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# Exploring the Relationship Between Socioeconomic Attributes and Resilience Capacity of *Murrah* Buffalo-based Livestock Production System in Changing Climatic Scenario

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## ABSTRACT

**Background:** The present study was conducted to study the resilience capacity towards changing climate of a farming community who reared specifically *Murrah* buffaloes in their livestock production system for their livelihood. As the study area was breeding tract of *Murrah* buffalo, hence in-depth study of resilience was performed in frequent changing climate.

**Methods:** In order to assess the resilience capacity and their relation with socioeconomic characteristic, total 320 *Murrah* buffalo farmers across four districts in India's Trans-Gangetic Plain, data were gathered using focused group discussions, PRA tools and in person interviews. Statistical tools such as principal component analysis for index development, cumulative square root methods for categorization of respondents and regression analysis were performed for exploring relationship.

**Result:** Result depicted that majority of the farmers has medium level of climate resilience index score *i.e.* 0.456. Further, it was found that farmer's involvement in social institute such as, gram panchayat, agriculture and dairy co-operative society, self-help group, farmers' association and others affected their resilience capacity in changing climatic scenario. The need for better technology inclusion and access to more formal systems of finance is necessary to increase the overall resilience capacity of households.

**Key words:** Climate change, Climate resilient index, Livestock, *Murrah*, Resilience, Socioeconomic profile.

## INTRODUCTION

Recent report of 'Intergovernmental Panel on Climate Change' shows that the frequency and intensity of climate change-induced shocks are growing all over the world (IPCC, 2014). Intensified extremes climatic events with higher frequency would add further stress on human health, food security (through agriculture and livestock production), water resources *etc*, where the rural poor are extremely prone and adversely impacted (IPCC, 2014; IPCC, 2001). Different researcher defines resilience as "the individuals, social groups or social-ecological systems capacity to absorb disturbances (climate change impacts) without alteration of the basic structure and ways of functioning and capable to learn, adopt the change and organized themselves" (Berkes *et al.,* 2003; Folke, 2006). Resilience has recently emerged as a key concept in describing a household's ability to act on weather shocks and adversity. Enhancing resilience while reducing exposure and vulnerability of farming community towards climate change impacts was utmost important to withstands with this scenario. Investigating the farmers' resilience to the aforementioned climate effects in the Murrah buffalo-based livestock production system may offer insights in to the mechanisms that facilitate or restrict the system's capacity for adaptation and trade-offs among services (Turner *et al*., 2014).

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## MATERIALS AND METHODS

The study was conducted in purposively selected Haryana state, India, as we need to analyze relationship of socioeconomic variable with resilience capacity of *Murrah* buffalo- based livestock production system in their breeding tract in the year 2019-2021. A total of 32 villages and n=320

farmer who is rearing *Murrah* buffaloes since last 10 years and has a minimum herd size of 4 were selected as respondents. Personal interview method, observation method and suitable tool (s) of Participatory Rural Appraisal (PRA) like focused group discussion, *etc*. was followed with the help of pre-tested structured interview-schedule to collect the primary data. All socioeconomic variables were categorized in to 05 major capitals *i.e*., human, social, physical, natural and financial capital (Fig 1). The respondents were contacted at their door-steps at home or farm. The collected primary data from the farming community were tabulated and statistically (mean, standard deviation,

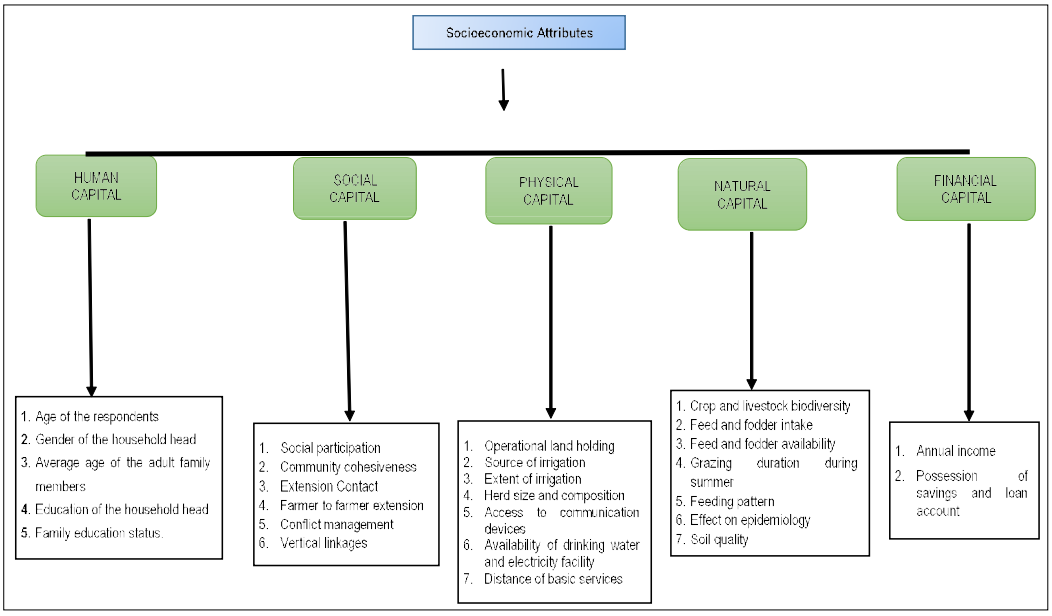


**Fig 1:** Socio economic attributes of respondents.

**Table 1:** Human capital possessed by the respondents. (n=320)

| Variables | Respondents | Categories | Frequency | Percentage |
|---|---|---|---|---|
| Age of the household head (years) | Young | Up to 35 years | 63 | 19.69 |
| | Middle | 35-55 years | 153 | 47.81 |
| | Elder | above 55 years | 104 | 32.50 |
| Mean±SD | | | | 48.10±13.71 |
| Gender | Male | 309 | 96.56 | |
| | Female | 11 | 03.44 | |
| Average age of adult family members | Young | Up to 35 years | 173 | 54.06 |
| | Middle | 35-55 years | 138 | 43.13 |
| | Old | >55 years | 9 | 02.81 |
| Mean±SD | | | | 34.88±07.82 |
| Education status of respondents | Illiterate | 0 | 48 | 15.00 |
| | Primary | 1 | 16 | 05.00 |
| | Secondary | 2 | 136 | 42.50 |
| | Higher secondary | 3 | 59 | 18.44 |
| | Graduate and above | 4 | 61 | 19.06 |
| Mean±SD | | | | 2.89±1.62 |
| Family education status | Low | 04.00-08.83 | 76 | 23.75 |
| | Medium | 08.84-11.18 | 150 | 46.88 |
| | High | 11.19-15.00 | 94 | 29.37 |
| Mean±SD | | | | 10.15±01.94 |
| Dependency ratio | Low | 1.00-2.79 | 102 | 31.87 |
| | Medium | 2.79-4.16 | 154 | 48.13 |
| | High | 4.17-7.00 | 64 | 20.00 |
| Mean±SD | | | | 3.45±1.15 |

cumulative square root frequency methods, regression) analyzed in the Dairy Extension Division, NDRI, Karnal. Whereas, climate resilience index was developed with the dimensions maintained in Annexure I. Finally, weighted index calculation method was used to calculate resilience index of MBLPS farmers.

## RESULTS AND DISCUSSION

### An overview of socio-economic profile of the *Murrah* buffaloes rearers

#### Human capital

Numbers of variables under human capital were depicted

**Table 2:** Social capital possessed by the respondents. (n=320)

| Variables | Respondents | Categories | Frequency | Percentage |
|---|---|---|---|---|
| Social participation | Households having | 1 (Yes) | 273 | 85.32 |
| | | 0 (No) | 47 | 14.68 |
| | Low | 2.00-03.12 | 73 | 26.74 |
| | Medium | 3.13-04.25 | 148 | 54.21 |
| | High | 04.26-6.00 | 52 | 19.05 |
| Mean±SD | | | | 3.46±1.28 |
| Community cohesiveness | Low | 1.00-4.05 | 119 | 37.19 |
| | Medium | 4.06-5.10 | 145 | 45.31 |
| | High | 5.10-6.00 | 56 | 17.50 |
| Mean±SD | | | | 4.87±0.98 |
| Respondents having extension contact | Yes | 1 | 320 | 100 |
| | No | 0 | 0 | 0 |
| Average frequency of contact | Never | 0 | 0 | 0 |
| | Occasionally | 1 | 67 | 20.93 |
| | Once in a month's | 2 | 178 | 55.63 |
| | Weekly | 3 | 75 | 23.44 |
| Extension contacts for climate change | Yes | 1 | 68 | 21.25 |
| | No | 0 | 252 | 78.75 |
| Level of extension contacts | Lower | 03.00-08.93 | 57 | 17.81 |
| | Medium | 08.93-11.31 | 181 | 56.56 |
| | High | 11.32-15.00 | 82 | 25.63 |
| Mean±SD | | | | 10.26±02.19 |
| Sources of extension contact for climate change | Veterinary and Livestock Development Assistant, Veterinary Officer, Agricultural Officer, Cooperative official and KVK Personnel | | | |
| Types of information seeking for climate change | New crop varieties, techniques of land shaping, sustainable cropping mechanisms *etc*. vaccination, health care and management *etc*. | | | |
| Sources of extension contact for agriculture and livestock farming | Veterinary doctors, Agronomy scientist, e-Mausam Krishi Sewa, Agromet Advisory Service (AAS) | | | |
| Types of information seeking for agriculture and livestock farming | Sowing time, feeding management, animal house management and adverse climate resistant variety of crops and animal breeds | | | |
| Farmer-to-farmer extension | Low | 3.00-07.32 | 86 | 26.88 |
| | Medium | 7.33-09.95 | 121 | 37.81 |
| | High | 9.96-12.00 | 113 | 35.31 |
| Having farmer-to-farmer extension | Yes | 1 | 320 | 100 |
| | No | 0 | 0 | 0 |
| Mean±SD | | | | 8.27±1.98 |
| Types of suggestion received | Different practices like zero tillage, high yield variety, vermicomposting, use of happy seeder, shed management, repeat estrous management in summer *etc*. | | | |
| Conflicts management | Low | 0.00-0.13 | 209 | 65.31 |
| | Medium | 0.14-1.14 | 50 | 15.63 |
| | High | 1.15-2.00 | 61 | 19.06 |
| Mean±SD | 0.54±0.79 | | | |
| Vertical linkages | Low | 1.00-2.43 | 87 | 27.18 |
| | Medium | 2.43-3.92 | 133 | 41.57 |
| | High | 3.93-6.00 | 100 | 31.25 |
| Mean±SD | | | | 3.02±0.89 |

in Table 1. Moreover, the data clearly described that the *Murrah* buffalo rearers were quite mature with regard to farm experience, well-educated and average years of schooling for the family of *Murrah* buffalo rearers were 10.15 which comes under medium level of literacy level and occupied by 46.87 per cent of the *Murrah* buffalo farmers.

Literacy rate in Haryana is 75.55 per cent (http://censusindia.gov.in/2011census/dchb/ dchb haryana.html) and the people of Haryana gradually giving much importance to formal education. This was the reason for medium to higher family education status of the respondents.

**Social capital**

An attempt was made to measure the involvement of the respondents in formal and informal social organizations (Gram Panchayat, Co-operative Society, Rural Youth Club, Self Help Group, Aanganwadi *etc*) as members or as office bearers through their social participation. Table 2 clearly states that majority (85.32%) of the respondents were either member or office bearer in any formal or informal social organization with average community cohesiveness among the farmer was 4.87, whereas, all respondents were having farmer to farmer extension and extension contact for

**Table 3:** Physical capital possessed by the respondents. (n=320)

| | | | | |
|---|---|---|---|---|
| Operational land holdings | Marginal | Up to 1 ha | 64 | 20.00 |
| | Small | 1-2 ha | 92 | 28.75 |
| | Semi medium | 2-4 ha | 104 | 32.50 |
| | Medium | 4-10 ha | 56 | 17.50 |
| | Large | >10 ha | 4 | 01.25 |
| Mean±SD | | | | 2.40±1.96 |
| Extent of irrigation to total holding | Average percentage of irrigation | 80.96 | | |
| | Maximum percentage of irrigation | 99. 00 | | |
| | Minimum percentage of irrigation | 49.50 | | |
| Herd size (standard animal unit) | Small | 02.95-04.33 | 47 | 14.69 |
| | Medium | 04.34-14.18 | 248 | 77.50 |
| | Large | 14.19-59.26 | 25 | 07.81 |
| Mean±SD | | | | 8.33±6.10 |
| Access to communication devices | Low | 1.00-2.13 | 108 | 33.75 |
| | Medium | 2.14-3.76 | 118 | 36.88 |
| | High | 3.77-5.00 | 94 | 29.37 |
| Mean±SD | | | | 2.96±0.92 |
| Climate resilient livestock technology followed by a farmers | Average number of climate resilient livestock technology (Mean score) | | | 1.76 |
| | Minimum no. of climate resilient technology | | | 1 |
| | Maximum no. of climate resilient technology | | | 4 |
| | SD | | | 0.78 |
| Practices: All weather shade for livestock, Microenvironment alteration by foggers, sprinkler *etc*., follow of vaccination and deworming schedule, alteration in feeding material and time of feeding as per season. | | | | |
| Climate resilient agriculture technology followed by a farmers | Average number of climate resilient agriculture technology (Mean score) | | | 1.45 |
| | Minimum no. of climate resilient technology | | | 1 |
| | Maximum no. of climate resilient technology | | | 4 |
| | SD | | | 0.62 |
| Practices: Zero tillage, diversification, micro-irrigation, ICT based agro-advisories, climate resistant crop variety and DSR | | | | |
| Availability of drinking water and electricity facility | Drinking water facility | 1 (Yes) | 312 | 97.50 |
| | | 0 (No) | 08 | 02.50 |
| | Sources of drinking water | Tap point, Hand pump, tube well | | |
| | | | Mean±SD | Max distance |
| Average distance to nearest all weather road, primary health Centre and veterinary hospital (km) | Distance to nearest primary health center (km) | | 2.85±2.40 | 7.5 |
| | Distance to nearest veterinary hospital (km) | | 2.01±1.26 | 6.2 |
| | Distance to nearest all weather road (km) | | 2.28±1.62 | 2.6 |

agriculture and livestock farming and out of which only 21.25 percent of the farmers were having extension contact for getting information related to climate change. Generally, rural farmers having a tendency to sit in chaupal and discuss the various issue of agriculture and livestock farming.

It is observed that speedy and effective transfer of technology and dissemination of information is possible through regular extension contact with agriculture officer, VLDA, Veterinary doctor *etc.*

**Physical capital**

Respondents were categorized as marginal (0-1 ha), Small (1 to 2 ha), Semi medium (2 to 4 ha), Medium (4 to 10 ha) and Large (10 ha and above) (Haryana and Agriculture and Farmers welfare report). From Table 3, it can be clearly understood that the average operational land holding of the respondents were 2.4 ha *i.e.*, majority of the farmers (28.75 and 32.5%) were falls under the small to semi medium holdings of land with average percentage of extent of

**Table 4:** Natural capital possessed by the respondents. (n=320)

| Variables | Reference range | Frequency | Percentage |
|---|---|---|---|
| Availability of climatic information Having climatic information | 1 (Yes) | 229 | 71.56 |
| | 0 (No) | 91 | 28.44 |
| Type of climatic information- Weather forecast on temperature, rainfall *etc*. | | | |
| Extreme climatic events experienced | Yes | 236 | 64.37 |
| | No | 114 | 35.63 |
| Types of extreme climatic events-Heat wave, cold wave, flood, Drought and Hailstorm | | | |
| Number of extreme climatic events experienced during last years | Only one events | 15 | 06.36 |
| | Two events | 23 | 09.74 |
| | Three events | 120 | 50.85 |
| | Four or more events | 78 | 33.05 |
| Number of diseases observed by respondents in livestock in last 10 years (Mastitis, Pneumonia, Ketosis, Hemorrhagic Septicemia, reproductive disorders *etc*.) | Maximum no. of animal affected by any diseases in a herd | | 9 |
| | Minimum no. of animal affected by any diseases in a herd | | 1 |
| | Average no. of animal affected by any diseases in a herd | | 3 |
| Number of diseases observed by respondents in human in last 10 years (Malaria, Dengue, Diabetes, Blood pressure, Kidney stone, common cold and cough, cancer and eyes disorder.) | Maximum no. of human affected by any diseases in a family | | 6 |
| | Minimum no. of human affected by any diseases in a family | | 1 |
| | Average no. of human affected by any diseases in a family | | 2.52 |
| Crop biodiversity (Crops - Rice, Wheat, Jowar, Bajra, Barley, Maize, Gram, Sugarcane, Cotton and Pulses) | Average number of crops | | 3.06 |
| | SD | | 1.13 |
| | Maximum number of crops grown by the farmers | | 6 |
| | Minimum number of crops grown by the farmers | | 2 |
| Livestock biodiversity (Livestock species-Cattle (*Hariana, Sahiwal*, *Tharparkar, Holstein Friesian*), Buffalo (*Murrah*, Graded *Murrah, Nili Ravi*), Sheep, Goat and Poultry) | Average number of livestock species | | 1.75 |
| | SD | | 0.75 |
| | Maximum number of livestock species | | 4 |
| | Minimum number of livestock species | | 1 |

Sources of climatic information- KVK (SMS service), radio, television, newspaper, block (or) panchayat administration, fellow farmers and mobile app.

**Table 5:** District wise soil quality indices in Haryana.

| District | pH | Electrival conductivity (Mili siemens) | Organic carban (%) | Phosphate $P_2O_5$ (kg/acre) | Potassium (kg/acre) |
|---|---|---|---|---|---|
| Bhiwani | 7.65 | 0.53 | 0.27 | 6.56 | 120.72 |
| Hisar | 7.59 | 0.44 | 0.28 | 6.79 | 168.17 |
| Jind | 7.94 | 0.78 | 0.20 | 15.94 | 171.54 |
| Rohtak | 7.87 | 0.51 | 0.23 | 5.89 | 169.79 |

**Table 6:** Financial capital possessed by the respondents. (n=320)

| Variables | Category | Reference range | Frequency | Percentage |
|---|---|---|---|---|
| Annual income (in lakhs) | Low | 03.00-06.48 | 130 | 40.63 |
| | Medium | 06.49-10.86 | 150 | 46.87 |
| | High | 10.87-26.00 | 40 | 12.50 |
| Mean±SD | | | | 8.49±3.54 |
| Average income and ratio of different farm output to total income of the sample households | Annual income of the households (In lakh) | | Mean | 08.49 |
| | | | SD | 03.54 |
| | % of average income of the households from agriculture | | Mean | 36.13 |
| | | | SD | 18.47 |
| | % of average income of the households from livestock | | Mean | 45.49 |
| | | | SD | 12.98 |
| | % of average income of the households from others | | Mean | 18.71 |
| | | | SD | 01.36 |
| Average cropping intensity | Mean | | | 173.56 |
| | SD | | | 10.32 |
| | Maximum cropping intensity | | | 200 |
| | Minimum cropping intensity | | | 140 |
| Savings and loan accounts holding | Low | 1.00-2.17 | 197 | 61.56 |
| | Medium | 2.18-3.23 | 84 | 26.25 |
| | High | 3.24-6.00 | 39 | 12.19 |
| Mean±SD | | | | 2.33±0.94 |

**Table 7:** Categorization of household based on their resilience index score. (n=320)

| Respondents' categories | Reference range | Frequency | Percentage |
|---|---|---|---|
| Low resilient | ≤0.401 | 73 | 22.81 |
| Medium resilient | 0.402-0.507 | 138 | 43.13 |
| High resilient HH | ≥0.508 | 109 | 34.06 |
| Mean | | 0.454 | |
| SD | | 0.053 | |

**Table 8:** Multiple linear regression analysis of *Murrah* buffalo-based livestock production system with determinants of resilience index.

| Explanatory variables | Coefficient±SE | VIF |
|---|---|---|
| Social participation | .023±.001** | 1.196 |
| Extension contact | .033±.002* | 1.205 |
| Farmer to farmer extension | .026±.001* | 1.191 |
| Community cohesiveness | .038±.002*** | 1.273 |
| Annual Income from different sources | .025±.003** | 3.741 |
| Years of schooling | .013±.001* | 1.517 |
| Family average education status | .015±.002* | 1.346 |
| Operational land holding | .019±.006* | 6.005 |
| Herd Size | .017±.004* | 2.955 |
| Savings and loan accounts | .010±.002* | 1.213 |
| Age of respondents | -.009±.002* | 1.818 |
| Family average age | .013±.002 | 1.513 |
| Access to basic services | .089±.003** | 4.082 |
| Conflict management | .036±.001* | 1.124 |
| Vertical linkages | -.038±.002 | 1.232 |
| N | 320 | |
| R-squared | 0.894 | |
| Adjusted R-squared | 0.883 | |

irrigation was 80.96 per cent and the major source of irrigation was extensive system of canals, tube wells and pump. Herd profile refers to the average herd size and herd composition of the respondents, who owned animals. The herd was composed of *Murrah* and graded *Murrah* buffalo, indigenous cattle, cross bred cattle and goat.

Technology or practices which was used in *Murrah* buffalo-based livestock production system to cope up with changing climatic scenario are known as climate resilience livestock practices. From the Table 3, it can be seen that farmers of the study area followed the practices such as all-weather shade for livestock, microenvironment alteration by foggers, sprinkler *etc*., follow of vaccination and deworming schedule, alteration in feeding material and time of feeding as per season and pond availability. These practices supposed to be enhanced resilience capacities of farmers by maintaining animal productivity in heat or cold stress.

Since, water is very crucial for sustaining life of all (Livestock, human being, plants *etc*). Therefore, availability of water for household triggers towards resiliency of a systems. Majorly 97.50 per cent of the farmers were having availability of drinking water at their home premises either via tap point or hand pump. Majority of farmers were followed the wheat-rice cultivation primarily followed by diversified farming in form of vegetables crops, horticulture crop whereas due to very less irrigation facility, Siwani block farmers's grow only those crops which required very less water like bajra (*Pennisetum glaucum*), pulses *etc*.

**Natural capital**

It refers to the access to information on different parameters of climate, especially information on cold waves and heat waves days, heavy rains *etc*. This information can help the

farmers in better management of risk and in creating favorable condition for timely adoption of different management practices to cope up with the climate change. The result is portrayed in Table 4 and depicted that maximum percentage of the farmers (71.56%) seeking information regarding climate change, 64.37 per cent of the farmers of Haryana region experienced extreme climatic events like flood, drought, cold and heat waves, hailstorm *etc*.

Respondents of the study area observed mastitis, pneumonia, ketosis, hemorrhagic septicemia, reproductive disorders, heat stress *etc*. Consequently, in changing climatic condition occurrence of mastitis, repeat breeding was noticed.

Diversification is one of the important strategies to confer resilience at time of crises. Level of diversity of concerned system *i.e*., in present study number of crops and livestock species reared by the farmers indicated their capacities to transform their livelihood strategies at the time of crises. In terms of feeding pattern, farmers follow the regularity in feeding on fixed time and concentrate ration fed to livestock mostly before milking (half in the morning and the other half in the evening). Most of the selected respondents of the study areas having soil health cards of their field.

Table 5 depicted the soil quality indices of selected district. Variability in moisture, temperature and local

**Annexure 1:** Resilience capacities, major components and sub-components.

| Resilience capacities | Major component | Indicators |
|---|---|---|
| Absorptive capacity | Natural disaster and climatic variability (NDCV) | Awareness of climate change |
| | | Climatic extreme events experience |
| | | Availability and accessibility of climatic information |
| | | Level of preparedness |
| | Stability (ST) | Knowledge regarding climate change impact |
| | | Perception to CC impacts |
| | Social capital (SC) | Social Participation |
| | | Community cohesiveness |
| | | Extension contact |
| | | Farmer to farmer extension |
| Adaptive capacity | Income and food access (IF) | Productivity of (crop/hac) |
| | | Productivity of animal (Milk yield/animal) |
| | | Annual income and proportion of income from different source |
| | | Household food insecurity access scale score diversity of food |
| | Health (H) | Animal health |
| | | Human health |
| | Water (W) | Availability of water for drinking |
| | | Ground water level |
| | | Extent of irrigation facility |
| | Socio demographic status (Human capital HC) | Family average age |
| | | Age of household head |
| | | Dependency ratio |
| | | Year of schooling of HH heads |
| | | Av. Education status of family |
| | Assets (A) | Farm size (Land holding) |
| | | Livestock ownership |
| | | Access communication device |
| | | Saving and loan associations |
| | Livelihood strategy and technology utilization (LS and TU) | Crop biodiversity |
| | | Livestock biodiversity |
| | | Climate resilient livestock practices |
| | | Climate resilient agriculture practices |
| Transformative capacity | Access to basic services (ABS) | Distance to nearest Health care services distance to nearest veterinary hospital distance to nearest all weather road |
| | | Household access to electricity |
| | Social capital | Conflict management, |
| | | Vertical linkage |

atmospheric chemistry within the soil impacts the microbial activity to climate change.

**Financial capital**

From Table 6, it can be understood that the average income of the households were more than 8.49 lakhs with that 46.87 per cent of the respondents comes under medium level of income categories. The result is clearly indicating that farmers look different source of income for livelihood maintenance.

**Categorization of respondents in different resilient categories**

All the components measured under resilience capacity (Annexure 1) were measured and analyzed to calculate climate resilience index. Selected *Murrah* buffalo farmers were categorized into 03 categories on the basis of mean±SD methods and findings clearly depicted in Table 7.

**Relationship of respondent's socioeconomic variables with their resilience capacity**

It was desirable to ascertain the contribution or variation explained by all antecedent characteristics (independent variables) towards resilience capacity of farmers against climate change. The data (Table 8) revealed that all the fifteen variables entered in the regression analysis accounted for 89.9 per cent of variation towards resilience capacity against impact caused by changing climate on livestock farmers.

Farmers of Haryana region having better economic status contributing households to better adapt to climate change impacts. In agreement with this finding, Asmamaw *et al.* (2019); Frankenberger *et al.* (2013), stated that diversified livelihood sources, better communication and financial institutions were contributing to enhance resilience capacity towards adverse effects of climate change. Variables such as more diversified social, financial and natural capital or assets by households reduces their vulnerability, at the same time as enhancing their resilience capacities to cope up with changing climate.

## CONCLUSION

In a social science research various phenomena such as resilience capacity, adoption of technology and their constraints *etc*, depends on socioeconomic status of the community. It influences the accessibility to the resources, livelihood pattern, food and nutritional security. Farmers of Haryana's region having better economic status contributing households to better adapt to climate change impacts. Variables such as diversified livelihood sources, better communication and financial institutions were contributing to enhance coping mechanism towards adverse effects of climate change. Consequently, more diversified social, financial and natural capital or assets by households reduces their vulnerability, at the same time as enhancing their resilience capacities to cope up with changing climate.

**Conflict of interest**

The authors declare that there is no conflict of interest.

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