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Traditional Farming and Soil Quality Analysis of Paddy Field of Ziro Valley of Arunachal Pradesh

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Abstract:

The Apatanis are the inhabitants of the Ziro valley who migrated to this valley from northern area beyond Khru and Kime river. They practice settled agriculture. Their traditional agriculture is unique in that both paddy and fish are cultivated together in the same plot. The farming is no tillage farming. No chemical fertilizers and pesticides are used and so it is totally organic. The paper seeks to study the climatic condition and the overall cultivation process of paddy cum fish in Ziro valley and average field size, source of water, variety of rice and fish used and yield in eight selected villages. Soil parameters of paddy fields like P^H , organic carbon, phosphorous, Iron and texture of five selected villages are tested chemically. All the villages use stream water to irrigate the paddy fields. They use an indigenous variety of paddy and fish. Colorimetric method and Atomic absorption spectrophotometry have used to estimate these parameters. P^H of the soil is slightly acidic. Organic carbon and Iron content are found high.

Keywords: Apatanis, Ziro, Paddy cum fish, traditional

1. Introduction

The Apatanis are the inhabitants of the Ziro valley who migrated to this valley from northern area beyond Khru and Kime river. The Apatanis are surrounded by Nyishis on the North, West and South, the hill Miris on the North and Siyajuli and Dolungmukh on the East. [Tage Mamu, 2010].

The Apatanis practice settled agriculture. Their paddy cum fish cultivation is well developed and has been practicing since the time immemorial. This traditional farming is unique in that both paddy and the fish are cultivated on the same plot simultaneously. The system is totally organic. Even no feeding provides for the growth of fishes. Presently, the system of rice, fish is being practiced in Bangladesh, Cambodia, China (1.2 million ha), Egypt (173000 ha), Indonesia (138,000 ha), Republic of Korea, Madagascar (13,000 ha), Thailand (3 million ha) and Vietnam (40,000 ha) (Halwart, 1998). But due to high input cost it becomes a barrier for the farmers. But Apatanis have made it possible at a low input cost and with a good economic return. (Saikia and Das, 2008). The traditional farmers' groups of the Apatani people have been successfully managing their natural resources for centuries. The Apatani have different types of traditional farmer groups, which have evolved over the years. (Dollo, Samal et al,2009)

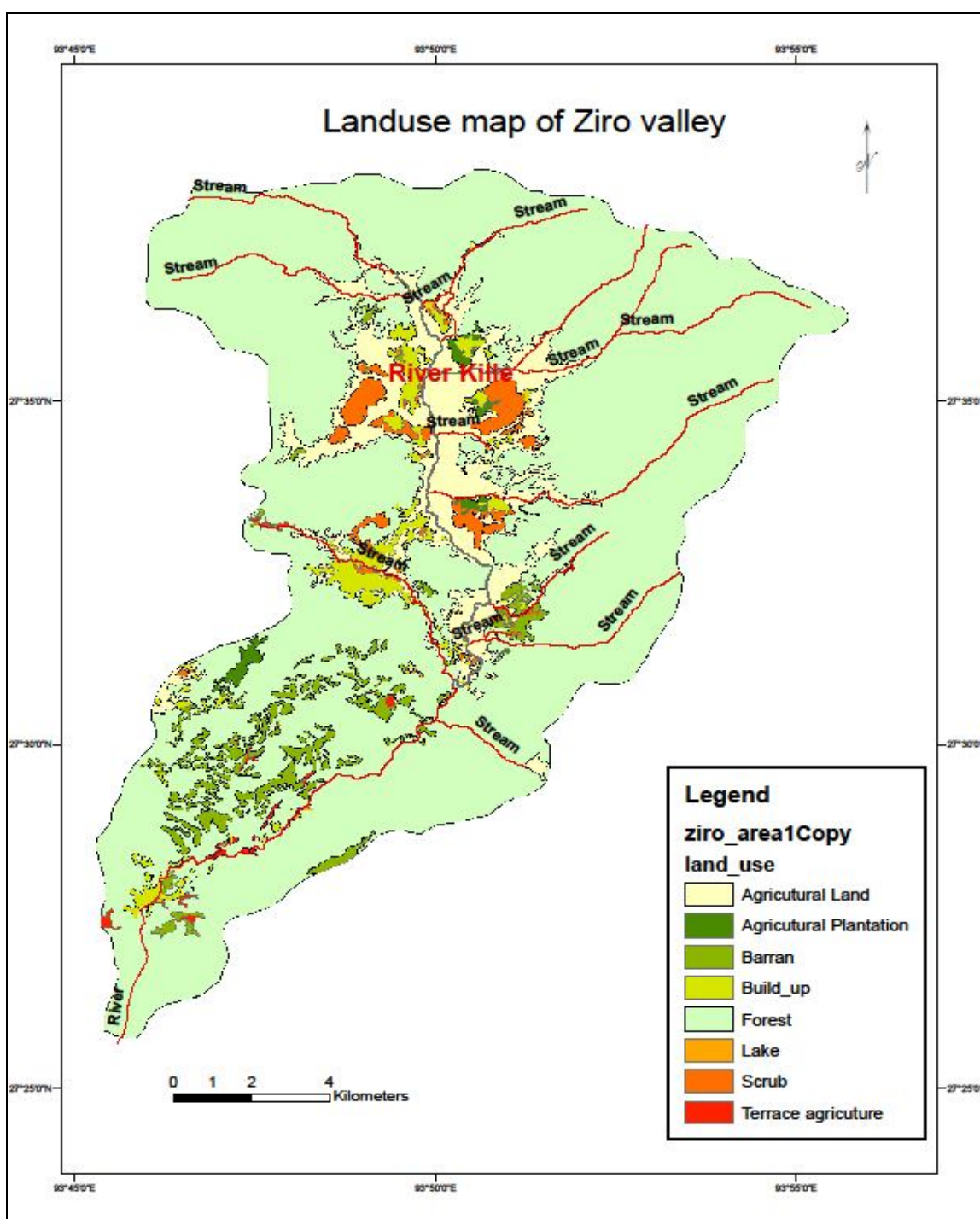


Figure 1: Land use map of Ziro valley

2. Methodology

The paper is based on both primary and secondary sources. Ten farmers who still practise paddy cum fish cultivation were selected randomly from each selected village. Data are tabulated and statistically analysed. Five soil samples were collected from each selected village. Colorimetric method is used for estimation of P and organic carbon. For P 5gm of soil is shaken with a 50ml extracting solution of 0.03 N NH_4F in 0.025 N HCl. The solution is filtered through Whatman No 42 filter paper. To filtered extract ammonium molybdate is added and as a result of which very faint yellow coloured phosphomolybdate complex gets precipitated. This complex is partially reduced by the stannous chloride solution to produce a characteristic blue colour. The intensity of the blue colour is measured using colorimeter. For organic carbon 1gm of soil is mixed with 10 ml of $\text{K}_2\text{Cr}_2\text{O}_7$ and 20 ml of H_2SO_4 and kept aside for one night. Next day the intensity of the colour is measured using colorimeter. For Fe estimation 10 g of soil is mixed with 20 ml of DTPA (Diethylene Triamino Penta Acetic acid). It is filtered and then after taking the standard reading Fe is measured from the filtrate by atomic absorption spectrophotometer. Drainage map and land use maps are prepared using Topo map and Google earth satellite image.

3. Results and Discussion

For cultivation of paddy, field preparation starts just after final harvesting. Paddy fields are burnt after harvesting. The burnt ashes act as fertilizer. The streams coming from the forest carry many degraded products which also provide nutrient to the fields when water passes through the fields. In the month of December- January earth works like raising and widening of dykes, excavation of trenches, loosening and levelling soil, provision of inlet and outlet with bamboo pipes etc. are done. In February weeding is started. Weeding is done 3 to 5 times per season. The weeds are left in the field to decompose. Simultaneously seedlings are grown in separate nurseries. In the last half of April seedlings are transferred from nurseries to the field. Fingerlings of size 80-100mm are also released to the field in the month of April-May. Minimum 1000 fingerlings are required for one ha land. In the month of April –May millets are also cultivated on the bunds. In June – July first harvesting of fishes is done when the fishes attain 200-300gm. Second harvesting is done in September. On an average 300-350kg of fishes are produced per ha from the paddy field. The fish species is *Cyprinus carpio*. This species has adaptability both at warm and low temperature. The maximum temperature at Ziro rises to 35° c and minimum falls down to 0° c. The common carp can sustain at both temperatures. The paddy varieties are Mypia, Emo and Pyapin. All these are indigenous variety. About 3-4 ton /ha rice is produced per season. The climatic condition of Ziro valley is as follows-

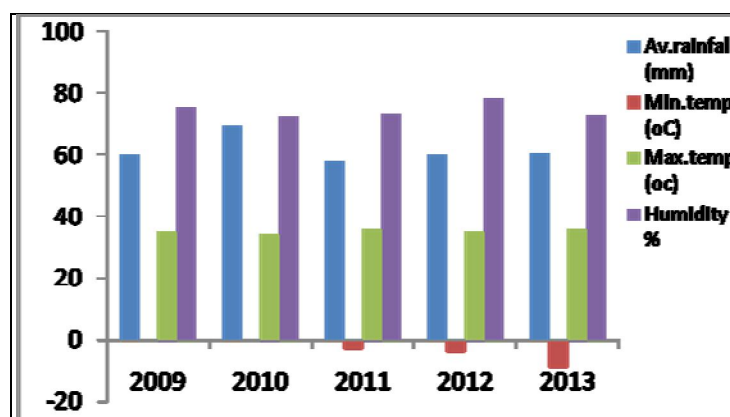


Figure 2: Climatic condition of Ziro valley

The field size, production etc in different villages can be shown as follows-

Village	Av. field size (m ²)	Source of Water	Major Local Rice Variety	Fish Variety	Yield	
					Rice ton/ha	Fish kg/ha
Hong I	2450	Stream	Emo, Mypia, Pyapin	Common carp	3.56- 4.78	400- 450
Hong II	1780	Stream	Do	Do	3.32-4.16	250- 300
Mudang tage II	1800	Stream	Do	Do	3.49-4.36	300-400
Hari II	1940	Stream	Do	Do	3.57-4.78	300-400
Tajang	1680	Stream	Do	Do	3.11-3.89	300-350
Hija I	1880	Stream	Do	Do	3.51-4.45	400-450
Hija II	1340	Stream	Do	Do	2.21-3.65	200-250
Kalong	1370	Stream	Do	Do	2.34-3.76	200-250

Table 1: Village wise production of rice and fishes in paddy cum fish cultivation

All the streams from the mountain are diverted towards the paddy field at the higher elevation using bamboo and pine wood pieces. The water is diverted by a network of primary, secondary and tertiary channel. The level of water is maintained by opening and closing of inlet and outlets which are called hubur made of bamboo. The water automatically flows down through the channels due to gentle slope and finally meets the major water channel at the lowest elevation which finally drains to the river Kille. Trenches of about 1-1.5feet depth are dug in the field so that fishes can take shelter in these trenches. When water dries up in the field, fishes take shelter in these trenches where water still remains. No feeding supplement is added for the fishes. Fishes feed on Azolla and Lemna minor (Phyto plankton) that grow in the paddy field. No chemical fertilizer and pesticides are used. They get a triple benefit from a single plot of paddy field simultaneously as paddy, fishes and millets are produced simultaneously in the same plot. The soil parameters of paddy fields of ziro valley are as follows-

Village	P ^H	Organic C %	P kg/ha	Fe ppm	Texture
Hong I	5.9	4.19	28.3	28	Clay
Hari II	5.8	4.11	27.9	28	Clay
Tajang	5.8	3.97	27.4	27	clay
Hija I	6.8	3.77	28.7	26	clay
Kalong	6.1	3.72	28.4	26	clay

Table 2: Soil parameters of paddy fields

The P^H of the soil is medium to slightly acidic due to presence of Fe. P is found in all the villages under recommended range. Fe and organic C is found high. No inorganic fertilizers are used. Burnt ashes, pig excreta and household kitchen wastes are dumped in the field to act as manure. After weeding weeds are also dumped in the field to decompose. Sometimes cow dung is used at a rate of 500-1000 kg/ha.

At the time of starting the integrated paddy cum fish cultivation system covered an area of 10 acres and the production of fish was 150kg/ha/season. Now it covers an area of 497 ha and the production of fish is 300- 500kg/ha/season. The requirement of the fish, seeds in the valley is 22million per ha. Fish seeds are produced in Govt. fish farm at Tarin and are sold at a rate of Rs. 1/fingerling. 50% beneficiary produces the seeds by themselves.

4. Conclusion

The Ziro valley is the rice bowl of Arunachal Pradesh. According to the increasing demand of fishes in the valley the production and supply is not enough. Development of infrastructure like marketing, processing unit, storage facility, transport facility, etc. should be provided by the Govt. They are practicing cultivation without any use of animal power. Extensive research should be carried out to know whether the animal power can be applied to increase their production or not. They use locally available material for their farming, which is both economically and ecologically viable. Integrating their traditional knowledge with proper modern technology can provide better benefit to the people of this region.

5. References

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