

## **Keynote speech**

### **Agriculture in the Contemporary World: The Economic and Environmental Issues**

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#### **Abstract**

This paper seeks to highlight the economic and environmental issues concerning the agricultural sector in the contemporary world. It emphasizes the role of agriculture in the process of overall economic growth and poverty reduction. The recent developments in the rental markets of agricultural capital goods have been tapped quite successfully by the small and marginal farmers which are a healthy sign when the average size of agricultural land holding is shrinking. On the other hand, the global climate change is expected to not only adversely affect agricultural yields, labour productivity, and insurance coverage but also increase the gap between rich and poor countries as far as the fate of their farmers is concerned. The role of innovations in agricultural technology in dealing with the dual challenges of degradation of natural resource base and global climatic change is also discussed in this paper.

**Keywords:** Agriculture and economic growth, Agricultural factor markets, Climate change, Agricultural technology.

#### **Introduction**

Agriculture has gone through several phases of transition thereby giving way to development of other sectors. In the process of structural transformation the shares of agriculture in gross domestic product (GDP) and employment have declined in all the economies around the world. However, the rate of decline in employment share of agricultural sector has lagged behind that in GDP in the developing countries mainly due to their low labour productivity. Consequently agriculture has still been the main source of livelihoods for the majority of their population. Notwithstanding this, because of lesser and lesser percentage contribution to the economy and a falling share of expenditure on agricultural products agriculture is often seen as a declining sector and one which should receive less policy priority than others in efforts to promote growth (Carlson 2018; Colman, 2009; Timmer, 1988). Such a perception is not only wrong but also unfounded. The world produces more agricultural output and feeds more people than ever before, and this role would be much bigger in the decades to come. Moreover, the role of agriculture in the economy does not end with only its percentage contributions to GDP and employment. Even in the developed countries where these shares are low agriculture has been and will continue to be the main driving force as the source of food and energy, and sustenance for the entire population irrespective of their sector specific employment. Because of this and the growing challenges of food and nutrition security that the policy makers need to refocus on agriculture to fight the challenges of 21<sup>st</sup> century including those emanating from beyond the national boundaries.

#### **Agriculture's role in economic development**

The general economic growth in any economy is to be preceded by a rapid agricultural growth (Timmer, 1988). Even the industrial revolution in England in the eighteenth century that paved the way for rapid technological progress and industrialization around the world was supported by agricultural revolution that preceded it. A rapid growth in agriculture provides cheap food and raw materials for the industrial sector. As productivity in agriculture improves with growth it releases manpower for industrial sector. Moreover, a progressing agriculture sector helps industrialization as the rural population constitutes the major chunk of demand for their

products. Because of this role it is often found that the economies which are stagnant in agriculture are those which are also lack industrial development (Timmer, 1988).

No country has been able to sustain a rapid transition out of poverty without raising productivity of its agricultural sector (Timmer, 2007). A rapid growth in the productivity of agricultural sector has an important role in poverty reduction in rural as well as urban areas. This is because of a lower food prices resulting from higher production and an increase in rural wages (Ravallion and Datt, 1996). For example, Thirtle et al (2002) find that a 1% increase in crop productivity reduces the number of poor people by 0.48% in Asia. Such a poverty reducing role of agriculture sector is much higher than other sectors of the economies of not only low income but also middle income countries (Pingali, 2010). Therefore, any anti-poverty policy should focus on uplifting the conditions of the agricultural sectors because it is the sector where most of the poor are dependent for livelihoods.

It may be noted that the process of structural transformation in most of the developing countries with relatively a higher poverty has remained slow because of bottlenecks like poor infrastructure, low technology, low labour productivity, higher transaction cost, and lack of integration between urban and rural economies.

#### **What makes agriculture distinct from other sectors?**

Agriculture is basically a land based activity which is critically dependent on natural factors like land, water, rainfall, temperature etc. The production system is itself biological which is critically dependent on the sustainable use of land and water, and also the climatic factors which are beyond the control of the farmers. This gives rise to the issue of sustainability of agricultural production which makes agricultural sector quite distinct from other sectors of the economy. Unlike the industrial and service sector the output of agricultural commodities is highly vulnerable to supply and price shocks. Moreover, compared to others the people engaged in agricultural sector find it more difficult to protect themselves from risk with insurance because of the fact that the risk faced by them are not independent and hence the private insurers are usually not interested to come into the picture as a result of which the insurance coverage for the farm sector very low in the developing countries. Further, the terms of trade of agricultural products are historically low and they have declined over the years.

#### **Agricultural factor markets: Recent trends and their implications**

Agricultural activities are mainly land based. The inelastic supply of land and conversion of agricultural land into non-agricultural activities have limited the scope of area expansion under agriculture is limited. On the other hand, the average size of farm land holding is declining. Historically the land reform measures that focused on distribution of land among marginal farmers are not only unfeasible but also may be counter-productive. There may not be enough land to redistribute and doing so may result in pulling down all rather than pulling up the marginal ones (Goswami, 2017). Therefore, what is more important in today's context is improving landless and needy farmers' access to land to operate on through appropriate tenancy reforms.

Contrary to the conventional wisdom small farm size need not be a hindrance to agricultural mechanization and development. For example, despite consolidation of land holdings remaining unimplemented in many parts of India and the average size of individual holding going down over the years mechanization of farms is on the rise even among the small and marginal farms in recent times (Das and Tamuli, 2017). The experience of many parts of India shows that the rental markets for water and agricultural capital goods have emerged which has been successfully tapped by many small and marginal farmers who cannot afford to buy these capital goods (Dutta 2017, Das and Tamuli, 2017). Moreover, the owners of such goods like shallow tube wells, power tiller, tractor etc. have also been benefitted by renting them out after using

them in their own field. Thus the markets have helped optimal use of the otherwise indivisible agricultural capital goods.

### **Trade in agriculture**

In this era of globalization the importance of trade in agricultural commodities can be visualized from the facts that the average annual volume growth in agricultural trade between 1950 and 2010 was about 4 per cent compared to the annual growth in global agricultural production of about 2 per cent (Cheong et al, 2013). This increasing volume of trade has played a huge role in reducing global hunger and food insecurity. However, agriculture is one of the most distorted sectors in international trade with relatively a high tariff and subsidies compared to other sectors (Cheong et al, 2013).

The well-being of farmers in the developing countries who are mostly poor has been a major socio-economic issue. The special contribution of the farmers in providing food and energy, and therefore the need of taking care of their well-being has implications for economics of cultivation in general and trade in particular of agricultural products. Agricultural subsidies and protection to farming has been a controversial issue in trade negotiations. While a relatively smaller number of people engaged in agriculture sector has been supported by a huge amount of subsidies by the rich countries the developing countries cannot afford to do the same out of their relatively smaller public exchequer for a huge population engaged in farming. Moreover, the provision and continuation of large amount of subsidies to their farmers may turn out to be counter-productive by hampering agricultural investment and thereby its growth. There still exist high tariff and non-tariff barriers which are detrimental to exports from the developing countries. Ironically the rich countries spend a huge amount in subsidizing and protecting their farmers which is detrimental for not only the farmers of developing countries but also their own taxpayers and consumers (Timmer, 2007). Besides, the agony of the developing countries in trade negotiations is compounded by the fact that while the developed countries promote production of 'dirty-industry' manufactured goods and buy them at lower prices from the former they discourage imports of agricultural produce by setting a higher standard of safety which the developing countries often fail to comply with.

### **Climate change and agriculture**

Perhaps the most serious challenge confronting the agricultural sector is climate change. Since agriculture is critically dependent on climatic factors like rainfall and temperature it is highly susceptible to the adverse effects of global warming and extreme weather events. Climate change which is predicted to be worse in coming decades threatens the sustainability of agriculture through its effects on biotic (such as pest, pathogens etc.) and abiotic factors (such as variations in solar radiation, water, temperature etc.) (Aryal et al, 2019).

The predicted future impact of climate change on agriculture, however, is going to be heterogeneous. The regions, especially in the developed countries where temperature is relatively low may be benefitted from the increased temperature as it may help cultivation of some crops which is otherwise not feasible because of low temperature. However, the available empirical evidence from around the world show that the net impact of climate change on agricultural yield is going to be negative in most of the regions. These adverse impacts are going to be exacerbated in the developing countries because of excessive dependence on rainfall, a relatively higher existing average temperature and limited adaptive capacity of their farmers who are mostly poor. In fact the developing countries are predicted to suffer an average 10 to 25% decline in agricultural productivity by 2080s (Mahato, 2014). The loss in crop yield may be even larger in some regions of the developing countries due to their existing relatively higher temperature, lack of adequate infrastructure like irrigation, farm loan, farm insurance etc.

Climate change has the potential to affect agriculture by changing labour productivity as well. It can increase the incidence of vector and water borne diseases thereby raising morbidity and illness. The extreme weather events like flood and drought may aggravate the problem of safe drinking water and mental illness. All this will affect health of the farmers who have very limited capacity to fight them which will ultimately adversely affect their productivity.

The amount of risk and uncertainties associated with the agricultural sector is going to be exacerbated owing to climate change. This will increase the insurance premium for the agricultural activities and thereby jeopardize their insurance coverage. Ironically the farmers would be unable to have access to insurance because of higher premium when they would require it more urgently than ever before. There is a need for modifications in the design of the crop insurance schemes with a much more important role of both the private and public sectors. The public sector may address catastrophic risk and provide multi-peril insurance where subsidy requirement is high, but allow private sector to provide insurance products for less severe events and for individual independent idiosyncratic and localized risk (Swain, 2014).

The above discussion points to the fact that climate change is going to further widen the gap between the developed and developing countries as far as the fate of their farmers are concerned. To reduce the adverse impacts a combination of adaptive measures may be adopted. The measures that can be helpful in this regard include cropping pattern changes, crop diversification, water harvesting and water management, preponing and postponing sowing dates, integrated pest management, water harvesting, real-time weather forecast, extension services, and technological development.

#### **Future of agriculture and the role of technology**

The increase in agricultural production in the 19<sup>th</sup> century was facilitated by area expansion scope of which gradually declined. Thus there was an urgent need of intensive cultivation and technology in the form of high yielding variety of seeds, chemical fertilizers and irrigation played an important role since the 1960s in increasing global food production and reducing global hunger. During 1960 and 1990, global cereal production doubled, per capita food availability increased 37 percent, per capita calories available per day increased 35 percent and real food prices declined 50 percent (McCalla, 2001). However, there are significant regional variations with respect to the impact of this new agricultural technology. Moreover, the intensive agricultural practices of the new agricultural technology have resulted in significant land and water problems such as soil degradation, and over-exploitation of ground water thereby threatening the sustainability of agriculture sector.

Despite the adverse consequences of the agricultural technologies in the recent past if anything can feed the growing population in the face of degrading natural resources like soil and water, shrinking cultivable land, and climate change it is the technology. Taking lessons from the past and to meet the new challenges technology is to be impoverished accordingly. The agricultural research and development have gone a long way with developments in the field of genetic engineering and biotechnology which has been facilitated by support of private sector. To make agriculture sustainable there is a need of development of seed varieties which are more resilient to climate extremes, and increased temperature, insects and pests attacks. Moreover, vertical farming and hydroponics can help produce more in the face of land and water scarcity particularly in case of fruits and vegetables. It is worth mentioning that many progressive farmers in rural and even urban areas are coming up who use a combination of traditional and modern farming techniques that can help sustainable agriculture. Many agricultural start-ups have come up which act as a link between farmers, input dealers, and wholesalers etc. who assist them in providing timely inputs along with useful information.

The forthcoming technology that can help the agriculture in the face of challenges include conventional breeding, genetically modified food, information revolution, GPS, vertical farming, high-tech urban start-up, nanotechnology etc. It may be noted that there has been a shift in the agricultural research and development (R&D) from public sector to multinational corporations which has been facilitated by a new set of incentives such as protection of intellectual property rights, growing importance of molecular biology and genetic engineering and more open agricultural input and output trade (Pingali, 2010). Though such developments in private agricultural R&D are welcome but they may be not accessible to poor farmers. Hence government should come forward and some philanthropists may also step in to help them in this regard.

### **Conclusion**

No country can progress by ignoring its agricultural sector. The role of agriculture in an economy is far bigger than just its contribution to GDP and employment in that it is the source of sustenance for the entire population. One of the biggest issues confronting the world today is to ensure food and nutrition security for a growing population in the face of dual challenges of degradation of natural resource base and global climatic change. In the developing countries where average size of agricultural land holdings is shrinking recent developments in the rental markets of agricultural capital goods along with some tenancy reforms can be very helpful for the growth of their agricultural sector. On the other hand, to cope with the adverse impacts of climate change on agricultural yields innovations in technology along with ex-ante coping strategies like changing cropping patterns, preponing and postponing sowing dates etc. may be helpful.

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