

Agro-Based Food Production System in Bangladesh: A Socio-Demographic Impact Assessment

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Abstract: Bangladesh faces a daunting challenge to feed its 150 million people of whom at least half of them are living in below food-based poverty-level and another one quarter of them live in extreme poverty. The economy of the country is mostly dependent on agriculture which directly or indirectly has to subsist a huge number of its population, keeping them fully relied on its diversified cropping economy. But due to an unprecedented population growth, the proportion of cultivable land has been squeezing drastically and failing to provide living space and settlements for expanded generations. It eventually puts a tremendous demographic pressure on its agro-based food production system in the rural areas. Based on my ethnographic data collected from the rural areas, researcher have documented genealogically the settlement pattern and food-production system in two villages named Dhononjoypara and Gopalhati in the Northern part of Bangladesh. The study depicts clearly the rate of conversion of the low-lying agricultural land by making a rapid transformation of these into homesteads for settlement. In this context, information have been incorporated since, 1850 to provide ethno-historic data from the revisional settlement surveys of different times and subsequently based on my field-data collected from these specific villages in two phases during 1984-1985 and 2009-2010. Alongside of this, the study also provides information on the over-time population growth and finally concludes with a clear analytical description of the proportionate loss of agricultural land having used clearly the impact on its agro-based food production system in the rural areas of Bangladesh. Finally, the study will also cite examples from other Asian countries to make them aware about it for future.

Key words: Agro-based, food production, poverty level, cropping economy, homesteads, Malaysia

INTRODUCTION

In the past many years, social scientists and researchers have dealt with demography and environmental topics, treating them separately from their own differential paradigmatic framework. But after a meeting of UNCED in Brazil in 1992 and the Population Conference of Cairo in 1995 many researchers and policy planners around the world have been able to find out a positive correlation between these two interrelated issues for their future exploration. Researchers know it very well that population is an aggregate of consuming unit which usually puts pressure to its surrounding environment searching their food and shelter. Incidentally to say about agricultural productivity and its detriments due to increased human population, agricultural scientists recently have also become concerned about continuous decrease of food for future generations in global context (Southgate *et al.*, 2007). To find out their subsistence and settlement, people are compelled to destroy their land and natural resources which eventually creates imbalance for the total ecosystem. This situation becomes fully true for

a poorest undeveloped country like Bangladesh where the factor of over-population has been the root cause of its environmental degradation in every respect.

Bangladesh has now been placed as the 8th most populous country of the world having a total of 148.5 million people in a squeezed living in a surface area of 147570 km². With such a huge concentration of population in so much a tiny land, provides the country with one of the highest population density of the world. As compared with the past, though Bangladesh has now been able to reduce its birth rate remarkably from 2.48 in 1974-1.7 in 1998, yet the population multiplication has brought the country in a most volatile situation. Under this critical situation, a few political leaders, bureaucrats, policy planners and specially the religious fanatics fully ignore this issue with a misconceived notion eloquently saying that population problem in Bangladesh could be solved if relocation of the manpower and redistribution of the resources are done properly. Nevertheless, these utopian policy planning may be regarded as a kind of oratory stunt for obfuscating the general masses in real sense of the term. It seems to me very much pretentious

and illogical when researchers find that an unprecedented population growth has been fully exhausting its terrestrial land-surface and natural resource-base for making accommodation of the total people of the country.

Bangladesh is predominantly an agrarian country and the level of urbanization here is 23% which indicate that 77% or about 110 million people are living in 59,990 villages primarily depending on agriculture. But due to over-population, these villages are becoming over-crowded and socio-environmentally problematic in terms of extensive pressure on food and shelter. Many people are now marginalized and uprooted from their original land and being shelter-less, they look for work-employment in the cities. The remaining people in the rural areas make their habitation in the villages by converting their cultivable land for homesteads. With this background, researcher intend to explore in this study, the demographic pressure in rural areas having shown the extent of conversion of agricultural land at the micro-level investigation is two villages in Bangladesh.

TRENDS OF POPULATION GROWTH IN BANGLADESH: AN OVERVIEW OF THE SOCIO-STRUCTURAL SITUATION

In having a brief idea about the population increase in Bangladesh, it is discernible from the Table 1 that beginning from the year 1901 until 1931, the growth rate remained more or less stable showing a consistent number. It is evident from Table 1 that though the average annual growth rate in the country was quite lower but there is no reason to believe that it had occurred due to low birth rate. There might be other demographic reasons for this. Because from socio-cultural and religious point of view, the villagers traditionally have had the tendency to keep their families larger (Mohiuddin, 1982; Zehadul Karim, 1990; Schendel, 1981). The 1941 census

reported that population of Bangladesh had increased at a considerably faster rate which again came down slightly in the year, 1951. This happened perhaps because of an out-migration of quite a good number of the Hindus in India after partition in 1947. During 1961 and onward, the population of the country started to increase abruptly keeping a similar pace until 1991. In the year, 1998 the country however has succeeded to bring the growth rate down to 1.7 per annum. A joint study compiled by World Bank and BCAS in the title of Bangladesh, 2020-A Long-term perspective mentioned that though a slight decline of the population growth had occurred in the country in recent time, yet the report projected clearly that population of Bangladesh will stand at 170 million by the year, 2020 (Mabud, 2008; World Bank and BCAS, 1998). In observance of the International population day in 2009, the UNFPA representative in Dhaka reported in his statement that Bangladesh has made a commendable progress in the reproduction of fertility through its national family planning program as the number of children per woman has sharply declined from 6.6 in the early 1970s to 2.7 per woman as of today. This apparent progress has been shown by calculating the national average also at the same time, this calculation was based on a situation which has had prevailed in 40 years back. But to my observation, the average number of children per woman in the rural areas, in slums and also among the uneducated poor and lower-income groups of people has not been reduced. This is because of the reason that the Family planning program in Bangladesh has not been working positively in the country and it tremendously failed during the previous government in the years, 2002 and 2006 because of having given lesser attention to this aspect due to the reasons unknown to us. It is documented in a report published by National Institute for Population Research and Training (NIPORT, 2000) that family planning field attendants in the villages used to visit 43% of the houses which stood at 35% in 1999 which successively came down to 18% (Table 1). Researchers have the observation from the empirical research on rural society that the average family size is always higher than the national average (Zehadul Karim, 1990). It seems that the family planning programs in the villages do not work so positively for which the population in the rural areas keep on increasing putting pressure on its homesteads and cultivable land.

Bangladesh has the highest record of using its agricultural land for purpose of producing food grains which is accounted to be 63% while the global average is only 11%. Among the Asian countries, China have been using 10%, Myanmar 14%, Sri Lanka 14%, India 50%, Pakistan 25% and Indonesia 8% (Jahangir, 2009). There

Table 1: The pattern of population growth in Bangladesh 1901-2008

Years	Population (millions)	Density of population (km ²)	Average annual growth rate (%)
1901	28.90	196	0.90
1911	31.60	214	0.94
1921	33.30	225	0.60
1931	35.60	241	0.74
1941	41.90	285	1.70
1951	41.20	284	0.50
1961	55.20	345	2.26
1974	76.30	484	2.48
1981	89.90	590	2.35
1991	111.50	720	2.17
1998	128.50	850	1.70
2008	153.50*	1066**	NA

*15.12% (an overtime increase of population since 2002 until 2008);

**World average density (as of 2008) is 13.1; BBS (GPRB, 1991; Saleemul et al., 1998)

are researchers (Afzal and Shibasaki, 2000; Mabud, 2008; GPRB, 2008) who clearly forecast that due to heavy pressure of population, the rate of using agricultural land will go on increasing further. Afzal Ahmed and Ryosuki Shibasaki of the Center for Spatial Information Science in Tokyo mentioned that agriculture in Bangladesh is already under pressure both from huge and increasing demands for food and from problems of agricultural land and water resources depletion (Afzal and Shibasaki, 2000). Based on these speculations, researcher emphatically argue that due to acute demographic pressure, the villagers in Bangladesh have been continuously transforming their agricultural land to homesteads for making their living and settlement. Accordingly, researcher have put forward an empirical documentation by providing socio-demographic data having an ethnographic base in two villages located in the Northern part of the country.

ETHNOGRAPHIC FIELD SITES AND MICRO-LEVEL INFORMATION-BASE

This part of the research has its ethnographic documentation on two villages in Bangladesh. Dhonjoypara and Gopalhati, the two study villages are both agricultural communities being located in the same physiographic and environmental setting. They belong to Puthia Union (A union is the lowest unit of local government organization in Bangladesh. It is usually comprised of 6-15 villages and is governed by an elected chairman and nine members directly elected by the villagers) of Rajshahi district in the North-Western part of Bangladesh.

Physiographically, Puthia and the study villages lie on the outer margin of the riparian tract which is about 8 miles in land from the left bank of the Padma river. It lies in the Southern low-lying bed or depressed marshy area (Ashraf, 1976) (Physiographically, Rajshahi district is divided into three broad divisions; the Barind region; the newly laid alluvial deposits along the bank of Padma and the beel or marshy area (Zehadul Karim, 1990). It is situated over 25°22' North latitude and 88°50' East longitude. The mean Fahrenheit temperature for Puthia and the study villages increases from 63° in January to >85° in the Summer months.

Of the yearly rainfall of about 56", no <50" occur in the rainy season. As compared to other parts of the country (Arefeen, 1986; Chowdhury, 1978), the rainfall of Puthia villages is far less which speaks to the necessity for irrigating its crop land. On the basis of surface level, there are three types of land in Puthia (Physiographically, Rajshahi district is divided into three broad divisions; the

Barind region; the newly laid alluvial deposits along the bank of Padma and the beel or marshy area (Zehadul Karim, 1990), Daira or Known as bhiti, meaning land for homestead or the elevated land above flood-level; Mathan or the flat fields of intermediate level which is partially flooded during the rain and Loyal or the low-lying land which are completely flooded during the rainy season. These diverse soils of the study villages provide them with diversified cropping pattern (There are varieties of newly-emerged rice in these localities which have been different in these areas as in other part of Bangladesh).

TRENDS IN SETTLEMENT, AGRICULTURAL LAND USE PATTERN AND THE POPULATION DYNAMICS IN THE VILLAGES

Researchers will examine the settlement trend land use pattern and the population dynamics in Dhononjoypara and Gopalhati to provide data at the micro-level investigation. Information about village settlement prior to 1850 is not available. According to the first village revenue survey of 1850, Dhononjoypara contained 205 acres of land while Gopalhati had 393 acres of land in its mouza. The Village revenue survey of 1850 indicated that mouza Dhononjoypara at that time had only five households occupying in total 9 acres for homesteads. The amount of cultivable land in Dhononjoypara was 190 acres and the remaining 6 acres was waste and uncultivated. On the other hand, Gopalhati had 14 households having 25 acres for homesteads; the amount of cultivable land was 368 acres (Table 2).

Information about village settlement is very significant as it gives us an indication about the population pressure for which people in the villages are compelled to convert their agricultural land for homesteads. According to the first Village revenue survey of 1850, Dhononjoypara contained 205 acres of land while Gopalhati had 393 acres of land in its mouza. The Village revenue survey of 1850 indicated that mouza Dhononjoypara had five households occupying in total 9 acres for homesteads.

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The census reports of 1951 and 1961 provided information on population, households and literacy but do not give any information on settlement pattern, thereby making it impossible to analyze in detail the changes over time. However, the Revisional settlement survey of 1968 which came out in 1978 filled the vacuum

Table 2: Land-use pattern for the Villages of Dhononjoypara and Gopalhati since, 1850 (acres)

Census years	Dhononjoypara (Land)				Gopalhati (Land)		
	Used for settlement	Used for cultivation	Waste and uncultivable	Total	Used for settlement	Used for cultivation	Total
1850	9	190	6	205	25	369	393
1968	58	152	-	210	99	293	392
1974	No information	No information	No information	210	No information	No information	399

Table 3: Demographic data for Dhononjoypara and Gopalhati

Years	Village Dhononjoypara				Village Gopalhati			
	Total household	Total population	Male	Female	Total household	Total population	Male	Female
1951	60	350	No information	No information	90	380	No information	No information
1961	72	371	195	176	99	513	264	249
1974	62	348	164	84	151	959	478	481
1985	105	660	345	316	196	1207	631	576
2010								

(GPRB, 1974); Field study 1984/85 and 2009 and 2010

in this regard and the census report of 1974 provided gross data on the total amount of land in each village. According to the Revisional settlement survey of 1968, mouza Dhononjoypara had 210 acres of total land of which 152 acres was cultivated. In Gopalhati, there were 392 acres of total land of which 99 acres has been used as settlement and the remaining 293 acres is agricultural land. It may be noticed from the Revisional Settlement data that there has been a tremendous increase of land for settlement in both villages since, 1850. The reason is obviously the increase in population.

In addition to the natural growth of the local population, in-migration to this less densely populated area from the high densely populated districts of Eastern Bangladesh further augmented the population growth. Khan and Shookat's study of migration in Puthia villages can be cited as an example to support my statement. The Census report of 1974 estimated 210 acres of total land for Dhononjoypara and 399 acres for Gopalhati. This estimate for Dhononjoypara is quite consistent with the Revisional settlement data but for Gopalhati, the figure projects a slight variation in the estimation, the reason being unknown to us (Table 3).

Demography, migration and literacy: According to the village census that researcher administered during my field work (August 1984-1985) there are 660 people in Dhononjoypara of which 591 (89.55%) are Muslims and the remaining 69 (10.45%) are a tribal community named Santal. In Gopalhati, out of a total 1207 people, Muslims constitute 1142 (94.61%) and 65 (5.39%) are Hindus. The average household sizes for Dhononjoypara and Gopalhati are respectively 6.28 and 6.18 which are a little bit higher than the national average.

To have a clear picture of population growth in Dhononjoypara and Gopalhati, a demographic view of the villages since, 1951 to the present is shown in Table 3.

But to enquire about the population transition of the villages for the past centuries it is necessary to know the population dynamics of Puthia Union and Puthia Upazila as a whole. Census recording in the sub-continent of Bangladesh-India and Pakistan began as late as 1872. But there is no information on population at the village level, nor does the village census of 1901 deal specifically with village statistics. It was simply a camouflage in the name of village census. In fact, population statistics at the village level only came in 1951.

The reported census of 1872 and 1901 produced data on the Thana (i.e., present Upazila) level which indicates that there has been decades of declining population in Puthia Upazila.

The Bengal district Gazetters-Rajshahi-1916 (O'Malley, 1916) indicated that the population of Puthia and adjoin Upazilas (i.e., Bagmara, Mohanpur, Paba and Charchat) declined tremendously between 1872 and 1891 due to prevalence of malaria, smallpox and cholera together with water-hyacinth which choked the water channels. This caused 15.01% decrease of population growth. Through 1901, Puthia and the adjoining upazilas sustained a loss of population by a decrease of 12.08% (Zehadul Karim, 1990). Many people died in this swampy water-logged are and others migrated to the comparatively healthier and more prosperous areas (Naogaon, Panchupur) of Rajshahi region (O'Malley, 1916). Nelson (1923) reported that the population of Puthia decreased by 44% during 1872-1912. This decline population trend for Puthia continued until 1951 due to a large emigration of the Hindus to India during and after 1947. From 1951 onward, population had increased in Puthia Union as it has for Dhononjoypara and Gopalhati. The increase of population for Puthia Union during 1951 and 1960 is 32.2%. This growth rate has been due to both increasing birth rate and to in-migration (Researcher have taken a few sample families from different classes of

peasant categories to represent their groups. In future, this will further be updated by interviewing each family to know specifically about their everyday food consumption patter).

AGRO-BASED FOOD PRODUCTION SYSTEM IN THE VILLAGES: ETHNOGRAPHIC EVIDENCES

In this study, researcher have the contention to provide brief information about the agricultural crop production system in the villages showing its direct relationship with the demography. Agriculture is the principal occupation of the majority people is Dhononjoypara and Gopalhati. Consequently, there is heavy pressure on land and there is great effort to utilize the land rather most intensively.

Statistics provided by Puthia Upazila Agriculture Department (Table 4) that the 141 acres of land in Dhononjoypara and 150 acres of land in Gopalhati were used for various kinds of rice (e.g., Aus, Aman, IRRI China, BR11, BR10, BR4 and Boro) cultivation during the year 1984-85 (There are varieties of newly-emerged rice in these localities which have been different in these areas as in other part of Bangladesh).

After rice, sugarcane occupies the most important acreage of 100 and 130 acres, respectively in Dhononjoypara and Gopalhati. The rabi crops (spices) includes mustard, pulses, turmeric, onions, garlic, ginger and potatoes, etc. and occupy 49 and 89 acres, respectively in Dhononjoypara and Gopalhati.

Cropping patterns in Dhononjoypara and Gopalhati reflect a close adaptation to seasonal variation which considerably influences employment and share cropping for the landless, marginal and poor farmers. Crop production follow the Bengali calendar which begins in the Baisakh is mid-April. The cropping cycle throughout this discussion follows the Bengal calendar (Table 5). Baisakh is the time for harvesting boro rice which is sown is Poush and Magh (mid-December to mid-February). Baisakh and Jaistha are the Summer months termed as grishma kal in Bengali. In the early Summer (in Baisakh), the villagers sow jute.

Until the beginning of Baisakh, the farmers continue sowing aus paddy which they actually began in Phalgun and Coitra (mid-February to mid-April). Aus is the major food crop in Dhononjoypara and Gopalhati and is sown in 44.78% of the total area in Puthia villages. The next important crop is aman paddy which is also sown in

Table 4: Area and percentage distribution of leading crops in Dhononjoypara and Gopalhati, 1984-85

Name of crops	Land used for cultivation (acres)	Percentage of total cultivation area	Land used for cultivation (acres)	Percentage of total cultivation area
Rice (aus, aman, IRRI China, BR 11, 10 and 4 and Boro)	141	39.83	150	34.64
Sugarcane	100	28.25	130	30.02
Jute	35	9.89	24	5.54
Wheat	29	8.19	42	9.70
Rabi crops	49	13.64	87	20.10
Total	354	100.00	433	100.00

Department of Puthia Upazila Agriculture

Table 5: Seasonal variation and cropping cycle in Dhononjoypara and Gopalhati

Seasons in Bengali	English equivalent	Bengali month(s)	Equivalent month for English calendar	The major crops (period)	
				Sowing	Harvesting
Grishma	Summer	Baisakh, Jaistha	Mid-April Mid-June	Jute, Aman paddy, turmeric at the farmers sow HYV rice, e.g., BR 4, 10 and 11. The sowing of these HYVs continues beginning of Baisakh	Boro rice, IRRI China (rice), teel (a kind of crop from which seed oil is made)
Barsa	Rainy season	Asar	Mid-June	Khesari and mustard	Jute: In the late rainy season the villagers harvest aus paddy which also continues until beginning of early Autumn
Sarat	Early Autumn	Bhadra, Ashwin	Mid-August Mid-October	Sugarcane transplantation	
Hemanta	Late Autumn	Kartik Agrahayan	Mid-October Mid-December		
Seet	Winter	Poush Magh	Mid-December Mid-February	Winter sugarcane, sowing wheat and potatoes	Aman paddy, BR 4, 10 and 11, turmeric, potatoes, mustard and Summer sugarcane
Basanta	Spring	Phalgun Chitra	Mid-February Mid-April	Boro rice, IRRI China, aus paddy (often continue the beginning of Summer), Summer sugarcane and jute	

Baisakh and Jaistha. IRRI China, another variety of rice is harvested in this period. Among the rabi crops, turmeric is transplanted and teal (a variety of oil seed) is harvested in the late Summer. Labor demands are greatest at this time because the land needs to be prepared for transplantation while the crops are ready for harvesting. So, the Summer months in Dhononjoypara and Gopalhati are the busiest period for the villagers and a peak period for the paitis and marginal farmers who are hired to work on other's land. One study (Nizamuddin, 1973) estimates that 40% of the demand for hired labor in rural Bangladesh is concentrated in the months of Coitra, Baisakh and Jaistha. In late Jaistha, the farmers also start sowing three varieties of HYV rice, BR 4, BR 10 and BR 11. The sowing of these continues until Ashar (mid-June to mid-July). Ashar and Srabon (mid-June to mid-August) are the barsha kal (rainy season) also the time for harvesting jute. In Srabon and Bhadra (mid-July to mid-September), the farmer's harvest aus paddy. Bhadra and Ashwin (mid-September to mid-November) is the sarat kal or early Autumn which is the slackest agricultural season. Except for sowing some rabi crops, e.g., Khesari (a kind of lentil) and mustard, the villagers mostly take a break at this time. The rich and average farmers do not worry that much as they can maintain themselves keeping on their peak season's stock. But the most desperate survival strategy for the landless, marginal and poor farmers is to accept loans either in the form of cash or grain from the rich peasants. Slack season under-employment and unemployment have been identified as one of the factors responsible for increasing pauperization in Bangladesh villages. In the villages, researcher have observed that such lending of money or grain makes a tie which perpetuates leader-follower relationships among the members of the samaj.

The slack Bhadra-Ashwin season ends when the farmers again become busy transplanting sugarcane, the second important crop of the villages. Three varieties of sugarcane are cultivated No. 313, No. 617 and Lohardung. All varieties of sugarcane are usually harvested after 11 months of their sowing. Winter sugarcane continues from the months of Kartik and Agrahayan (mid-October to mid-December) which is the hemanta kal (late Autumn) to Phalgun and Coitra (mid-February to mid-April). About 1 acre of sugarcane produces 50-60 maunds of gur (unrefined sugar) as compared to 9-15 maunds of aus paddy. Kartik and Agrahayan are also the months for sowing wheat.

After hemanta kal comes seet (Winter), in the beginning of which farmers harvest four varieties of rice (Aman, BR 4, 10 and 11). For that reason, in Poush and Magh the farmers of Dhononjoypara and Gopalhati have

plenty of cereals. Women make various types of pithas (rice cakes) and serve them with date juice. Some farmers at this time sow IRRI China which they harvest in Baisakh and Jaistha. Boro (another variety of rice) is also sown at this time. Some rabi crops like turmeric, potatoes and mustard are plucked at the end of the Winter. Again demand for hiring labour is high in the months of Poush and Magh. The months of Phalgun and Coitra are the basanta kal (Spring season). The beginning of the season is another slack time for the people of Dhononjoypara and Gopalhati. During the later part of this season, the villagers start sowing aus-paddy which they harvest in the rainy season. The seasonal cycle concludes with the month of Coitra and that is the end of Spring.

During the revisitation of the study villages again in the years, 2009 and 2010, researcher have observed that the villagers have been utilizing their total agricultural land for multiple crop production. Many of the villagers reported to me that they can no longer keep their land fallow any more as their forefathers did in the past. This is because of their food shortage and heavy demand for food as they now have to feed more and more people in the family.

In regard to food consumption, the villagers usually maintain the most traditional way of eating rice principally 3 times a day. But it often becomes difficult for the poor and landless families as many of them cannot afford it for 3 times a day. Side by side, researcher have observed the calorie intake pattern of the people by procuring data from some representative families of different class-categories in the villages during the year, 2009 and 2010. It seems that most of the poor, landless and marginal farmers eat less protein than what they needed for their health. It would have been better to show the calorie intake in the villages by interviewing each family which concomitantly would have proved the demographic impact in a succinct way.

CONCLUSION

The study has described both genealogically and empirically the agro-based food production system in Bangladesh, closely relating it with demographic factor. Having collected the field data in two phases at the village level, I have been able to depict an intimate picture of agrarian rural Bangladesh showing a consecutive loss of cultivable land in different phases. The study has consistently argued that an extreme pressure of population in the rural areas drastically reduced the cultivable land having a tremendous impact on its agro-based food production system. As demographic pressure influences such conversion, the villagers have

no options remaining than to use their agricultural land for purpose of settlement. When the families become extended due to increase of kin members absolutely through birth, their inherited residential homesteads become congested and they fail to accommodate the growing number of people in the lineages. For obvious reason, they effectually go for occupying new agricultural plot and convert them for homestead settlement. Since, food production is a survival-necessity, the farmers having cultivated the same plot of land repeatedly, encounters a decreasing return of productivity in land further aggravating the food crisis.

Researchers have also evidences that many affluent families and the so-called newly-emerged political elites having rooted their origin in the rural areas have recently developed a neo-feudal attitude to occupy a huge amount of agricultural land for expanding their farm-like settlement areas in the villages. Following a European manorial system of middle ages, it often gives them extra prestige and honor in the villages which they require for strengthening their power-base in the whole region. Such processes of land concentration may also be added as one of the important causes for the continuing decline of cultivable land in the villages. It simultaneously creates economic crisis and unemployment in the agricultural sector as well. Where agricultural land remains under pressure, the villagers have to seek employment outside and many people being pauperized thus move to the cities and towns for their subsistence which eventually creates socio-economic and environmental problems for the urban dwellers as well.

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