ANALYSIS OF TRENDS IN FARMING BETWEEN FARMERS OF ODISHA AND THE FARMERS OF STATES OF THE NORTH EAST OF INDIA

Abstract

As compared to the developed countries, there has been comparatively less development in technology in India and the adaptation of it if any is very slow. But, recently the agriculture in India has witnessed monumental rise in the research and development activities. This has had a great impact on the productivity and household income of farmers. Odisha, is an agrarian state that has 70% of the population engaged in activities related to agriculture. The farming patterns of Odisha are very similar to states that are in the North East of India. Since proximity to the sea and abundance of rainfall is regularly witnessed by India's many states of the eastern region, they have similar soil types if not same.

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I. INTRODUCTION

A study of the agricultural patterns in the eastern states would enable us to know how, the farmers of Odisha fallback in technological and proficiency aspects of agriculture as compared to other states. The statistical data taken for analysis in this chapter relates to years 2003 to 2015.

II. THE CHAPTER AGRICULTURE IN ASSAM

Assam is one of the top five most convenient states for producing varieties of crops when compared to the whole of India. Assam follows an integrated model for farming. Electrification and water sufficiency is given priority in the state for the agricultural sector. Assam has been able to produce seeds increasingly in recent times in all three types of seeds that are Certified, Breeders and Foundation. Small systems of irrigations are underway in the production of seeds and other materials for fruit and vegetable projects.

By producing the own ingredients of organic farming like fertilizers, vermicomposting, azolla and bio-pesticides, etc., Assam focusses on bio resource flow by enhancing income from farming and utilizing the resources to the utmost level. Assam's crop crisis forewarning systems like macro and micro weather monitoring are the best of its kind. There are 21 automatic weather monitoring stations in Assam alone. Not only the weather monitoring stations, but it also has 5 e-villages. These e-villages have been established to adopt, to share and to use updated information about technological developments in agricultural promotion. The other aspects of the state's development is its livestock related improvements in the form of training on frozen semen technology, cross breeding of goats, poultry feeds, production and storage of improved qualities of semen, etc.

The Assam model of Agriculture has successfully established the process of fertilization of seeds. It means the fertilizer injection, which is used to amend soil, to amend water and different soluble products in water into a system of irrigation. Through these models, they are tapping carbon dioxide from the farmland and by using azolla tanks converting the same into oxygen.

Azolla can be defined as- "an aquatic floating fern, found in the temperate climates suitable for paddy cultivation". This fern generally looks like a shield on water and is green in colour. Cyanobacteria which is an algae that is a combination of blue and green colours, sometimes known as anabaena azollae, is existent along with the fern in the lower cavities. It is responsible for fixing nitrogen levels of the atmosphere. The rate of the nitrogen fixed in the atmosphere amounts to around 25 kilograms per hectare.

To sum up, the agricultural model of Assam gives independence to farmers in dealing with production of seeds, establishment of model nurseries, enabling seed fertilization, procurement of bulls along with their progeny (capacity to reproduce off springs) tests, bio medical waste management, learning through vet nary clinic complexes, etc.

III. STATE OF AGRICULTURE IN MANIPUR

An expertise in as many as 18 crops makes Manipur one of the important attractions for study. But rice has occupied around 80% of share of crop produce in the state. The main reason behind it is the heavy rainfall throughout the year.

There are two different farming practices that are adopted by the farmers of Manipur-shifting cultivation and settled farming. The settled farming is practiced in hill slopes, river valleys, foothills and plains as well, whereas shifting cultivation happens to be at the hill slopes only.

Farmers planned and implemented an integrated model for farming in Manipur during 2011-14. This model was first tested and implemented in a, a tribal farmer Henkpao's 4 hectare field. He took the help of sub plan for tribal. High yield varieties of Paddy (RCM- 9), Maize (Pusa Composite-3), Peas (Azad Pea-1), Groundnut (ICGS-76), Piglets, Cabbage (Rareball), Cauliflower (Early Hemlata, Fisheries, Poultry, and 50 trees each for beans, oranges and lemon were among the major technological intervention made in the process.

Such technological interventions proved to be a wonder once tried on Mr. Henkpao's field. The major observations that were made from the experimentation was as put below:

Table 1

Sl.	Product	Harvest prior toexperiment	Harvest postexperiment
1	Paddy	3.2 tons/ha	4.8 tons/ha
2	Maize	1.7 tons/ha	3.25 tons/ha
3	Piglets	6	21
4	Water Harvesting	Not tried previously	30,000 litres
5	Groundnut drypod	Not tried previously	2.4 tons/ha
6	Income Generated	1,05,000 Rupees	3,63,500 Rupees

Due to huge success from the above experimentation, the processes are now widely used in all parts of Manipur and the government is doing all that can be done to reap the best results for the farmers.

IV. STATE OF AGRICULTURE IN ARUNACHAL PRADESH

As far as agriculture is concerned, independence has been allowed to the farmers of this state, keeping the benefits in mind for its farmers. The main aim behind it is to involve in the planning and process of execution of benefit and investment decision of the agricultural stakeholders. State programs such as Flagship and Agri-mechanization programmes have been the driving forces to involve the stakeholders for producing crops such as rubber and tea.

The programs were initiated with the objective of creating in the farmer minds a motivation for privatization, an approach that sounded to be a co-operative effort by planning an organization that would be called the farmer-producer organization, and generating access

to fair and profitable farmer markets. This would help mobilizing the farmers into various groups, for planning and implementation of crop specific groups, according to the various crop cycles.

Such programmes also help farmers, organizations and producers to be institutionalized, for farmer empowerment and rendering help in terms of practices that are better adopted for farming and intervening in the efforts in marketing, realizing more revenues for the farmers to allow the remuneration of farmers to double.

Among other objectives that relate to the programmes are to generate market surplus by creating systems such as collective farming, adequate and proper supply of inputs of agricultural instruments, seeds and fertilizers, in terms of quality for experiencing better outputs of agricultural produce, etc. This is not all. These programmes help in designing a cooperative approach to farming by creating a farmer-producer organization.

For identifying the true potential of lands that are arable, the land fertility and technologies that could help agriculture, the state government has invested a lot of funds into the sector. For assessment of water resources and soil conditions in the state, technological help was sought from GIS, GPS and remote sensing systems. Based on the severity of need and importance, the segregation of crops is done. After studying the soil suitability and evaluation of other necessary resources the farmers are then asked to cultivate certain specific crops. At some instances, crop planning, management of soil health and water and soil conservation is implemented.

Certain changes are described below would certainly result from the implementation of the state's management plan-

1. Scientific data are used to back farmers and farming systems.
2. Productivity of agriculture and the livelihood security in agriculture related sectors, was showing improved results.
3. Each village was facilitated with laboratories for soil testing along with establishment of the concept of land terracing.
4. Bringing about provisions for organic certifications.
5. Training was provided to farmers on better technology use and methods of cultivation, through hostel stay facilities. Such training was provided through the agriculture hubs that were state level.
6. Cash crop development programs, pest management systems and integrated nutrient mechanisms were all implemented.

V. STATE OF AGRICULTURE IN NAGALAND

Nagaland experiences a high variation in its altitude. Hence, the people of Nagaland follow a variety of patterns for cultivation, the prime pattern being cultivation shifting. Extraction of pathogens and other pests from soil as well as the surface of crops is benefited from shifting cultivation. The main merit of shift cultivation is germination of seeds quickly and avoiding infection of seeds. Paddy in Nagaland is generally produced between alternate crops to avoid movement of pests and allow physical separation among crops. This process

allows the Naga farmers to be engaged in farming throughout the year, and helps avoiding food deficiency and allows farmers to generate perennial income from farming.

A variety of grass known as "Job's tears" is generally grown in patches between crops. These grasses help in creating a loud unpleasant sound during winds that helps avoiding frequent visit of birds and other pests into the crop fields. Pathogens are avoided directly or indirectly by a rotten pungent smell created to to a mixed cultivation of garlic, ginger, chilli and onion. Further, farmers spread of leaves on the fields, which when decomposed creates a pungent smell avoiding the visit of pathogens and rodents.

Nagaland becomes the second state in India after Manipur to have successfully practiced shift cultivation. As far as shift cultivation is concerned the agricultural land is exchanged among the farmers that avoids the need of crop rotation. This system of farming is spread in an area as large as 7 thousand square kilometers in the state.

The government in Nagaland has come up with initiatives to facilitate more organic farming through several programmes from time t time. The National Program for Organic Farming (NPOF) was initiated in Nagaland very quickly by APEDA. Since, organic food is preferred by most of the consumers in recent times, the practice of organic farming reaps 15-20% better price as compared to conventional crops.

VI. STATE OF AGRICULTURE IN SIKKIM

In 2016, Sikkim became the first state in India to have experienced Organic farming to an extent of 100%. This was identified when a team of experts visited all directions of Sikkim and eventually found that all 16 farms they visited for their study were under the practice of Organic farming already. Not only this, but, it surprising that farmers of Sikkim were experiencing huge success as far as Organic farming is concerned. Organic farming was practiced by the Sikkim farmers by default, much before the introduction of state administration's initiatives towards Organic farming that began in 2003. Cardamom, which is Sikkim's main cash crop is grown with little or no fertilizers, thereby, making Sikkim as one of the states in India that is lowest among fertilizer using states.

In a span during 2003 to 2014 Sikkim completely banned the use of fertilizers by initially reducing the use of fertilizers by 10% and gradually moving to realize a state of zero fertilizer agriculture. Sale and use of fertilizers in Sikkim is now completely banned and any breach to this law attracts fine of rupees one lack, as punishment. Thanks to the SOM (Sikkim Organic Mission) to have imparted training and education on a continuous basis to its farmers. The SOM also needs to be appreciated for helping gradual transformation the traditional practice of cultivation to Organic farming.

VII. STATE OF AGRICULTURE IN TRIPURA

Facilitation of materials as prerequisites for plantation of tuber, fruits, spices, etc. and vegetable seeds is what the KVKs (Krishi Vigyan Kendras) in Tripura provide to the farmers. The KVKs have been training farmers on aspects like adoption of latest farming technologies, homestead farming, and bio-resource conservation that is possible keeping in view the climatic and soil conditions of Tripura. Special support in the form of jalkund

(artificial water reservoirs), poultry and vermin-compost are also made available by the KVKs to the farmers to facilitate water harvesting and farm compost creation. Maintenance of rich harvests through integration of requisite components has been the aim of the Government of Tripura, which is clearly visible from the improvements that have been seen in the lives of farmers in recent years. Such improvements could be estimated as farming in 0.166 hectares of land could reap an income as high as Rs. 67705 per year.

VIII. STATE OF AGRICULTURE IN MEGHALAYA

Meghalaya is predominantly an agrarian economy. The occupation of Meghalaya people is primarily agriculture. The crops produced in this state can be segregated into food grains contributing to 62%, cash crops contributing to 25%, horticulture amounting to 9% and other miscellaneous crops 4%. The state produced crops in wide due to its geographical conditions and diversified topology. The major or primary crops are maize, rice, cotton, pineapple, jack fruit, bananas, lichi, lemon, cabbage, cauliflower, guava, lettuce, beetroot, beans, peas, etc. Moreover, spices like Indian long pepper, winged prickly ash, Bengal ginger, turmeric, aromatic ginger, etc are also produced by the farmers of the state.

Meghalaya has been practicing organic farming since long now. Moreover, it is sustainable and chemical free. They also use environmental friendly manure which is organic. The Meghalaya farmers are using liquid bio-fertilizers. It act as a safety shield for soil health and provides nutrients to the plants. Important micro-organisms which help in the improvement of fertility of the soil, happen to be existing in bio fertilizers that may be in solid or liquid form. It protects the plants from environmental threats. The returns on investment in framing in Meghalaya are comparatively very high as compared to other states. The use of bio-fertilizers helps in reducing the chemical fertilizer use to large amounts. The most important thing is that it, it is quite easy for the farmers to use the bio- fertilizers. The Meghalaya farmers are using different types of liquid bio fertilizers for different crops. Some of them are discussed below:

1. Rhizobial

- It is found in the soil in living state in the form of bacterium.
- Such bacteria are able to infect a definite type of crop which is leguminous and hence, are treated as special. The pea family happens to carry and produce such bacteria, of which the flowers are very prominent and the pods carry the seeds and the roots contain symbiotic bacteria which are capable of nitrogen fixation.

2. Phosphate Solubilizing Bacteria (PSB)

- It is considered as a bio fertilizer that is soluble and can be used through many processes to make use of fixed phosphate.
- Development and growth of plants is managed by it.
- Since it is easy to digest for the plants, it is widely acceptable for creation of plant growth hormones. The use of this fertilizer helps a growth of 10-20% of the plant productivity.

3. Potassium Mobilising Bacteria (KMB)

- One of the vital inputs to allow the plant to swallow potassium nutrients is KBM.
- Development of roots is promoted by these bacteria to allow increase in soil health through the plant.
- 50-60% of requirements of potassium by the plants is reduced by applying KBM.
- The ability to suit all soil types, in one of the greatest benefits offered by KBM.

4. Micronutrients

- Microorganisms are responsible for transformation of micronutrients like copper and zinc present in the soil into bio fertilizers.
- The soil in most parts of Meghalaya has zinc in huge quantities in it, which can be used effectively for farming.
- Thiobactillus Thioxidants, Bacillus subtilis, and Saccharomyces are microorganisms that are able to make zinc soluble and hence can be made to use for plant growth.

5. NPK

- A combination of microorganisms such as phosphate solubilizing bacteria, potash solubilizing bacteria and nitrogen fixer, that are compatible to each other forms this fertilizer and is generally available in liquid state.
- It is widely used by farmers for growing tea.

It is understandable from the above study that, owing to continuous improvements in technology, and skill and knowledge levels of the farmers, the North Eastern States have seen a regular rise in productivity as far as agriculture is concerned. This study needs to take help of certain statistical interpretations to prove such theoretical assumptions. Thus, Statistical interpretation of farmer income and agricultural productivity becomes necessary to know where Odisha stands in comparison to the above mentioned agricultural states.

To fulfil our objective “Factors affecting agri-products distribution with reference to north eastern states of India”, the theoretical evidence has already been discussed. So, now it becomes must to bring about a comparative statistical analysis to make sure the above theory is true.

Hence, let us go through the below mentioned statistical data to see if the hypothesis taken for the study stands accepted or rejected, the hypothesis being:

Ho: The agricultural produce distribution systems in the eastern states in India are better than that of Odisha.

Ha: The agricultural produce distribution systems in the eastern states in India are not better than that of Odisha.

Table 2: Total Income of Agricultural Households in Indian States

State/ Group of UTs	Earning from Crop Farming	Earning from Animal Farming	Earning from Farm Wages	Earning from Business (Non-Farm)	Total Earning
Andhra Pradesh	2022	1075	2482	400	5979
Arunachal Pradesh	6647	1310	2076	836	10869
Assam	4211	799	1430	255	6695
Bihar	1715	279	1323	240	3558
Chhattisgarh	3347	-19	1848	1	5177
Gujarat	2933	1930	2683	380	7926
Haryana	7867	2645	3491	431	14434
Himachal Pradesh	2876	1047	4030	824	8777
Jammu & Kashmir	3063	801	7336	1483	12683
Jharkhand	1451	1193	1839	238	4721
Karnataka	4930	600	2677	625	8832
Kerala	3531	575	5254	2529	11888
Madhya Pradesh	4016	732	1332	129	6210
Maharashtra	3856	539	2156	834	7386
Manipur	2924	1563	3815	540	8842
Meghalaya	6472	657	3776	887	11792
Mizoram	4561	864	3655	19	9099
Nagaland	3212	1384	5393	59	10048
Odisha	**1407**	**1314**	**1716**	**539**	**4976**
Punjab	10862	1658	4779	760	18059
Rajasthan	3138	967	2534	710	7350
Sikkim	1696	980	3113	1009	6798
Tamil Nadu	1917	1100	2902	1061	6980
Telangana	4227	374	1450	260	6311
Tripura	2772	311	2185	162	5429
Uttarakhand	2531	848	1069	253	4701
Uttar Pradesh	2855	543	1150	376	4923
West Bengal	979	225	2126	650	3980
Group of UTs	1864	213	5179	1312	8568
All India (Average Earning)	**3081**	**763**	**2071**	**512**	**6426**

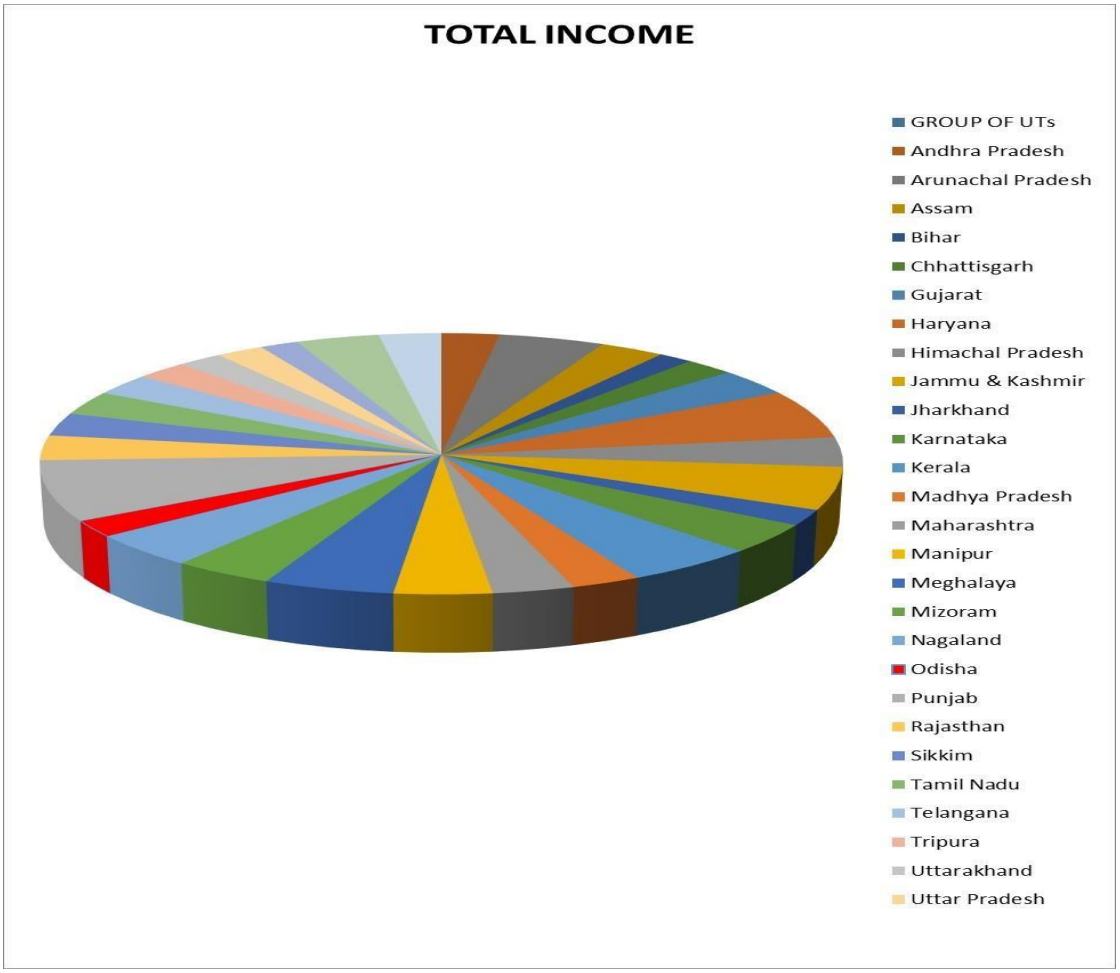

Figure 1

Table 3: Comparative Analysis of Income for Agricultural Households in Northeastern States and Odisha

State	Earningfrom Crop Farming	Earning from Animal Farming	Earning from Farm Wages	Earningfrom Business (Non- Farm)	Total Earning
ArunachalPradesh	6647	1310	2076	836	10869
Assam	4211	799	1430	255	6695
Manipur	2924	1563	3815	540	8842
Meghalaya	6472	657	3776	887	11792
Mizoram	4561	864	3655	19	9099
Nagaland	3212	1384	5393	59	10048
Odisha	**1407**	**1314**	**1716**	**539**	**4976**
Sikkim	1696	980	3113	1009	6798
Tripura	2772	311	2185	162	5429

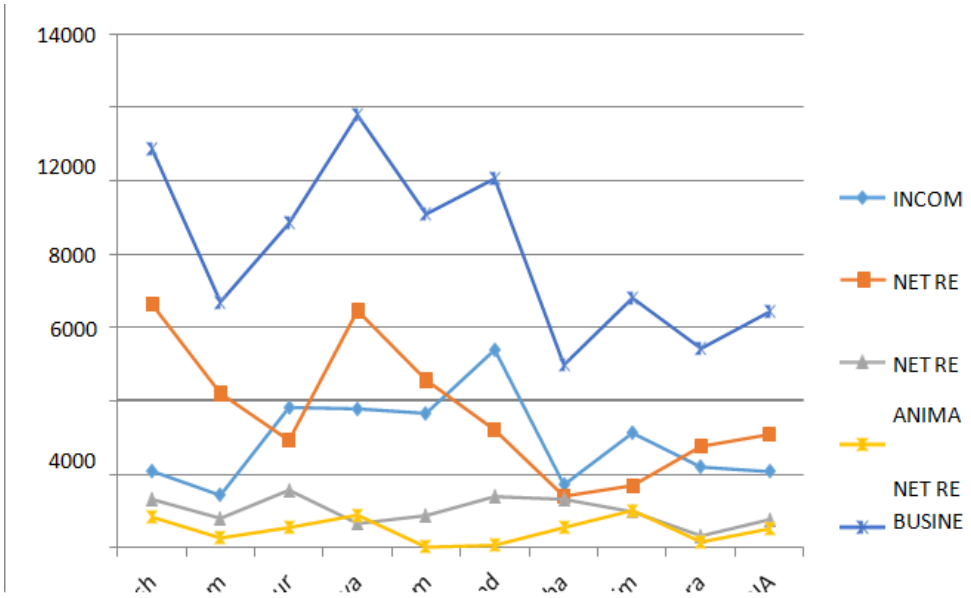

Figure 2

A comparison of the net income of agricultural households from agriculture of the taken nine state including Odisha, would help us in arriving at a desired figure to decide the validity of the hypothesis considered to prove our approach to be correct or not.

Table 4: Comparative Analysis of Earnings of Nine States and Assigning Ranks to Them based on the Percentage of Total Income

State	Net Receipt from Cultivation	Net Receipt from Farming of Animals	Total Income	Percentage of Total Income of All Nine States	Position Based on Total Monthly Income
Arunachal Pradesh	6647	1310	7957	18.47	1
Assam	4211	799	5010	11.63	4
Manipur	2924	1563	4487	10.41	6
Meghalaya	6472	657	7129	16.54	2
Mizoram	4561	864	5425	12.59	3
Nagaland	3212	1384	4596	10.67	5
Odisha	**1407**	**1314**	**2721**	**06.32**	**8**
Sikkim	1696	980	2676	06.22	9
Tripura	2772	311	3083	07.15	7

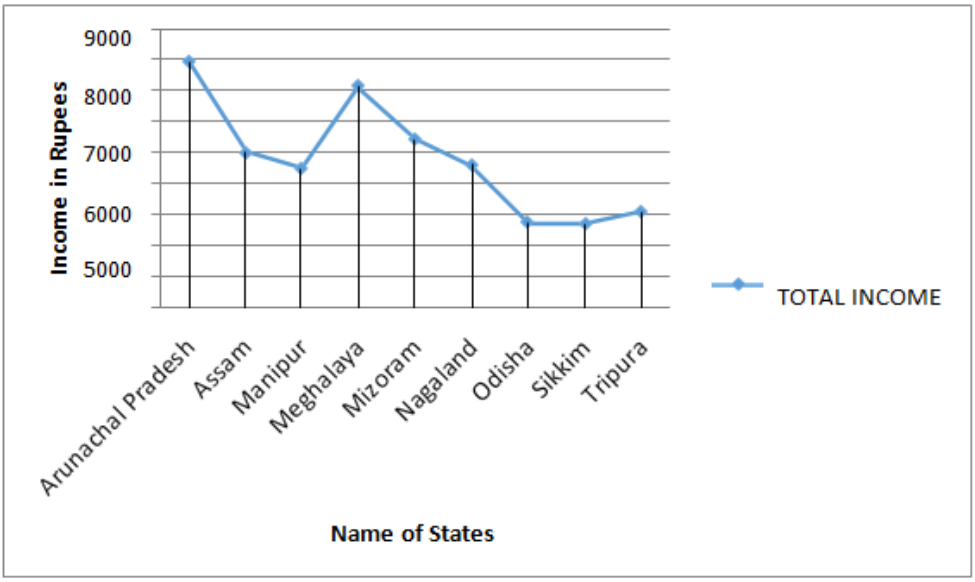

Figure 3

From the above statistical table it is clear that the Odisha farmers' contribution to the total of agricultural production in India, in comparison to other states is very low and Sikkim stands next to it, as Odisha contributes to 6.32% of the total income generated by all states put together. Hence, the state is ranked 8th among the nine states.

So, the analysis done above is sufficient to prove that the Income of Odisha from agriculture is poor in relation to the states of the North East of India, in general. So, the Null hypothesis taken for the study "the agricultural produce distribution systems in the eastern states in India are better than that of Odisha" stands to be correct and so the study now successfully fulfills the objective taken into consideration.

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