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RESEARCH ARTICLE :

Means for retaining farming communities in semi-arid regions of Gujarat state

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SUMMARY : Developmental programme are carried out to support small holder farming communities for their livelihood. The research study was conducted in Panchmahal district of Gujarat to understand the nature of agricultural system, socio-economic status, cropping and livestock rearing pattern for implementing suitable interventions. It was found that agriculture productivity was less intensive and majority of farmers had inclination towards rearing of buffaloes. Majority of the respondents did not have higher level of education and had an average 4.35 acres of land for cultivation. The system of feeding is mostly stall fed and did not found any significant impact over milk yield of animals in comparison with grazing system. The milk co-operative societies played greater role for monetary incentive among most of the respondents. It is suggested that the nature of feeding system, changing preference to rearing of livestock, agricultural cultivation and dependence of dairy societies by smallholders need to be given adequate consideration in promoting location specific technologies.

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Farming, Sustenance, Livestock, Semi-arid, Dairy, Feeding system, Knowledge systems

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BACKGROUND AND OBJECTIVES

The term livelihood refers to level of security derived from material and non-material resources (Scoones, 2009). It is evaluated and based on wellbeing of human and status of natural resources and it acts as guiding principle for livelihood strategies (Xu *et al.,* 2012). The degree of urbanization and enhanced availability of monetary incentive had created huge impact among communities traditionally involved in sustenance agriculture. There are also policy issues being discussed for meeting food demand particularly meat, milk and to meet environment changes (Msangi *et al.,* 2014; Howden *et al.,* 2014). The challenge for scientific community and extension functionaries has been immense like never before, as technologies had proved and adopted by progressive farmers elsewhere.

However, in rain-fed regions such high level of adoption was minimum (Kumar and Chauhan, 2014). Further, research priorities tend towards agro-climatically favourable regions (Chambers and Ghildyal, 1985) and there is minimum engagement of farmers in rainfed regions. These technological alternatives may be of low cost, involve lesser skill but possess minimum advancement from large scale market driven technologies (Pierpaoli *et al.,* 2013). The community

knowledge in terms of nutritional security, plant protection practices and livestock production system needs explored for diversification. Henceforth, the research study was undertaken to understand the prospects among these communities for developing and sustaining appropriate technologies. This will aid in reinforcing location specific demonstrations and promote desired livelihood opportunities.

RESOURCES AND METHODS

The study was carried out in the regions of Gujarat state to assess nature of livelihood opportunities among farmers for transfer of technologies. Two villages *viz*., Vankoda of Kothambataluk, Lunawada block and Dhakaliya of Shehera taluk, Shehera block of Panchmahal district in Gujarat state were selected randomly. Twenty seven farmers were randomly selected from each of these two villages and constituted the sample size for the study. Thus, a total of 54 farmers were selected for the study. The information from these respondents was enumerated with help of structured interview schedule through personnel interview. Their socio-economic status, crop cultivation practices and livestock rearing practices were ascertained. The study also analysed the role of rearing system over milk productivity due to changing livestock pattern in such small holders production system. The collected data were processed and analysed with help of t-test (Gupta, 2000).

OBSERVATIONS AND ANALYSIS

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Socio-economic profile :

Research studies had looked beyond family head for effective leverage of new ideas, technologies due to aging farm population (Ramirez, 2013). In the present study the average 4age of respondents was found to be 47 years [47.18 (14.09α ±1.91 SE)]. Akudugu *et al.* (2012) indicated that technology adoption may be influenced by economically active age group. Hence, it was pertinent to understand these active age groups while implementing effective livelihood strategies. It was found that 25.92 per cent of the study population were either illiterate or had education upto primary school (Table 1). It was enumerated that 33.33 per cent of the population had studied up to secondary education and 40.74 per cent of the population had higher secondary and above. In these semi-arid study regions, about 59.25 per cent of the respondents had studied only upto secondary education. Udmale *et al.* (2014) identified low education as one of the major constraints in adopting technologies. Majority of respondents did not have higher level of education and these features needs to be focussed for effective intervention intervention.

Table 1 : Socio-economic variable **(n=54)**

Sr. No.	Socio-economic variable	Frequency	Per cent
1. Education			
	Illiterate	5	09.26
	Upto primary school	9	16.66
	Upto secondary school	18	33.33
	Higher secondary and above	22	40.74
2. House			
	Thatched	8	14.81
	Pucca	46	85.18
3. Source of income			
	Agriculture	54	100.00
	Livestock	54	100.00
	Labour activity	10	18.51

Majority (85.18%) of the respondents possessed pucca house and only 14.81 per cent of them live in thatched house. All of the respondents possessed land and had an average size of 4.35 acres of land for agriculture activity. These findings illustrate that the farmers in the study region had small landholding size. Chand *et al.* (2011) identified that at all India level, 19 per cent of farmers had share as small landholders in agrarian system. Studies had found that the enhanced level of land holding had positive impact for adoption of technologies in improvising dairy farming practices (Chauhan *et al.,* 2006). In such small farm economic system, local knowledge needs to be sustained for improvising their livelihood as they already existed and can be adopted without much resistance. Hence forth approach for enhancing agriculture productivity efforts for farming needs to be devised suitably for small holding systems.

All respondents had agriculture and livestock as their primary source of income generating activity. In most smallholding systems, ruminant animal population plays greater role for their livelihood (Adams and Yankyera, 2014). Interestingly about 18.51 per cent of the respondents referred labour activity also as major source of income. Among the respondents, 20.37 per cent of

the respondents engaged in labour work and traveled to other places for seeking such employment opportunities.

Crop cultivation pattern :

The farmers in the study region mostly cultivates Makkai (Maize), Danger (Paddy), Harhar or tur (Pigeon pea), bajra (Pearl millet), mufali (Groundnut), jowar (Sorghum), kapas (Cotton), til (Sesamum), ragi (Finger millet), mung bean (Green gram) and chowla (Cow pea) during *Kharif* season (May – September). During *Rabi* season (November to April), the cropping pattern was to cultivate Makkai (Maize), Gehu (Wheat), gram (Chick pea), Rajka(Lucerne), Suryamukhi (Sunflower) and local crop varieties such as Suidya, Lilizar (Table 2). Availability of water is one of the limiting factors (Pathak *et al*., 2013) and hence cultivation pattern of crops rely according to such natural resources. These features indicate that agricultural cropping pattern was found to be less intensive, serving the subsistence requirements of farmers.

Table 2 : Crop diversification pattern in semi-arid regions of Gujarat state (n=54)

Sr. No.	Crop	Crop cultivation	
		Frequency	Percentage
***Kharif* (May – September)**			
1.	Makkai (Maize)	54	100.00
2.	Danger (Paddy)	54	100.00
3.	Harhar (Pigeonpea)	54	100.00
4.	Bajra (Pearl millet)	53	98.14
5.	Jowar (Sorghum)	27	50.00
6.	Kapas (Cotton)	27	50.00
7.	Til (Sesamum)	27	50.00
8.	Ragi (Finger millet)	27	50.00
9.	Mung bean (Green gram)	27	50.00
10.	Chowla (Cow Pea)	27	50.00
***Rabi* (November to April)**			
1.	Makkai (Maize)	54	100.00
2.	Gehu (Wheat)	54	100.00
3.	Gram (Chick pea)	54	100.00
4.	Rajka (Lucerne)	54	100.00
5.	Suryamukhi (Sunflower)	27	50.00
6.	Suidya (Local variety)	27	50.00
7.	Lilizar (Local variety)	27	50.00

Livestock rearing pattern :

The research study found that each of the respondents had owned less than three animals. This can be explained from the findings that minimum land holding size, limited grazing land and forage availability might have limited them to have more number of animals. This is in accordance with Amsalu and Addisu (2014) who had attributed the decrease in livestock unit to decline in availability of grazing land as well as feed shortage (Assefa *et al.,* 2013).

It was also noticed that 87.03 per cent of respondent's rear buffaloes andonly 33.33 per cent owned cattle (Table 3). The study had illustrated an evidence of livestock farmer's preference for buffaloes in the region. Kumar and Singh (2008) indicated the dominance of cattle and buffaloes in irrigated region. The trend in rearing buffaloes in semi-arid regions needs to be noticed for developing suitable policy for service delivery by state animal husbandry department. Less than 17 per cent of the respondents reared bullocks for draught purpose. Interestingly it was noticed that these small holders did not possess small ruminants and poultry.

Table 3 : System of livestock rearing in the study region

Sr. No.	Livestock species*	Frequency	Per cent
1.	Buffalo	47	87.03
2.	Cattle	18	33.33
3.	Bullock (Draught purpose)	9	16.66

* Species of animal possessed by respondents

Feeding pattern among farmers of the study region:

The predominant green fodder in the study region was found to be bajra (100.00%) followed by sorghum (50.00%) and groundnut (01.85%), respectively (Table 4). Incase of dry fodder, all respondents of the study provided maize, paddy, pigeonpea and bajra to their livestock. About 46.29 per cent of the respondents provided mung, cowpea and 1.85 per cent fed groundnut as dry fodder, respectively.

Table 4 : Nature of fodder provision to livestock

Sr. No.	Fodder	Frequency	Per cent
Green fodder			
1.	Bajra	54	100.00
2.	Sorghum	27	50.00
3.	Groundnut	1	01.85
Dry fodder			
1.	Maize	54	100.00
2.	Paddy	54	100.00
3.	Pigeonpea	54	100.00
4.	Bajra	54	100.00
	Mung	25	46.29
	Cow Pea	25	46.29
	Groundnut	1	01.85

Table 5 : Impact of feeding pattern on milk productivity **(n=54)***

Sr. No.	Livestock feeding system	Frequency	Percentage	Milk production in litre (per day) Mean (Standard deviation α ± Standard Error SE)
1.	Stall fed system	35	64.82	10.88 (4.47 α ± 0.75 SE)
2.	Grazing system	19	35.18	08.68 (3.77α ± 0.87 SE)
3.	Total (n)	54	100.00	10.11 (4.33 α ± 0.59 SE)

*NS=Non-significant and indicate significance of value at P=0.01 t (table value) = 1.96; $t_{0.05}$ (calculated value) = 1.82

Effect of feeding system on milk productivity :

The Table 5, indicated that about 65 per cent of farmers stall fed their animals and did not take animals for grazing activity. Only 35 per cent of the respondents indicated that they take animals for grazing activity. The shift in feeding system of the respondents towards stall feeding was noticed for livestock intervention strategies. This may be due to lack of availability of grazing premises, time consumed in such activities by farmers. It may be important to visualize the socio-economic characteristic of farmers in maintaining large ruminants and small ruminants. The study had illustrated that none of the farmers had maintained small ruminants and hence, it may be one of the factor that small holders who did not maintain small ruminants tend, not to take their animals for grazing activity. These stall fed animals had different managerial difficulties and hence it will be ideal to conduct such studies in rainfed regions for intensification of small holders system. This study had found that the study region did not have intensive livestock rearing system and majority of the respondents depend on stall feeding system. This was in accordance with the findings of Sharif *et al.* (2014). It was also found that on an average the remaining respondents take their livestock for slightly more than 7 hours of grazing activity.

Under such small holding livestock units, the impact of different rearing system over the milk produce needs to be ascertained. This will help to develop suitable package of practices by stakeholders in promoting scientific dairy farming practices. It is illustrated in Table 5 that the calculated t value for v = 52 (degree's of freedom, $t_{0.05=}$1.82) was less than t table value at 5 per cent level of significance ($t_{0.05}$=1.96). Thus, there was no significant difference in terms of milk productivity among animals that were taken for grazing and stall fed.

Dependence on milk co-operative societies :

The marketing function of local produce by diary society is an important means for sustenance Khan *et al.* (2014). Majority of these respondents (51.85%) supply milk to dairy society (Table 6). It was also found that these farmers were not depend on labour activities for their livelihood as it contributes basic return in terms of cash. Hence, it may be concluded that prevalence of marketing mechanism at the premises of small holders may reduce movement of labour from village. The total milk procurement growth was to the tune of 3.6 per cent during the year 2013-14 in comparison to previous year (GCMMFL, 2014). These features illustrates any dairy development program needs to be focus upon the marketing channel established by milk co-operatives in the country. FAO (2011) referred that milk collection centres need to be focussed for intervention of providing fodder to livestock. Hence livelihood strategies need to focus on dairy co-operative society for enhancing the scope for retaining farming occupation and intensification.

Table 6 : Supply of milk to dairy society

Sr. No.	Purpose	Frequency	Per cent
1.	Supply to dairy co-operative society	28	51.85
2.	Domestic consumption	26	48.15
3.	Private sale/to other marketing channels	0	00.00

Conclusion:

Technology to focus on species :

Among major breeds of animal, buffalo species was found to be most suitable among peasants in the study locale and small ruminants were not part of them. Hence technologies should be oriented towards catering need of large ruminants more preferably buffaloes.

Technology to focus feed:

Bajra was found to be predominant green and dry fodder offered to these animals. Majority of the farmers maintain their animal under stall fed system and less on grazing. The study revealed that in semi-arid region lack of grazing activity did not significantly alter the productivity of large ruminants on comparing with stall fed system. This may be due to the free space available to animal in their nearest vicinity wherein these animals were tethered. There is a need to develop suitable strategy

for effective supplementation of nutrient supplements based on such feeding systems.

Focus on dairy society for specific intervention:

The study found that majority farmer's supply milk to dairy co-operatives irrespective of their social status. Hence, dairy society needs to be central focus for identification and demonstration of location specific technologies. It was felt that farmer to be considered as innovator as they are the best personnel's to develop and adopt location specific technologies (Bellotti and Rochecouste, 2014).

Focus on farmer's diversification :

The study referred that farmers were trying to diversify their source of income and labour activity was seen as an alternative option. Hence there needs to be a mechanism to leverage such human capital in terms of generating and utilizing value added practices. Strengthening indigenous veterinary medications, promoting local plant varieties among farmers engaged in extensive agricultural systems as it reduces cost of input.

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