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URBAN AGRICULTURE AND SUSTAINABLE DEVELOPMENT, A CASE STUDY DHAPA IN EASTERN KOLKATA

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ABSTRACT

Urban Agriculture is practicing, processing, and distribution of food in or around the city, town and peri-urban area. According to Daniel G. Maxwell (1995) urban agriculture is such an activity which help to the urban peoples in high level of food security and nutrients. But I found out through my study that the agricultural land of eastern Kolkata is made up of urban wastes both solid and liquid therefore it may be harmful for the peoples of the concerned area by the pollutant of the garbage that's why this article examines the health condition of agricultural labours, household peoples of the agricultural area and the daily consumers. This study is also focused on to examine the different trading players with age sex composition, agriculture land ownership and market economy. The work has been done based on the both primary and secondary. Dhapa a local area has been selected for study which lies into two wards (ward no. 57 and 58) of the eastern part of Kolkata in west Bengal. The primary data has been collected through four surveys of agriculture field, household, market and daily consumers in the sample study area. Secondary data related detailed land use, land cover map, ward map of Kolkata collected from municipalities, population related data from census of India. Satellite images are cropped from the Google earth.

Keywords: urban agriculture, trading player, market, health, sustainable development.

INTRODUCTION

From the earlier decades or centuries, we, the human beings are involved in new experiments. Urban Agriculture is one of the new experiments. Urban Agriculture refers to that activity which working on growing of plants, processing and distribution of food within or around a village, town, or city (Bailkey, et al. 2000). Not only the food crops rather various types of activities like

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

animal husbandry, aquaculture, agro forestry, urban beekeeping and horticulture can be involved in urban agriculture (Etienne Nel, et al. 2009). Various non-food productions (wood material, medicines, recreation and leisure) and environmental conservation plan can be covered in urban agriculture (Akinropo C et al. 1992, pp. 263- 267). Usually various characteristics may have seen in urban agriculture viz. mostly cultivated land are near to the market area, high competition for land, uneducated farmers, specialization of crop is high, urban waste i.e. organic waste (both solid and liquid) are used (Rene van Veenhuizen,2006). Urban agriculture mainly practiced outside or on fringes of metropolitan area, suburban, peri-urban area in large scale but in small scale it also located in the front or backyard, rooftop, courtyard, balcony, fence, wall, window sill, or basement of residence (Kimberley et al. 2011).

Urban agriculture plays the major role of sustainable development. Huge amount of urban waste are used for urban farming. It is assumed that 10 percentage of waste water released from whole world is used in cultivation and 100 percentage of waste is used in Santiago in chile and Maxico City. A large amount of waste both in solid and liquid waste have efficaciously used in Wet land of Eastern Kolkata in India and suburban ponds of Dhaka in Bangladesh as nutrient productive medium for vegetable production and fishing (Rahul Gupta el at. 2006, pp. 1757-1760). According to Rahul Gupta vegetable Cultivation in Eastern Kolkata has not only the environmental significance but also in local economic development. A large amount of urban poor are sustain their live from this economic activity in urban land. Another group of people living in the city get fresh vegetables. Everything has positive and negative impacts. Urban agriculture also has some negative impact. Urban agriculture is practiced with various pollutants generated from the industrial, commercial and residential affects the soil, air, water which usually used in urban farming. Industrial solid, liquid, inadequate waste disposal and automobile exhaust are that pollutants contain heavy metals in the soil, air, water and on plants. It might harmful for cultivators, consumers, environment and also appearance of the city (Jac Smit et al. 2001). Takawira and Shingirayi (2006) argued that urban agriculture has potential risks for human health but this negative effect can be reduced if the urban agriculture practiced properly and it is possible when municipalities will develop and implement the policies that might minimize health risks without compromising the food production needs of urban poor.

OBJECTIVES

The paper is focused on three objectives: first is to find out socio economic condition of agricultural labours and cultivators, second to examine the trading players of market and finally third to examine the health condition of agricultural labour, households of Dhapa and daily consumers of agricultural product which produced at agricultural field.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

DATABASE AND METHODS

The present work is mainly based on the both primary and secondary data.

First stage: Primary information has been collected through intensive field survey, which is based on four type survey first related to the agricultural field survey to know health condition of the people. Second market survey for identification of market players, third household survey of farmers and labours to know health socio economic condition and forth is households of market surrounding area to know health condition of daily consumers of agricultural product. 5 percent respondent (90 respondent) has been selected for sample household study to the total agricultural labour and cultivators i.e. 1802 (1214 agricultural labours and 588 cultivators) from selected study area as per census of 2011. From the total sample 90 households among them 60 household has been surveyed of agricultural labour and 30 cultivators. Second stage: There are four hamlets (Arupota, Durgapur, Mukuttala, Sahebabad) in the study area were taken to collect the information about health and socio-economic condition.10 respondents were selected from each hamlet. Third stage: There are four markets (Muthpukur, Damdam, Parkcircus, Garia) were selected to collect the information about cost of different vegetables, to identify market players. Fourth stage: Fourth survey was done at those three markets surrounding areas to collect the information of health condition of respondents living in market surrounding areas and of those persons who approximate daily consume such urban agricultural product.

Secondary data related detailed land use, land cover map, ward map of Kolkata collected from municipalities; population related data from census of India. Satellite image are cropped from the Google earth. Maps, tables, diagram are prepared by computer using MapInfo software 7.0, Microsoft office word and excel 2007.

STUDY AREA

Ward number 57 and 58 Dhapa of Eastern Kolkata which is selected for study is located at the eastern fringes of Kolkata city. It is the largest and oldest integrated resource recovery practice based on a combination of agriculture, aquaculture and horticulture. It is situated between 22º25´N to 22º40´N and 88º20´E to 88º35´E and adjacent to the eastern part of Kolkata bordering the salt lake on the one hand and the upcoming new township at Rajarhat on the other. It is contain 12741 hectors area in total (Sayan Bhattacharya et al. 2012). Out of total area 45.93% (5852.14 ha.) contains water bodies, 38.92% (4959.86 ha.) agricultural land, 4.37% (602.78 ha) garbage disposal site, 10.42% (1326.52 ha) settlements (EKWMA, 2014). Actually it's the part of the mature delta of river Ganga (Sayan Bhattacharya et al. 2012). The study area is belonging with two wards of Kolkata metropolitan city i.e. ward number 57 and 58. The total population these two wards is 138321 among them 1214 are agricultural labours and 588 are

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

farmer or cultivator (Census of India, 2011). So only 1.30 percent (1802 persons) of total populations of these two wards (57 and 58) are mainly depend on agricultural economic activity (Census of India, 2011).

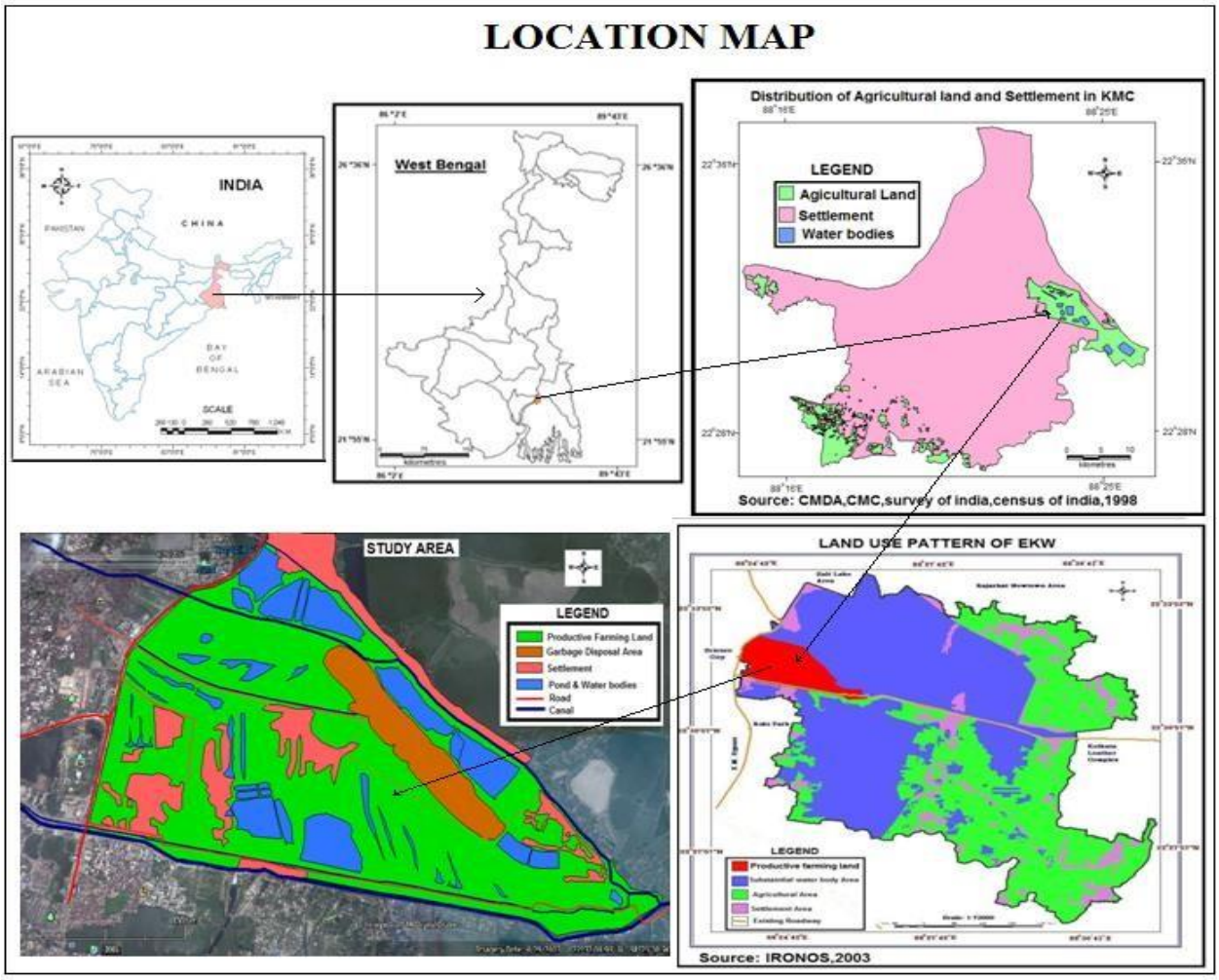

Figure 1: location map of study area.

Maps are prepared by author.

Socio economic condition of the study area: To know about the socio economic conditions of the study area entire households have been categorized in to four income levels. This grouping has been done according the monthly income of the sampled population of the concern area.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 1.1: showing the income of the sampled households of the study area

Income groups	Monthly income of the sample household (Rs.)	Total sampled households	
		Number	Percentage
Very low	Less than 3000	12	13.33
Low	3001-6000	20	22.22
Medium	6001-9000	48	53.33
High	Above 9000	10	11.11
Total	-	90	100

Source: Primary survey 2014

Table 1.1 shows the status of the income structure of the sample respondent which explain that out of 90 respondents the 13.33 percent have been recorded under very low income group that is less than Rs. 3000 per month. On the other hand 22.22 percent respondents reported for low income group (Rs.3001-6000). But the highest percentage that is 53.33 percent of the sampled respondent has been recorded under the medium income group (Rs.6001-9000). The high income group (above Rs.9000) which includes only 11.11 percent sampled respondents in the study area.

So from this table (table 1.1) it is observed that highest percentage of people earn only Rs. 6001 to 9000 per month. This income structure represents not so well condition of peoples associate with agricultural activity.

Transports: A pitch road of 4 km is the main communication way for the peoples of the study area which runs through the middle of the Dhapa. Few dirt roads (which are not paved) are connecting all settlement with the main road.

Types of Houses: Types of houses are one of the important tools to identify the socio economic condition of any region. It also represents the living standard of the people of any region. Types of houses are categorized through the materials that used to build the houses. There are three types of houses are seen in the study area i.e. kucha (made by mud, bamboo, plastic, etc.), pucca (made by bricks, cements, asbestos etc.) and semi pucca (made by mud bricks, bamboo, tin, thatch etc.).

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 1.2: Types of houses at the study area, Dhapa

Monthly Income	Type of Houses in percentage		
	Kucha	Semi Pucca	Pucca
Very low	13.33	8.89	0.00
Low	13.33	11.11	1.12
Medium	4.44	15.56	11.11
Very high	0.00	7.78	13.33
Total	31.10	43.34	25.56

Source: Primary survey 2014

Table 1.2 illustrated that very low and low income group have kucha houses (13.33 percent) while on the other hand medium income group people have semi pucca houses which is majority among all income group. It is easily identified from this analysis that lower income groups have kucha house and higher income groups have pucca and semi pucca house. Though minimum peoples of the study area are categorized into high income group so minor amount of pucca house have seen in the study area. Therefore socio economic condition is not so well of the study area.

Literacy Rate: Literacy is that indicator which reflects the education status of a region. In this study total households are categorized into six age groups these are 10 to 15, 16 to 25, 26 to 35, 36 to 45, 46 to 55 and above 55. This classification of age groups has help to understand about the literacy among different age groups. From the table 1.3 represents that 40.81 percent male and 29.72 percent female literate of total sampled households. It has been observed that total 70.53 percent households of sampled population is literate among them maximum are child (bellow 14 years old) and minimum percentage are old (above 35 years old).

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 1.3: showing the literacy rate of sampled household at the study area

Age Groups	Percentage of total sampled households		Percentage total literacy of sampled households		Percentage of total illiteracy of sampled households	
	Male	Female	Male	Female	Male	Female
10 to 15	14.36	11.59	12.59	8.82	1.76	2.77
16 to 25	10.08	7.30	7.81	5.54	2.27	1.76
26 to 35	9.32	7.81	7.05	5.29	2.27	2.52
36 to 45	9.82	7.30	5.79	3.02	4.03	4.28
46 to 55	7.56	5.54	4.53	3.53	3.02	2.02
55 above	4.03	5.29	3.02	3.53	1.01	1.76
Total in Percentage	55.16	44.84	40.81	29.72	14.36	15.11
	100		70.53		29.47	

Source: Primary survey 2014

Survey profile of working men at urban Agricultural field: Urban agriculture provides job opportunities for the urban poor and Dhapa farm land is an example of this situation. A large amount of urban poor of wards 57 and 58, are involved with this agricultural field.

Table 1.4: Survey profile of working men at urban Agricultural field

Name Of Settlement	Total Respondents	% Of Respondents	Types of Respondents				Average Distance Of UAL (in km)
			Farmer		Labour		
			Total farmer	% of farmer	Total labour	% of labour	
Arupota	23	25.56	8	26.67	10	16.67	1.9
Durgapur	23	25.56	10	33.33	18	30.00	1.5
Mukuttala	23	25.56	7	23.33	17	28.33	1.9
Sahebabad	21	23.33	5	16.67	15	25.00	1.17
Total	90	100.00	30	100.00	60	100.00	-

Source: Primary survey 2014

*** UAL- urban agricultural land

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Table 1.4 shows about the survey profile of working men of Urban Agricultural land at the study area. There are 4 settlements of wards number 57 and 58 which has been selected for survey as the sample area. These are Arupota, Durgapur, Mukuttala, and Sahebabad. There are 23 respondents selected from Arupota, 23 respondents from Durgapur, 23 respondents from Mukuttala and 21 respondents from Sahebabad. Total 90 respondents are selected from these 4 settlements. Among these 90 respondents 30 are farmer and rest 60 are labourer who are working at this Agricultural field as a worker know as 'jon'(called in local language). Table also shows the average distance of respondent's home from their Agricultural field. Respondents of Arupota wise to move 1.19 km to their agriculture field from home. 1.5km for Durgapur's respondents, 1.9km for Mukuttala's respondents and 1.17km for Sahebabad's respondents have to travel to go their Agricultural field.

Land ownership of the Agricultural field at the Study Area: Dhapa contain 4959.86 (Sayan Bhattacharya et al. 2012) hectors area for agricultural land. This agricultural land has been reducing day by day due to urbanization. Newly constructed fly over occupy huge area from this agricultural land. Two types of land holders have been identified at the study area these are own land holder and rental land holder.

Table 1.5: Land ownership of the Agricultural field at the Study Area

Amount of Agricultural land (in bigha)	% of respondents of land ownership		Total percentage of ownership in different category
	Owner	lease	
<0.5	13.33	13.33	26.67
0.6-1.0	10.00	6.67	16.67
1.1- 2.5	6.67	20.00	26.67
2.6 - 3.5	6.67	13.33	20.00
>3.6	3.33	6.67	10.00
Total in %	40	60	100

Source: primary survey 2014

Table 1.5 shows the Agricultural Land owner ship at the study area. There 2 types of categories have been seen for land ownership at study area. These are owner of the land and another is lease from the other. First of all total of agricultural land categorized into five groups that is <0.5, 0.6-1.0, 1.1-2.5, 2.6- 3.5, and <3.6 (bigha). Among these categories 26.67 percent of total respondents have less the 0.5 bigha amount of Agricultural land among them 13.33% both in

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

owner and lease. 16.67 percent have 0.6-1.0 bigha Agricultural land among which 10% have own agricultural land and 6.67% have taken agricultural land by lease. 26.67% of respondents have 1.1-2.5 bigha Agricultural land in which 6.67% have own agricultural land and 20% of total farmer have taken agricultural land as lease. 6.67% of total farmers have 2.1-3.6 bigha of Agricultural land among them 6.67% have their own agricultural land and 13.33% have taken the land as lease from other. 10 % of total farmers have 3.6 bigha amount of Agricultural land at study area.

Age and sex composition of working men at Agricultural field

Table 1.6: Age and sex composition of working men at Agricultural field

Type of Respondent	Number of respondents		% of respondents		Age Structure of Respondents in percentage						
	Male	Female	Male	Female	<35	36-40	41-45	46-50	51-55	56-60	>61
Farmer (N=30)	26	4	39.39	16.67	5.56	8.89	11.11	1.11	4.44	2.22	1.11
Agricultural Labour (N=60)	40	20	60.61	83.33	12.11	24.44	15.56	5.56	3.45	3.33	1.11
Total	66	24	73.33	26.67	17.67	33.33	26.67	6.67	7.89	5.56	2.22

Source: Primary Survey, 2014

Note: N denotes number of Respondent.

Table 1.6 shows Age and sex composition of working labour at agricultural field. Among total respondents (90) there are 66 male and 24 female works at agricultural field. All the ages are categories into seven groups that is <35, 36-40.41-45, 46-50, 51-55, 56-60, >60. Out of all respondents 73.33 % are male and only 26.67% are female. 17.67 percent respondents who are less than 35 years old, 33.33 percent respondents who are come under 36-40years category, 26.67 percent respondents come under 41- 45 years age category, 6.67 percent respondents are come under 46-50 years age category, 7.89 percent respondents are come under 51-56 years age category, 5.56 percent respondents come under 56-60 years age category, and only 2.22 percent respondents who are above 60 years old. Most of people are working in the study area that is 36-40 years old. Only few people whose are above 60 years old, working at the study area. Therefore it is revealed from this table (table no.1.6) that maximum labourer of associated with Dhapa are more than 35 years old and maximum percentage illiterate peoples living in the study area who have more than 35 years old. So it is concluded that maximum peoples engaged with

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

the agricultural activity are illiterate.

Cultivator and Retailer: Vegetable production in waste land of eastern Kolkata plays an important role for local economic development. It also reflects from the study that there are various types of agricultural trading players (cultivators, agricultural labour, direct seller, middle man retailer, agencies etc) involves with the urban farming.

Table 1.7: showing the different players at agricultural field

Amount of Agricultural Land In Bigha	Number of Respondents in %	Trading Players in %		
		Direct	Middleman	Agencies
<0.5	26.67	16.67	10.00	0.00
0.6-1.0	16.67	3.33	13.33	0.00
1.1- 2.5	26.67	6.67	20.00	0.00
2.6 - 3.5	20.00	0.00	6.67	13.33
>3.6	10.00	0.00	3.33	6.67
Total in %	100.00	26.67	53.33	20.00

Source: Primary survey 2014

Table 1.7 showing the different trading players are dealing with the vegetable crops at agricultural field. According to amount of land of the farmers all agricultural land are categorized in five groups that is <0.5, 0.6-1.0, 1.1-2.5, 2.6-3.5, and <3.6 (bigha). Table represents 26.67% farmers have less than 0.5 bigha agricultural lands and among them 16.67% and 10% are wise to sell their vegetable direct to the consumers and middleman respectively. 16.67% of total farmer have 0.6-1.0 Bigha agricultural land. In this category only 3.33% of farmer are sell their vegetable direct to the consumer and 13.33% through middleman. 26.67% farmers have 1.1-2.5 Bigha agricultural land; in this category 20% farmers are wise to sell their crops through middleman. Last two categories these are 2.6-3.5 bigha and greater than 3.6 bigha, the maximum farmer (13.33% and 3.67% respectively) are wise to sell their crops to the agencies. From the above discussion it may be concluded that those farmers have small amount of agricultural land they wise to sell vegetable direct to the consumers. Those farmers have 1.1-2.5 bigha agricultural lands are wise to sell direct to the consumer as well as through middle man. On the other hand maximum amount of land holders' are wise to sell or deal their vegetable through agencies.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Trading Market:

Table 1.8: Trading markets trade by different worker:

Amount of agricultural land(bigha)	Trading markets in %				Total in %
	Mutpukur	Parkcircus	Damdam	Garia	
<0.5	16.67	10.00	0.00	0.00	26.67
0.6-1.0	10.00	6.67	0.00	0.00	16.67
1.1- 2.5	10.00	10.00	0.00	6.67	26.67
2.6 - 3.5	3.33	3.33	6.67	6.67	20.00
>3.6	0.00	0.00	0.00	10.00	10.00
-	-	-	-	-	100.00

Source: primary survey, 2014

Table 1.8 introduces the different trading market of the study area. Cultivators of the study area are like to trade with four markets most these are Mutpukur, Parkcircus, Damdam and Garia and the distance of these markets are 2 km, 8.3 km, 12.3 km, and 12.5 km respectively. From the analysis it has been reflected that the trading of the cultivators with the different markets depends on the amount of agricultural land. At first all the agricultural lands of the sample population are divided into five categories i.e. <0.5, 0.6-1.0, 1.1-2.5, 2.6-3.5, and <3.6 (bigha). The cultivators, those who have small amount (less than 0.5 bigha) are like to sale their cultivated vegetables nearest market that is Mutpukur. Here (table 1.8) shows 26.67 percent have less than 0.5 bigha agricultural land among them 16.67 percent wise to sale the vegetable product to the nearest market i.e. is Matpukur which is 2 km long from the farm land. Maximum (10 percent) medium land (1.1 to 2.5 bigha) holders are like to cover the market (viz. Mutpukur and Parkcircus) which is not too far from the farm land. While on the other hand maximum percentage (6.67 and 10 percent) of large land (2.6 to 3.5 and above 3.6) holder wise to sell the vegetables to Garia and Damdam which cover long distance (approximately 12.5 km and 12.8 km respectively) from the farm land. So it is concluded from the forgoing analysis that small amount of land holders wise to sell their cultivated vegetable to near markets to reduce the shipping cost or traveling cost and on the other hand farmer having large land are use to travel longer distance in order to capture large market.

Frequently arrival Disease: It is clearly revealed from the analysis that various types of diseases are largely spread within the agricultural field as well as slums of the study area.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Maximum agricultural labours, cultivator and their family member are affected by various diseases. It has been found from four primary surveys that skin disease, head ache, malaria are salient feature seen among the urban agricultural labours who are work in the waste land. It also found from the primary survey that respiratory disease and head ache are prominent among the daily consumer of vegetable which cultivated within the eastern Kolkata (study area).

Table 1.9: Percentage of suffering from disease respondents at Agricultural field, Households within agricultural field and daily consumer of market surrounding area

Disease	% of Agricultural labour at study area	Households of study area	Daily consumer of agricultural product of study area
	% of affected households		
Malaria	5.56	8.75	3.75
skin disease	16.67	15.00	5
Head Ache	14.44	12.50	8.75
Eye itching	7.78	3.75	5
Diarrhoea	5.56	3.75	7.5
Weakness	11.11	10.00	6.25
Respiratory disease	5.56	3.75	10
Typhoid	3.33	2.50	6.25
Total % of affected sample	70.00	60.00	52.5
Total in %	100	100	100

Source: primary survey, 2014

Table 1.9 reflects that large percent peoples both agricultural labours (70%) and household family members (60%) at agricultural field are highly affected by various diseases. The workers of the study area are highly affected by skin disease, head ache and weakness those are 16.67 percent, 14.44 percent and 11.11 percent respectively. These diseases are prominent among the agricultural workers because they work at a polluted environment. The household family members at agricultural field are also affected more or less same as workers of agricultural field. Skin disease (15%), head ache (12.50%), weakness (10%) and small percentage of malaria (8.75%) are common among the family members living at the garbage dumping area.

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

Households at market surrounding area are also taken as sample for gathering information about health and occurrence of disease. Mainly those peoples who are daily consuming the vegetables which are cultivated at garbage dumping area of eastern Kolkata are conceder as sample. Among them, 10 percent households have suffered from respiratory disease and 8.75 percent and 7.5 percent households experience eye head ache and Diarrhoea respectively.

Sustainability in urban agriculture of Dhapa

Dhapa contain 4959.86 hectors agricultural land which is 38.92% of total area of Dhapa (EKWMA, 2014) and this agricultural land is made by urban waste (both organic and inorganic). According to eastern Kolkata wetland management authority's report (2014) Kolkata city generates 2500 tons of garbage a day. These waste materials are reused through the vegetable production. From the primary survey it has been extracted that 80% respondents are not use any pesticides, herbicides, insecticides and fungicides so waste materials are used as organic fertilizers. That's why Dhapa as an urban agricultural land plays an important role for sustainable development though production and marketing of consumable products. A large percentage peoples of Arupota, Durgapur, Mukuttala, and Sahebabad are depends on this productive farmland. A number of benefits that have emerged from the Dhapa's vegetable cultivation for example developed socio- economic conditions by providing jobs opportunities for the urban poor and reduce food costs for the urban peoples. But somehow agricultural labours are affected by the waste pollutants of Dhapa. So government should provide some awareness programmes about heath and make a suitable condition for the cultivation.

CONCLUSION

From the above discussion through empirical observation it may be concluded that urban agriculture of Dhapa provides lots of opportunities for the urban poor and people earn according to their holding land size through urban farming. Dhapa also plays an important role for sustainable development. Huge amount of garbage dumping ground is reused through urban agriculture and this garbage is utilized as organic fertilizer. So it reduces the input expenditure of farmer and gives maximum output throughout the year. Three main types of trading players are identified from this study area i.e. i) the farmers who sell agricultural product directly to the consumers, ii) the middle man who buy the agricultural products from the farmers and sell to the consumers, iii) the agencies who distribute agricultural products to the market, collecting huge agricultural product directly from the farmers. These trading players conduct the whole retailing system of agricultural products of the study area. A strong relationship between working labour and disease can be observed from this study. Maximum agricultural labours suffer from skin disease, eye itching and headache because they are directly engaged with garbage dumping

ISSN: 2455-8834

Volume:03, Issue:08 "August 2018"

ground. Rests of the people at Dhapa slightly suffer from the same diseases as they live in the polluted surroundings. Another disease Malaria is somehow prominent among the households due to shorting of living space and wet environment. The daily consumers also affected by the respiratory illness.

Though the Dhapa's agricultural land is one of the best examples of sustainable development so government should take some policies and programmes to reduce the pollution problem of the concern area. It also extracted from the study that maximum peoples working at this agricultural field are illiterate that's why they are not aware about the pollution of Dhapa. So not only government but also the peoples of the Kolkata city should take active participation on awareness programmes about pollution, health, education and so on to this make this farm land more sustainable.

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