Triple Helix Partnership*

Upgrading the modern poultry value chain requires knowledge, innovation and investment. In emerging economies in Rwanda, the private sector tends to be small and often partially informal. In such cases, generating the required knowledge and innovation can be challenging. This underscores the need to bring knowledge institutes into the sector as partners. This approach has been adopted in Rwanda.

The specifics of working with educational institutions have not yet been fully exploited. Staff at the IPRC indicated that they are keen to do more research and have been exploring topics such as using solar and water systems or engaging in food processing. This research can be integrated into the activities of the Innovation Centre. More cooperation is necessary in the fields of training, applied research and extension. However, the willingness on the part of the private operator is there, and the IPRCs are keen to get involved further.

The Innovation Centre has a broader mandate for local economic development. However, there is no representation of local development actors on the board. To get more buy-in, local development actors can be incorporated into the board. The Innovation Centre is ultimately a Triple Helix partnership to generate and implement innovations. To assess the extent of the journey towards building a Triple Helix partnership, we explored the status of key building blocks of strong Triple Helix platforms (Liu and Cai, 2018). These included leadership, consensus spaces and governance models.

The potential for extending a Triple Helix partnership exists, but will require more work, especially on leadership. Abusol has strong leadership, but there have been changes in the leadership of the IPRCs. These kinds of changes may kill momentum or relaunch cooperation. Gatune (2023) recommended the creation of consensus spaces and broader partnerships, for example, involving local governments. There do not seem to be spaces and forums for regular formal and informal interactions to help build partnerships further.

### *Research Question 3: Is the Innovation Centre successful in stimulating education, research and innovation platforms?*

### *The Teaching Platform*

The Innovation Centre leads to better education because of the interaction of staff and students with the private partner. It also leads to education being more aligned with market needs. The Innovation Centre allows practical education, promotes work experience, and stimulates on-the-job training for students. However, the education was originally limited to a few short courses targeting the local community. In the beginning, students were not really involved, apart from a few visits to watch the production process. The explanation for this is that the curricula for poultry courses still had to be developed by the IPRC. The IPRC has recently developed a level 2 curriculum and advanced diploma in animal production, and submitted it for accreditation. This curriculum will be attached to the facility once the new courses are approved, and a plan for closer collaboration

between the two parties has been developed.

The Innovation Centre could function even more as a platform to gain work-related experience for students and staff, since there are currently no students working at the facility. In the beginning, Abusol took an arm's length approach, where they just ran the facility and paid the rent. Additional training events made them aware of the broader objectives to be achieved. Abusol starts to see the platform from this perspective.

Interviews with poultry farmers also indicated that they had been trained and were positive about the training. However, there is greater demand for training. The key areas for acquiring knowledge include disease identification and treatment, biosecurity, poultry housing, production of compost and liquid fertilizer, and record-keeping. Beyond teaching and research, higher education institutes play an important role in community development. The Innovation Centre seeks to enhance this function.

### *The Research and the Innovation Platforms*

The Innovation Centre is expected to stimulate frugal innovation that leads to the upgrading of poultry farmers and farms and to spin off new enterprises. The facility was originally designed as a production platform. In this setup, there were no facilities to conduct research. Abusol did not consider the location within IPRCs as an opportunity to conduct research and development activities. Likewise, the IPRCs did not formulate a research agenda around the platform. Recently, a research plan was developed, suggesting applied research concerning animal feed production equipment using locally sourced materials and knowhow in line with frugal innovation principles. Marketing studies are recommended for different products at the Innovation Centre. Abusol is now more open to applied research and has been working recently with IPRCs on research on the use of soldier flies for animal feed production. Abusol also collects data on feed performance. It is not yet clear how, with current facilities, more space can be made available to allow production as well as proper experimentation.

## Discussion

The Innovation Centre studied had a particular governance structure, which, in combination with the Triple Helix approach, allowed involvement of the major stakeholders, identifying the needs of local poultry farmers, and stimulating relevant research and technology development to address their problems. Concerning the other functions of an Innovation Centre mentioned in the literature, this was certainly an example of pushing technology adoption and transfer to promote more sustainable agricultural practices. A number of training and extension activities were conducted to stimulate skill and entrepreneurship development. Finally, some farm trials and demonstrations were conducted testing and introducing innovations.

Was the partnership successful and which factors determine the success of such a partnership? In line with the theory on the success of partnerships, a clear role for different partners was defined through the contract, an agreement specifying who should do what. The evaluation showed that the conception of the Innovation Centre as a lease contract for a poultry production unit implied that, in the beginning, the interaction with other stakeholders was restricted. Through external contributions to the necessary investments, a win-win situation for the different partners has been created. Private and public partners shared resources and risks and worked within a clear regulatory framework. Hence, the conditions for successful partnership were fulfilled.

Is the poultry partnership between an educational institution and a private company successful

in creating education, research and innovation platforms? Cooperation between institutes of higher learning and the private sector to upgrade the modern chicken value chain took place in the form of an Innovation Centre. Gatune (2023) concludes that "while the poultry Innovation Centre is an example of a successful PPP, it will have little impact in terms of education, research and entrepreneurship development if care is not taken to integrate staff and students more into the operations". The Innovation Centre has the potential to interact with many departments of IPRCs to drive a frugal innovation platform. Indeed, there are already innovations needed to reduce egg breakages (which is a current challenge) and to determine what to do with broken eggs (and other waste). Innovations are also needed for waste reuse (Kiran et al., 2024) and animal feed production. This provides opportunities for multidisciplinary research and driving frugal innovation. In this regard, a locally designed machine to produce pellets for animal feed is currently under development. This may help to reduce animal feed prices. The building blocks for a Triple Helix approach to value chain upgrading through an Innovation Centre are in place, and the approach has worked and resulted in nascent education and research platforms.

However, the idea of becoming a frugal innovation platform has not received sufficient attention. Currently, IPRC staff members are keen to explore other ways of collaborating in research. A follow-up project prepared plans for closer cooperation between the IPRCs and private partners. In addition, an inventory was made of what it takes to turn the Innovation Centre into a dynamic cluster.

Did the Innovation Centre become an engine of contributing to local economic development and will it eventually lead to a poultry cluster? Is the partnership an example of a Triple Helix model that can be repeated elsewhere (Mascarenhas et al., 2019)? The Innovation Centre helps drive private sector development, transforming education and promotes local economic development. To develop into a cluster, the Innovation Centre can work with local enterprises and student entrepreneurs to develop the required local frugal innovation ecosystem. The Innovation Centre is essentially a Triple Helix partnership. The Innovation Centre has been successful as a partnership, but had limited impact so far in terms of applied research and frugal innovation. We showed that there is potential for moving closer towards becoming also a training and demonstration centre to transfer skills and help develop a 'Ngoma Egg' cluster that specializes in anti-biotic free eggs and also frugal technologies, e.g., cages, animal feed production equipment to drive upgradation of the poultry value chain.

## Conclusions

The analysis shows that the Innovation Centre has the potential to evolve into a strong Triple Helix platform to drive local economic development. The key partners are on-board, and the path to local economic development is clear. There is potential for creating economic activities around the Innovation Centre. The Innovation Centre could work with local artisans to develop localized chicken housing, fabricate equipment, etc.

The Innovation Centre, governed by a public private partnership, following a Triple Helix approach, has been successful. The partnership with educational institutions has become a learning, research, and innovation platform, but not all opportunities have been fully used yet. Education-Enterprise Partnership model helps in obtaining technical and financial sustainability as far as education facilities and infrastructure are concerned, while it also promotes private sector development. The key objective of the model is to drive knowledge, innovation, entrepreneurship and ultimately local economic development through close collaboration between industry, academia

and government.

Introducing these innovations is equivalent to developing smart agriculture in Rwanda. The value chain upgrading strategy suggests to go on with increasing the productivity of raising chicken by stimulating competition, producing and marketing more and better poultry products and introducing the corresponding best agricultural practices and affordable technologies to support local producers.

A successful Innovation Centre should eventually foster a strong regional cluster. The Innovation Centre contributes to local economic development. It should become the nucleus of a dynamic poultry cluster in Rwanda (Cai and Liu, 2015). That is not yet the case. With the right characteristics of an Innovation Centre in place, the partnership may become the dynamic nucleus of a bigger agro-cluster of poultry-related activities, which may subsequently develop.

## Recommendations to Develop a Poultry Cluster

Are there potential pathways for developing poultry clusters? As the stated objective of the Innovation Centre is to support the production of antibiotic-free eggs, there is an opportunity to build a cluster at the district level. The district can use healthy eggs as a regional brand. This will require significant efforts in building the needed systems to backstop farmers, to monitor and certify, and also to develop joint marketing system of 'Ngoma eggs'. Most factors mentioned in the literature for developing a cluster are positive: there is a good location, investments have been made (with foreign support), there is a lead firm, and there are linkages between the different poultry activities in the emerging ecosystem (Devi, 2024). Finally, the government plays a positive role in enabling further development of this poultry Innovation Centre.

Currently, some commercial firms produce poultry feed, but the feed tends to be too expensive and cannot be bought everywhere. Improving the feed supply would also be an important opportunity for indigenous and small-scale chicken farmers. In addition, more information should be made available regarding the importance of the different components of the feed such as protein, fat and vitamins.

There is limited knowledge and skills in the indigenous chicken raising sector. Hence, it is important to provide more effective extension services for traditional chicken farmers. Oviedo-Rodríguez et al. (2024) show in a convincing way how the terms by which farmers are incorporated into the market vary significantly depending on the type of farmer and the market. Cooperatives could play a role in helping these traditional farmers, by buying inputs, providing training, and selling outputs, but they currently lack direction. Smart indigenous poultry raising would require a combination of using cages (eventually with ventilation) and supplying additional and appropriate feed, obtaining information on prices of their inputs and output by radio, television, or through mobile telephones, and making indigenous chicken a trademark, which then commands a higher price. Indigenous chickens also benefit from improved varieties and information about cages, feeding, and other markets. Biosecurity has become an increasingly important issue that should also be taken seriously.

What needs to happen to allow the Innovation Centre develop into a dynamic poultry cluster? The proposed interventions include promotion of poultry-related frugal innovations and their commercialization, including building cages, local animal feed production and making other products from eggs. What also remains is to further expand the partnership in running the Innovation Centre. Bring on board other partners. This is the key to having a strong Triple Helix partnership. They are stakeholders in local economic development. The actors include other relevant ministries, local

governments, local community-based organizations, development partners working in the district, and relevant industry associations such as the local branch of the Private Sector Federation in Rwanda. Building a strong Triple Helix partnership takes time. What can be done easily should first be done. The key is to convene other actors to get their buy-in and develop a programme of action. Other collaborations include using students as ambassadors to support farmers. It is also important to build a business incubator to support start-ups emerging from innovations being catalysed and to build consensus spaces to support interactions with various actors.

## About the authors

**Meine Pieter van Dijk** is a Professor Emeritus in Economics at the Maastricht School of Management, Maastricht University, Maastricht, The Netherlands. **Julius Gatune** is a Senior Project Consultant and Assistant Professor at the Maastricht School of Management, Maastricht University, Maastricht, The Netherlands.

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