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Comparative analysis of farmers practicing different farming systems in lower Subansiri district of Arunachal Pradesh

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Abstract

Arunachal Pradesh is the land of tribal people, where majority of them practices traditional farming systems such as jhum cultivation and terrace cultivation. However, their farming systems suffers from low production, marginality, fragility, labour intensive, lack of high yielding varieties, etc. Therefore, there is a requirement of holistic combination of horticulture crops, agriculture crops and livestock enterprises which will boost farmers income and secure their livelihood. In this study, four major farming systems has been identified from Ziro-I and Ziro-II block of Lower Subansiri district of Arunachal Pradesh. A total of 200 farmers were selected as respondents, 50 farmers practicing each farming system. A comparative analysis was conducted on selected four major farming systems in order to identify the farmers performing best under different farming systems which can be further recommended for that particular region. For the comparative analysis Man Whitney U test was run and it was found that in Ziro-I block, 'Kiwi+Paddy+Fishery+Piggery' (mean rank 75.03) farming system perform better than 'Paddy+Fishery+Piggery' (mean rank 25.97). In Ziro-II block, 'Large cardamom+Paddy+Piggery' (mean rank 74.95) farming system perform better than 'Paddy+Piggery' farming system (mean rank 26.05). When all four farming systems were compared using Kruskal Wallies, the mean score of 'Kiwi+Paddy+Fishery+Piggery' farming system was highest (163.47) followed by 'Large cardamom+Paddy+Piggery' (132.75), 'Paddy+Fishery+Piggery' (66.96) and 'Paddy+Piggery' (38.82). Therefore, a combination of horticulture and livestock enterprises with the traditional farming system not only helps to increase farm income and profitability but also helps to preserve and conserve indigenous farming systems.

Keywords: Farming system, comparative, analysis, performance, profitability

1. Introduction

Arunachal Pradesh is the land of indigenous people comprising of 26 major tribes and more than 100 sub tribes. Majority of the population is dependent on agriculture and allied sectors for its livelihood. Based on tribes and different regions, they practice different styles of farming system. Mostly, they practice traditional farming system or subsistence farming such as jhum cultivation and terrace farming which are two major forms of farming system in Arunachal Pradesh. In jhum cultivation, lands are composed by cutting down or burning the unwanted vegetations in the area. Once the crops are grown and harvested, the farmers burn the land. They then move to a clear patch of land for a new batch of cultivation and as a result, the land gains back its fertility, naturally. While in terrace farming, multiple cultivated steps or terraces are shaped on the slopes of hills and mountains to prevent soil erosion and washing away of soil nutrients (Anonymous 2019). There is one tribe in Lower Subansiri district of Arunachal Pradesh, where Apatani tribe practices settled cultivation i.e. paddy-cum-fish cultivation using intricate system of canal irrigation unlike other tribes who practices shifting cultivation. But recently, due to low investment-low-income from traditional agricultural farming situation, gradual shift of farmers from agriculture sector to horticulture sector has been observed which is needed to accelerate the agricultural growth process in the state. As farmers in the state are still heavily dependent on traditional farming system, farming system in the state suffers from low production, low productivity, marginality, fragility, soil erosion and deprivation of high yielding varieties which puts farmer's livelihood in danger along with overall state economy which is majorly dependent on agriculture and allied sectors. These constraints can be overcome by approaching holistic combination of agricultural crops, horticultural crops and livestock along with good farming knowledge and skills possessed by farmers. In this study, performance of farmers practicing different farming systems are

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analyzed and compared so that a suitable farming system for a particular region can be identified which will increase farmer's profitability, income and overall better well being. Moreover, by ignoring farmer's performance in farming, the efforts to improve profitability and viability are likely to fail or will have only a marginal impact (Niall 2017) [3]. However, it is hypothesized that large improvements in profitability and sustainability of farming systems are possible through improved understanding and management of farmers. With this background, this study was attempted to analyze and compare the performance of farmers practicing different farming systems

2. Materials and methods

The study was conducted in Ziro-I and Ziro-II block of Lower Subansiri district of Arunachal Pradesh. Four major farming systems were identified from these two blocks of Lower Subansiri district. 'Paddy+Fishery+Piggery' farming system and 'Kiwi+ Paddy+Fishery+Piggery' farming system from Ziro-I block and 'Paddy+ Piggery' farming system and 'Large Cardamom+Paddy+Fishery+Piggery' farming system from Ziro-II block were identified for the study. Apatani tribe residing in Ziro-I block is famous for practicing paddy-cum-fish cultivation and also they are recently recognized for cultivating organic kiwi plantation whose production is highest in the state. Nishi tribe residing in hilly tracks of Ziro-II block mostly practice wet terrace paddy cultivation and like Apatani tribe, they have also been recognized for cultivation of large cardamom in the area recently. Both horticulture crops were found to be favourable to the agro-climatic situation of the area, therefore, combination of these crops along with traditional farming systems were identified for the study. A total of 200 farmers were selected as respondents from these two blocks; 50 farmers practicing each farming systems were considered for the study. In order to measure the performance of farmers practicing different farming systems, a comprehensive scale was developed under the guidance of experts and following Likert (1932) [2] and Edwards (1969) [1] methods for the construction of scale. The scale consists of 33 statements including negative statements and the response for each statement was collected on a four point continuum, namely, 'Always', 'Sometimes', 'Rarely' and 'Never' with assigned score of 3, 2, 1, and 0, respectively for positive statements and reverse scoring for negative statements. The performance score was measured by adding up the scores obtained by the respondents on all 33 statements. The score of performance scale ranges from a minimum of 0 to a maximum of 99. Based on the scores of respondents, performance level were categorized into poor, average and better by calculating total cumulated score and applying mean and standard deviation on them. For comparative analysis of performance of farmers practicing different farming systems, Man-Whitney U test and Kruskal wallies test were applied.

3. Results and discussions

3.1 Performance of farmers practicing 'Paddy+Fishery+Piggery' farming system in Ziro-I block

The result from the Table 1 indicates the performance of farmers practicing 'Paddy+Fishery+Piggery' farming system in Ziro-I block. It can be observed from the table that 40.00 per cent of the farmers belonged to poor level of farming performance, which is followed by average performance (32.00%) and better performance (28.00%), respectively. The

possible reason behind their poor performance level could be that all farmers are practicing traditional farming system or subsistence farming system in the block. They do farming for living and not for profit. This results in less income generation even though they are fully employed throughout the year. Moreover, they are not using any high yielding variety or improved technology to boost the yield and production. Every field operations are done manually which requires high labour cost and time. Hence, majority (72.00%) of them belonged to poor and average performance level.

Table 1: Performance of farmers practicing Paddy based farming systems in Ziro-I block $n_1=50$

Performance Category	Frequency	Percentage
Poor (<36.10)	20	40.00
Average (36.10-46.09)	16	32.00
Better (>46.09)	14	28.00

Mean= 41.1, Standard deviation= 9.98

3.2 Performance of farmers practicing 'Kiwi+Paddy+Fishery+Piggery' farming system in Ziro-I block

The result from Table 2 indicates the performance of farmers practicing 'Kiwi+ Paddy+Fishery+Piggery' farming system in Ziro-I block. It can be observed from the table that one-third of the farmers (34.00%) belonged to better farming performance category followed by average performance (38.00%) category and 28.00 per cent of the farmers belonged to poor level of performance, respectively. The possible reason behind their better to average performance level could be that kiwi based farmers are more innovative as compared to paddy based farmers and always would like to try changes in their farming systems. They not only rear pigs for living but also to compliment and support kiwi enterprise by using their excreta as manure. Also, climate and soil in Ziro-I block are conducive to kiwi production, therefore, paddy and fish growing farmers along with kiwi crop cultivation as major farming system are performing well in the study area.

Table 2: Performance of the farmers practicing Kiwi based farming system in Ziro-I block $n_2=50$

Category	Frequency	Percentage
Poor (<61.99)	14	28.00
Average (61.99-66.36)	19	38.00
Better (>66.36)	17	34.00

Mean= 64.18, Standard deviation= 4.36

3.3 Performance of farmers practicing 'Paddy+ Piggery' farming system in Ziro-II block

The result from the Table 3 indicates the performance of farmers practicing 'Paddy+ Piggery' farming system in Ziro-II block. From the table, we can observed that half of the respondents (52.00%) belonged to poor level of farming performance, which is followed by 26.00 per cent belonged to average level and 22.00 per cent of the farmers belonged to better level of performance, respectively. The possible reason behind their poor performance level could be that farmers practicing 'Paddy+Piggery' farming system do not invest much time and effort on paddy field unlike 'Paddy+Fishery+Piggery' farming system farmers in Ziro-I block. Apart from this, they do not adopt improved production technologies in paddy cultivation which results in low yield and increased cost of production in the area. Further, they have small piggery units and they get some

income when piglets are matured. Unlike, Ziro-I block farmers, farmers of Ziro-II block don't incorporate pisciculture with paddy field, therefore, their mean score was less compared to Ziro-I block farmers. Hence, farmers practicing 'Paddy+Piggery' farming system tend to be poor performer.

Table 3: Performance of farmers practicing Paddy based farming system in Ziro-II block $n_3=50$

Category	Frequency	Percentage
Poor (<28.99)	26	52.00
Average (28.99-37.12)	13	26.00
Better (>37.12)	11	22.00

Mean= 33.06, Standard deviation= 8.12

3.4 Performance of farmers practicing 'Large Cardamom+ Paddy+ Piggery' farming system in Ziro-II block

The result from the Table 4 indicates the performance of farmers practicing 'Large cardamom+Paddy+ Piggery' farming system in Ziro-II block. From the table, it can be observed that 36.00 per cent of the farmers belonged to average level of farming performance. It is interesting to note that more than one-third (34.00%) of the farmers had better farming performance level followed by 30.00 per cent of them had poor performance. The possible reason behind their average to better performance level could be that large cardamoms in the study area are very favourable to the place and farmers are aware of its potential regarding its production and profitability. With the help of horticulture and agriculture officers, they invest lots of time and money on large cardamom cultivation especially in early years before fruiting since the plant is sensitive and requires care from time to time. Further, they are practicing traditional paddy farming and piggery along with cardamom cultivation which gives additional income for the family. Hence, 'Large cardamom+Paddy+ Piggery' farming system farmers are more actively involved in managing, producing, socializing and marketing activities. Therefore, the results tends to favour better and average level of performance.

Table 4: Performance of farmers practicing Large cardamom based farming systems in Ziro-II block $n_4=50$

Category	Frequency	Percentage
Poor (<55.79)	15	30.00
Average (55.79-61.56)	18	36.00
Better (>61.56)	17	34.00

Mean= 58.68, Standard deviation= 5.76

3.5 Comparison between two different farming systems in Ziro-I block

For comparing performance of farmers practicing two different farming systems, Mann-Whitney U test was applied which is depicted in Table 5. The result indicated that there was a positive significant difference between performance of farmers practicing 'Paddy+Fishery+Piggery' and 'Kiwi+Paddy+Fishery+Piggery' farming system at one per cent level. The mean rank of farmers practicing 'Kiwi+Paddy+Fishery+Piggery' was high (75.03) when

compared to 'Paddy+Fishery+Piggery' (25.97). The probable reason behind better performance of kiwi based farming might be that kiwi farmers are more progressive, innovative and actively involved in production and marketing activities of kiwi fruits. Moreover, they formed a society called 'Kiwi Growers Cooperative Society Ltd. Ziro' where they encourage each other to prosper in kiwi based farming system. Other than these aspects, climate and soil factors are conducive to kiwi plantation and good production of kiwi fruit in Ziro-I block. In case of paddy based farming system in Ziro-I which involves pisciculture and piggery enterprise, it is an age old traditional farming system practiced by Apatani tribe residing in Ziro-I block. Though they are very efficient in farming but their hardwork is not justified by their yield and income generation from their farming system. They do not use any chemical fertilizer, high yielding varieties or hybrid seeds or mechanization to ease their work or to boost their income generation. Although, they are known for very clean paddy field with very less weeds and pisciculture to boost their productivity but still they are suffering from low productivity and income. Hence, this difference was observed.

Table 5: Comparison between performance of farmers practicing 'Paddy+Fish+Piggery' and 'Kiwi+Paddy+Fish+Piggery' farming systems in Ziro-1 block $n=100$

Sl. No.	Farming systems	N	Performance	
			Mean rank	Sum of ranks
1.	Paddy+Fishery+Piggery	50	25.97	1298.50
2.	Kiwi+Paddy+Fishery+Piggery	50	75.03	3751.50
Mann-Whitney U			23.50**	

**Significant at 1 per cent level

3.6 Comparison between two different farming systems in Ziro-II block

The results of the Mann-Whitney U test from the Table 6 shows that there was a positive and significant difference between performance of farmers practicing 'Paddy+Piggery' and 'Large cardamom+Paddy+Piggery' farming systems at one per cent level. The mean rank of farmers practicing 'Large cardamom+Paddy+Piggery' was high (74.95) when compared to 'Paddy+Piggery' (26.05). The probable reason might be that large cardamom is a plantation crop which requires less investment except for initial stage as compared to paddy crops and due to better market price, farmers get more income from this crop. Also, the soil and climate are more conducive to production of large cardamom in the area as compared to paddy based farming system where there is a difficulty in farming since it is a terrain area and they have to cultivate paddy by terracing the land whereas in large cardamom, terracing is not required. In paddy based farming system they hardly get income from paddy but piggery helps them to get some income since not much expenses are involved in piggery. Another reason could be that farmers practicing cardamom based farming system are progressive and innovative in nature, they have frequent contact with horticulture/agriculture officers for advices and guidance which keeps them up to date of any information relating to their crops.

Table 6: Comparison between performance of farmers practicing 'Paddy+Piggery' and 'Cardamom+Paddy+Piggery' farming systems in Ziro-II block n=100

Sl. No.	Farming systems	N	Performance	
			Mean rank	Sum of ranks
1.	Paddy+Piggery	50	26.05	1302.50
2.	Large cardamom+Paddy+Piggery	50	74.95	3747.50
Mann-Whitney U			27.50**	

**Significant at 1 per cent level

3.7 Comparison between four different farming systems in Ziro-I and Ziro-II block

The Kruskal-Wallis one-way ANOVA was applied to test the significant difference between performance of farmers practicing different farming systems in Ziro-I and Ziro-II blocks which are depicted in the Table 7. The test turned out to a positive and significant difference among different farming systems viz. 'Paddy+Fishery+Piggery', 'Kiwi+Paddy+Fishery+Piggery', 'Paddy+Piggery' and 'Large cardamom+Paddy+Piggery'. The data revealed that mean score of 'Kiwi+Paddy+Fishery+Piggery' farming system was more (163.47) followed by 'Large cardamom+Paddy+Piggery' (132.75), 'Paddy+Fishery+Piggery' (66.96) and 'Paddy+Piggery' (38.82). The probable reason might be that, in kiwi based farming system piggery excreta are used as manure, also most of the pigs are reared in the field itself so

that its manure such as urine and faeces can be passed down to kiwi plants. In addition to that pisciculture is practiced in the same paddy field which helps in increasing paddy yield. Farmers involved in kiwi based farming system and cardamom based farming are more actively involved in societies and have frequent contact with departmental officers, governments, colleagues, etc. They are more innovative, progressive, actively involved in managing their fields, marketing their products and also they have entrepreneurial skills compared to others. Whereas, 'Paddy+Piggery' practicing farmers lacks in managing and entrepreneurial skills. Their production is less and they invest lots of money on labour inputs which do not bring much remuneration to them making them financially weak. The findings are in conformity with Shwetha (2016) [5].

Table 7: Comparison between performance of farmers practicing different farming systems in Ziro-I and Ziro-II block N=200

Sl. No.	Farming systems	Frequency	Mean Score	Chi-Square value
1.	Paddy+Fishery+Piggery	50	66.96	7.81**
2.	Kiwi+Paddy+Fishery+Piggery	50	163.47	
3.	Paddy+Piggery	50	38.82	
4.	Cardamom+Paddy+Piggery	50	132.75	

**Significant at 1 per cent level

4. Conclusion

Farmers practicing paddy based farming systems in Ziro-I and Ziro-II block being traditional in nature rely on age old practices as a result they are poor performers as compared to kiwi based farming system farmers and large cardamom based farming system farmers. Being indigenous to the tribes, they are labour intensive yet less productivity, provides low income and profit despite being engaged whole year round. Therefore, a holistic combination of potential horticulture crops such as kiwi and large cardamom and other high value crops which is suitable for the area are required along with livestock in order to increase the profitability and viability of farm in addition to conserving and preserving indigenous farming systems.

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