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Food security and sustainability of agricultural production: An economic appraisal in Indian context

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Abstract
Food security is interlinked with agricultural production. Enhancement in farm productivity and providing diversified demand of food due to growth in per capita income, urbanization and changes in food habit is the major challenges. Study is based on secondary data collected from different published sources for the period from 1988-89 to 2017-18 i.e. for 30 years. Simple tabular analysis and compound growth rates were calculated to draw meaningful conclusion. The findings revealed that growth rate of net sown area for overall period was found negative (-0.05%). In case of gross cropped area, growth rates were found positive for all periods under investigation. The growth was due to more use of land to fulfill the growing demands of food and other agricultural commodities due to rise in population as reflected by growth trend of population. Growth rates for area and production of food grains indicated that area under food grains remained almost stagnant (0.001%) during the period under investigation. But in the last decade production growth was assessed positive (0.41%). Production growth may be attributed to technological change in cultivation practices like use of improved varieties of seeds and use of fertilizers etc. Growth rates of area under cereals were computed to be negative. The reason may be erratic weather condition or may be less remunerative crops or farmers would have shifted cultivated area to high value crops. Due to technological intervention, the productivity was recorded positive. Decrease in area under cereals is of great concern as a study commissioned by the Agriculture Ministry emphasized that given the current rates of population and income growth, India will have to push a growth of 4.2% per annum in cereal production till 2020, instead of the less than 2% as it was achieved in the previous decade.

Keywords: Food security, sustainability, agricultural production, economic appraisal, Indian context

Introduction
Nutrition-sensitive agriculture is the relationship between agriculture, nutrition and environment. Enhancement in farm productivity and diversification of nutritious food crops are the vital challenges in agricultural development, as improved productivity and crop diversification provide opportunities to reduce poverty, food insecurity and malnutrition. However, healthy environmental condition is also an important component for improving the quality of life beside ensuring food and nutrition security as people interact with their environment.

Globally, food security as well as ensuring food for all is an important challenge. Food security refers to the situation "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2010) [2]. Many people consider it as a basic human right but approximately one billion people around the world especially in the food deficit and low income developing countries are still living with chronic poverty and undernourishment (IEG, 2011) [6]. Among them, most of the people live in rural areas and depend on agriculture for meeting their daily needs as well as for their livelihood. For enhancement in the rural economy, mainly through boosting agricultural production as well as intensifying agricultural productivity and resource use efficiency are the major component to tackle problem of poverty, increasing food security and improving rural livelihoods (Pinstrup-Andersen and Pandya-Lorch, 1998) [9].

Despite high rates of economic growth, the prevalence of under-nutrition declined marginally from 210.1 million in 1990 to 190.7 million in 2016. Currently over one-fourth of the children are stunted in large states like Gujarat, Jharkhand, Karnataka and Madhya Pradesh, and over 40% of the children are underweight in Jharkhand, Madhya Pradesh and Bihar. On the other hand, on account of enhanced incomes, people in urban areas are demanding a more nutritious and diversified food.

The composition of the food basket is increasingly shifting away from cereals to high value agricultural commodities like fish, eggs, milk and meat. With the increasing trend of income, the trend will continue and the indirect demand for food from feed will grow rapidly in India.

Food production provides the base for food security; it is a vital factor of food availability. Agriculture is the main livelihood and employment provider for most of the nutritionally vulnerable households in the world (World Bank 2007; World Bank 2013) [14, 15]. Agriculture and in particular food systems, provide food for all human beings and hence, have foundational role in nutritional security. The role of agricultural development and food system to enhance nutritional security is well recognized through providing access to various nutritional diets. Agricultural development is more pro-poor and is related to greater reduction in stunting than non-agricultural growth (World Bank 2007; Webb and Block, 2012) [15, 13]. Still the full potential of agriculture to boost up nutrition of vulnerable individual within farming households as well as general population has to be realized (Ruel and Alderman 2013; Webb 2013) [10, 12]. Many studies have advocated the need of better designed research to understand how agriculture interventions can fetch potential of enhancing nutrition in better ways (Ruel and Alderman 2013; Hawkes *et al.,* 2012; Herforth *et al.,* 2012; Masset *et al.,* 2012) [10, 4, 5, 7].

Indian economy is the fastest growing economy of the world surpassing China during financial year 2015 and 2018. GDP of the country could be recorded 7.1% in 2016 and it declined to 6.7% in 2017. Despite relatively stable growth, the nation is facing hunger problem and malnutrition. The agriculture sector employs nearly half of the workforce in the country and contributes to 17.5% of the GDP (at current prices in 2015-16). Over the past few decades, the agriculture sector's contribution has declined from more than 50% of GDP in the 1950s to 15.4% in 2015-16 (at constant prices). India's production of food grains has been increasing every year, and is among the top producers of several crops such as wheat, rice, pulses, sugarcane and cotton. It is the highest producer of milk and second highest producer of fruits and vegetables. In 2013, India contributed 25% to the world's pulses production, the highest for any one country, 22% to rice production and 13% of wheat production.

However, productivity of most of the crops is found to be lower as compared to other top producing countries like China, Brazil and the United States. Although India ranks third in the production of rice, its yield is lower than Brazil, China and the United States. The same trend is observed for pulses, where it claims the second highest producer. Agricultural growth has been fairly volatile over the past decade, ranging from 5.8% in 2005-06 to 0.4% in 2009-10 and -0.2% in 2014-15. Such a variance in agricultural growth has an impact on farm incomes as well as country's nutritional security.

India has been ranked 97th among 118 surveyed countries in global hunger index in 2016. As per National Family Health Survey (NFHS) conducted during 2015-16, the percentage of underweight children below 5 years of age accounting the share 35.7%, 38.4%, were stunted and 58.4% assessed anaemic. Further, it revealed that 22.9% of women (15-49 years of age) reported to have chronic deficiency and 53% got anaemic. As much as 38.3 percent of children below 5 years of age were found underweight, 41.2% stunted and 59.4% anaemic in rural India. According to FAO report 'The State of Food and Nutrition in the world, 2017' about 190.7 million people were undernourished in India i.e. 14.5% of population remained undernourished. According to this report, 51.4% women in their reproductive age between 15 to 49 years were found anaemic.

As per the data of Ministry of Agriculture, Government of India, the nation has achieved self-sufficiency and claimed of being a net exporting country in agricultural produce. The country exported 22.3 million tonnes of agricultural produce in 2017-18 and imported 9.4 million tonnes in 2017-18. Despite, everything seems to be in the right direction still the country on the other hand importing foodgrains on a large scale. This indicated insufficiency in staple food production of the country. In 2016-17, foodgrains accounted for 78 per cent of the imported agricultural produce; large-scale import of wheat in 2016 is often attributed to drought years. But there has been large-scale import of edible oil and pulses as well during the past two decades. Several parts of the country are still starved of rice, wheat and pulses. Food availability per person has remained stagnant for the past many decades. As per Economic Survey, 2018, annual report, the net availability of foodgrains was 151.9 kg per person per year in 2001 this went up to 180.30 kg per person per year. In 2016, the per capita food grains availability per annum was 177.7 kg. In contrast, in 2015, China's food grain availability per capita was 450 kg, 200 kg in Bangladesh and more than 1,100 kg in US.

As food accessibility did not improve over the years, nutritional intake remained disappointing. In 2011-12, there was 30 per cent gap in the actual and the recommended dietary energy intake of people living in rural India. That year, the gap was 20 per cent in urban areas. The gap exists despite the Country's per capita income having increased almost 14.88 times i.e. from Rs 6,270 in 1991 to Rs 93,293 in 2016. But the purchasing power of people has reduced, because of the absence of investments in the un-organized and the agriculture sectors. Between 1993-94 and 2011-12, the mean calorie intake increased among the low income group. However, there was decline in the calorie intake among the rich households. According to Chand, the increase in calorie consumption among the poor denotes improved access to food. He attributed the decline in calorie intake among the rich to changing food habits and increase in health consciousness. Three-fourth of the nutrition comes from cereals and pulses. The decline and unavailability of cereals is the major cause to severe under-nourishment.

Keeping in view the above facts, an attempt has been made to investigate the arable land position, population growth and food grains area and production in the country and how people be provided sustainable food security to eradicate the poverty.

Materials and Methods

The investigation is based on secondary data collected from different published sources like Agricultural Statistics at Glance, Ministry of Agriculture and Farmer Welfare, Government of India pertaining to net sown area, gross cropped area, area and production of food grains and population. The period of investigation is 30 years i.e. from 1988-89 to 2017-18 and this period is divided into three sub-periods i.e. period-I from 1988-89 to 1997-98, period-II from 1998-99 to 2007-08 and period-III from 2008-09 to 2017-18. Simple tabular analysis and compound growth rates were calculated to draw meaningful conclusion.

Results and Discussion

Land resource scenario

India's economic security is predicated upon the agriculture sector and continues to be predicated. As of today, India supports 16.8% of global population on 2.3% of world land and 4.2% of water resources. Per capita availability of resources is about 4 to 6 times less as compared to global average. This will decrease further on account of changing demographic pressure resulting in diversion of agricultural land for non-agricultural uses. The results of compound growth rates computed for different periods are presented in Table 1. It is evident from the table that growth rate of net sown area for overall period was found negative (-0.05%). The result is in conformity of the findings of Sinha *et al.*, 2016. Period was findings pointed out that in period-I and period-III the growth rates of net sown area were positive because culturable waste lands were made for cultivation. During last three to four years, it is reported that culturable waste land after reclamation are being used for cultivation, this may be the reason for positive growth in the recent period under investigation.

Table 1: Compound growth rates of net sown area, gross cropped area and population of India

Period	Net sown area (%)	Gross cropped area (%)	Population (%)
1988-89 to 1997-98(I)	0.02	0.48	1.96
1998-99 to 2007-08 (II)	-0.07	0.39	1.64
2008-09 to 2017-18(III)	0.05	0.52	1.17
1988-89 to 2017-18(Overall)	-0.05	0.32	1.61

In case of gross cropped area, growth rates were found positive for all periods under investigation. The growth was due to more use of land to fulfill the growing demands of food and other agricultural commodities due to rise in population as reflected by growth trend of population.

Food production scenario

Compound growth rates for area and production of food grains (Table 2) indicated that area under food grains remained almost stagnant (0.001%) during the period under investigation. But during the period-III the area under food grains was found positive being 0.41%. Positive growth in area may probably be attributed to changing policy regarding procurement prices of the food grains by the government.

The trend in the production of food grains in all the periods under study was obtained positive. Production growth may be attributed to technological change in cultivation practices like use of improved varieties of seeds and use of fertilizers etc.

Growth rates of area under cereals were computed to be negative in all the periods under observation. The reason may be erratic weather condition or may be less remunerative crops or farmers would have shifted cultivated area to high value crops on account of rise in income leading to demand push for high nutritious food. Due to technological intervention, the productivity was recorded positive in all the periods under study. Decrease in area under cereals is of great concern as a study commissioned by the Agriculture Ministry emphasized that given the current rates of population and income growth, India will have to push a growth of 4.2% per annum in cereal production till 2020, instead of the less than 2% as it was achieved in the previous decade. A large part of Indian diet depends upon cereals (especially in the poor households), which do not always offer quality nutrient. Indians nearly get 66% and urban Indians derive 56% of their protein from cereals which are of poorer quality than that of pulses, meat, fish and eggs. The bottom 30% of the population in terms of mean per capita expenditure are the most dependent on cereals, with rural Indians obtaining 76% and Urban Indian 67% of their protein from cereals (Gulati *et al.*, 2009).

Table 2: Compound growth rates of area and production of food grains, cereals and pulses in India

Period	Food grains (%)		Cereals (%)		Pulses (%)	
	Area	Production	Area	Production	Area	Production
1988-89 to 1997-98(I)	-0.40	1.66	-0.38	1.80	-0.51	-0.93
1998-99 to 2007-08 (II)	-0.01	1.03	-0.19	1.04	0.86	0.90
2008-09 to 2017-18(III)	0.41	2.12	-0.13	1.91	2.5	4.71
1988-89 to 2017-18(Overall)	0.01	1.69	-0.11	1.70	0.51	1.61

Growth performance of pulses in the country during 1988-89 to 1997-98 i.e. for the Period-I was observed to be, by and large, negative. The reason may probably be that the pulses have been a secondary choice, mostly grown to the rainfed ecology. In the other period, under observation area and production both registered positive growth and the comparatively high growth rate was ascertained in both area and production of pulses during 2008-09 to 2017-18. Over the last four years, the on-going National Food Security Mission (NFSM) has converged with multi–pronged strategies to enhance the production and productivity of pulses in the country.

About more than 40% of human population reside in the rainfed regions of the country. More than 80% of total pulses are grown in said region. Pulses are vital constituent of cropping and consumption pattern and are the only rich source protein (20-25%) for 43 percent vegetarians (Urban-48%, rural -41%). Legumes tend to fix 72 to 350 kg per ha per year atmospheric nitrogen to the soil which helps to regain soil fertility. With the twin objectives i.e. achieving food and nutritional security vis-à-vis enhancing income of the rainfed farmers, the government decided to harness the potential of pulses (Anonymous, 2018) [1].

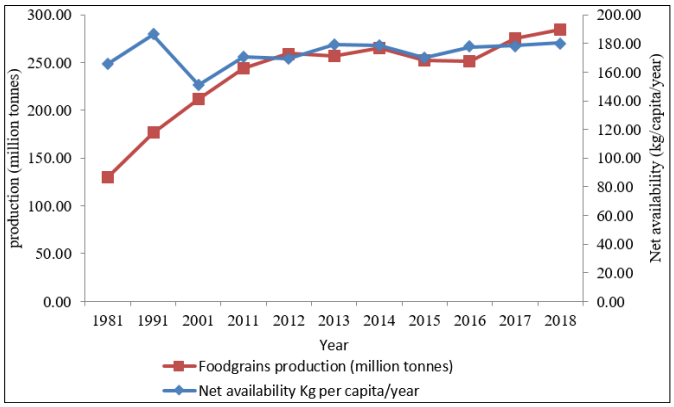

Fig 1: Food grains production and net availability (kg / capita / year

Net food availability was 151.9 kg per person per year in 2001 which rose to 180.30 kg per person per year in 2018 (Fig. 1). In 2016, the per capita food grains availability per annum was 177.7 kg. In contrast, in 2015, China's food grain availability per capita was recorded 450 kg, 200 kg in Bangladesh and more than 1,100 kg in US.

Alongside this, growth in per capita income, urbanization and changes in food habit changed the food demand. The demand for food consumables such as meat and eggs in 2020 is expected to be four times that of 1993, for milk and milk products as much as five times. The growing demand for milk and meat items has several implications as modern dairy and poultry animals also consume significant quantities of cereals and oilseeds, thereby, reducing the effective amount of food produced. There are several such factors that also spin a complex web of issues for policymakers and stakeholders to resolve the hunger problem of the nation.

Our policymakers emphasized only on providing subsidized on farm inputs and free electricity which is economically irrational. This, in turn, simply increases the burden on the government and detracts from the ability to make long needed capital investments to make agriculture more productive and even profitable. The pressure of a growing population may be eased, if policy measures focusing on improving domestic livestock and as well as cereal production are implemented.

Even so, improved food production alone will not mitigate India's food problem. Even if the country could produce enough food to feed its people, there is still the problem of putting enough money in their hands to buy more food.

If the country has to "take off" in economic terms, then we cannot have an agricultural sector that employs nearly 60% of our workforce and continues to grow at 2% annually. There is an urgent need and scope for Indian agriculture to become efficient, and help in the country's development rather than to be a burden.

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