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Indigenous Food Production System and the Impact of Population Growth: Community-Based Examples with Anthropological Evidence

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Abstract

It is reported that 99% of human food on this planet Earth usually comes from terrestrial environment, and the *remaining* 1% is extracted from other aquatic sources (see FAO, 2002). Thus, it is indicative that land is essentially the most fundamental resource-base for food production and people have long been utilizing their land by adopting their own indigenous knowledge to boost food production from agrarian sources. An excessive population growth has a consequential effect on agricultural resource-base, where a huge amount of farming land has drastically been reduced in the past few decades; and that process is still continuing. Meanwhile, it is reported that only 12% of the total land allowed the production of food and cereals which does not seem to be sufficient to cover the subsistence of a huge number of people around the world (see Buringh, 1989). Contextually, I formulate a clear statement saying that due to an excessive demographic pressure, the farmers around the world go for a mechanized cultivation by making a transformation of their indigenous traditional food production system to a more intensive mechanized cultivation. The resulting effect is the degradation of the soil which keeps land fully dependent on organic manure and mechanized irrigation, putting the environment in a vulnerable situation. To understand this, the paper has cited a few examples from different regions of the world, and simultaneously, has described facts from one specific ethnographic case study from a South Asian community. Based on the above ideas, I conclude it with a modest caution saying that we must find some preventive mechanisms to keep our population at a replacement level. This will eventually allow us to revert back to our indigenous food production system, which seems to be essential to make our planet earth more natural and habitable for the future generation.

Keywords: indigenous food production, impact of population growth, community based anthropological evidences

1. Introduction and Problem-Statement

Recent interdisciplinary research on the environment and natural resource management has found a positive correlation between insurmountable population growths with that of unsustainable use of the finite resources. This hypothesis of population growth and environmental limits stands at a paradox, often generating a heated debate between the Cornucopians (Note 1) and Malthusians (Note 2) without having any fullest victory for either side (see Dryzek, 1987). Many demographers and social scientists are not however, very much obsessed with these polemicists; rather, they propound a most rational argument saying that certainly the cumulative growth of population has resulted in a massive change in the eco-environmental atmosphere of this planet earth (see Jaya Kumar, 2000). Robert Thomas Malthus had expressed his concern for this continual demographic pressure long before in 1798 saying with great caution that, since population grows much faster than natural resources, it is quite obvious that due to its pressure, Earth's natural resources will recede at a continuous yet faster process. It has been learned from a study conducted by David Pimentel and his associates saying that approximately ten million hectares of arable land have eroded and these are abandoned throughout the world every year. And to recover such loss, additional land are taken from forests and other sources as these are essential for human living and farming activities (see Pimentel et al., 1998).

Accordingly for that reason, the demographers and environmentalists have come up with a posing question that the main challenge for the environment throughout the world is the over-sweeping position of our earth's

capacity to accommodate such number of burgeoning populations and in this context, it exceeded the carrying capacity of the world (Note 3). To reiterate this view, I would simply say that the consecutive loss of agricultural land is thus a 'process' which will reduce our per capita availability of land for food resources, relating it directly with the demography. In his book titled 'World Soil Erosion and Conservation' published in 1993, David Pimentel further mentions that per capita shortage of land is the main reason for severe food shortages and nutrition problem in many parts of the world. The environmental depression is further intensified due to soil erosion in the agricultural field where 75 billion of metric tons of soil are demoed from the field due to blowing of wind and having impact of water erosion which eventually affect the cultivatable land (Myers, 1993). Furthermore, we have enough evidences where deforestation and desertification have also been taking much of the cultivable land creating further shortage of farming land (Skole & Tucker, 1997). Due to increased rate of desertification and deforestation, a huge amount of forest areas are also now converted for farming activities. Thus, it is the double-edge pressure on cultivable land and also at the same time, it is squeezing the total land of the world. And it is suffice to say that all these shortages of land in fact, has great impact on food production system as a whole.

In the meantime, total world population reached from 3 billion to 6 billion in 1999 making it double in 40 years (see Karim, 2011). Such a drastic increase of population is alarming; it has consequently resulted in extensive requirement of cropland for food and plain land for settlement. In harnessing food and shelter, people on Earth now have been compelled to exploit it more torturously by clearing the bush and hills, destroying the vegetation and finally killing the indigenous species, wildlife and animals to total extinction (Bucholz, 1993; Pimentel, 1995; Pimentel & Pimentel, 2006). To multiply food production, human beings have been using chemical fertilizer to such an extent that it is in fact gradually destroying the fertility of the soil. Due to using too much chemical fertilizer, people now suffer from many unknown and incurable diseases like cancer, liver problems and kidney abnormalities. The exploitation of forests has resulted in soil erosion; expansion of deserts, a radical global climate change and reduction of the capacity for holding soil, causing unusual floods in the plain land (see Jaya Kumar, 2000).

An excessive population growth has direct bearing on agricultural resource-base where a huge amount of farming land has been drastically reduced in the past few decades; consequently, it poses tremendous pressure on food. In a recent statement in 2012, FAO Chief, Jose Graziano da Silva and his associates mentioned that the global demand for food is expected to increase 60% by the year 2050 (see Graziano da Silva *et al*., 2012). In the context, if we want to secure food for everyone, then we must keep our population at the optimum level by making food available for everyone. It is reported that the food plantation and cereal production only contain 12% of the total land which does not seem to be sufficient to cover the subsistence of a huge number of population of this planet Earth. In this regard, I formulate a clear statement that due to excessive demographic pressure, the farmers around the world have moved on very swiftly to mechanized cultivation; they have transformed their indigenous traditional food production system transforming them very abruptly and radically towards mechanized cultivation. The resulting effect is the degradation of the soil; keeping land fully dependent on a chain of using chemical fertilizer and uncontrolled irrigation which puts the environment in a vulnerable situation. To exemplify this situation, this paper incorporates a few ethnographic examples as proper evidence of the situation. On the basis of above contention, I make an emphatic statement saying that, if we want to seek food for everyone in the human society, the population of this earth should be kept in an optimum level.

2. Trends in Global Population Increase

2.1 It's Equation to Show Adversity

In assessing the global demographic situation, it is essential to provide a chronological background of it since the beginning of human history until 1800, when the population of the earth started increasing more or less at a consistent rate. We have statistical evidences on world demographic situations which clearly show that in 1830, the total amount of world population was 1 billion, which took only 100 years to make the number double by making it 2 billion in 1930 (see Karim, 2011). But subsequently within only 30 years in 1960, the cumulative growth of population stood at 3 billion worldwide. This progressive increase of population continued to proceed when it took only 15 years by 1975 to increase 4 billion. In analyzing the causative factors for a lesser population growth prior to 1930, it was not because of its lower birth rate; rather it was an effect of higher mortality of human beings due to some severe epidemics and uncontrollable diseases which brought a massive destruction of world population.

Mortality rate in the past also increased due to some unexpected calamities and natural disasters which reduced the population at a greater extent even though there was high fertility throughout the world. It becomes clear

from the above equation that within a stipulated time-frame of 45 years ranging from 1930 to 1975, the population of the world simply doubled. Continuing with this trend, within another 12 years, global population reached 5 billion in 1987. Interestingly, keeping track of the same equation, the population of the world increased to a cumulative total of 6.8 billion people by the year 2009 (Population Reference Bureau, 2009). An average of approximately 82 million people are added every year since 1930, instigating the social scientists and demographers during the 1950s and 1960s for the first time to use an appropriate term 'world population explosion' in relating to this abnormal population growth. According to a prediction of Population Reference Bureau (2009), world population is estimated to reach to 9.1 billion in the year 2050. Most of this added population every year actually is coming from the poor and underdeveloped countries, where demographic pressure and poverty go together. Now the question comes as to why the populations of the underdeveloped nations are increasing so rapidly compared to developed nations. The present growth rate of population at the rate of 1.8 does not actually apply to people living in rural areas and people living in the urban slums and low-cost areas (see Karim, 2011).

Although an overall population growth throughout the world as well as in many developing countries had decreased considerably during the recent past, this trend of slower growth however, has not been very effective for many poor and underdeveloped countries. In fact, most of these 'underdeveloped Third-World nations' are already over-burdened by their serious demographic pressure and concurrent economic poverty. For example, being one of the poverty-stricken nations of the world, Bangladesh has a total population of 153 million who live in an area of 147,570 sq. km. It remains the most densely populated country of the world having tremendous pressure on land and settlement. Based on human development approach, the country stands at the lowest index category gaining the 146th position in its rate of per capita GNI (see UNDP, 2008; UNDP, 2011). At least 40% of its people in Bangladesh still live below poverty level having acute food shortages. Worldwide statistics clearly show that 80% of the total population of this planet comes from lower-income countries and even the growth rate is also comparatively higher in these countries (see United Nations Population Reference Division, 2009).

It was found that the percentage of population growth rate in global context is 2.4% in the year 1960, which was successfully reduced to 1.8% in 1999 (see Karim, 2011). Most of the poor countries as yet have features of high birth rate compared with declining death rates. The richest countries of Europe, the United States and Canada have a growth rate of less than 1%; while the growth rate in African nations still continues growing at the rate of 2.4% (see Population Reference Bureau, 2009). We know that the world population is increasing at the rate of 1.2%, yet the doubling time of population for many underdeveloped nations is estimated to take 25 to 37 years (see Karim, 2011). In the year 1930, Bangladesh had a population of 35.5 million which has now reached to 153.5 million in 2008, despite the fact the country has succeeded enormously in reducing its birth rate. This situation however, is not simply applicable for Bangladesh alone; it is perceptibly true for many Third World nations of the world. It is suspected that many of these Third world underdeveloped countries of Asia and Africa will face immense problems in terms of managing their proper food and nutrition intake.

When the global population continues to increase abnormally at a higher rate, it is quite likely that people living here will require more food for their survival. To feed such a huge incumbent population, we will have two alternatives left behind: one is to bring more and more uncultivable land, forest and hills under cultivation which effectually will convert our unused land resources at a faster rate. Alternatively, we can increase our food productivity by using the same plot of land cultivated repeatedly through a massive quantity of energy, chemical fertilizers, pesticides, herbicides and the underground water by employing deep tube wells and shallow tube wells, putting a tremendous pressure on the ground water table.

3. Demographic Impact on Food and Natural Resources

3.1 A Chronological Situation from an Analytical Viewpoint

In the preceding section, I have provided a chronological documentation on successive overtime numerical increase of the population in different calendric time-frame which shows a clear regional variation of it from the global perspective. In this section, an assessment of its consequence is highlighted in context to its carrying capacity which sets an upper-limit of a cluster of population who can live on a specific environment and resources. It is expected that an upper-limit of the population should not exceed that supposed optimum level.

Global population had not always been a great concern for us as for years in human history it was in a stable situation at certain stages. Approximately, around 12,000 years ago, when our distant ancestors were living as hunters and gatherers, we had a fairly small number of people living in bands and tribal organizations. The people at that time had an abundance of natural resources having been regarded by anthropologists as an 'original affluent society' (see Sahlins, 1972). But as population increases and multiplies successively, the

abundance of games and animals fell short, more and more people started putting pressure on games and animals, aquatic resources, birds and fishes. When people moved to agriculture and due to tremendous pressure on land, the quality of the soil was reduced and the "extent of the forests available for energy production set an upper-limit in the amount of energy and gas be extracted from a given environment by means of a technology of energy production" (Harris, 1985, p. 208). This is what the anthropologists most often regard as 'carrying capacity', to indicate about population density. Although, carrying capacity is often hard to measure, yet it is possible to make a rough assessment of the situation by comparing a certain number of people and their circumscribed environmental resources.

Rappaport (1968) conducted an anthropological study on the food energy system of the Tsembaga Maring people who were living in some semi-permanent villages on the northern slopes of central highland of New Guinea. Because of a very small number of people at that time, they could satisfy their required caloric needs and protein-intake by exploring their surrounding environment with very simple technology and also employing their own indigenous slash-and-burn agriculture. Another example of food procurement and calorie-intake has been studied by Lee (1979) who identified a group of people named! Kung San in the Kalahari Desert on both sides of the border between Botswana and Namibia in southern Africa. In terms of abundance, the Kung had plenty of natural resources that their women's gathering of nuts and vegetables provided them with 60% of the protein intake and the remaining part was provided by animal sources. Thus, anthropologists around the world have depicted enormous examples where the low density of population yielded more availability of food calories. Now the situation has changed where the per capita food consumption and protein intake has gone down to these nonindustrial societies due to over-pressure of population.

Although 80% of the global food-intake of human beings comprises cereals, per capita consumption of it has gone down drastically putting people in severe crisis of food and nutrition (see FAO, 2002a; FAO, 2002b). As late as 1981, the World Bank reported that "while there is no evidence that outright starvation has become more pervasive, nonetheless the number of malnourished people has probably increased and the position of particular groups and certain areas may have deteriorated seriously" (see Goldthrope, 1984) (Note 4). Although world food problems were not shown as having any base on any particular local issue, a few studies on certain countries may give us some ideas about the intricacy of this issue.

To supplement such food deficiency in the Third World nations, the very concept of Green Revolution has been introduced through HYV grains, chemical fertilizer and mechanized productions which boost food production and as a matter of fact, it apparently attracts many people. The local species for indigenous food production is now sharply replaced with the new plants called high-response varieties (HRVs).There are plenty of researches which report that incidence of poverty in Bangladesh appreciatively had fallen down to 31.9% in the year 2000 having a tolerable reduction of it from 41.5% in 1990(see Alauddin & Quiggin, 2008). Such an encouraging improvement in poverty however, is simply due to multiplication of food grain at a cost of chemical fertilizers and mechanized irrigation. Although food production has increased in many underdeveloped countries with the collective effort of Green Revolution, in most poor countries, grain produced by them is eaten by its own people. This is simply because of the pressure of population. When we have billions of mouths to feed and provide them with subsistence, certainly we have to find some alternative strategies for their survival. Under such situation, many underdeveloped nations become the victims of neo-colonial political oppression. This is what happened in the case of Bangladesh when its "own food production was poor, the international market was tight, and it had to find extra foreign exchange to pay for expensive oil. But food supply was dropped in response to the general shortage". (Goldthrope, 1984, p. 114).

4. Population Growth, Access to Land and Food

4.1 An Ethnographic Example from Two Villages in Bangladesh

Per capita access to land, availability of food and assessment of the malnutrition situation have always been the best indicators for making a judgment on demographic pressure on resources; in the context to Bangladesh, it becomes quite true. As recently as 2013, the United Nations in collaboration with SRDI (Soil Resource Development Institution) of Bangladesh has conducted an extensive survey on land loss in the country. The report clearly mentions that the loss of cultivable land in the country in the last decade increased to five times more and in this context, every year more than 68,000 hectares of cultivable land is taken for non-agricultural activities and other purposes (BD News, 2013) (Note 5). This can be exemplified particularly by incorporating a case study of two villages named Dhononjoipara and Gopalhati in the north-western part of Bangladesh as part of an ethnographic research conducted by the author (see Karim, 1990). This ethnographic detail was conducted in 1984-1985 and the book was published in 1990; its data however, is further supplemented by researcher's

re-work on it again in 2011-2012. The villages of Dhononjoypara and Gopalhati are situated in the same physiographic and environmental region at a distance of four-kilometers of each other. They belong to the same culture area, to the same regional economy and are also bounded in the same administrative zone. Yet, they have differences in density of population, literacy of the people, their migratory features as well as in terms of their availability of governmental institutions which provide services for modern cultivation.

To focus on population increase and to relate it to land use trend in the villages, it is essential to provide some data on the village settlement. When the first village census was conducted during the British era in 1850, Dhononjoypara had only 9 acres of homestead land and a huge amount of remaining 196 acres were used for cultivation and other purposes. During the Revisional Settlement Survey of 1968, the amount of cultivable land was reduced to a great extent in Dhononjoypara. Similarly, during 1850, Gopalhati contained 369 acres of land for agricultural purposes which came down to 293 acres in 1968. However, during my revisitation of the villages in 2012, I procured some data on land use which indicated that the villagers are running short of cultivable land as most of these lands have been transformed into homesteads. It was reported by the villagers that the land for settlement went more than double the amount which they originally had during Revisional Settlement Survey of 1968. It has been found that while in the year 1850, only 9 acres of land in Dhononjoypara and 25 acres in Gopalhati were used for settlement, within one hundred years, this requirement increased to 58 acres in Dhononjoypara and 99 acres in Gopalhati (for detailed ethnographic evidence, see Karim, 1990). Although the subsequent census reports did not provide us with land use pattern of the villages as such, we have however, estimated a rough calculation of the homestead land in 2012 when it was found that both these villages accumulated in their possession double the amount of homestead land within a span of 40 years since 1968. This is absolutely because of the increasing pressure of population which required living space for settlement.

More and more land are now occupied for housing, constructing roads and village-ways, building mosques, *madrashas*, schools, local offices and accommodations for many other purposes. It therefore becomes quite clear that David Pimentel's hypothesis in regard to 'occupying agricultural land designed for food production purposes throughout the world is taken for other purposes' is now a simple reality. I am in agreement with David Pimentel and my statement in context to Bangladesh has also been substantiated in a few studies of mine in the past (see Karim, 2010; Karim, 2011). When we accept this hypothesis, it becomes quite clear that population growth produces extra pressure; a huge amount of land is now transformed for people's settlement.

4.2 Indigenous Farming Activities and Land Use Pattern in the Villages

In this part of the paper, there is documentation to provide brief information about the agricultural crop production system in the villages showing its direct relationship with the demography. This part of the paper has relied heavily on author's ethnographic research published in 1990 (see Karim, 1990). Statistics provided by Puthia Upazila Agriculture Department during the period of 1980s, it was found an estimated amount of 141 acres of land in Dhononjoypara and 150 acres in Gopalhati were used for various kinds of rice cultivation (e.g., Aus, Aman, IRRI China, BRII, BR10, BR4 and Boro) between 1984 and 1985. After rice, sugarcane occupies the most important acreage of 100 and 130 acres respectively in Dhononjoypara and Gopalhati. The *rabi* crops (i.e. non-cereal and non-heavy plantation crops) include mustard, pulses, turmeric, onions, garlic, ginger, potatoes, etc., 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 sharecropping for the landless, marginal and poor farmers. During my revisitation of the villages in 2011 and 2012, I observed that almost all the villagers have been utilizing their total agricultural land for multiple crop production. Many of the villagers reported 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.

With regard to food consumption, the villagers usually maintain the most traditional way of eating rice, principally three times a day. But it often becomes difficult for the poor and landless families to procure rice as many of them cannot afford it three times a day. Furthermore, I observed the calorie intake pattern of the people by procuring data from some representative families of different class in the villages during the year 2011 and 2012. It seems that most of the poor, landless and marginal farmers eat less protein that what is 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 more succinct way.

Table 1. Agricultural food production system in Bangladesh and its specific examples from Dhononjoypara and Gopalhati villages

Type of Fertilizer used in Food Production		Type of Irrigation System		Type of Food Production	
After 1960s	Prior to 1960s	After 1960s	Prior to 1960s	After 1960s	Prior to 1960s
Chemical fertilizers like potash, urea, TSP	Locally prepared fertilizer named paosh (prepared from cow-dung)	Mechanized irrigation	Dependent on natural rain and seasonal shower	Rice production based on HYV seeds with modern varieties like BR-4, BR-10, BR-11, IRRI China etc.	Indigenous rice production of traditional and local varieties named Aus, Aman and Ropa Aman
Too much use of chemical fertilizer	Other locally evolved materials used for production	Heavy irrigation through shallow tube wells and deep tube wells	Irrigating the land with local tools named jant and chetri	Non-cereal rabi crops using modern seeds	Non-cereal food items produced: like, pulses local moshur, mung and many other local varieties of rabi crops (e.g., spices, potatoes, varieties of beans, etc.).

5. Discussion and Conclusion

Global population has now reached 6.8 billion in 2009; demographers simultaneously calculate the projected growth for 2050 which is estimated to be around 9 billion having an overtime increase of 47% (see Ramchandaran *et al.,* 2008). The concomitant viewpoint further indicates that this increase of population mostly will occur in Asian and African countries specifically putting a large number of Third World nations on these continents under tremendous environmental pressure; food crises and economic sufferings for them will be tremendous in the coming years. In a recent report, it has been mentioned that due to desertification, cropland loss, water scarcity and resource depletion, food production throughout the world could be as much as 25% less than the expected demand of it by the year 2050 (UNEP, 2009). Graziano da Silva *et al.* (2012) in their recent report estimate that the demand for food is expected to increase by 60% by 2050. The effectual reason is the population growth. Consequently, there are multifarious effects of population growth and the most important victim is the agricultural sector which has to take the direct load of it in different ways. Since land is the principal item of food production, it is affected due to population pressure and I have given an example of such continuous loss of agricultural land in two villages of an agricultural community in Bangladesh. On the basis of my field-based ethnographic documentation of the two villages, I have been able to show that within the span of two hundred years, the village land has been reduced to such an extent that people now have to buy food from the market but the situation in those villages however, was not exactly the same in the past. Many villagers reported to us that their forefathers never bought food from the market but pauperization effect caused by landlessness has compelled them to do so. Those who have lost their cultivated land cannot afford to buy food; as an alternative, they have remained unfed or take one meal a day. My field-data clearly show that it is the demographic pressure which caused consecutive land-loss in those villages.

By contrast, anthropologists have clearly mentioned that as long as human population was very small among the hunters and gatherers and among early settlers, people remained in comfortable affluence in terms of their food and nutrition (see Lee & Devore, 1968; Sahlins, 1972; Rappaport, 1968). As population multiplied, food scarcity started to be acute; although at this time, it is to some extent tolerable as many poor nations fully remain dependent on the affluent society for their food. But if it continues to increase, it might not be possible for many developed nations to provision food supply for these nations.

Many people often unrealistically get inspired by seeing the agricultural growth supported by high technology, which according to them is always effective in reducing hunger and malnutrition. Despite the increase of food and agriculture, they must think about the catastrophic destruction which they are incurring on their land. They never think about the destruction of land fertility and damage of the soil which occur due to overuse of chemical fertilizers and modern forms of extensive irrigation. To end this discussion, I would conclude by saying that if we want a better life free from diseases and having proper access to food and nutrition, we have to keep our population size at an optimum level. The lesser number of populations will also allow us to revert suitably to indigenous food production system which is very much essential for a healthy future generation.

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Notes

Note 1. The cornucopian faith is reinforced by emphasizing on the assumptions that there is an abundance of the natural resources; and food production can be increased through mechanized farming and increasing globalization. In this context, they fully disregard the topsoil loss which might degrade the environment by having some other impacts on human life (see Dryzek, 1987).

Note 2. Thomas Robert Malthus is repudiated to be the first theoretician who raised a voice with caution that a geometrically faster growth of population will eventually supersede the food supply and extracted resources putting the human beings in real crisis (see Malthus, 1798).

Note 3. The squeezing of land and depletion of environmental resources is the best example showing the effect of exceeding carrying capacity (see Pimentel, 1998 for details).

Note 4. It must be recalled that during that period (1973-1975), an artificial food crisis was created in Bangladesh by some western super-power to put the Government at that time, in a severe famine-situation. During the years of 1973 through 1975, the country suffered a tremendous food crisis which was predesigned by the western power to make the government unpopular from political point of view. The evidence suggests that western super-powers in 1975 were so much cruel that in that year, they even diverted some food-carrying ships sailed for Bangladesh from the United States to return back.

Note 5. I have procured this information from a national daily named BDNews 24.com of 11 July, 2013. The part of the findings of a larger project has been published in the news media; but the whole findings of the research are however, a full-fledged documentation on this issue. The project was funded by FAO, European Union, and USAID. It was designed by the National Food Policy Capacity Strengthening Program (NFPCSO) of Bangladesh.