

CONSTRAINTS AND STRATEGIES TO ENHANCE FOOD PRODUCTION AND FOOD SECURITY IN BIHAR

Sadhvi Singh

Research Scholar,

Univ. Dept. of Economics, T.M. Bhagalpur University, Bhagalpur, Bihar.

Abstract : Agriculture would continue to play an integral part of the development process, as around 88 per cent of the population still live in villages and they would continue to depend on agriculture as a prime source of their livelihood. The state cannot progress without a satisfactory growth of its agricultural sector. At each stage of development, one must be careful that right kind of inputs are available at the right time for the growth of agricultural sector, and adequate quantity of food grains is available to meet the demand for food. Any economy which is mainly based on primary sector's income is very vulnerable to changes, and has to face tough competition in the race of development. An analysis of agricultural development is incomplete unless it is looked in terms of overall process of macro-economic development. Agriculture is the single largest private sector occupation in Bihar. This paper discusses the key constraints to agriculture and food security situation in Bihar and strategies to enhance food security in the State. These findings are divided in terms of the three key dimensions of food security: (a) availability of food (b) accessibility of food and (c) adequacy/utilization of food. Based on literature reviews, several key constraints were identified as factors hindering food security in Bihar.

Keywords: Food security, agricultural growth rate, availability, accessibility, adequacy/utilization.

INTRODUCTION

In recent years, Bihar has acquired considerable attention throughout the country and even abroad for its remarkable performance in the development front. For a state which had suffered stagnation for long and which had almost resigned to its perpetual backwardness, this was a turning point, leading to new hopes and aspirations. These changes were possible because of the state government's firm commitment to an agenda of development which is both speedy and inclusive. To fulfill this agenda, the state government had not only utilised its limited resources most prudently, but had also strengthened its administrative machinery and introduced a number of institutional reforms. The results clearly show that the past growth process of the state's economy is not a short term phenomenon, but the beginning of a long term stable growth process.

Bihar is gaining back its lost pride in the last few years. The data on state income shows that the economy of Bihar has been showing a steady growth trend for the last 6 years. During the first 5 years after separation of Jharkhand in 2000, the economy had grown at an annual rate of 4.42 per cent at constant prices. However, the economy witnessed a turnaround due to policies pursued by the present state government and, as a result; the economy grew at an annual rate of 11.36 per cent during the period 2004-05 to 2010-11. Thus, the recent growth process can be termed as 'revival of a stagnant economy'. Due to different changes now the economy can claim to be at a 'taking off stage' to a sustained development path. The buoyancy in the economy can be easily sustained by the inter linkages in its various sectors.

Agriculture would continue to play an integral part of the development process, as around 88 per cent of the population still live in villages and they would continue to depend on agriculture as a prime source of their livelihood. The state cannot progress without a satisfactory growth of its agricultural sector. At each stage of development, one must be careful that right kind of inputs are available at the right time for the growth of agricultural sector, and adequate quantity of food grains is available to meet the demand for food. Or else, the resulting disequilibrium would pose a threat with a higher inflationary pressure. In this direction, the state government is not only stressing for a second Green Revolution based on bio-technological improvement, but also putting forth a concept of 'Rainbow Revolution'. The economy would also focus on increasing the production of pulses, vegetables, fruits, milk, fish and animal husbandry, alongside cereals. A strategy is being chalked out for enhancing the income and promoting the welfare of agricultural producers.

Any economy which is mainly based on primary sector's income is very vulnerable to changes, and has to face tough competition in the race of development. An analysis of agricultural development is incomplete unless it is looked in terms of overall process of macro-economic development. Agriculture is the single largest private sector occupation in Bihar. Hence, the goal of the agricultural production system should be to maximize income of land owning and landless rural populace to improve their livelihoods.

Table 1 : TA of Gross State Domestic Product (GSDP) at Factor Cost (2004-05 Prices) (2001-10) (Rs. Crore)

Sectors	TA 2001-04	TA 2004-07	TA 2007-10
Agriculture and Allied	22707	25126	27537
Industry	8828	12040	18573
Services	42546	45735	67010
Total GSDP	73964	82901	113121

TA : Triennium Average

Source: Economic Survey of Bihar, GOB (Various issues)

Therefore, on the basis of triennium averages of 9 years, (table 1), it can be proved that after service sector, the major contributor of GSDP in Bihar is agriculture and allied sector. One remarkable point to be noted is that the triennium average shows that the share of agriculture is gradually declining over the years compared to the other two sectors. From 2001 to 2010, the share of agriculture falls from 30 to 24 percent, whereas, the share of industry and service sector increases from 12 to 16 per cent and 58 to 59 percent. Therefore, the importance of agriculture is declining and needs special attention to develop it as a highly productive sector.

CAGR of three major sectors viz. agriculture, industry and services, for three periods i.e. from 2001-06 and from 2006-11 and total 2001-11, it is clear that in all the three time periods, the contribution of agriculture was the lowest. Secondly, there is gradual fall in

agricultural growth rate from 2001-06 to 2006-11, as clear from the above figure. As Bihar has agro-based economy and majority of rural population depend on agriculture, the growth of agricultural sector should also be an earnest concern. Until and unless, this sector is improved, there will be increase in poverty and disguised unemployment.

This paper discusses the key constraints to agriculture and food security situation in Bihar and strategies to enhance food security in the State. These finding are divided in terms of the three key dimensions of food security: (a) availability of food (b) accessibility of food and (c) adequacy/utilization of food. Based on literature reviews, several key constraints were identified as factors hindering food security in Bihar.

The District Directors were asked to rate these aspects based on the relative significance of each of these key constraints to their own districts. Based on the information collected from the 38 districts in Bihar during the site visit, extension services and access to agricultural inputs such as seed, fertilizer etc. were identified as the main constraints for food production and availability.

In terms of accessibility of food the major issues identified were transportation and infrastructure, market connectivity due to poor roads, and timely availability of transportation modes. Processing of food and knowledge on nutritional aspects were identified as key issues related to the utilization and adequacy of food. The safety and nutritional quality of food are also important factors that were highlighted by the government officials. In addition, interviews with groups of farmers, researchers, and urban poor were also conducted to obtain different perspectives on the different issues identified in table 2.

Table 2 : The Relative Significance of Different Constraints to Food Production and Food Security in Bihar

Constraints to Food Production	Rate
Availability	
Land quality related issues	4
Lack Irrigation	4
Lack of Infrastructure	3
Land holdings, land tenure issues	5
Poor access to agricultural inputs	1
Poor extension systems	1
Low investment in agricultural research and development	2
Accessibility	
Lack of transportation and infrastructure	1
Poor market connectivity	1
Lack of Income	2
Rising Food Prices	3
Adequacy	
Lack of processing facilities	1
Lack of Nutritional knowledge	1
Poor Quality of food	2

AVAILABILITY OF FOOD IN BIHAR

Agricultural Production Factors Affecting Food Availability: The agriculture Sector in Bihar, especially the crop subsector, has witnessed a sharp decline and relative stagnation due to more than a decade of low investment in agriculture and infrastructure (Banerjee and Iyer, 2005). During the past three to five years, there has been a host of significant political, social, institutional and economic reforms in the state. As a result, the per capita production of food grains increased from 141 Kg. in 1993-94 to 167 Kg. in 2007-08 (Singh, 2009). However, the yields of major food crops are lower than the national average and high-performing states like Punjab and Haryana (3996 Kg./Ha and 3087 Kg./Ha respectively in 2005 -06). The situation for commercial crops is the same.

Based on observations and interactions with District Directors, farmers, and researchers it was evident that agricultural production and food availability in Bihar is constrained by a number of reasons. Different perspectives on the different issues were obtained:

- Land quality
- Lack of irrigation
- Lack of infrastructure
- Land holdings, land tenure issues
- Poor access to inputs and inferior farming practices
- Poor training, research and extension system
- Low investment in agricultural research and development

The District Directors ranked land quality related issues to be one of the less serious issues affecting food availability. However, several farmers responded that they were getting low yields due to weakening of soil fertility. Although Bihar is blessed with rich soils, continuous farming activities, use and overuse of poor quality inputs such as seed and fertilizer, and obsolete farming practices have undermined soil fertility. It was clear from the interaction with farmers misapplied inputs such as fertilizer or used inferior farming methods due to either lack of knowledge or because they did not have the right quantities of fertilizer available to them at the required time.

When farmers were asked their biggest challenges in the present day agriculture when compared to ten years ago, the majority of the farmers responded that it was the drastic change in the pattern of rain fall and uneven distribution of rain. Although close to 57 per cent of the gross cultivated area is irrigated, the irrigation schemes are highly dependent on the timely arrival of the monsoon as most agricultural production uses surface water. The problem is that there is not enough rain harvesting systems to store rain for future use. Farmers have constructed small wells made of cement and concrete to harvest rain water; they were very basic and at the time of the visit they were mostly shallow. Some farmers mentioned that the state tube wells located in the village were mostly dysfunctional due to obsolete machinery or non-supply of electricity. Some progressive farmers have installed tube wells and diesel pump-sets to extract ground water on their own to sustain their agricultural production. However, the operating cost of diesel tube-well for irrigation in the rural areas is costly and inefficient.

The Government of Bihar provides a 'diesel subsidy' to farmers to minimize cost. Initially this subsidy was available to both tenant-farmers and landowners, but at present this support is limited to landowners. Thus, this subsidy is only benefiting a small portion of the farmers as many farmers in Bihar do not own the land that they farm. Bihar's agricultural production is highly vulnerable to availability of water for cultivation. In the event of a severe drought; food availability will be at a greater risk unless water management methods are improved. District Directors confirmed that land tenancy issues and water management were limiting agricultural production.

Nearly 41 per cent of the land is prone to both floods and drought (NABARD, 2007). Thus in spite of the fertile soils, agricultural production is often destroyed by natural calamities. The problems of flood and drought are attributed to poor water management practices. In addition, there is also an inequitable distribution of water (rain, ground and surface water) within the State. According to a local farmer, there is depletion of water sources in the area – that drinking water and irrigation water in the village is being depleted. Another farmer mentioned that they can plan their agricultural operation and reduce loss of harvest due to flood and drought if they received timely and reliable weather forecasts from the government. The District Directors however ranked poor water management as a less serious issue.

Lack of basic infrastructure and community services such as road systems, electricity, telecommunication, piped water, drainage etc. are prime impediments to the growth in agriculture, availability of food and standards of living. In Bihar, the basic infrastructure that connects farmers to inputs and agricultural products to consumer are lacking especially in rural areas. Poor infrastructure disconnects farmers from markets, thus increasing the cost of production but also reducing the potential to earn higher income. However, compared to inputs and extension, infrastructure seemed to be a less significant concern to farmers. The reason is that over time farmers have adapted to the existing conditions and have become less influenced by limitations of infrastructure and community services. The District Directors also reported similar problems.

Although issues related to land tenancy and obsolete land records are a problem in Bihar, it was not identified as significant issue. This is mainly because the majority of the farmers in the village are land owners. However, as mentioned earlier holding size varies from 0.5 to 7 hectares. A few farmers have more than 2 hectares of land. According to farmer, land is a constraint to production and income. One farmer mentioned that production in some seasons is so low that the income (cash/kind) from cultivation is barely enough to remunerate the land owners. Furthermore, the District Directors also gave least importance to issues related to land holdings and land tenure issues. They stated that since the majority of the land is cultivated by poor marginal farmers, they often continue to farm in spite of land issues to earn their livelihood.

Almost 90% of the farmers stated that poor access to inputs was a major constraint to agricultural production in Bihar. Almost all the farmers purchase their inputs for agriculture from the same suppliers irrespective of the land holdings. While their income from agriculture is becoming less and less, the cost of inputs is increasing. Many farmers often must buy the fertilizer and seeds from the black markets at high prices since these inputs are not available in a timely manner. They claim that some seed companies and their intermediaries are distributing defective seeds to them and most of these seeds do not grow into seedlings. Thus, the effective seed replacement rate is very low. Further, fertilizer and seed subsidies are available only to a very few farmers, and sometimes the beneficiaries of these subsidies are non-farmers or those that do not hold land (either leased or owned), in other word, the actual farmers are not getting the government assistance they ought to get. Thus, they cannot get the required amount of inputs at the right time to maintain their agricultural production. District Directors also identified poor access to agricultural inputs as a very serious constraint to agricultural production. However, they mentioned that the government is trying increase seed availability through various state-sponsored programs.

Both farmers and District Directors identified extension and transfer of new technology as the next major constraint. An effective extension system is needed to disseminate technologies and respond to farmers needs. According to a survey conducted by National Sample Survey organization (NSSO, 2003) under the Ministry of Statistics and Programme Implementation only 5.7 per cent of farmers in Bihar got information on improved agricultural technology from the public extension system, while 32.4 per cent learned from input dealers and 41.3 per cent obtained information from other progressive farmers.

The farmers stated that they had very limited interactions with extension agents and they often learned about new inputs and technologies from other farmers. The extension problem in Bihar is complex. Farmers have very little interaction with extension officers and they often learn about new inputs and methods from other farmers. Extension requirements vary from place to place based on the requirements of the farmers and available infrastructure. Also, many of the technical posts remain vacant and personnel need to be trained for extension positions. At the time of the site visit, there were 10 to 15 agricultural extension officers that been trained at ICAR on modern farming technologies. The District Directors reported that the total number of extension officers were less than 3,000 for the entire state. These factors hinder the transfer of technologies and innovations to the grass-root level (lab to land and vice-versa).

Since agriculture is the main enterprise in Bihar and the main source of employment, continuous agricultural research is very important to keep upgrading existing agricultural technologies and services and extending them to the farmers in a timely manner. Farm production can be significantly improved by introducing modern technologies, innovations, and practices. In recent years the major research institutions in Bihar have become less innovative, mainly due to lack of expertise, funding and depreciating infrastructure (Economic Survey of Bihar, 2006-07 and ICAR, 2008).

In fact, very little applied research is conducted in cereals, pulses, horticulture, animal husbandry and fisheries. The District Directors identified lack of investment in agricultural research and development as a serious issue. Investment on agricultural research and extension has been lacking for many years. Only 0.2 per cent of agricultural GDP is spent on agricultural research and education compared to the national average of 0.4 percent. Almost 95 per cent of this investment is used for salaries and 5 per cent for operating costs, thereby leaving few funds for conducting research (Department of Finance, GOB 2006-07). However, they added that the government investment has been gradually increasing, especially during the past three years.

The population of Bihar has been growing steadily over the past decade (figure 1). With this increasing population comes increasing consumption needs. However, agricultural production has not been able to keep pace with the growth in population in Bihar. Data from the National Sample Survey Office on annual food availability, which includes both food available through domestic production and estimated consumption suggest that Bihar was deficit in total food grain production since the early 1990s (Singh, 2009).

Production, consumption and population for 2012 (the terminal year of the 11th Five Year Plan, 2001 – 12) were estimated using available secondary data from 2000 to 2009. The average population growth rate was calculated from 2000 to 2009. This rate was assumed to be constant for the next three years (2010 to 2012). Bihar total population for 2010 to 2012 was projected using this rate. The normative food requirement for 2012 was calculated by multiplying the per capita food grain requirement for the year by the population. Data on anticipated production assumes that only 50 per cent of target production increase set by the Road Map is achieved provided that all new programs planned for agricultural development are implemented at grass-root level). (State Government of Bihar, 2010)

Although data was limited a trend line was generated for production and consumption from 2000 to 2012 (Figure 2). The above graph shows that there has been a continuous shortage in food production. If the current trend continues Bihar will be deficit in food grains in 2012 by about 3 million tons. Given the magnitude of the deficit and the existing production constraints, the target set by the Road Map may be hard to achieve within the next two years. Thus, ensuring the timely availability of the required quantity of food is a major challenge to food security in Bihar.

Changing Composition of Agriculture in Bihar : The composition of agricultural sectors itself has been changing over the years (Fig. 2). Fig. 2 shows that the share of crop subsector in the total agricultural GDP has declined over the years. On the other hand there has been a gradual increase in the contribution of the livestock subsector. This increase was mainly due to the flourishing dairy sector.

Milk production has continued to increase over the years. Although production is high, demand for milk and other livestock products is limited by low levels of income and purchasing power of the majority of households in Bihar (Singh, 2009).

The fisheries industry, on the other hand, has been quite stagnant at less than 5% throughout this decade. With the livestock sector continuing to grow, part of the food production is diverted to livestock industry as animal feed. This is anticipated to be a major challenge to food security in the future unless food grain production is increased.

Although cereals and pulses continue to dominate the crop sector, it is evident that there has been a shift within the sector. In recent years, farmers have started to shift from low valued staple crops such as cereal and pulses to high-valued crops such as vegetables and fruits. The main reason for this shift is that income from staple crops has been poor compared to horticulture crops.

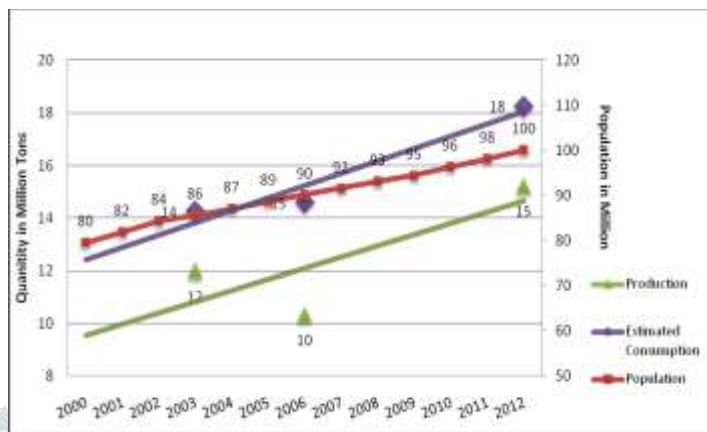


Fig. 1 : Production and Estimated Consumption of Foodgrains and Population in Bihar (2000 – 2009)

Source: Ministry of Statistics and Programme Implementation, Government of India

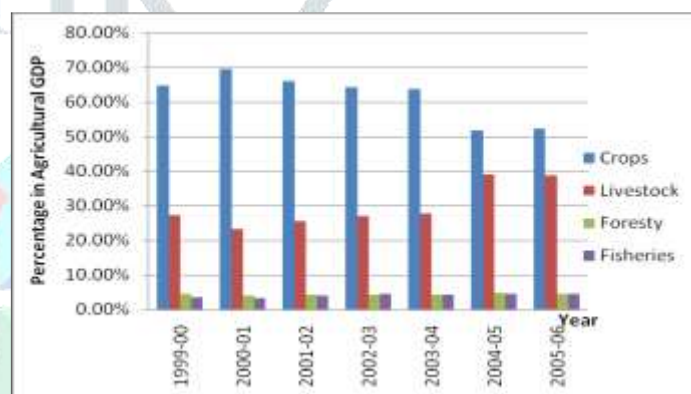


Fig. 2 : Structural Changes in Agricultural Economy from 1999 – 2006

Source : Central Statistical Organization, India

ACCESSIBILITY OF FOOD

A sizable share of the population in Bihar lacks a combination of physical, economic and social access to food needed to meet the requirements of an adequate and nutritional diet. According to District Directors, physical access to food, especially in the rural areas is mired by a) poor infrastructure, logistics, and basic amenities and b) poor market connectivity. Site visits were instrumental in gaining first hand experiences on deficiencies in infrastructure and market connectivity. In maximum villages in Bihar, there were no proper paved roads, efficient transportation services, electricity, piped water and other basic amenities.

In many of the developing countries, grains are stored in farmhouses until transported to the market. Vegetables, fruits, leafy vegetables, milk and meat spoil quickly unless they are stored in cold facilities. Thus, post-harvest losses are very high and improper storage also compromises hygiene and safety of food.

In Bihar, mandi markets provide key access to fruits and vegetable. However, mandi markets are mostly confined to populated cities and villages. While access to these markets was not a major constraint to the residents of most people, indicated that there is no mandi in the villages. The nearest mandi is around 5 kilometers away and since there are no regular transportation options within the village, they face serious difficulties in accessing this market. These constraints have not only adversely affected their food security but also standards of living as they have little to no access to other basic needs such as clothing, medicine etc.

Economic accessibility to food is achieved when a person or household has the income to purchase food needed to meet the requirements of an adequate and nutritional diet without compromising the attainment of other basic needs such as clothing, shelter etc. According to estimates from the Planning Commission of India (2004-05), close to 40 per cent of the people in Bihar lives Below Poverty Level (BPL), so there is a critical constraint to economic access to food by the poor.

A poor laborer in the area of Patna stated that low wages and lack of employment are the biggest constraints to accessing food. Another person mentioned that although she was entitled to the government mandated rations distributed through the PDS, she had not received her ration card due to bureaucratic steps and processes. Those who had ration cards claimed that the government distribution of rations was not equitable. She said that these services are not implemented properly and there is corruption at ground level. Children

from poor families often have to give up schooling to earn and feed their families. The average per capita income is very low and has only increased by only 10.15% over the past decade (Table 3). One woman expressed that she has been working for the last 20-25 years and she started with INR. 1000 (approx. \$22) per month and she still earns the same wage.

Table 3 : Per Capita Income in Bihar from 1999 -2009

Period	Per Capita Income (INR.)	Period	Per Capita Income (INR.)
1999-2000	5786	2004-2005	6772
2000-2001	6554	2005-2006	6719
2001-2002	5994	2006-2007	8167
2002-2003	6658	2007-2008	8703
2003-2004	6117	2008-2009	9586

Source: Government of Bihar (2009)

Although the Central Government has set a minimum wage rate of INR. 100/day, the laborers are paid between INR. 50 to 100. Agriculture is the main occupation and means of employment for the majority of the people in Bihar. The majority of those employed in agriculture are small and marginal farmers who produce crops to feed their own families and take the surplus to the market to earn an income. Their quality of life will only improve if they gain a profit from this excess produce. Thus, farmers in poor States like Bihar are caught in a vicious cycle of poverty, poor farming practices, poor yields, poor market orientation and poor returns. Those in agricultural labor are the poorest of the poor, receiving compensation in cash or kind or both. Even though NAREGA has been able to lift the wage rate a little, wage rates in Bihar are still less than the minimum wage rate. Furthermore, NAREGA has not been able to reach all poor people mainly due to slow implementation and poor management.

While the agricultural sector has been growing very slowly, the number of laborers employed in the agricultural sector has been increasing. Performance of the agricultural sector directly impacts their income and livelihood. Thus, hunger and poverty likely cannot be reduced unless the agricultural sector is revived and sustained. The increasing reliance on agriculture is the main cause of poverty in Bihar.

The data on wholesale food prices in urban areas indicate that there has been a sharp increase in the price of basic food products. For example the price of rice has increased more than 50 per cent while vegetable prices have increased by nearly 60 per cent (Table 4). The growth of income has not kept pace with the rise in food prices. The result has been food becoming increasingly more expensive and inaccessible to the poor. With the existing conditions it is highly unlikely that a dramatic change to income will occur in the near future (Singh, 2009).

Table 4 : Urban Whole Sale Prices in 2007–2010

Food Item	2007 -08	2009-10	% Change
Rice (Kg)	12.5	19.00	52.0%
Maize (Kg)	6.75	8.50	25.9%
Wheat (Kg)	9.75	14.00	43.6%
Lentil (Kg)	30.50	38.50	26.2%
Milk (Litre)	15.00	19.00	26.7%
Chicken (Kg)	65.00	75.00	15.4%
Vegetable (Kg)	11.00	17.50	59.1%
Average Increase in Food Prices			35.6%
Per capita income	8435.00	9586.00	13.6%

The Food Security Atlas for Rural Bihar (2009) identifies improvement in the role and position of women as central to improving food security in the State. There are gender-based inequalities in food consumption in rural India. The existence of such gender-based inequalities in household consumption is demonstrated through numerous case studies (Jackson and Rao, 2009). Although women generally work longer hours than men, they get less food and less nutrition than men. This gender differentiation and discrimination influence the individual access to food within a household.

ADEQUACY AND UTILIZATION

Adequacy and utilization of food is important to meet the Recommended Dietary Allowance (RDA). An assortment of food items is commonly consumed for a balanced nutrient intake through the daily diet. In Bihar, these food items are classified into eight categories mainly cereals, pulses, vegetables, roots and tubers, fruits, oil and fat, meat, fish, poultry, milk and milk products, and sugar and jaggery. According to the National Statistics Survey conducted in 2005 – 06, the cereal intake in Bihar is higher than the RDA requirement (Table 5). In all other categories of the food items Bihar was in deficit in terms of meeting the RDA requirement. The District Directors identified lack of processing facilities and nutritional knowledge as serious issues to adequacy and utilization. Poor maintenance of food safety and quality standards was also a serious issue.

Table 5 : Average Food Intake, Recommended Dietary Allowances (Rda) and Surplus/Deficit in Bihar (kg./month) for 2006-07

Particulars	Average intake	R.D.A	Surplus/Deficit (%)
Cereals	13.16	13.80	4.86
Pulses	0.71	1.20	(-) 40.83
Vegetables	4.01	5.80	(-) 16.46
Tuber and root crops	2.46	3.00	(-) 18.00
Fish/Egg/Meat	0.45	0.90	(-) 50.00
Milk	2.98	4.50	(-) 33.78
Oil & fats	0.13	0.60	(-) 78.33
Sugar/Jaggery	0.12	0.90	(-) 86.67

Source: National Statistics Survey (2005-06)

These trends have continued in recent years. Consumption patterns indicate that diets are deficient in protein sources such as pulses, meat, and dairy products. This is due to the low purchasing power of the majority of the population whose income is not sufficient to meet their daily food needs. Several women stated that they mostly eat cereals such as wheat and rice since they cannot afford to buy vegetable, fruits, meat, milk, etc. due to low income and high cost of living. They have to split their income between food and other

necessities, so sometimes they have to prioritize their spending patterns to fulfill other obligations such as paying for rent, medicine, etc. Several of them said that they knew milk and meat was good for them but they just didn't have the money to buy them.

The general trend in Bihar is to consume fresh and unprocessed food products except cereal grains such as rice and wheat. The majority of fruits and vegetables is consumed fresh with very little processing, packaging and value addition. Less than five per cent of fresh fruits and vegetables is processed. This aspect needs to be enhanced to improve the utilization of the food products and reduce post-harvest losses which are more than 30 percent.

Food quality and safety is another important issue in Bihar. The majority of the villages in Bihar do not have electricity, so farmers cannot use cold storage facilities to store perishable food items. Unless they are consumed or sold quickly, spoilage of these food items is inevitable. Improper storage and processing exposes food to bacteria, fungi, insect pests and rodents, causing both negative health impacts and post-harvest food losses.

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