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Study of integrated farming system for doubling farmers income in district Kushinagar of eastern Uttar Pradesh

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Abstract
Kushinagar district of Eastern Uttar Pradesh is divided into 14 blocks with 1571 villages. The net sown area is 2.33 lakh ha out of that 1.67 lakh ha under irrigation. This district has a prominent place for fruits and vegetables cultivation. The major crops of the district are paddy (rice), sugarcane, wheat, maize, pulses, potato, vegetables and mango. Rice-wheat based cropping system is most dominated in the district. Traditional integration is practiced in such a way that product of one component should be the input for other enterprises with high degree of complimentary effects on each other and also increase the farmer income. The study advocated the benefits of productivity improvement by 30-50% depending upon the number and kind of enterprises and their management. Sole rice could not give high income as compare of mixed /integrated farming system, so its needs to be refine / developed suitable integrated farming system in that's reasons. To sustain and satisfy needs, farmers include crop production, livestock, poultry, goat keeping, etc. in their farming systems. Earlier, the important objective of existing farming was subsistence and few farmers are now approaching for quality and soil health aspects also.

Keywords: farming system, farmers income, marginal

Introduction
The district of Kushinagar is named after sacred death place of Lord Buddha. The latitude of Kushinagar, Uttar Pradesh is situated at $26^073'$ N latitude and $83^038'$ E longitude with an altitude of 81 m above mean sea level. The area of the district is 2906 sq km and lies on the eastern fringe of Uttar Pradesh bordering the state of Bihar. The district falls under the middle Gangetic (North-East) plains having alluvial soil. Total population of the district is 28.93 lakh with average density of 996 persons per sq km. The district is divided into 14 blocks with 1571 villages. Out of the total geographical area the area under forest is 818 ha, net area sown 2.33 lakh ha, 1.67 lakh ha under irrigation, fallow land 5156 ha and land not available for cultivation 50859 ha with the cropping intensity of the district is 156.1%. The average annual rainfall received during monsoon is 1200 mm. The district has a prominent place in fruits and vegetables cultivation. The major crops of the district are paddy, wheat, maize, pulses, potato, vegetables and mango. Sugarcane is the main cash crop of the district. The important crops cultivated on commercial basis in the district are sugarcane mango, litchi, banana, okra, green pea, etc. Dairy sector and fisheries provides gainful employment and also increases the income of rural people. In the dairy sector Buffalo population (198312) in the district is higher than cows (151373) that produce higher milk yield. Considering the diversity of farming system a survey was conducted during 2016-17 to characterize existing integrated forming system in five villages like Paikauli, Sonia, Mangarua, Aragpur and Jhanga bazaar in the district Kushinagar. Majority of the farmers are small and marginal (around 96 %) and own around 80 percent of total cultivated area. The livelihood security is based on crop cultivation. The crop solely not provided good source of income for survival their form family. Some innovative farmer integrates crop, dairy, goat, poultries and gur making from sugarcane.

Methodology
The district Kushinagar falls under the middle Gangetic (North – East) plains having alluvial soil. The major crops of the district are paddy (rice), wheat, sugarcane, maize, pulses, potato, vegetables and mango also miner integration with dairy, fisheries and poultries. Different integrated farming systems exist in Paikauli, Soniya, Mangarua, Aragpur and Jhanga bajar villages were randomly selected from each block to find out a sustainable and economically viable existing mixed / integrated farming system prevalent at the villages on 0.4 ha (1.0 acre)

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land holding. Six different viable models *viz* sole crop, crop + 1 pair of bullocks + 1 cow, crop + 1 pair of bullocks + 1 buffalo, crop + 1 pair of bullocks + 1 cow + 1 buffalo, crop + 1 pair of bullocks + 1 cow + 1 buffalo + 5 goats and crop + 1 pair of bullocks + 1 cow + 1 buffalo + 5 goats + 10 poultry birds were being practiced on the land holding of 0.4 ha (1.0 acre) suitable for this region. Information's were collected by personal and collective interviews. The details regarding size of land holdings, numbers of livestock, family labour, expenditure on crop, livestock and other enterprise along with annual income from agriculture and livestock gathered from the randomly selected five respondents in each village. To calculate the net margin from livestock & crop cultivation,

various cost concepts were followed. Livestock farming - paid out expenses like feed cost, hired labor, medicines, computed value of family labor and miscellaneous recurring expenses. The livestock and poultry birds included in the present study of local and desi type of breed. The expenses incurred in crop farming like hiring of human labours, bullock labour, tractor hour, cost of seed, manure, fertilizer and family labour were computed. To calculate the net margin, various cost concepts were used for the livestock and crop production are as follows. The modularly treatments prevalent under marginal farmers having 0.4 ha (1.0 acre) land holding are given as under (Table-1).

Table 1: Income and expenditure (₹) for one 0.4 ha (1.0 acre) land of different existing farming modules for marginal holder in Paikauli, Soniya, Mangarua, Aragpur, Jhanga Bajar villages in district Kushinagar, U.P. during 2016-2017.

Farming system	Expenditure	Gross income	Net returns (₹ ha^{-1})	B:C ratio	Employment days
Sole Rice	10212	21875	11663	1.14	153
Sugarcane	27291	55993	28702	1.05	167
Crop+1pair of bullock+1cow	17762	38785	21023	1.18	248
Crop+ 1 pair of Bullock +1 Buffalo	18723	43034	24311	1.30	252
Crop 1 pair of Bullock + 1 Cow +1 Buffalo	21213	48864	27651	1.30	276
Crop + 1 pair of Bullock + 1 Cow + 1 Buffalo + 5 Goats	25043	57894	32851	1.31	287
Crop + 1 pair of Bullock + 1 Cow + 1 Buffalo + 5 Goats + 10 Poultry	23818	61144	37326	1.57	293

Table 2: Income and expenditure (₹) statement of livestock farming

Particulars	Cow	Buffalo	Bullock	Goats	Poultry
No. of animals	1	1	1	5	10
Expenditure	2490	3451	2530	1915	690
Gross income	5830	10079	5540	10030	3250
Net income	3430	6628	3010	8115	2560
Cost return ratio	1.16	1.92	1.18	4.27	3.71
Employment days	35.4	41.5	41.3	39.9	13.4

Results & Discussions
The outcomes of study showed that integration of various enterprises on 0.4 ha (1.0 acre) land holding were acceptable and economically viable (Tables 1 and 2). Integration of livestock rearing with crop production was shown higher economic return as compared to crop production alone. Further, better utilization of land, water and other inputs in integrated model can be possible as compared to sole rice crop (Table-2). Mixed farming of 1pair of bullock + 1 cow + 1 buffalo + 5 goats + 10 poultry birds gave a higher net return of ₹ 37326 as compared to ₹ 11663 from arable farming only but due to higher cost of cultivation resulted lower the benefit cost ratio. Similarly, employment potential of mixed farming system was higher than arable farming. In a mixed farming system of 0.4 ha (1.0 acre) land, the employment generation was found 293 man days with uniform distribution throughout the year as compared to man days in sole cropping system. Amount of feed for animals was also available from the system itself. The farmyard manure from the animal component was used for manuring of crops and save 25-30% of fertilizer use was observed in mixed farming system. Present findings are in agreement with the findings of Singh (1994) [2] reported that 1 ha canal irrigated land gave net return ranging from Rs. 14000 to Rs. 32700 in different years in mixed farming with 3 crossbred cows. Whereas, it was observed that mixed farming with three buffalo, the net return with a range from negative to Rs. 19700. Ramrao *et al.* (2006) developed a mixed farming (crop-livestock) module of 1.5 acre small scale holders with the employment generation of 571 man days and net income of Rs. 58456 per year over crop

farming alone with employment generation of 385 man days and net returns of Rs. 18300 per year. From the present study, an attempt was made to identify the existing viable model representing the various combinations of the mixed farming system.

Conclusion
From the study undertaken, it was found that integrated farming system model with 1 pair of bullock + 1 cow + 1 buffalo + 5 goats along with keeping poultry birds was found most beneficial that augmented the income and socio-economic status of marginal farmers. Integration of livestock and crop production enterprises gave higher economic returns as compared to crop production alone. Hence, it was concluded that the integrated farming systems assume greater importance for marginal farmers in comparison to crop alone under above mentioned region. Livestock serves as a means for recycling nutrients and as a source of energy and value-added production. Complementary role of livestock within the farming system is unique and needs to be fully exploited. Although, the highest expenditure was incurred under the module, crop + 1 pair bullock + 1 cow + 1 buffalo + 5 goats and 10 poultry. Whereas, under the same module, the highest net returns (₹ 37326), B: C Ratio (1.57) and employment generation (293 man days) was noted. Thus, the present study proved that integration of different complementary enterprises enhances the socio-economic status of the marginal farmers living under the middle Gangetic (North-East) plains in district Kushinagar of Uttar Pradesh.

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