



An Economic Analysis of Different Farming Systems Prevailing in Udaipur District of Rajasthan

Sarita Kumari¹, Latika Sharma¹, S.S. Burark¹, Azad Murdia² and Bharat Bhushan^{3*}

¹Department of Agricultural Economics and Management, MPUAT, Udaipur, INDIA

²Department of Statistics, MPUAT, Udaipur, INDIA

³Dy Registrar (Academics), SKUAST-J, Main Campus Chatha, Jammu, INDIA

*Corresponding author: B Bharat; Email: b_bhushan2121@yahoo.co.in

Received: 30 September, 2015

Accepted: 22 Nov., 2015

ABSTRACT

The Present study was conducted in Udaipur District in Southern Rajasthan during 2013-14 with the aim to identify the existing farming systems and to study the economics and income and employment generation by different existing farming systems. Four prominent farming systems were observed in the study area, viz; FS-I: Crop + Dairy (C + D); FS-II: Crop + Dairy + Goat (C + D + G); FS-III: Crop + Dairy + Vegetable (C + D + V) and FS-IV: Crop + Dairy + Goat + Vegetable (C + D + G + V) Girwa and Gogunda two tehsils were selected randomly for the study. FS - I was being adopted by maximum no. of farmers in Girwa tehsil while in Gogunda tehsil maximum number of farmers adopted FS-III. The total cost of farming system in Girwa tehsil was lowest in FS-I and it was highest in FS-IV in both the tehsils. In Girwa tehsil the highest net returns were observed in FS-IV while in Gogunda tehsil highest net return were observed in FS-II due to internal adjustment of costs in taking goat and dairy enterprises along with crop cultivation even though the total costs in these farming systems were also higher. The return per rupee investment in both the tehsils of Udaipur district was highest in FS-IV (C+D+G+V) and On per hectare basis employment generated in Girwa tehsil was minimum in FS-III (225 man days) and maximum in FS-II (250 man days). In Gogunda tehsil lowest employment was generated in FS-III (C+D+V) (250 man days) and in highest FS-IV (350 man days).

Keywords: Farming system, dairy, crop, Udaipur

Farming system is a resource management strategy to achieve economic gains and sustained production to meet diverse requirement to farm household while presenting resources base and maintaining a high level environment quality (Lal and Miller, 1990). Farming system consists of several enterprises like cropping system, dairying, piggyery, poultry, fishery, beekeeping etc. These enterprises are interrelated with each other. A part of end product and wastes of one enterprise are used as inputs in others. The waste of dairying like dung,

urine, etc. is used for preparation of FYM, which is an input in cropping systems. The straw obtained from the different crops is used as fodder for cattle. Thus, different enterprises of farming systems are highly interrelated. The goal of farming research system is to develop sustainable land use systems which will optimize the farm resource use, minimize degradation with consideration to regenerative capacity and increase income and employment for farm families and promote quality of life and environment. Several studies



conducted on farming systems showed that farming system approach is better than conventional farming (Ravishankar, *et al.* 2007 and Singh *et al.* 2007). The outcome of the present investigation is of immense importance to evolve, develop and implement the location specific farming systems in study area as well as the area with similar situations elsewhere. It will help farmers, academicians and policy makers to decide the strategies which will lead to overall development of agriculture in the region.

Rajasthan, the largest state of Indian union, occupies nearly 10.4% geographical area of the country. Agriculture and allied activities accounted for nearly one fourth of the state domestic product against 14% at national level. Therefore, agriculture despite all odds, considered to be the main stay of rural masses. The agriculture in most part of the state is rainfed and is prone to high production risk. In order to meet the farm and family requirement, the farmers in the state have evaluated different location specific combinations of crop, livestock, goatry, vegetable etc. Food security always remains an uncompromising goal of farm level agriculture for rural masses in most part of the state. Accordingly, every region of the state has evaluated crop and livestock species suitable for the region. The farming systems models practiced by the farmers include various combinations of field crops, horticulture crops and livestock. In these regions crops like maize, sorghum, soybean, groundnut, cluster bean etc. are grown in *kharif* and crops like wheat, barley, rapeseed and mustard, etc are grown in *rabi season*.

There is substantial area under different vegetables in these regions. Among livestock, buffalo, cattle and goat are the most dominating animals. However, it could doubtlessly benefit from integrating additional insights from various systems sciences. In view of this, on-farm study on characterization analysis of farming system of Udaipur district of Rajasthan was undertaken with the objectives to identify and characterize the major farming

systems of the study area, economics of different farming systems and suggesting technological interventions for improving profitability.

METHODOLOGY

For collection of information related to different aspects of farming systems, a survey was carried out during 2013-14 using pre-structured schedule. Survey was conducted by adopting multi stage sampling. Three stage samples (Tehsil, Farmer) was considered for the purpose of primary data collection on the sub-systems from the farmers. Out of eleven tehsils in Udaipur district two tehsils, namely Girwa and Gogunda were selected randomly for this study. A list of all the households in the selected tahsil was prepared. Out of which 30 farmers were randomly selected from each tahsil. Thus, a total of 60 farmers were selected from two Tahsil.

Costs and Returns Estimation

(a) Operational or Variable Cost

Operational costs were the actual costs incurred by the farmer along with incidental charges incurred towards labour and material cost. Interest on variable capital was calculated at the prevailing bank rate (8%) on the value of the farm and livestock assets.

Fixed Costs

The various items of fixed costs were land revenue, land rent and depreciation. Interest on fixed capital was calculated at the prevailing bank rate (12%) on the value of the farm and livestock assets. The following method for estimation of costs and returns was used:

$$\text{Cost} = \text{Total Variable Cost (TVC)} + \text{Total Fixed Cost (TFC)}$$

$$\text{Gross Return} = (\text{Quantity of produce} \times \text{Prevailing price of produce} + \text{Quantity of by produce} \times \text{Price of by produce})$$

$$\text{Net return} = \text{Gross return} - \text{Total cost}$$

Table 1: Existing Farming Systems in Study Area

Farming System	Udaipur	
	Girwa Tehsil	Gogunda Tehsil
FS-I	Crop + Dairy + (C+D) 30.00%	Crop + Dairy (C+D) 20.00
FS-II	Crop + Dairy + Goat (C + D + G) 26.67 %	Crop + Dairy + Goat (C+D+G) 13.33%
FS-III	Crop + Dairy + Vegetable (C+D+V) 33.33 %	Crop + Dairy + Vegetable (C + D + V) 56.67 %
FS-IV	Crop + Dairy + Goat + Vegetable (C+D+G+V) 10.00%	Crop + Dairy + Goat + Vegetable (C + D + V + G) 10.00 %

Table 2. Existing Farming Systems in Girwa tehsil

Farming System	No. of Farmers	Gross cropped Area (ha.)	Cultivated Area (ha.)	Cropping Intensity (%)	Crops	Area (ha.)	Vegetable	Area (ha.)	Dairy Cattle (No)	Goat (No)
FS-I (C+D)	9 (30.00)	6.98	3.71	188.14	Maize	2.16			3.6	—
					Sorghum	1.04				
					Wheat	2.37				
					Barley	0.75				
					Mustard	0.66	—	—		
FS-II (C+D+G)	8 (26.67)	8.52	5.36	158.95	Maize	1.96			5.75	5.38
					Sorghum	2.03				
					Wheat	3.33				
					Barley	1.2	—	—		
					Maize	3.24	Okra	0.18		
FS-III (C +D+V)	10 (33.33)	12.99	6.37	203.92	Sorghum	2.67	Tomato	0.18	4.7	—
					Wheat	3.61				
					Barley	1.67				
					Maize	0.76				
					Sorghum	1.06	Okra	0.61		
FS-IV (C+D+G+V)	3 (10.00)	4.3	3.83	112.27	Wheat	1.56	Tomato	0.16	6.33	6
					Barley	0.66				

Figures in parentheses indicate percentages to the respective totals.

RESULTS AND DISCUSSION

Farming Systems

There are number of farming systems existing in the study area.

FS-I : Crops + Dairy+(C+D)

FS-II : Crops + Dairy + Vegetable (C+D+V)

FS-III : Crops + Dairy + Goat (C+D+G)

FS-IV: Crops+ Dairy + Goat + Vegetable (C + D + G +V)

These farming systems were prevalent in Girwa and Gogunda tehsils of Udaipur district with some variations. The discussion on various aspects of farming systems is on an average per farm.

Farming Systems in Girwa Tehsil

The farming system existed in Girwa and Gogunda tehsil of Udaipur district were studied and discussed under the heads of number of farm households, cropping intensity, cropping pattern and non-crop enterprises in different farming systems.

Girwa Tahsil

In this tahsil village four farming systems were prevailing viz; Crop+Dairy(FS-I), Crop+Dairy+Goat (FS-II), Crop+Dairy+Vegetable (FS-III) and Crop+Dairy+Goat+Vegetable (FS-IV). Out of 30 selected farm households the Maximum number of farm households i.e. adopted FS-III (C+D+V). Cropping intensity varied from 112.27% to 203.92%. The highest cropping intensity was observed in FS-III (C+D+G) and lowest cropping intensity was found in FS-IV. The cropping intensity in all farming system was higher because farmers took crops and vegetables in both the seasons due to availability of adequate irrigation facilities in the tahsil. The total gross cropped area in all farming system FS-I, FS-II, FS-III and FS-IV was 32.78 ha in which FS-III contributed the maximum area 12.99 ha Followed by FS-II 8.52 ha. Minimum area was found under FS-IV(4.3 ha) Non-crop enterprises like dairy and goat had shown their presence in all farming systems i.e. Fs-I, FS-II, FS-III and FS-IV. In FS-IV (Crop+Dairy+Goat+Vegetable), maximum average number of dairy cattle was 6.33 along with 6 goat followed by FS-III (Crop+dairy+Goat) where

**Table 3. Existing Farming System in Gogunda tehsil**

Farming System	No. of Farmers	Gross Cropped Area (ha.)	Cultivated Area (ha.)	Cropping Intensity (%)	Crops	Area (ha.)	Vegetable	Area (ha.)	Dairy Cattle (No)	Goat (No)
FS-I (C+D)	6 (20.00)	5.73	2.02	283.66	Maize	1.12			3.5	—
					Sorghum	0.44				
					Soybean	0.01				
					Wheat	1.2				
					Barley	0.76				
FS-II (C+D+G)	4 (13.33)	4.21	3.73	112.86	Soybean	0.2	—	—	7.25	3.50
					Maize	1.78				
					Sorghum	1.20				
					Wheat	2.48				
					Barley	0.80	—	—		
FS-III (C+D+V)	17 (56.67)	11.19	6.31	177.33	Maize	2.04	Okra	0.23	3.82	—
					Sorghum	2.57	Tomato	0.20		
					Soybean	0.40				
					Wheat	2.69				
					Barley	1.96				
FS-IV (C+D+G+V)	3 (10.00)	2.03	1.5	135.33	Urd	1.01			3.00	2
					Maize	0.63	Okra	0.2		
					Sorghum	0.20				
					Soybean	0.40				
					Wheat	0.80				

Figures in parentheses indicate percentages to the respective totals.

average number of dairy cattle was 5.75 along with 5.38 goats. Same findings were observed by Ravishakar *et al.* (2007), Jayanthi *et al.* (2007), Ramrao (2005) and Channabasavanna and Biradar (2007).

Farming system in Gogunda Tehsil

Gogunda Tehsil

In Gogunda tehsil all four the farming systems were existing. Maximum number of farm households adopted FS-III (C+D+V). Cropping intensity on the selected farm varied from 112.86% to 203.66%. The highest cropping intensity was observed in FS-I (C+D) and the lowest cropping intensity was observed in FS-II (C+D+G). Gross cropped area was 23.88 hectares of which highest area i.e. 6.31 hectare was in FS-III (Crop+Dairy+Vegetable). Maize, sorghum, wheat, barley and Urd were the major crops of this area. Besides crops, farmers were also growing vegetable under FS-III (Crop+Dairy+Vegetable) and FS-IV (crop+Dairy+goat+Vegetable). The non-crop enterprises like dairy existed in all farming systems, viz. FS-I in which only dairy cattle, FS-II in which dairy cattle

and goats, FS-III in which dairy and vegetables and FS-IV in which dairy, goat and vegetable were taken up. In FS-II the average number of dairy cattle maintained on farms was highest (7.25) cattle along with 3.50 goat. Okra and Tomato were the main vegetables found in FS-III (Crop+Dairy+Vegetable) and FS-IV (Crop+Dairy+Goat+Vegetable).

Costs and Returns under Different Farming Systems in selected Girwa Tehsil

FS-I: The total cost for FS-I was ₹ 1728669 of which the major part of ₹ 1378857 (79.76%) was shared by total variable cost and the remaining part of total fixed cost was ₹ 349811.4 (20.24%). Of this total cost per farm, 57.59% was incurred to the raise rabi and kharif crops and 42.40% to rear the dairy cattle. Out of total fixed cost on this farming system, the share of cost incurred was highest in dairy (42.40%). The total net return per household from this system was ₹ 850462.1 in which contribution by kharif crop was ₹ 323175 (38%) and contribution rabi crop was ₹ 229624.77 (27%). The overall return by spending one rupee was ₹ 1.49 in FS-I. Return

Table 4. Costs and Returns under Different Farming Systems in selected Girwa Tehsil

(₹/household)

Particulars	Girwa Tehsil			
	FS-I	FS-II	FS-III	FS-IV
Costs				
TVC	1378857	2270764	3009976	851075.5
TFC	349811.4	472711.5	568351	288949.5
TC	1728669	2743475	3578327	1140025
Returns				
GR	2579131	3990950	5656203	1948410
NR	850462	1247475	2077876	808384.5
Returns/ ₹ Investment	1.49	1.45	1.58	1.71

per rupee investment was highest in kharif crops in this farming system.

FS-II: The total cost in FS-II was ₹ 2743475 including total variable ₹ 2270764 (82.76%) and total fixed cost of ₹ 472711.5 (17.23%). Of the total cost per household, highest cost (40.09%) was incurred to rear dairy cattle and least to rear goats (1.50%). Among the total fixed cost, highest share was incurred by dairy (45.29%) and minimum towards goat rearing (1.98%). The total net return from this farming system was ₹ 1247475 in which highest share of ₹ 2500486 (40.12%) was from dairy enterprise. The overall return by spending one rupee was in FS-II i.e. ₹ 1.45. Thus, it can be concluded that dairy and enterprises was relatively more profitable in this system.

FS-III: In this system Crop+Dairy+Vegetables were taken. Within the system, the share of total cost was maximum in rabi crops (38.20%), followed by dairy cattle (28.56%), kharif crops (24.79%) and lowest in vegetables (8.46%). In total variable cost the contribution was highest by *rabi* crops and lowest in vegetable (8.18%). The share of total fixed cost to the total cost was highest in dairy (43.73%). The total net return of the system was ₹ 2077876 in which return from the dairy was highest

i.e. 53.41%. The return per rupee investment was ₹ 1.58 more than FS-I and FS-II, because of lowest cost incurred in vegetables growing which was closely followed by dairy cattle.

FS-IV: In farming system IV (C+D+G+V) the percentage of cost incurred was the highest in rabi crops (32.90%). The gross return was ₹ 1948410 in which rabi crops contributed 36.44% followed by dairy cattle i.e. 24.60%. The net return was ₹ 808384.5 in which the contribution of rabi crops was highest i.e. 39.93% followed by kharif crops 35.39% and dairy 17.18%. The return per rupee investment was highest in FS-IV ₹ 1.71. Thus in this system on the basis of per rupee invested per household were found most profitable.

Cost and Return under Different Farming System in Selected Gogunda Tehsil

In selected tahsil four farming system were existing. The total variable cost component was highest in farming system III(C+D+V) (1825451) and lowest in farming system I (C+D) (1325011) and total fixed cost component was highest farming system IV (C+D+G+V)(342821) and lowest in farming system II (C+D+G)(292513). Total cost of the farming system was highest in farming system II

Table 5. Cost and Return under Different Farming Systems in Selected Villages of Gogunda Tehsil (₹/household)

Particulars	Gogunda Tehsil			
	FS-I	FS-II	FS-III	FS-IV
Costs				
TVC	1325011	1825451	1800791	1454578
TFC	312151	292513	296054	342821
TC	1637162	2117964	2096845	1797399
Returns				
GR	2582418	3623178	3554259	3278123
NR	945256	1505214	1457414	1480724
Returns/₹ Investment	1.57	1.71	1.69	1.82

**Table 6. Income and Employment generated in Different Farming Systems in Girwa tehsil**

(₹)

Sl. No.	Particulars	Units	FS-I	FS-II	FS-III	FS-IV	Overall
I							
Income							
A	Net Income /household	₹/household	850462	1247475	2077876	808385	1246049
B	Net Income per ha	₹/ha	229235	232737	326197	211066	258516
C	Land holding size	Ha	3.71	5.36	6.37	3.83	4.82
II							
Employment							
A	Employment /household	Man days/household	705	1340	1083	670	950
B	Employment/ha.	Man days/ha	190	250	170	175	197

(C+D+G) (₹ 2117964). Net returns were highest in farming system II (C+D+G) (₹ 3623178) and it was most profitable farming system. Highest return per rupee invested was found in FS IV (C+D+G+V) (1.82) in Gogunda Tahsil.

Income and Employment Generation

Income and employment generated in different farming systems adopted by the farm households in Girwa and Gogunda tehsil of Udaipur district was also studied.

Income and Employment Generated in Different Farming system in Girwa Tehsil

Out of four farming systems adopted by the farm households in Girwa tehsil in Udaipur district maximum net income per household was generated from FS-III (₹ 2077876) followed by FS-II (₹ 1247475), FS-I (₹ 858462) and it was minimum in FS-IV (₹ 808385) as depicted in Table 6. The maximum net income per hectare was generated in FS-III (₹ 326197) followed FS-II (₹ 232737), FS-I (₹ 229235) and it was minimum in FS-IV (₹ 211066). The employment generated per hectare was maximum in FS-II (250 man-days) followed by FS-I (190 mandays), FS-IV (175 mandays) and it was minimum in FS-III (170 mandays). The overall net income generated per hectare was ₹ 258516 and employment generated was per hectare 197 mandays.

Income and Employment Generated in Different farming system in Gogunda tehsil

Out of four farming systems adopted by the households in Gogunda tehsil in Udaipur district maximum net income per household was generated from FS-II (₹

1505214) followed by FS-IV (₹ 1480724), FS-III (₹ 1457414) and it was minimum in FS-I (₹ 945256) as depicted in Table 7. The maximum net income per hectare was found in FS-IV (₹ 987149) followed FS-I (₹ 467948), FS-II (₹ 403543) and it was minimum in FS-III (₹ 403543). Employment generation per household was maximum in FS-III (1578 mandays) because of crops, dairy and vegetable activity followed by FS-II (1175 mandays), FS-I (585 mandays) and it was minimum in FS-IV (525 mandays). In FS-IV, although the net income generated per household and per hectare was least, but employment generated per hectare was maximum (350 man-days) followed by FS-II (315 mandays), FS-I (290 mandays) and it was minimum in FS-III (250 mandays). FS-IV generated maximum net income per hectare due to crops, dairy, goat and vegetables. Thus, it can be concluded that employment generated on per household basis was highest in FS-III while on per hectare basis net income and employment was found highest in FS-IV. The overall net income and employment generated was per hectare ₹ 1347152 and 285, respectively.

CONCLUSION

In Girwa tahsil the highest net return per household was observed in farming system III(C+D+V) and highest return per rupee invested was also found in this farming system (₹ 1.58). In Girwa tahsil highest employment per household was generated in farming system II (C+D) (1340 man days) and lowest employment per household and per hectare was observed in farming system IV (C+D+G+V). Net highest income per household and per hectare was found in farming system III(C+D+V) and lowest income per household and per hectare was found

Table 7. Income and Employment generated in Different Farming Systems in Gogunda tehsil

(₹)

S. No.	Particulars	Units	FS-I	FS-II	FS-III	FS-IV	Overall
I			Income				
A	Net Income /household	₹/household	945256	1505214	1457414	1480724	1347152
B	Net Income per ha	₹/ha	467948	403543	230969	987149	397390
C	Land holding size	Ha	2.02	3.73	6.31	1.5	3.39
II			Employment				
A	Employment /household	Man days/ household	585	1175	1578	525	965
B	Employment/ha	Man days/ha	290	315	250	350	285

in farming system IV in Girwa tehsil. In Gogunda tehsil highest return per rupee invested and highest net return per household was found in farming system IV (C+D+G+V). In Gogunda tehsil employment generation per household was highest in farming system III (C+D+V) (1578 man days) and lowest in farming system IV(C+D+G+V) (525 man days) while highest employment generation per hectare was found in farming system IV(C+D+G+V) (350 man days) and lowest per hectare employment was found in farming system III (C+D+V) (250 man days). In most of the farming systems where dairy cattle is a part of the system, the major share of fixed cost is incurred in dairy enterprises in the form of fixed infrastructure.

Policy Implications

In tehsil Girwa of the study area farming system III (Crop + Dairy+ vegetable) and farming system IV (Crop + Dairy+ goat + vegetable) gave better results in terms of highest net return per household, return per rupee invested, employment generation per household and income generation per household. Thus, farmers may adopt vegetable cultivation along with crop and dairy wherever irrigation facilities are available as it is higher return giving activity and also goat rearing which is low cost activity. In tehsil Gogunda of the study area farming system III (Crop+Dairy+Vegetable) and farming system IV (Crop + Dairy +goat + vegetable) gave highest return per rupee invested but employment generation per hectare was more in farming system II (Crop + Dairy). Net return per household was also high in farming system III and II. Thus, non crop activities like dairy, goat rearing and vegetables utilized the farm resources rationally and thereby increase the household income. Livestock including goat rearing is better activity in term of increases in net farm income, employment and sustainability in Udaipur district of Rajasthan.

REFERENCES

- Ackoff, R. 1974. *Redesigning the future*. New York: Wiley.
- Ackoff, R. 1999. *Ackoff's best. His classic writings on management*. New York: Wiley.
- Channabasavanna, A.S., Biradar, D.P., Prabhudev, K.N. and Mahabhaleswar, H. 2009. Development of profitable integrated farming system model for small and medium farmers of tungabhadra project area of Karnataka. *Karnataka Journal of Agriculture Science* **22**(1): 25-27.
- Holling, C.S. 2001. Understanding the complexity of economic, ecological and social systems. *Ecosystems* **4**: 390-405.
- Ison, R.L. 2012. Systems practice: Making the *systems* in Farming Systems Research effective. In: I. Darnhofer, D. Gibbon, and B. Dedieu (Eds.). *Farming systems research into the 21st century: The new dynamic*. Dordrecht: Springer, in press.
- Jayanthi, C., Devasenapathy, P. and Vennila, C. 2007. Farming system principle and practices. Tamilnadu agriculture university, coimbtore Satish serial publishing house, Delhi **1**: 189-192.
- Lal, R. and F.P. Miller 1990. Sustainable farming systems for the tropics. Proc. Int. Symp. "On Natural resources management for a sustainable agriculture" 6-10 February 1990, New Delhi, India
- Luhmann, N. 1995. *Social systems*. Stanford: Stanford University Press (German edition 1984).
- Meadows, D. 2008. *Thinking in systems. A primer*. D. Wright (Ed.). White River Junction: Chelsea Green Publishing.
- Mitchell, M. (2009). *Complexity. A guided tour*. New York: Oxford University Press.
- Noe, E. and H.F. Alrøe 2012. Observing farming systems: Insights from social systems theory. In: I. Darnhofer, D. Gibbon and B. Dedieu (Eds.).



Farming systems research into the 21st century: The new dynamic. Dordrecht: Springer, in press.

Ramrao, W.Y., Tiwari, S.P. and Singh, P. 2005. Crop-livestock integrated farming systems for augmenting socio-economic status of small holder tribal of Chattishgarh in central India. *Livest. Res. Rural Dev.*, **17**: 252-259.

Ravisankar, N., Pramanik, S.C., Rai R.B., Shakila Nawaz, Tapan, K.R., Biswas and Nabisat Bibi. 2007. Study on integrated farming system in hilly upland areas of Bay Islands. *Indian J. Agron.*, **52**(1): 7-10.

Singh, K., Bohra, J.S. and Singh, Y. 2007. Development of sustainable farming system model for irrigated condition of Northern Eastern plain zone of Uttar Pradesh. *J. Farm. Syst. Res. Dev.*, **13**(1): 10-16.