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DIVERGENCE OF FOOD AND NUTRITIONAL SECURITY- A STUDY ON WESTERN ODISHA

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Abstract

Food security and nutritional security are the subsets of livelihood security. Poor nutritional outcomes of infants and children arise from the poor health status of women, overall poverty, lack of hygiene and inadequate health facilities. The study discusses the divergence between food security and nutritional security in the state as a whole and the region in particular.A multi stage random sampling technique has been adopted for the collection of data.Statistical analysis used for drawing valid inferences are testing of hypothesis, chi square test, regression analysis and fitting of trend lines. In the present study an attempt has been made to address the issues namely: i) incidence of malnutrition and food insecurity through three critical links viz. children, adolescent girls and women, ii) surplus/deficit of production of cereals, pulses, food grains and oilseeds as per requirement iii) trends of production and availability of secondary diets such as egg, meat, fish and milk iv) indicators of malnutrition. Production must be diversified from cereal crop production like paddy to other crops.A life-cycle approach to management was adopted that integrates strategy, people resources, processes and measurements to improve.
Key Words: *Food security, Malnutrition ,Nutritional security, Secondary diet.*

1. Introduction:

Food, nutrition and livelihood security are essential for a nation. Food security and nutritional security are the subsets of livelihood security. Food insecurity exists whenever food security is limited or uncertain. The measurement of food insecurity at the household or individual level involves the measurement of those quantitative, qualitative, psychological and social or normative constructs that are central to the experience of food insecurity, qualified by their involuntariness and periodicity. Risk factors for food insecurity include any factors that affect household resources and the proportion of those resources available for food acquisition. Potential consequences of food insecurity include hunger, malnutrition and (either directly or indirectly) negative effects on health and quality of life(Campbell,1991). The selection of food and nutrition security(FNS) indicators to screen, diagnose and evaluate interventions at individual and household level, hence needs to be coordinated across these disciplines. The selection of FNS indicators (status and drivers) should also make reference to the time scale and geographical pattern of FNS outcomes. In such situations of food insecurity caused by a sudden drop of purchasing power and access to food, indicators should provide information about the immediate needs for essential nutrients derived from specific food commodities. They have classified four dimensions to FNS: availability, access, utilization and stability. At the macro level, indicators of macro-economic profiles

such as agricultural import tariffs, inflation rate, exchange rate and food price index are considered as important FNS access indicators. The presence of effective and efficient safety nets, micronutrient interventions, food reserves and institutional regulation are all important drivers of FNS to keep track of (Pangaribowo,Gerber & Torero,2013)**.**Normalization and weighting are not very crucial decisions, whereas special attention has to be paid in choosing the data imputation and aggregation methods. He emphasized transparency on the steps to build the index for judgment or comparison with existing indicators (Santeramo,2014).

Poverty and inability to purchase adequate food leading to under nutrition and micronutrient deficiencies persist even today among the poor segments of population. Body size and physical activity levels are two major determinants of human nutrient requirements. The nineties witnessed the emergence of dual nutrition burden in all the countries with persistent inadequate dietary intake and under nutrition on one side and low physical activity/ food intake above requirements and over nutrition on the other side. The persistent high underweight rates in preschool children have been a matter of serious concern in India. As both under-and over nutrition are associated with health hazards, India has to combat and prevent dual burden of under nutrition and over nutrition(Ramachandran, 2013). Ensuring food and nutrition security is a challenge for India, given its huge population and high levels of poverty and malnutrition. The level of food absorption is also low. Food and nutrition security is broadly characterized by three pillars: availability, accessibility, and absorption (nutritional outcomes). The Integrated Child Development Scheme and Mid Day Meal Scheme are two flagship public programs directed toward addressing the nutritional outcomes for women and children. There are other food-based programs targeted to ensure the nutritional security of the vulnerable groups. Growth alone may not be able to ensure food security for the poor and vulnerable. Poor nutritional outcomes of infants and children arise from the poor health status of women, overall poverty and lack of hygiene, and inadequate health facilities. It is also true that higher growth resulting in better employment and income opportunities is a more sustainable solution to ending poverty and hunger. This is in line with the inclusive growth principle of the country (Nandakumar, Ganguly, Sharma & Gulati, 2010).

The Food and nutritional insecurity prevails even in the food-surplus areas, with low-income households being more vulnerable to it. The access to food determined by the level of income and family-size has been found as the most important factor influencing food and nutritional security in food-surplus areas. Increase in production alone does not ensure food and nutritional security. The incidence and depth of food and nutritional insecurity and its determinants has been estimated in a food-surplus area, e.g. the state of Punjab. Almost 76 per cent of the rural landless households were food insecure, with 27 per cent deficiency in food intake than the requirement. Rural and urban labourers as well as other poorly asset-backed and low-income households are more vulnerable to food and nutritional insecurity. They suggested that income and employment opportunities for more vulnerable sections of the society will have to be augmented to alleviate their food insecurity and malnutrition(Sidhu,Kaur&Vatta,2008).Considering a large set of estimates on income elasticity for calories, protein, fat, zinc, iron and vitamin A, they found that changes in consumption patterns in response to price and income change could impact on nutrient intake with related positive or negative consequences. Through meta-analysis, calories and proteins were found to be more income-inelastic than fat and micronutrients, which was found to be more sensitive to income changes (Santeramo & Nadia, 2015).

Western Odisha regions are frequently visited by natural calamities including severe droughts and floods. Persistence of heavy incidence of poverty in these regions is a cause of concern. The longer-term problem related to malnutrition and poverty is referred to as chronic food insecurity, which is largely due to, continued lack of access to productive assets and employment. Agriculture plays an important role in tackling the problem of chronic food

insecurity by providing livelihood to the poor. The state's coastal areas are relatively better off, but the hinterland which also inhabits vast Scheduled Tribe (ST) population in hilly and forest terrain, is quite backward. The majority of total ST population is concentrated in the western districts of Ordisha.Traditional agricultural system, indigenous knowledge were neglected, demeaned, discarded at last for establishment of capital-based agriculture.First green revolution has played an important role to achieve their aim. Now farmers are completely dependent on market for seeds, fertilizers, pesticides coupled with dependent on government and non-government institutions for begging loan. It is worth mentioning that fertile soil is important rather than hybrid seed. More importance on paddy and wheat destroyed our food basket with different varieties of food and self-sufficiency of food. There is acute shortage of Millets like *Desi Mandia, Bazra,Kudo, Koshla, Suan, Guruji, Kangu, Zuar, Gangei.* varieties of dal like *Mung, Biri, Kandul, Harhar* etc., varieties of oil like coconut, Mustard, *Til, Methi* etc., varieties of *Masala* and vegetables. Millets in our country linked directly with portentous food basket, food security, and ecological protection. Crop failures occur due to lack of irrigation facilities, scanty rainfall, natural calamities and crop diseases. Now a day there is no other alternative provision for farmers in the occurrence of crop failure of paddy and wheat. The population of this region suffers from high morbidity on account of under nutrition as well as endemic malaria and other life threatening diseases. The people living in this region lack in their awareness on various aspects of life including lack of access to various amenities and opportunities created and also to the natural as well as environmental resources around them. Ignorance and inadequate purchasing power to access the resources may have tremendous effect on their health and nutritional standard.

Further, since time immemorial people have been celebrating *Nua-Khai*[1], *Cher Chhera*[2], *Paus-Purnima*[3]. *Nua –Khai* is celebrated in the month of *Bhadraba Sukla Panchami*, which is the season of food insecurity. This festival as a ritual festival played a major role in promoting agriculture as a way of life. As farmers who have already sown all their grains in agricultural fields, it is believed that even birds do not get food during this starvation period. Only '*Saria Dhan*'[4] a short period paddy variety is harvested during this time. The ancient origin of "*Nua Khai*" traced back at least to *vedic* times, when the *rishis*(Sages) had talked *panchayajna*[5], the five important activities in an annual calendar year of an agrarian society(Jamiullah,2014).

The Food Security Act is a reply to food hunger in a holistic manner. One has to deal with three kinds of hunger if food and nutrition security has to be achieved. First, one has to help farm families overcome under nutrition as a result of calorie deprivation. This can be achieved through the provisions of the National Food Security Bill. Secondly, protein hunger is becoming serious due to the inadequate consumption of pulses and milk (in case of vegetarians) and eggs, fish and meat (in case of non-vegetarian). Third, there is widespread hidden hunger, caused by the deficiency of micronutrients like iron, iodine, zinc, vitamin A, vitamin $B_{12,}$ etc. in the diet.

With this backdrop of acceleration of food prices and sharpening of malnutrition, food insecurity and hunger among the poor household, the purpose of the study is to find out the ways and means to tap the divergence between food and nutrition security.

2.Database and Methodology:

A multi stage random sampling technique has been adopted for the collection of data. In the first stage a random sample of three districts comprising of one tribal, one irrigated and one non-irrigated districts were selected out of ten districts of Western Odisha by the method of random sampling. Then one block from the corresponding district and one village from the corresponding block were selected by the method of simple random sampling. These three villages represent one irrigated, one non-irrigated and one tribal village from the

corresponding blocks. In the next stage the sample households were selected on stratified random basis to represent different land classes such as Marginal, Small, Medium, Semi Medium and Large farmers' category. Each category consists of 20 farmers from each village under study. Therefore, there are 300 respondents under study.

In the present study the three sample districts represent Sundargarh(tribal), Sambalpur(non irrigated) and Bargarh(irrigated). The three blocks are Bargaon, Bamra and Attabira of Sundargarh, Sambalpur and Bargarh districts respectively. The three villages are Bhoipali, Bamphei and Sindurbahal of Bargaon, Bamra and Attabira blocks respectively.

Various statistical tools and techniques such as regression analysis to estimate the model parameters and fit the trend lines, testing of hypothesis of attributes through Chi-Square tests are employed for data analysis and drawing valid statistical inferences about the population parameters. The data are classified and represented through tables and bar diagrams for ease of comparison.

3.An overview of Socio-Economic Profile of Odisha

The status of Odisha in Human Development Index(HDI) is alarming the grave situation of socio-economic life of the people. The comparative study of HDI between Odisha and India highlights the status of living condition of people of Odisha(See Table 1). While Odisha could retain its HDI positions at 11^{th} and 12^{th} in the years 1981 and 1991 respectively, its position got worsen to 19^{th} in 2011, indicating the lower status of living standard. It's a challenge for every human being to have an opportunity for healthy and productive life. These are (i) adequate dietary calories to prevent under-nutrition (ii) adequate quantity of proteins to fight protein hunger (iii) eliminating hidden hunger caused by the deficiency of micronutrients like iron,zinc,iodine Vitamin A and Vitamin B_{12}. Hence malnutrition impairs cognitive development, intelligence, strength, energy and productivity. To add this woe, malnourished children are always vulnerable to infections and communicable diseases. In short, malnutrition is a negation to social development. There also appears to be a high correlation between Infant Mortality Rate(IMR) and Maternal Mortality Rate (MMR).Three factors explain a high level of IMR in Odisha:(i) poor availability of professional attendants at birth, (ii) high percentage of low birth weight babies, and (iii) lack of professional pre and post-natal care. The World Bank report finds that most of the retardation in growth in India occurs either during the pregnancy or during the first two years after birth. Critics often argue that the economic reforms have failed to reach the poor and deprived sections of society(Kausal, 2011) (See Figure-1).

Table 1. Human Development Index for Odisha and India

	1981		1991		2001		2011	
States	Index	Ranks	Index	Ranks	Index	Ranks	Index	Ranks
Odisha	0.267	11	0.345	12	0.404	11	0.442	19
India	0.302		0.381		0.472		0.504	

Source : Statistical Abstract of Odisha 2012, PP 825

The infant mortality rate is high in Odisha as compared to India. The three critical links of malnutrition are children, adolescent girls and women. The poor amongst the poor are more vulnerable to chronic diseases because of material deprivation and psychosocial stress, higher levels of risk behavior, unhealthy living conditions and limited access to good quality healthcare. Once disease is established, the poor are also more likely to suffer adverse consequences than wealthier people. This is especially true of women, as they are often more

vulnerable to the effects of social inequality and poverty, and less able to access resources. The percentage of malnutrition of both boys and girls are more than 50% which is alarming the situation. Severe malnutrition may lead to high infant mortality rate (See Table-2).

Table 2. Status of Malnourishment in Odisha

State	Children Weighed		No. of Malnourished Children		Percentage	
Odisha	Boys	Girls	Boys	Girls	Boys	Girls
	1007504	970474	510450	518038	50.66	53.38

Source: Statistical Abstract of Odisha 2012, PP 398.

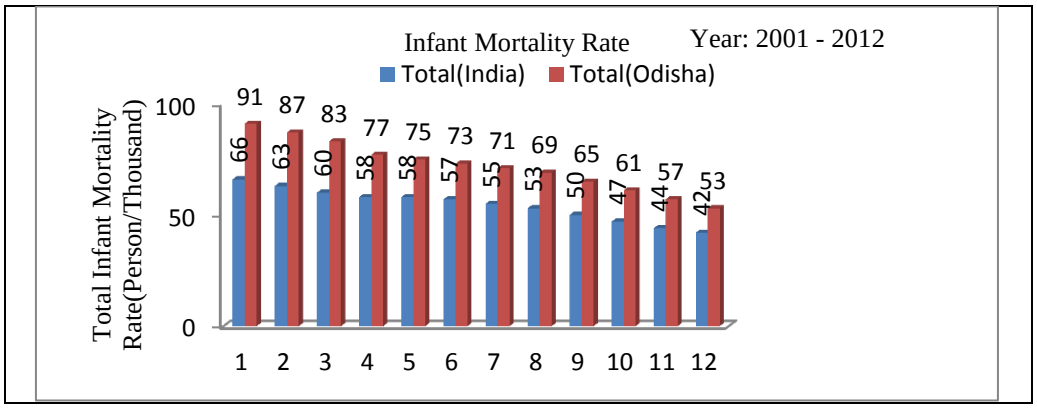
A) Basic Amenities of Life: There is a wide gap between rural and urban in households. Urban was ahead in pucca house, improved drinking water, toilet facility, availability of electricity, use of computer or laptop,mobile phones, use of kerosene and LPG as main source of fuel followed by rural area. Only 82.3 percent have improved source of drinking water facility while 91.3 percent people are living in their own house (See Table-3).

Table 3.Household Characteristics in Odisha (in Percentage)

SL No.	Item	Total	Rural	Urban
1	Households living in a pucca House	39.9	33.8	71.0
2	Households living in a Kachcha House	42.4	47.4	17.0
3	Household living in Own house	91.3	96.7	63.2
4	Households living in Rented house	6.6	2.0	30.2
5	Household having improved source of drinking water	82.3	80.9	89.3
6	Access to toilet facility	25.3	16.7	69.7
7	Availability of Electricity	61.9	56.3	91.2
8	Household using Electricity as main source of lighting	51.4	44.2	88.0
9	Household using Kerosene as main source of lighting	47.9	55.1	10.8
10	Household having separate Kitchen	60.2	57.8	72.5
11	Households using firewood/ Cow dung /residues as main source of fuel used for cooking	80.9	89.2	38.3
12	Households using Kerosene as main source of fuel used for cooking	1.1	0.3	5.0
13.	Households using LPG/PNG as main source of fuel used for cooking	10.4	3.3	47.1
14	Households having telephone/Mobile	42.6	36.2	75.6
15	Households having computer /Laptop	3.9	2.2	12.7

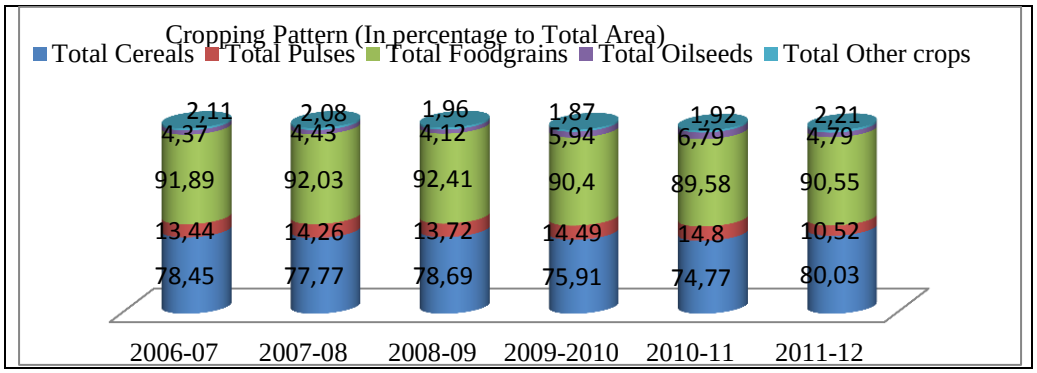
Source : Annual health Survey2010-11,PP-124-130

B) Cropping Pattern in Odisha: There is a strong evidence of mono-cropping in Odisha. Among the food grains total cereals occupied the highest position in percentage to total area followed by total pulses. Total oilseeds and total fibre occupied the insignificant position in percentage to total area. As maximum number of farmers belonged to small and marginal farmers, they do not want to take more risk in horticulture and floriculture because of low risk aversion capacity. Farming is inherently more risky than any other system. Therefore system approach is applied to agriculture for efficient utilization of all resources, maintains sustainability in production and obtaining higher net returns (See Figure-2).



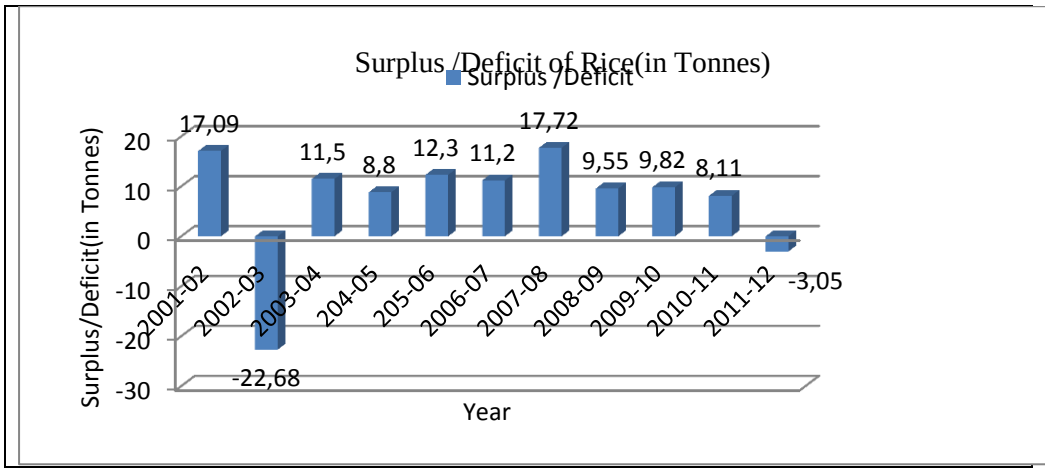
Source: Statistical Abstract of Odisha 2012 PP-402

Figure 1. Infant Mortality Rate (Person/Thousand)



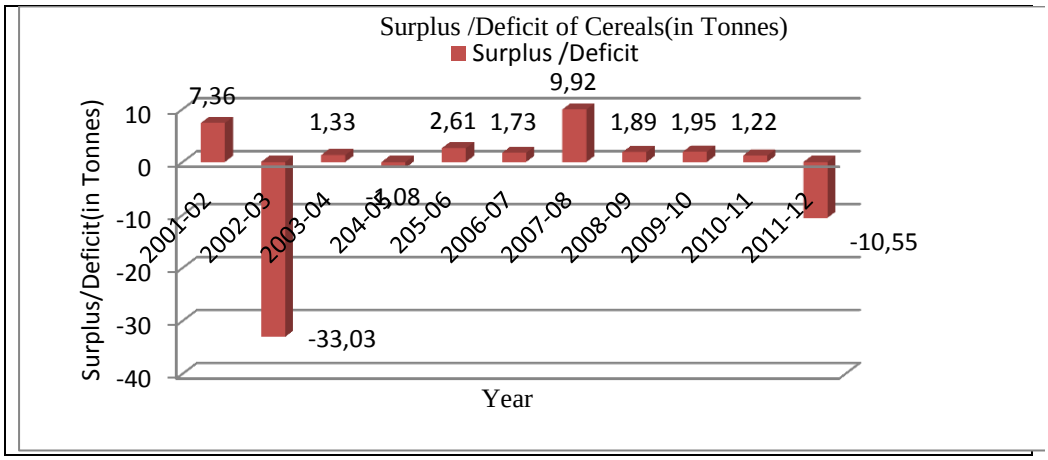
Source: Ecobnomic Survey2012-13,PP 108-109

Figure 2. Cropping Pattern in Odisha (In percentage to Total Area)



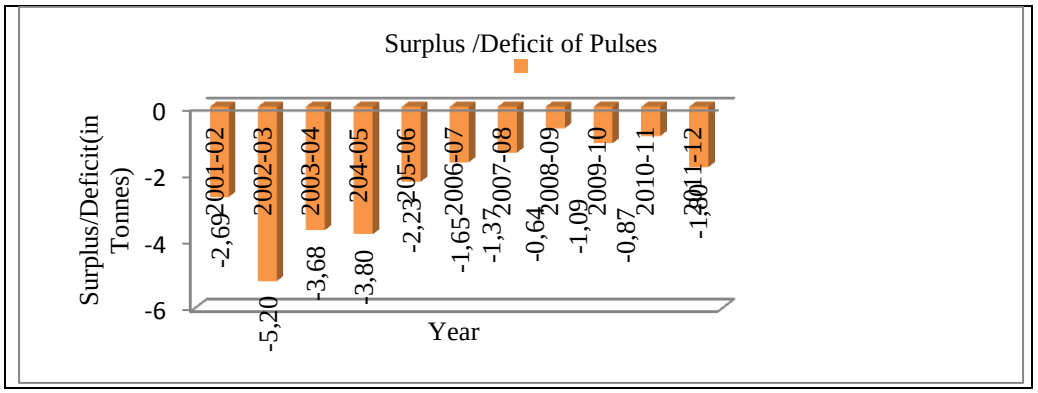
Source: Statistical Abstract of Odisha 2012, P-219

Figure 3. Surplus/Deficit of Rice (In Tonnes)



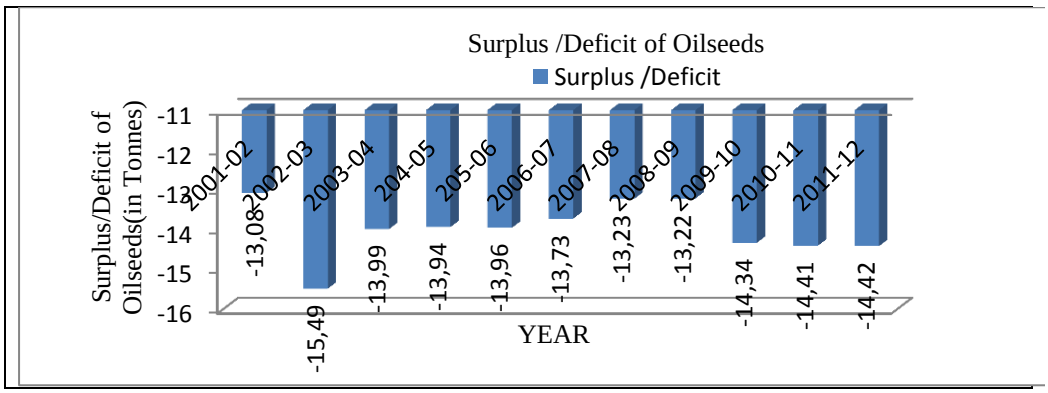
Source: Statistical Abstract of Odisha 2012,P-219

Figure 4. Surplus/Deficit of Cereals(In Tonnes)



Source: Statistical Abstract of Odisha 2012,P-219

Figure 5. Surplus/Deficit of Pulses in Odisha(In Tonnes)



Source: Statistical Abstract of Odisha 2012,P-219

Figure 6. Surplus/Deficit of Oilseeds in Orissa(In Tonnes)

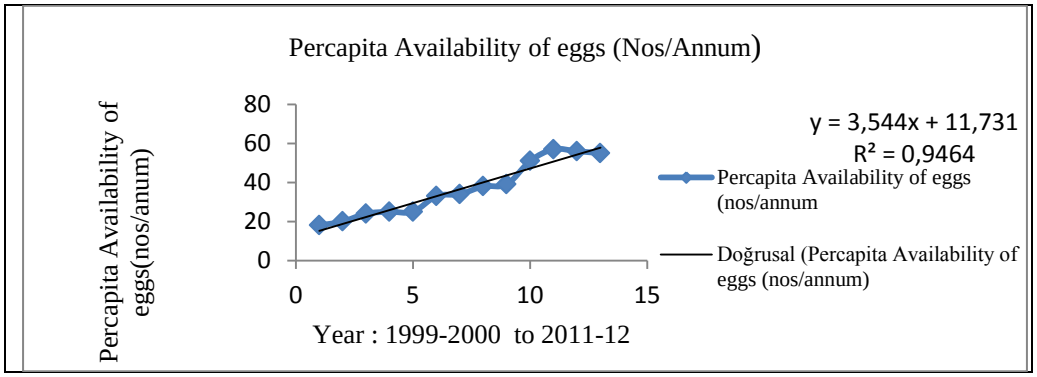


Figure 7. Percapita Availability of Eggs(Nos/Annum)

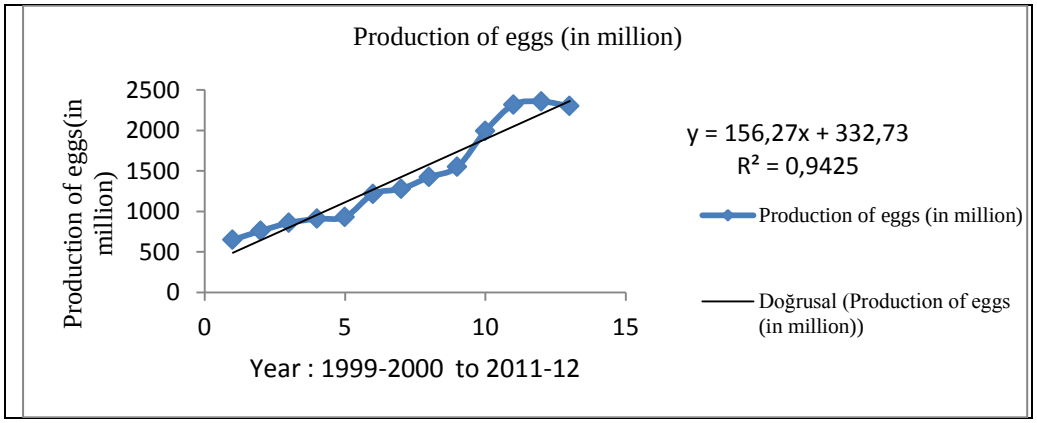


Figure 8. Production of Eggs(In Million)

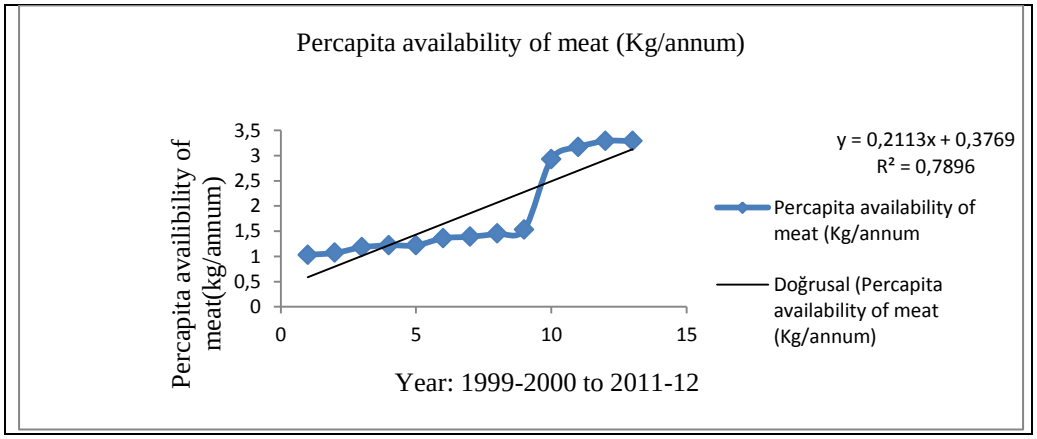


Figure 9. Percapita Availability of Meat(Kg/Annum)

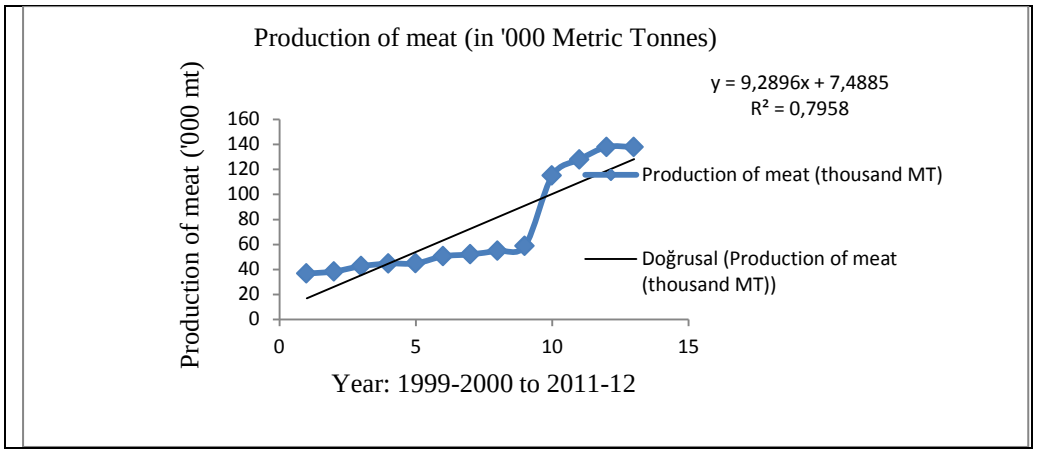


Figure 10. Production of Meat(In '000Metric Tonnes)

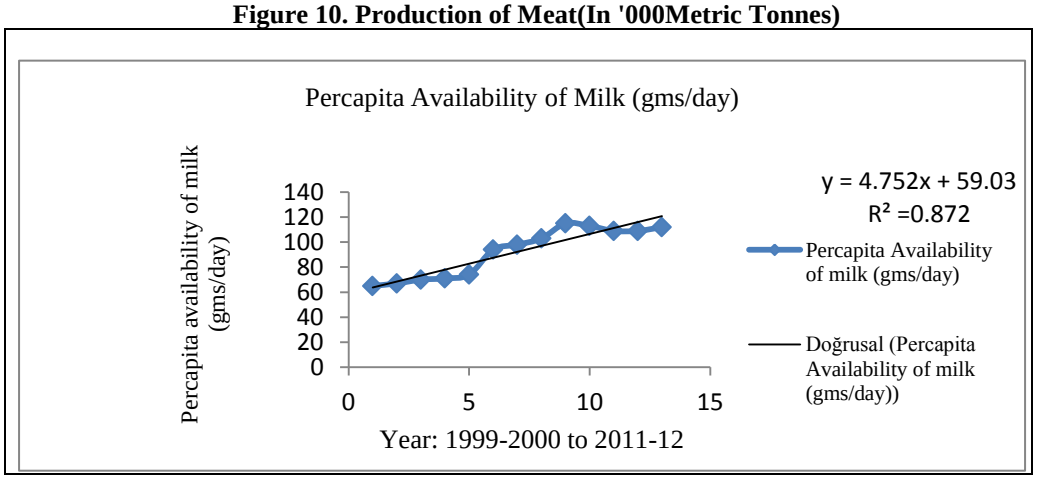


Figure 11. Percapita Availability of Milk (gms/Day)

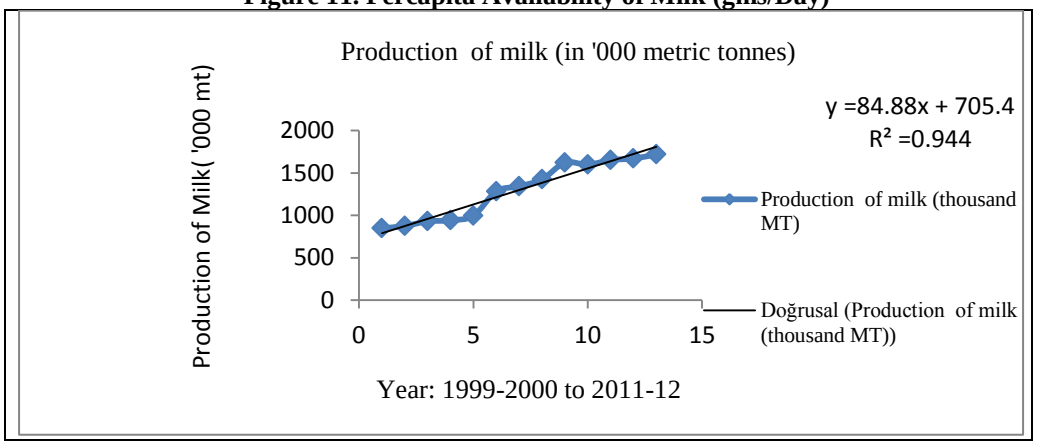


Figure 12. Production of Milk (In '000 Metric Tonnes)

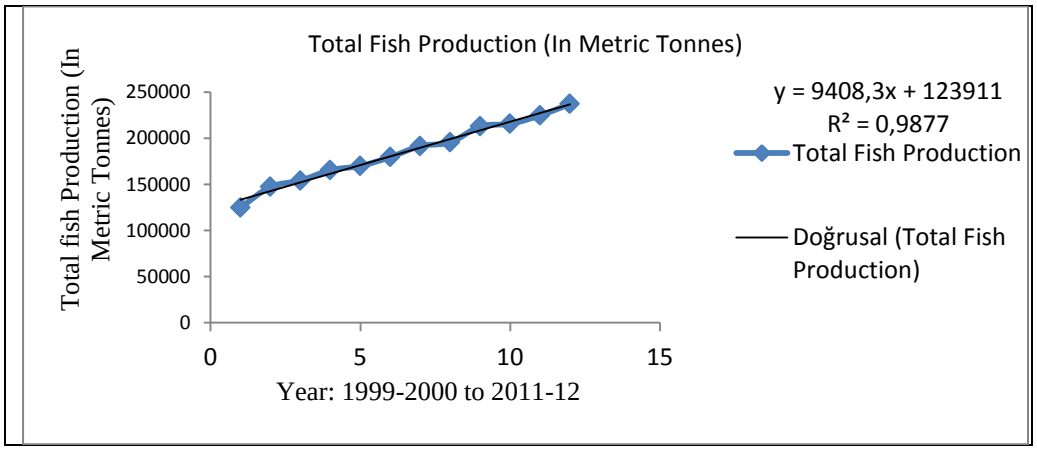


Figure 13. Total Fish Production(In Metric Tonnes)

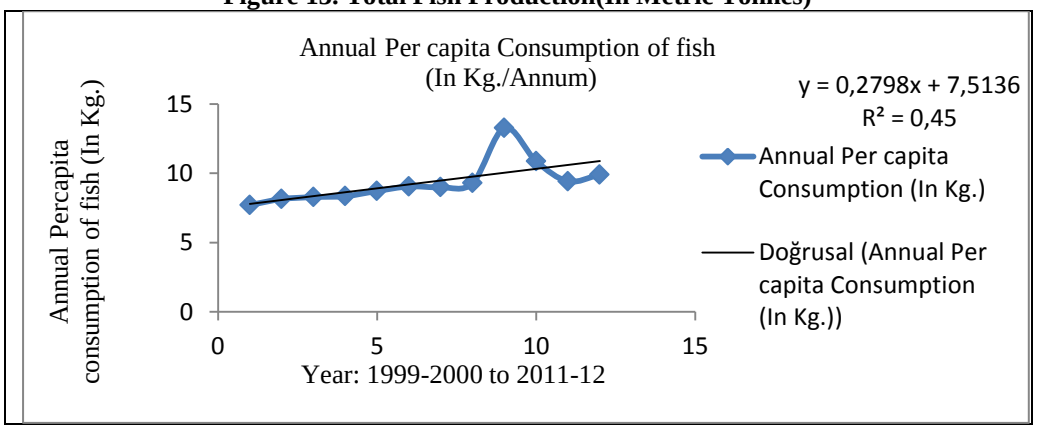


Figure 14. Annual percapita consumption of fish(Kg/Annum)

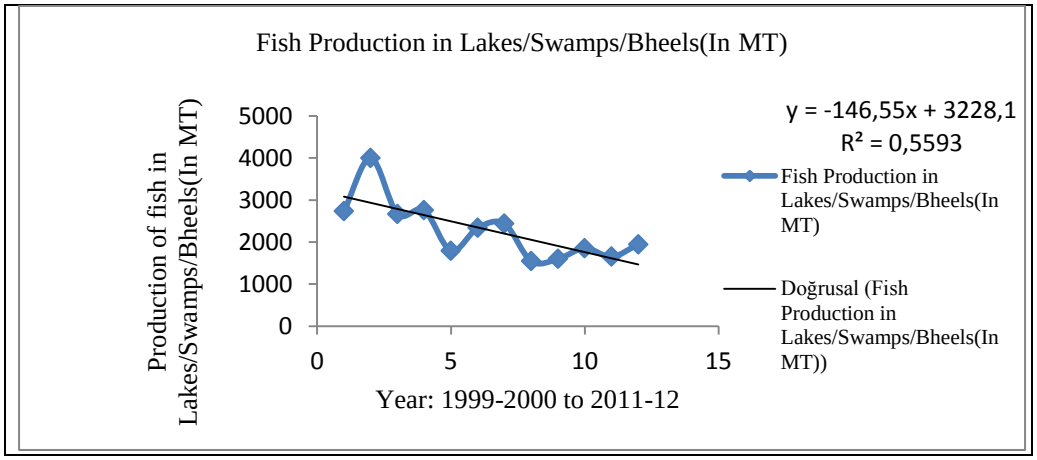


Figure 15. Production fish in Lakes/Swamps/Bheels(InMT)

C) Surplus/Deficit of Production of Crops: Changes in consumption patterns in response to price and income changes could impact on nutrient intake with related positive or negative consequences. Good health enhances the capability of human being to work and participate in socio-economic development. The demand side of the same has been analyzed as follows: The minimum requirement of rice is 400gms per adult per day. Total consumption requirement of rice is going on increasing with increase in population. While calculating the estimates of marketable surplus of rice, 2002-03 is the remarkable year of deficit, which touched the tune of -22.68 tonnes due to severe drought and in the year 2011-12 it was 3.05 tonnes while in all years there was surplus of rice. Paddy is the only crop produced by farmers of some districts in Odisha. The notable thing is that the farmers were suffering from distress sale of paddy. Rice requirement per adult @400gms per day was considered as standard measure(See Figure-3).

Paddy is only surplus item in total cereals produced in Odisha. Cereals requirement per adult @500gms per day was considered as standard measure. While calculating estimates of marketable surplus, deficit of cereals occurred in the year 2002-03 by 33.03 tonnes and 10.55 tonnes per one lakh population.There is marginal surplus in cereals production (See Figure-4).

Pulses requirement per adult @50gms per day was considered as standard measure. There is deficit in availability of pulses in Odisha (See Figure-5). During last twelve years 2002-03, 2003-04, 2004-05, 2005-06 experienced more deficits by 5.20, 3.68, 3.80 and 2.23 tonnes per one lakh population. People are less interested for mix cropping.

Oilseeds requirement per adult @45 gms per day was considered as standard measure.The availability of oilseeds is also less in Odisha (See Figure-6).For the last three years namely, 2009-10,2010-11,2011-12 the deficit of oilseed was aggravated andfor the last twelve years oilseed production was negligible.

It has been observed that the farmers in rural areas sell their milk to the open market immediately. So the butter milk available in the rural areas has been decreased continuously. This is an example of another kind of non-availability of balanced diet in rural area. The primary aim was to collect milk from rural areas for supply to cities. Farmers have become only the producer of milk not the consumer which is the main cause of malnutrition of the population of rural India. Further non availability of various kind of leafy vegetables in thegarden or community land is an addition to food insecurity. The term of nutrition security emerged with the recognition of the necessity to include nutritional aspects into food security. Secondary diet includes egg, meat, milk, and fish for consumption purposes.

Livestock Sector plays a pivotal role in rural employment and livelihood. This Sector has the highest potential for rural self-employment generation both for men and women at the lowest possible investment per unit. Rising income and change in habits of the people raise the demand for secondary diet like egg, meat, milk, fish, etc. This portion analyses the production side of Allied sector of agriculture, which is depicted in figures (See Figures-7 to 12). The per capita availability of eggs, meat and milk shows an increasing trend which are at the rate of 3.544(No./annum), 0.211(kg/annum) and 4.752(gm/day) respectively. Similarly the production of eggs, meat and milk shows an increasing trend which are at the rate of 156.2 million,9.289 thousand and 84.88 thousand metric Tons respectively.Thus production of milk, meat and egg are increasing with the increase in per capita availability in Odisha**.**The government sponsored programme also enhances the consumption of eggs by the people. The primary aim was to collect milk from rural areas for supply to cities. Farmers have become only the producer of milk, not the consumer which is the main cause of mal nutrition of the population of rural India.

Figures (13 to 16) exhibit fish production (in MT), annual percapita consumption of fish (in kg/annum), fish production in lakes/ swamps/bheels (in MT) and total fish production in canals and rivers. Annual per capita consumption of fish was increasing by 0.279kg per

annum. Fish production in lakes/ swamps/bheels, rivers and canals were decreasing by 146.5 MT and 1263MT per annum respectively. The share of energy supply derived from cereals, roots and tubers as well as the average supply of protein derived from animal sources is an attempt to go beyond cheap sources of calories.

D) Declining traditional sources on nutritional availability: Agriculture is the foundation of state's prosperity and no strategy of economic development can succeed if it does not ensure rapid growth of production and employment in agriculture. Raising productivity per hectare is the only main instrument to increase production in the food sector. The twin objectives of ensuring adequate food supplies to the growing population and at the same time design a subsidy regime that is fiscally sustainable point to the need to increase productivity of the sector.Per capita consumption of pulses has also steadily declined due to rise in price of pulses.

The fluctuating yield rate has been shown in case of total cereals, total pulses and total food grains. The yield rate of oilseeds is also in declining trend except the year 2011-12. The yield rate of total vegetables, total fibre and tobacco is increasing from the 2006-07 to 2011-12 continuously without any declaration of minimum support price. The yield rate of sugarcane is also fluctuating with the existence of government intervention as cash crops(See Table-4).

Table 4. Average yield of different crops in Odisha under NFSM (National Food Security Mission) Period (Yield rate in Qntls/Hectare)

Year	Total cereals	Total Pulses	Total food grain	Total Oil seeds	Total vegetables	Total Fibre	Sugarcane	Tobacco	Total condiment
2006-07	22.78	7.01	21.24	5.75	95.15	2.68	634.17	7.31	13.65
2007-08	25.15	6.97	23.22	6.49	127.29	3.2	539.5	7.36	13.75
2008-09	22.76	7.62	21.29	6.29	127.81	3.23	600.43	7.44	13.85
2009-10	23.61	6.77	21.67	6.27	132.21	3.29	614.88	7.28	28.18
2010-11	24.12	7.07	22.09	6.24	131.41	3.63	686.88	8.61	29.57
2011-12	21.61	7.51	20.16	7.05	138.62	4.95	610.19	8.35	30.81

Source: Statistical Abstract of Odisha 2012-13

4. Socio-Economic Profile of the Sample Villages

The family size plays an important role in determining the capacity to save and reinvest in farming. The average family size is positively related with the operational holding of the household. The extent of male and female workers is nearly same in case of marginal and small farmers but varied in case of medium and large farmers groups.Average persons in a family were 7,6,7 in Bhoipali, Bamphei and Sindurbahal respectively. The age of the farmers is one of the significant factors, which influence the type of farming system(See Figure-5). In Odisha mostly the older farmers are cultivating who rarely adopt innovations and they are risk averters.It has been observed that majority of respondents belong to the age group of 30 to 60 years. Farmers belong to 30 to 45 years age group are very crucial and are in search of new way of opportunities to earn net profit. The respondents within the age group 45 to 60 slightly hesitate to adopt new way of farming and fade up with the government policies towards agriculture. The educational level of the respondents plays an important role in the level of adoption of innovations(See Table-6).

Table 5. Age distribution of sample farmers in percentage

Village	>18 – 30 years	30 – 45 Years	45- 60Years	> 60 Years
Bhoipali	8	21	53	18
Bamphei	12	26	49	13
Sindur Bahal	10	29	55	6

Source: Primary data 2012-13

Table 6. Educational Levels farmers

Villages	Illiterate	Under class-V	Under class -X	Intermediate	Graduate &above
Bhoipali	13	23	48	8	8
Bamphei	29	18	41	10	2
Sindur Bahal	25	21	39	13	2

Source: Primary data 2012-13

Land is the fundamental means of production in an agrarian society without which no agricultural production can take place. An understanding of the pattern of ownership and operational holdings of land is, therefore, of central importance to an understanding of the agrarian class structure. Individual operational holding for Scheduled Caste (SC) is lowest(0.50 Acre) in Attabira block in case of marginal farmers followed by Bamra and Bargaon block. Bamra block is lowest (0.61) in Individual operational holding for Scheduled Tribe (ST) followed by Attabira and Bargaon block. Individual operational holding for others are more in all blocks in compare with SC and ST for small, medium and semi medium farmers. But the situation is different for large farmers. Individual ownership for ST is higher in compare with SC farmers in Bargaon and Bamra block whereas individual ownership for SC is higher in compare with ST farmers. Individual ownership for other farmers is higher in compare with SC and ST in Attabira block whereas individual holding for ST farmers is higher than other farmers. Individual holding for all classes is higher in compare with SC and ST farmers(See Table-7).

Table 7.Size of Operational holding of various social groups

Size of Holding in Hactare	Bargaon			Bamra			Attabira		
	SC	ST	Other	SC	ST	Other	SC	ST	Other
	Individual holding	Individual holding	Individual holding	Individual holding	Individual holding	Individual holding	Individual holding	Individual holding	Individual holding
Marginal	0.67	0.67	0.78	0.58	0.61	0.58	0.5	0.65	0.66
Small	1.66	1.65	1.69	1.69	1.74	1.78	1.65	1.72	1.73
Semi-Medium	3.12	2.93	3.04	3.39	3.12	3.25	2.96	3.05	3.16
Medium	5.34	5.67	6.16	7.5	5.56	6.86	4.93	4.93	6.69
Large	0	16.17	13.47	0	20	15.4	13.48	0	18.42
All Classes	1.16	1.06	1.64	1.06	1.05	1.95	0.94	1.16	2.2

Source:http://agcensus.dacnet.nic.in/tehsilT1table5.aspx

A) Supplementary Nutrition Programme: Supplementary Nutrition Programme(SNP) is a centrally sponsored scheme with cost sharing between the centre and state in the proportion of 50:50.Children in the age group of six months to six years, pregnant women and lactating mothers are the beneficiaries of this scheme. Each beneficiary is given nutritious food. The

ration costs have been revised upward to Rs. 4/-, Rs. 6/- and Rs. 5/- for normal, mild and moderately malnourished children and pregnant and lactating mothers respectively from the year 2009-10. The SNP has been implemented by 71134 by functional Anganwadi Centre(AWC) covering 46.85 lakh beneficiaries (6 months to 6 years) during 2012-13. Expenditure of Rs.375.22crore has been incurred against the provision of Rs. 546.03 crore. It has been observed that Attabira block (though irrigated and leading agricultural block) experiences highest percentage of malnourished children among the three blocks. In government sponsored poverty alleviation programme, the tribal block Bargaon covered 100 percent below poverty line (BPL) families followed by non-irrigated block Bamra and irrigated block Attabira. Under the Swarna Jayanti Gramin Swarozgar Yojna(SGSY), rural artisans should be covered in a significant manner. Another category would be the unemployed educated youth. Generally, the people who are asset-less and skill-less are poorest of poor and get left out under the programme. Such category of people may require small doses of multiple credits over a period of time coupled with emphasis on awareness creation, training and capacity building so that they will not fall in the debt trap. But it is grave concern that very less percentage of families were covered under SGSY programme in Attabira block in 2010-11(See Table-8).

Table 8. Status of Malnourishment in Block Levels

Blocks/ District	Malnourished children in % (o-3years) Boys (2010-11)	Malnourished children in % (03years)Girls (2010-	Malnourished children in % (3-6years)Boys (2010-	Malnourished children in % (3-6years) Girls (2010-	Beneficiaries provided employment in block with compared to district level covered under SGSY Programme in % (2010-12)	BPL families covered under SGSY in blocks in %
Bargaon	1.41	1.74	0.71	0.41	6.5	100
	4036*	3887*	3619*	3587*	4179#	272$
Bamra	11.43	19.24	12.31	17.87	10.61	1.73
	2502*	2489*	2380*	2327*	2572#	15721$
Attabira	24.75	25.78	26.48	28.07	3.88	0.88
	3538*	3483*	6064*	5721*	75793#	18959$

Source: District Statistical Handbook 2011
Note: '*' indicates No, of Children weighed,'#' indicates Total No of beneficiaries in district level,'$' indicates Total No of BPL families in the block level

Health system is focused with percentage in infant mortality rate, still death and maternal death. Sambalpur is highest in percentage of infant mortality, still death and maternal death whereas Bargarh is lowest in all these indicators. It is worth mentioning that all three selected districts are above the average of state level in percentage of maternal death. There is high correlation between Infant Mortality rate(IMR) and Maternal Mortality Rate(MMR). A high level of Infant Mortality Rate in Odisha are the result of (i) poor availability of professional attendants at birth(ii) high percentage of low birth weight babies and (iii)lack of professional pre-and post-natal care(See Table-9).

Table 9. Health Status in District Level

Birth	Death	Infant Death	%of Infant Death	Still Birth	%of Still Death	Maternal Death	% of Maternal Death
Total	Total	Total		Total		Total	
41109	16704	947	5.67	521	3.12	29	0.17
23159	10024	698	6.96	429	4.28	46	0.46
21942	8873	231	2.6	214	2.41	10	0.11
785524	277484	17808	6.42	12432	4.48	290	0.1

Source : Statistical Abstract of Odisha 2012 PP 371

B) Educational Infrastructure

Education is the only way to change in life of human being. Educational physical infrastructure amplifies the quality of education of a State. The district Bargarh is ahead in Schools having without drinking facilities and boys toilet followed by Sundargarh and Sambalpur where as Sundargarh is ahead in schools having without girls toilet, ramp, play ground, library and boundary wall followed by Bargarh and Sambalpur respectively(See Table-10).

Table 10.Facilities in Government Schools in Odisha(2011-12)

District	Total No.of Schools		No.of Schools without drinking Waterfacility		No. of Schools without Boys Toilet		No. of Schools without Girls toilet		No.of Schools without Ramp		No.of Schools without playground		No.of Schools without Library		No.of schools without boundry wall	
	P	UP	P	UP	P	UP	P	UP	P	UP	P	UP	P	UP	P	UP
Sundargarh	1596	819	0	0	1	1	1270	571	734	216	1401	601	1427	607	216	1401
Sambalpur	899	486	0	0	0	0	564	254	509	166	727	333	421	172	166	727
Bargarh	1019	660	8	3	8	3	598	268	531	206	833	456	425	272	206	833

Source: Statistical Abstract of Odisha 2012, P-452

It has been observed that Sundargarh district was highest (68.2%) households living in Kuchha house followed by Bargarh(54.5%) and Sambalpur (54.4%) respectively in rural area. But in state level 47.4% households are living in rural areas whereas 71% households are living in urban areas. If someone look into the households living in Pucca house in rural areas, Bargarh was highest (31.9%) followed by Sambalpur (28.8%) and Sundargarh (12.6%) respectively(See Table-11).

Table 11. Housing Characteristics- Structure of house Housing Characteristics- Structure of house

Households living in a pucca house (%)				Households living in a Kachcha house (%)		
	Total	Rural	Urban	Total	Rural	Urban
State (Odisha)	39,9	33,8	71	42,4	47,4	17
Sundargarh	31,9	12,6	71,5	51,6	68,2	17,5
Sambalpur	43	28,8	66,9	41,6	54,4	20,2
Bargarh	34,8	31,9	68,1	51,9	54,5	21,7

Source: Annual health Survey 2010-11,P-124

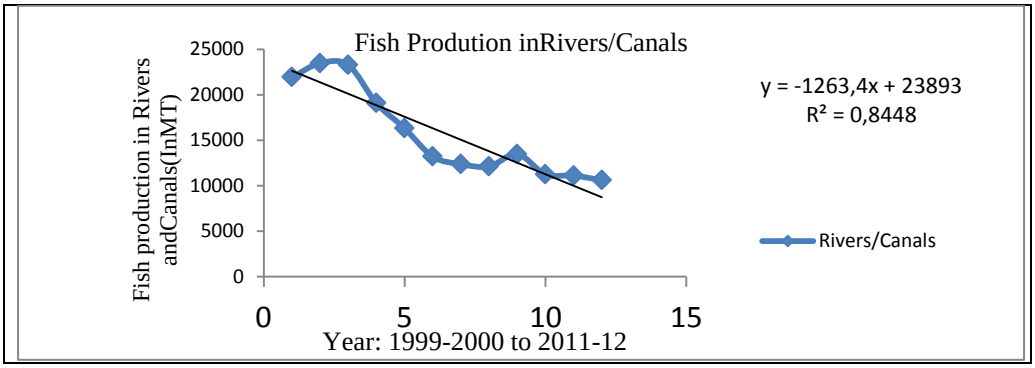
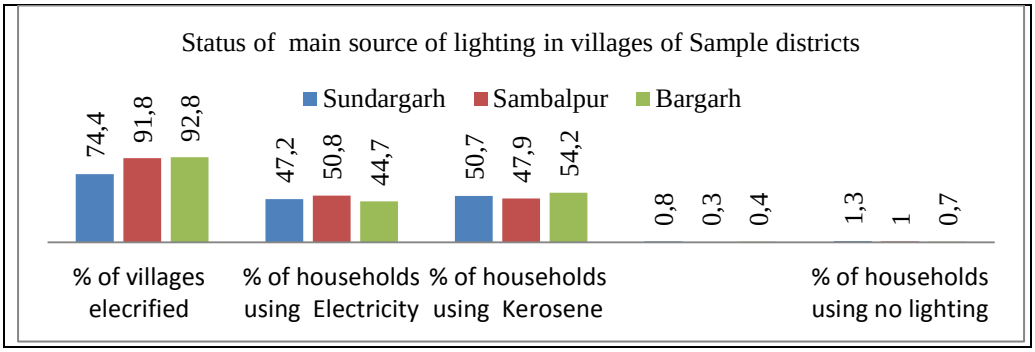
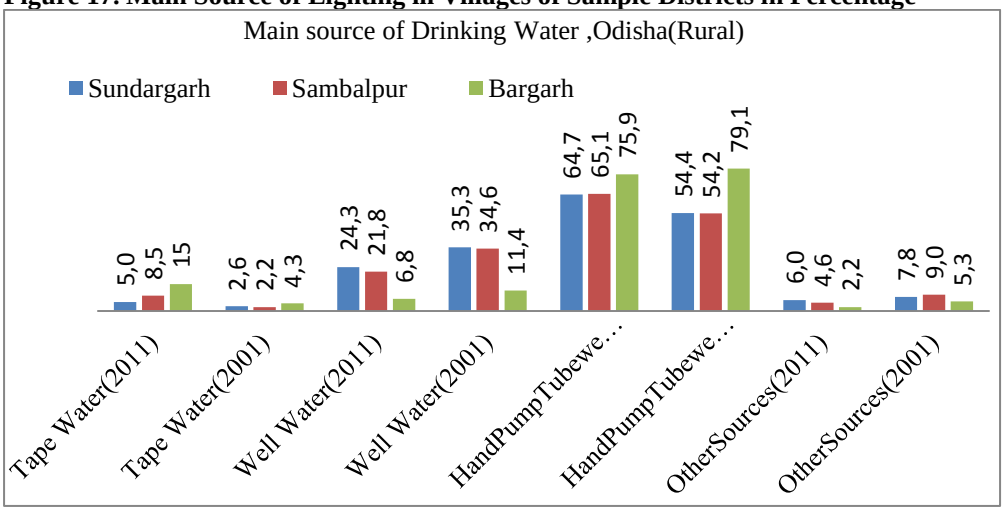


Figure 16. Fish Production from Rivers and Canals(In MT)



Source: Atlas on Houses, Household Amenities and Assets,Odisha 2011,P-11

Figure 17. Main Source of Lighting in Villages of Sample Districts in Percentage



Source: Statistical Abstract of Odisha,2012,p-404

Figure 18: Main Source of Drinking Water in Sample Districts Rural (In Percent)

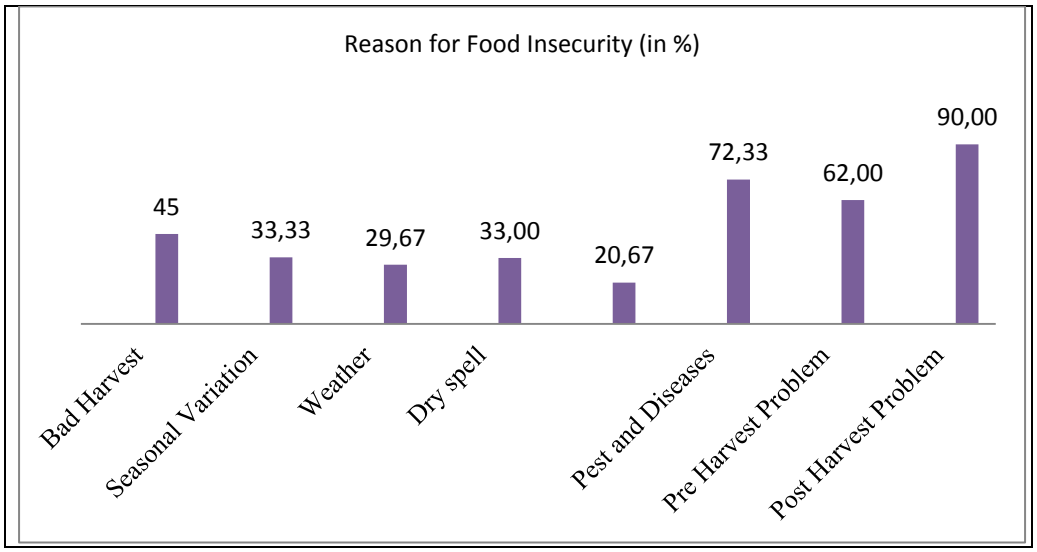


Figure 19. Reason of food Insecurity, Source: Primary Survey 2012-13

The villages in Sundargarh district is lowest percentage of electrification followed by Sambalpur and Bargarh district respectively. But Bargarh district secure the lowest position in percentages of household electrified followed by Sundargarh and Sambalpur respectively.Percentage of household using kerosene as the main source of lighting is highest in Bargarh followed by Sundargarh and Sambalpur respectively(See Figure-17).

Tape water increased from 2001 to 2011 in all sample districts whereas handpump water decreased in Bargarh district in compare with Sundargarh and Sambalpur district from 2001 to 2011 census. Well water use also decreased from 2001 to 2011 census in all sample districts(See Figure-18)

Structural food and nutrition insecurity is categorized as long-term and persistent. It occurs when people are unable to meet their minimum energy and micronutrient requirements over a sustained period of time, or when issues affecting people's utilization of food and nutritional outcomes (e.g. knowledge and caring capacity, access to safe water, sanitation, health care, etc.) are persistent. Structural food insecurity is often the result of extended periods of poverty, lack of assets and inadequate access to productive or financial resources. Structural nutrition insecurity can stem from issues ranging from gender discrimination to poor infrastructure. The present paper is an attempt to find out reason of food insecurity and coping strategy adopted during food insecurity period.

C) Period and Reason of food Security: It is evident that the people very often suffer from food crises from the month of April to September. Reason of food insecurity is different for different farmers. Bad harvest is common to all types of farmers. The variation in the weather parameters i.e. rainfall during or after harvest of the crop makes irreparable loss on the quantity or quality of the crops. Seasonal variation is also depending on weather parameter like irregular rainfall; sunshine hours, temperature, humidity etc. were noticed to affect the yield of crops during Kharif season. But the effect of seasonal variation was not proper impact on farmers of Sindurbahal village due to irrigation facilities. But they are also affected indirectly due to canal irrigation. They are getting water earlier than the tail area of the Hirakud dam command area. Reaping crops is early at Sindurbahal in compare to the tail area. The farmers of Sindurbahal are facing problem in cutting of crops and its rotation.

But this problem was not felt in case of Bhoipali or Bamphei. The large farmers were using lift irrigation at their own cost.So rotation of crops, mixed cropping also possible in these villages. Dry spell is also another aspect of weather condition. Except Sindurbahal other two villages are suffering from dry spell due to lack of irrigation facilities. The problem of pest and diseases was not much affected in Bhoipali and Bamphei in compared with Sindurbahal. Canal Irrigation, planting of hybrid seeds, monoculture were the main cause of pest and diseases in Sindurbahal. The farmers of Bamphei and Bhoipali were not bothered to protect their crop even if these attacked in minor forms due to lack of money to acquire plant protection equipments and pesticides. The farmers of Sindurbahal suffered from duplicate pesticides and insecticides, weedicides etc. The farmers of Bamphei and Bhoipali were using their traditional herbal method. During pre- harvest problems, after production and before consumption food grains are subjected to several adverse physical and chemical factors as well as microbial and parasitic agents, which cause their spoilage or lead to diseases when consumed. Some processing, preservation and storage are treated as post –harvest problem(See Figure-19).

Table 12. Coping Strategies during food insecurity

SL No	Statements	Pearson Chi Square	d. f.	P Value	Remark (α=0.05)
1	Access to credit institution	9.028	2	0.011*	Reject Ho
2	Sharing of food with relations/neighbours	20.819	2	0*	Reject Ho
3	Borrowing of money/Food	1.439	2	0.487**	Accept Ho
4	Selling of goods and other personal assets	2.151	2	0.341**	Accept Ho
5	Non-farm employment (migration to search work and food)	13.516	2	0.001*	Reject Ho
6	Resource management studies like proper time ,labour and food allocation activities	10.465	2	0.005*	Reject Ho
7	Change in food consumption pattern	9.28	2	0.010*	Reject Ho
8	Help from local organisation	5.289	2	0.071**	Accept Ho
9	Participation in feeding programme self/children/family	28.892	2	0*	Reject Ho
10	Mortgage	0.355	2	0.838**	Accept Ho
11	Use of livestock saving	3.041	2	0.219**	Accept Ho
12	Purchase and store of food when income is high	11.16	2	0.004*	Reject Ho
13	Substitutes of less employment commodities and shift to alternative food sources	3.131	2	0.209**	Accept Ho

14	Access to subsidized foods	18.76	2	0*	Reject Ho

Source: Primary data 2012-13
Note:* Significant, ** Insignificant

D) Coping Strategies during food insecurity: The concept of coping strategies is used to mean any action aimed at obtaining food or income during times of stress, either through production or through formal and informal exchange and claims (Ragassa,2011).

The reward of nature, through the common property resources, forests etc. comes to the rescue of the rural people. Fish, snails and water weeds collected from water bodies partially fulfils the nutritional requirement due to decline in consumption of pulses. Collection of fruits and various leafs and flowers are supplemented as diet to overcome nutritional security. With the absence of all these, the principal food system as well as the secondary food system declined substantially. All the above, the household suffer from access to food from common property gradually due to climate change and contaminated water bodies. The range of food baskets is going on declining day by day. Households use a number of coping strategies ranging from one or more principal coping strategies to various complementary strategies; switching between principal and complementary activities during chronic food shortage. A principal coping strategy is characterized by providing a main source of food and income for a household, substituting for farming which is relatively regular and reliable, while complementary coping strategies are opportunistic and often irregular, providing some food or income for shorter time periods.

The following discussion highlights the different coping strategies adopted by different group of farmers in different time,based on the respondents positive or negative responses with respect to attributes mentioned in each statements.The following hypotheses are set :

Null Hypothesis (H_o) : There exists no significant difference in responses among the three villages with respect to Coping Strategy.

Null Hypothesis (H_1) : There exists significant difference in responses among the three villages with respect to Coping Strategy.

Pearson Chisquare test has been conducted to test the possible rejection of the Null hypothesisand the following inferences regarding the coping strategy has been drawn(See Table-12):

i) **Access to credit institutions**: There has been a significant difference among the three sample villages with regard to credit institutions. This means the people of irrigated area like Sindurbahal have more access to credit institutions in compare with Bamphei and Bhoi Pali.

ii) **Sharing of food with relations/neighbours**: There has been a significant difference among the three sample villages with regard to Sharing of food with relations/neighbours. Thus it may be deduced that the people of non irrigated area like Bamphei and a tribal village like Bhoi Pali have more shairing of food with relations/neighbours in compare with and Sindurbahal.

iii) **Non-farm employment (migration in search of work and food)**: There has been a significant difference among the three sample villages with regard to Non-farm employment (migration in search of work and food). Thus it may be argued that the people of non irrigated area like Bamphei and a tribal village like Bhoi Pali have more non-farm employment (migration in search of work and food) in compare with and Sindurbahal.

iv) **Resource management studies like proper time, labour and food allocation activities:** There has been a significant difference among the three sample villages with regard to resource management . It is quite evident that resources management is important

for all the sample villages but varies with regard to proper time, labour and food allocation activities. For example non irrigated village and tribal village require more labour utilization in lean season. At the same time food allocation activities are required for the life cycle of a human being with respect to different time.

v) **Change in food consumption pattern**: The three sample villages differ significantly with regard to change in food consumption pattern which means that the people of irrigated area have changed their dietary need. They opt secondary diet like egg, meat, fish etc. Further, due to diabetes, blood pressure and obesity the people have shifted their food habits from consumption of rice to consumption of wheat.

vi) **Participation in feeding programme self/children/family**: There has been a significant difference among the three sample villages with regard to Participation in feeding programme .The people of irrigated area don't prefer to send their ward to Govt. schools where mid day meal programme draw the attention of parents and pupils for increasing regular attendance, retention by decreasing drop outs. Rather they prefer to send to public school for better learning.

vii) **Purchase and store of food when income is high** : There has been a significant difference among the three sample villages with regard to purchase and store of food when income is high. The medium and small farmers also sell their products immediately after harvesting at minimum support price and prefer to purchase and store food grains having high nutritious value, cultivated in single cropped area for the whole year.

viii) **Access to subsidized foods**: The three sample villages exhibit a significant difference in access to subsidized foods. It is observed that even though poor, a group of people of Bhoi Pali (a small hamlet) have no access to subsidized food due to non availability of ration card. They have been deprived of subsidized food programme through PDS. They are daily wage earners and work from morning to evening which is matching to the official time.

On the other hand the three samples may be considered to be identical with regard to the coping strategies adopted such as borrowing of money/food, selling of goods and other personal assets, help from local organization, mortgage, use of livestock saving, substitutes of less employment commodities and shift to alternative food sources. Therefore the study progresses to know the regional differences in yield.

It is observed that Bargarh district is ahead in total cereals followed by Sundargarh and Sambalpur. Sundargarh district is first position in total pulses followed by Sambalpur and Bargarh. It has been seen that Bargarh district leads in yield of food grains, sugarcane and condiments and spices.Sundargarh district is ahead in yield of total fibre and vegetables. No district has been achieved average yield percentage in condiments and spices at par with that of Odisha. Kitchen garden system has been abolished. All these explanations are linked with the supply side of different agricultural products (See Table-13).

Table 13. Average yield of different crops in three selected Districts of Odisha in the year 2011-12

District	Total cereals	Total Pulses	Total food grain	Total Oil seeds	Total vegetables	Total Fibre	Sugarcane	Total condiments & Spices
Sundargarh	26.28	28.66	26.35	5.91	140.47	11.98	542.29	20.74
Sambalpur	27.09	9.58	26.40	3.79	128.32	6.80	441.67	19.00
Bargarh	32.19	4.68	29.68	8.40	119.08	6.01	748.00	21.61
Odisha	21.61	7.51	20.16	7.05	138.62	4.65	610.19	30.81

Source : Statistical abstract of Odisha 2012 ,PP 181-186

In the same way, forests are a major source of livelihood for the self employed poor, whether they are cultivators, livestock rearers or tribal forest dwellers. But this forest cover is very rapidly depleting denying the self employed the income generating resources. Vegetables also hold a greater promise for agricultural development on account of its labour-intensive nature. Transmission losses are generally high for horticulture commodities because of inadequate infrastructure and market information.

Livestock output in India, is growing faster than any other agricultural sub-sector. The small and marginal farms in the country are more livestock-centric. The possibility of competition for scarce land has increased with the deterioration of common resources in the country. The pressure on availability of fodder is also on account of deterioration in the quality of crop residue with the increased application of pesticides for crops. The livestock population has been decreasing in the recent period.

Committing suicide by farmers, decreasing fertility of the soil, reducing productivity of the crop, hazardous pollution of the soil ,water and air , decreasing taste and nutritive value of the produce, reducing bio-diversity, farmers being poorer every day and committing suicide due to debt have created a very alarming situation. Thus there is a dire need to research a new farming system, technologies and management. (Pandey, 2015)

Not only increase in population, the reducing area under cultivation, will also cause food shortage and unemployment among the farmers. The poor people are not endowed with village level opportunities like fire hood collection, growing self required vegetables, grazing cattle and other amenities at free of cost or at village level rates. They need to buy everything with net cash. Diversification is measured with concentration ratio, therefore their food security is at extreme risk.

6. Conclusion:

The most important issue concerning agriculture is lack of nutrients in soil and its products, recycling use of agricultural waste within agriculture and its allied sector, proper land utilisation system and result oriented Government sponsored programmes and schemes. The scientists should be entrusted to ensure that not only the productivity of Indian agriculture rises but also the cultivator becomes affluent, and has more money in his pocket. Soil, water, seed, manure, pesticide, rural roads, soil testing labs, power supply, internet connectivity, marketing technique and weather forecast were put in place before embarking on the grand mission. Agricultural output needs a major boost in order to tackle hunger. Farmers' insecurity got converted into food insecurity for the nation. Prices of wheat, rice, pulses, edible oils, vegetables etc. all sky rocketed. Worst sufferer is the poor. To make available food to the masses at the reasonable prices, we need to maintain reasonable level of buffer stock, which in turn could be ensured by making sufficient procurement. This paper concludes with the following implications:

Production must be diversified from cereal crop production like paddy to other cereals like pulses, oil seeds, spices, vegetables, fruits, fodder, fuel wood and timber. The self employed in the rural non-farm sector must be given some assistance and pushing through various beneficial programmes, because they suffer from diseconomies of scale and market distortions. A life-cycle approach to management was adopted that integrates strategy, people resources, processes and measurements to improve. Mixed cropping, integrated agricultural management system with protection of indigenous knowledge can be viable methods for mitigating food insecurity in the region.Government intervention is necessary to tap the divergence between food and nutritional security through sustainable agriculture.The arduous task for the said programmes is due to lack of humanitarian touch. It needs a holistic approach for indubitable success.

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Notes:

[1.]'Nua Khai' is such a food festival that nobody becomes underfed on this day.The festival "Nua Khai" is observed by the people in the month of September (Bhadraba in Odia Calender) where farmers even the animals and birds face difficulty to get their food.The people of Western Odisha give the "Prasad" prepared by new rice (Cultivated in Aatt) to their Adhistatri Devi/ Esta Devi of the locality. They believe that God (Adhistatri Devi/ Esta Devi) will not deprive them to get food throughout the year.

[2.]'Cher-Chera' deals with food distribution among 'haves' and 'have nots'.

[3.]'Pausa-Purnima' is only food festival where no deity is worshipped. The concept 'Man is God.' is true in this sense. People only take varieties of dishes after harvest.

[4.]'Saria Dhan' is a short period paddy variety is harvested during early autumn.

[5.] 'Panchayajna' means five activities, which have been specified as Sitayajna (the tilling of the land), Pravapana (the sowing of seeds), Prabalambana Yajna (the initial cutting of crops), Khala Yajna (the harvesting of grains) and Prayayana. In view of this, 'Nuakhai' may be seen as having evolved out of the third activity, namely 'Pralambana'. Yajna'which involves cutting the first crop and reverently offering it to the mother Goddess.