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Practice of Agro-Pisciculture among the Apatani tribe of Ziro Valley, Arunachal Pradesh

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Abstract

The Apatani tribe inhabiting in the Ziro valley of Lower Subansiri District, Arunachal Pradesh are one of the few ecological farming practicing communities of the world. The unique combination of Rice and Fish firming in the same field with distinguishing irrigation system makes the Apatanis unique in themselves. Along with the rice cum fish cultivation the terraces of Ziro valley produces lots of agricultural products, Kiwi is one of the many to mention.

Agriculture sector worries the scientists because the amount food products produce per hectare would not be enough for the whole population to feed in the coming future. Scientist has come out with High Yielding Variety (HYV) seeds to meets the needs of the population. This seeds are of better quality compare to the normal one and production is bit more than the normal seed. However, there are unique farming practices in different parts of the world which are sustainable and self-sufficient in nature. The agro-pisciculture is a very unique concept seen in the Ziro Valley of Arunachal Pradesh, situated in the Eastern Himalayan region of India.

Present study is based on the agriculture practice of Apatani tribe, residing in Ziro valley of Lower Subansari district, Arunachal Pradesh. The sustainable agriculture practice of Apatani tribe is widely famous in the world. Present study is undertaken to understand more about their sustainable agriculture and about their land use land cover for their agriculture and how they have maintained their way of agriculture in this modern world and the amount of production they produce to this increasing population.

Key Words: Apatani, Rice cum Fish cultivation, Ziro, LISA

Introduction

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Due to growing population several agriculture lands has been turned into urban areas. Therefore, sustainable agriculture is practiced to meet the necessity of the human and environmental needs. “Sustainable agriculture can be understood as an ecosystem approach to agriculture” (Altieri, Miguel A. 1995). Sustainable agriculture can be found in many places of Southeast Asia where the farmers practice agriculture as an alternative farming or ecological farming. In the present study the study area is selected to observe the sustainable agriculture is the Ziro valley of Arunachal Pradesh which is mostly occupied by the Apatani tribe. The uniqueness of the place not only provides food security to the inhabiting tribe but also attracts tourists from across the world to look onto their unique culture. The combined impact of agriculture and tourism is leading the economic prosperity of the Valley.

“Organic agriculture is seen by practitioners as a holistic endeavor, with attitudes and lifestyle of the farm family being inseparable from the well- being of the other components of the farm system. The all-important holistic nature of the farm implies interactions between components such as crops with crops, crops with animals, and soil condition and fertility with insect and disease incidence in the crops and livestock. These interactions, in the minds of many, limit the degree to which component parts may be meaningfully separated in field or laboratory studies.” (Crosson, 1989)

As a part of study an analysis is made to establish the type of alternative farming or ecological farming practiced mainly by the Apatani community residing in Ziro valley of Arunachal Pradesh as LISA (Low Input Sustainable Agriculture) using LISA model foewarded by Neil Schaller, Programme director, Low Input Sustainable Agriculture Research and Education Program, Cooperative State Research Service, USDA, Washington. “LISA is a way of thinking about farming. In incorporates some ideas found in what people have labeled ecological, organic, regenerative biological or simply alternative agriculture.” (Schaller, 2005)

Objective

The major objective of the present study is to understand the unique agricultural system of the Apatani tribe of Ziro valley of Arunachal Pradesh.

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Database and methodology

Both primary and secondary data have been used in the study. Focused group discussion has been carried out with the elderly people of the community who were engaged in the agricultural practice. GPS points have been collected from different agricultural plot during the field visits for accuracy assessment and for the area calculation. Moreover, secondary data have been used from sources, such as research papers, journals, published and unpublished research work, internet sources.

Descriptive research method is used to analyse the pattern of agriculture of the Apatani tribe. A detailed pre study on the agricultural practice of the Apatani has been carried out. Survey was conducted in the Ziro valley with the help of structured questionnaires by selecting a particular village of the valley named Dutta village. The questionnaires focused on sustainable agricultural practices among the Apatanis mainly Paddy-cum-fish cultivation. Extensive interviews and informal discussions were held with older farmers and local tourist guides to gather information on their land use pattern including paddy-cum-fish practices. Based on the collected and observed information analysis is done regarding the research problem.

Previous literature on Apatani tribe

The Apatanis are the inhabitants of the Ziro valley, Arunachal Pradesh from Northern area beyond Khru and Kime River. The Apatanis are surrounded by the Nyishis on the North, West and South, the hill Miris on the North and Siyajuli and Dolungmukh on East. (Tage Mamu, 2010). Similarly F. Persis (2017) carried out study on ‘Symbiosis between nature and culture- A case study of Apatani Cultural landscape, India. The paper includes the remarkable precise of yielding rich as well as fish, by the Apatani tribe, has been sustained over generations and has not been influenced by any modern techniques. The relationship between nature, culture, and human mutually supporting each other has been recorded in the paper. H. Sarah (2018) gives an overview of Culture of Friendship among the Apatani community of Arunachal Pradesh. The paper seeks to explore the aspects of friendship and its relevance of friendship in the circulation of labour for sedentary agriculture.

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Sustainable Agricultural Practices among the Apatanis of Ziro valley

"The orchid state Arunachal Pradesh is a mosaic of composite culture, tradition and is well known for its ethnic diversity. The Lower Subansiri district, the unexplored paradise, famous for its non-nomadic Apatani tribe is mostly found in the Ziro valley of Arunachal Pradesh. Ziro valley is famous for its rolling pine hills, rice cultivation, aqua culture and the fascinating Apatani people. In April 2014, Apatani cultural landscape has also been added to the tentative list of UNESCO World Heritage Sites for extremely high productivity and unique ways of preserving ecology" (Gupta, 2014). The Apatani people are famous for their unique methods of sustainable farming. The sustainable agricultural farming is an ecological farming which promotes methods and practices that are economically viable, environmentally sound and protect public health. In Ziro valley, about 48.38 % land is under paddy-cum-fish cultivation, followed by 32.64% clan forest, 16.41% bamboo forest and 2.75% home garden (Rai, 2004).

Cropping season

The Ziro Valley is popularly known as " Rice Bowl of Arunachal Pradesh, Ziro, a scenic valley is the home of the Apatani tribe whose unique land use pattern, resource management and culture of conservation have made them a focal point of attraction" (Ramakrishnan, 1990; Moyoung et. al., 2012). The agricultural seasons of Ziro valley is divided into three seasons viz. kharif, Rabi and zaid. The Apatani tribe mainly focuses on kharif season for their agricultural practices. During Rabi and winter seasons the agricultural fields are left barren as the tribe focuses mainly on kharif season. The kharif cropping season starts from July to October during the South-West monsoon.

Table 1: Activities calendar of paddy field management by the Apatani tribe.

Sl. No	Month	Activities	Local name
01	November-December	Chanel's	Hattar
02	December-January	Manuring of paddy field with,	Abu ache badu
		Poultry droppings	a) Paropaii

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		Pig excreta Cow dung Rice husk Local beer waste product Ashes from household firewood burn product Ashes from burn straw Decompose straw and weeds	b) Alyiekha c) Sheeekha d) Pinang e) Ooh poi f) Mubu g) Muyu h)Lissi & tamiiyanii
03	January-February	Bund	Agar
04	February mid to March first week	Sowing	Andhi Lilo
05	April to May first week	Transplanting	Andhi Ali
06	May	Weeding & re-transplant	Tami hodu & Andhi Lithidu
07	June to August	Weeding once a month	Tami Hodu
08	September last week to October 3rd week	Harvesting	Antee Dandu

Source: Integrated Paddy, Fish and Finger Millets Cultivation by Apatani Tribes in the Eastern Himalayan Region – Arunachal Pradesh (Tilling Tayo et. Al., June 2017).

During the months of November and December, channels are made from natural streams towards the agricultural fields for the purpose of irrigation with the help of pipes made of bamboo. As soon as the fields are filled with water, organic fertilizers are deposited to the paddy fields which are done during December to January. The main organic fertilizers used include poultry droppings, pig excreta, cow-dung, rice husk, etc. After the manuring of field, bunds are repaired wherever crakes are noticed or weak point is observed which might not be able to withstand the pressure of water during the peak period of next rainy season. Bunds were made during January to February. After preparation of land, the nursery bed were slightly elevated with the help of wood or bamboo which is further divided into two-three different compartment so that excess water is drain out through the depression present between each compartment. Paddy seeds are sown in the month of mid-February to first week

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of March. Transplantations of paddy sapling start from late April to first week of May, when saplings attend a height of around 12cm. First weeding is done in the month of May, and re-transplantation of paddy saplings is carried out selectively, for died or vacant spot. There after weeding is done once in every two months from June to August till paddy attends milking stage. By the end of September the paddy becomes mature for harvest and harvesting continued till third week of October.

Methods and tools

The method and tools involve in the Apatani agriculture system is very indigenous and it has still not been affected by modern farming techniques. Their agriculture system is fully dependent upon human labourer. "Unlike other farmers Apatanis never use cattle and other livestock for ploughing purpose, they plough the fields manually with the help of spade (Dipe) and break the soil with legs by marching till it become fine enough to make a liquid paste and distribute the soil evenly with the help of legs by splashing the soil thereby moving the legs in semicircle manner clockwise and anticlockwise direction till the surface of land is made even." (Tayo tilling.et.al. 2017). They make strong bunds for the purpose of paddy as well as for rearing the fish. The farmers also ear mark a particular field for nursery and it is maintained throughout the year for that purpose only. The plots are filled with water throughout the year and weeding is also done on monthly basis. The paddy cum fish culture of the Apatani people is very much successful because of their unique irrigation system. During the survey it was observed that water for irrigation depends on streams that originate from the mountain. Water channels are constructed in such a way that it can irrigate all the fields equally located in the upstream and downstream areas. The outlet channel is opened for the lower fields after the upper fields receive their share of water. 'However, in this process, it takes some time for the water to reach the tail end. During this time the lower fields have to remain without water. To overcome this problem, a separate channel at the head is made from the mainstream through which water is diverted to fields located at the tail end.'(C.P.R. Environment Education Centre). They have restrained themselves from using pesticides and fertilizers and seldom provide supplementary feed to the reared fishes. To enhance the fertility of the soil, they uses the domestic waste such as home waste, animal dung, ashes and remains

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of burnt straw after harvest 'The channel for irrigation also carries a lot of natural fertilizers of rotten leaves from the wooden land to fields' (Rai.S.C. 2004).

Types of seeds

"Rice being the staple food of Apatanis, paddy cultivation of settled type agriculture is practiced, in which fish and finger millets are integrated for higher economic return and judicious utilization of land pattern system" (Tiling Tayo et.al.,2017). Paddy seed varieties used by the Apatani tribe are of traditional varieties. Because of the use of LISA, the output rice production is generally high as compared to the other tribes.

Table 2:- Local Paddy varieties of Apatani Tribe.

Sl. No.	Rice variety	Characteristic	Harvesting time
01	*Papying*		
	Dulleypapying	Yellow rice husk	September
	Papyingphakhe	Black rice husk	September
02	*Mipya*		
	Pyate Mipya		
	Pyate Paphyu	Yellow rice husk	August (lost)
	Pyate Phake	Yellow rice husk	August (lost)
	Phulu Mipya	White rice	July
	Phare Mipya	Yellow rice husk	July (lost)
03	*Amho*		
	Radhe Amho	Yellow rice husk	October
	Tanii Amho		
	Ampu Amho	Off white rice husk	October
	Alang Amho	Red rice , very hard	August (lost)
	Arehe Amho	Yellow rice husk	July (lost)

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	Ankhee Amho	black rice husk, rice white	August (lost)

Source: Primary observation (2019) and Integrated Paddy, Fish and Finger Millets Cultivation by Apatani Tribes in the Eastern Himalayan Region – Arunachal Pradesh (Tilling Tayo et. al., 2017).

The Apatani farmers mainly cultivate three different types of paddy seed in their fields. These three paddy seeds are locally known as *Papying, Mipya* and *Amho*. The harvesting time of *Papying* is generally September. *Papying* seed varieties are sub divided into *Dulley Papying* which is of yellow rice husk and *Papying Phake* which is of black rice husk. Both the varieties of *Papying* are harvested in the month of September. Another major paddy seed variety of Apatani is Mipya which is divided into five sub varieties i.e. *Pyate Mipya, Pyate Paphyu* which is of yellow rice husk, *Pyate Phake* which are also of yellow rice husk, *Phulu Mipya* is generally of white rice husk and *Phare Mipya* which is characterized by yellow rice husk. Harvesting for the *Mipya* rice is done in the month of August and July according to the varieties. Another seed variety cultivated by the Apatani Tribe is *Amho* which is divided into four different seed varieties and crops are harvested in the months of July, August and October according to the seed varieties. Few of the sub varieties within the major varieties are not cultivated nowadays due to early harvest season and such varieties are very prone to pest (birds and rats) attacks, as a result early harvest varieties are not cultivated by the farmers considering extra labour needed in guarding the pests.

Paddy-cum-Fish Farming

The wet paddy-cum-fish farming system is extensively practiced by the Apatani tribe of Lower Subansiri district, Arunachal Pradesh. It is a unique way of practicing three components in systematic way, through judicious use of land by taping the potential of every inches of cultivable land by conservation of water along with fish rearing and soil conservation through plantation of finger millets along the bund thereby improving the land use pattern. This unique skill of integrated paddy with fish farming (traditionally called *Aji-ngyii)* was introduced in 1980s with great success and constantly evolved since then

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(Ramakrishnan 1984 and 1992; Dolo 2009; et. Al.). The paddy-cum-fish farming system is a network of channels and canals to ensure that water is distributed to every corner of the field. The streams are connected to a single canal to which each field is connected with a bamboo or pinewood pipe.

Table No. 3:-Release of fingerling and harvest of fish.

Sl. No.	Release of fingerling	Fish species	Harvest of Fish
01	January – February	a) Mirror carp (Cyprinuscarpiospecularis) b) Scale carp (C. carpiocommunis) c) Leather carp (C. carpionudus) d) Grass carp (C. idella)	May – June
02	April – May	a) Mirror carp (Cyprinuscarpiospecularis) b) Scale carp (C. carpiocommunis) c) Leather carp (C. carpionudus) d) Grass carp (C. idella)	July – August

Source – Integrated Paddy, Fish and Finger Millets Cultivation by Apatani Tribes in the Eastern Himalayan Region – Arunachal Pradesh (Tilling Tayo et. Al. , June 2017).

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Marketing

The Apatani communities not only cultivate their goods as subsistence agriculture, they also sell the surplus produce in the local market (Hapoli). The agricultural activity is fully dependent upon the human labourers and not animal traction. According to the estimates of the local villagers yield of rice per bigha is 350 kgs and from this they earn an income of 30-40 thousand per year. The Apatani people practices paddy cum fish cultivation in which they rear fish along with the paddy cultivation. Generally, the fish is reared mostly for the purpose of self-consumption. Different varieties of fishes are reared in two different seasons; one is during the month of May to June and other from the month of July to August. Besides, the surplus fishes are also sold in their local market from which they earn around Rs. 300 per kg.

The goods produced by Apatani communities are both for subsistence and commercial purpose, whereas the Adi tribe cultivate mainly for self-consumption. The Apatani tribe practices paddy cum fish cultivation only in kharif season in which they rear fish along with the paddy cultivation. They generally rear fish mostly for the purpose of self-consumption and paddy both for self-consumption and selling. Whereas, the Adi tribe cultivate paddy in kharif season and in Rabi season- mustard and sesame are cultivated. Rice production is done for subsistence and mustard and sesame are cultivated both for self-consumption and selling. Rice is generally cultivated for self-consumption though they also sell at the price of Rs.500 per tin (one Adi Tin amounts almost 12 to 15 kg) whenever they are scarce of money. Both mustard and sesame are sold in the local market at the price of Rs.30 per kilogram and Rs.81 per kilogram respectively. But the selling price of both the products is not fixed and varies with the availability of the product.

Conclusion

The Apatani tribe is practicing the unique combination of rice cum fish cultivation in the same field along with the spectacular irrigation system. Economic benefits are seen from both agriculture and tourism which are flourishing in the valley.

Thus, it can be concluded that the paddy-cum-fish agro-ecosystem performed by the Apatanis is highly productive and is 3 to 4 times of the average yield of the paddy in the state and the

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practice is economically viable. The cost of cultivation is low and inputs include only labour, organic manure and seeds; animal power is not used which establishes that a Low Input Sustainable Agricultural method is being adopted by the Apatani tribe. Another agro based product gaining significant importance among the tourists visiting the vally is the locally produced kiwi wine. This kind of entrepreneurship will enhance the prospect of economic development in the valley. Due to this unique agriculture practice and the lush green valley of the Apatanis, tourist are also attracted to the valley which leads to the growth of new urban center in the Ziro valley of Arunachal Pradesh namely Hapoli or New Ziro.

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