Asian Journal of Agriculture and Rural Development
Volume 12, Issue 1 (2022): 20-29.

http://www.aessweb.com/journals/5005

WHAT ARE THE CONSEQUENCES OF LIVELIHOOD DIVERSIFICATION, AND WHAT SOLUTIONS ARE SUGGESTED? FINDINGS FROM TAMIL NADU, INDIA

Sathyapriya E[a †]
M.Vengateswari[b]
R.Raja Priya[c]
Reeba Jacob[d]
Asokhan, M[e]

[a]*Department of Agricultural Extension, Amrita School of Agricultural Science, Amrita Viswa Vidyapeetham, Coimbatore, Tamil Nadu, India.*
[b]*Krishi Vigyan Kendra, Ramanathapuram,Tamil Nadu, India.*
[c]*Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.*
[d]*Department of Social Sciences, S Thangapazham Agricultural College, Tamil Nadu Agricultural University,Tenkasi,Tamil Nadu, India.*
[e]*Department of Agricultural Extension,Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.*

† ✉ sathyasree321@gmail.com *(Corresponding author)*

Article History
Received: 2 December 2021
Revised: 12 January 2022
Accepted: 27 January 2022
Published: 14 February 2022

Keywords
Livelihood
Diversification
Constraints
Consequences
Survey
Sustainability
Policies
Western zone
Suggestions
Garratt ranking.

ABSTRACT
Agriculture is one of the major sectors affected by climate change, and farmers are having to adapt rapidly to overcome the risks. However, farmers face many struggles because of lack of awareness and experience of new methods. Understanding farmers' constraints and adaptation strategies is very important for the implementation of adequate policies for agricultural and food security. Hence, this research aims to investigate the consequences faced by farmers due to livelihood diversification and suggestions to overcome. Data were collected from 240 respondents in Tamil Nadu, India by a thorough survey method with the help of a pretested, well-structured interview schedule. Percentage analysis is an appropriate method that gives answers to how many respondents give a particular response. The Garratt ranking technique was used to study the preferences and change in priority of consequences encountered by farmers–and the potential advantages–into numerical scores. The Z test was used to determine whether two population means are different with the same variance. Data analysis was done using SPSS software. The results show that the majority of farmers reported concerns regarding constraints such as lack of previous experience, poor family support, and involvement of risk factors. The survey reveals that Tamil Nadu farmers suggested the conducting of specific training, encouraging livestock management and providing subsidies for agricultural and allied enterprise development as strategies to overcome the constraints of livelihood diversification. The Z test results indicated that there is a difference between irrigated and nonirrigated farms with respect to farmers' age, educational status, level of income, occupation, and awareness of climate change. The suggestions offered help policymakers develop suitable policies.

Contribution/Originality: This study documents the constraints faced by diverse farmers and provides suggestions to overcome these in various locations. The study results will help policymakers, extension personnel, and scientists to update their understanding of this area. This study results will encorage scientists to carry out a similar in-depth study in another location.

DOI: 10.18488/5005.v12i1.4421
ISSN(P): 2304-1455/ ISSN(E): 2224-4433
How to cite: Sathyapriya E --- M.Vengateswari --- R.Raja Priya --- Reeba Jacob --- Asokhan, M (2022). What are the Consequences of Livelihood Diversification, and what Solutions are Suggested? Findings from Tamil Nadu, India. *Asian Journal of Agriculture and Rural Development*, 12(1), 20-29. 10.18488/5005.v12i1.4421

1. INTRODUCTION

Agriculture is highly dependent on weather. Recent evidence suggests that global climate change is likely to increase the incidence of natural hazards, as well as the variability of rainfall, temperature, and other climatic parameters.Hence, climate change will affect all aspects of food security, i.e., food availability, access, utilization, and stability. In these circumstances, people seek diversification as their livelihood security.

People make diversification decisions due to desperation rather than new opportunities. With regard to migration, increase in agricultural income stagnates, the share of income from non-agricultural sources is considerably increased and high non-farm growth rates are seen by allocating greater labor to local non-farm sectors. Hence, diversification seems to be beneficial to poor agricultural communities and farmers have adopted livelihood diversification as the strategy to overcome the risks from farming, even though they face difficulties in their life because of diversification. Farmers in Minnesota, USA regarded diversified cropping systems as both ecologically and economically advantageous, but they also saw inadequate markets, uncertain government policies, unfavorable climate, and greater workload and difficulty as factors hindering further diversification. Diversification reflects the reduced dependence of farmers on agriculture as a source of income, and also implies some kind of entrepreneurial activity on behalf of the farmers. The majority (72.00%) involved in rainfed farming found a lack of availability of inputs, including credit, as the major constraint faced by them. Marketing issues were found to be another major problem among farmers. Also, it was further quoted that to promote diversified integrated farming, ecological techniques need to be combined with social engineering and backed up by reliable information and training or advisory services, along with credit or insurance and processing or marketing support. Rural–urban migration should be supported by migrant-friendly policies and should be treated as a strategy for improving the incomes of rural households, alleviating of rural poverty, and reducing pressure on rural resources. Rural–urban migration has been globally recognized as an important pathway out of rural poverty. For removal of entry barriers to non-farming employment opportunities, education and skills need to be developed. Tailor-made training programs could be arranged for rural workers to enhance the probability of them getting employment in the non-farm sector. Agro-climatic factors account for the high degree of the seasonality of supply. Similarly, many fruits, often grown on trees or other perennials, also exhibit climatic sensitivity and seasonality. Fruits and vegetables tend to require greater postharvest care to avoid damage and spoilage, exacerbating the distribution problem. The main constraints faced by households in diversified areas were a poor asset base, lack of credit facilities, lack of awareness and training facilities, fear of taking risk, lack of rural infrastructure, and lack of opportunities in the non-farm sector, while the main constraints in less diversified area were poor transport facilities, poor asset base, an unfavorable agro-climate, lack of credit facilities, lack of awareness and training, and lack of basic infrastructure[7]. Diversified farmers faced huge hurdles, even though in order to overcome climatic and other agricultural risks and maintain their livelihood they should adopt diversifications either on-farm or off-farm. Hence, the study focused on finding appropriate solutions to overcoming these constraints.

To promote sustainable farming, all types of vegetable production systems should adopt soil conservation, plant protection, and cropping techniques. High external input systems would benefit from a more judicious application of fertilizer, diversified cropping pattern, and a shift to labor-saving technologies (e.g., mechanization). Reduced application of inorganic fertilizer is not, however, a universal prescription; in fact, low external input systems, which are also fairly widespread, would benefit from greater fertilizer application.

For removal of entry barriers to non-farm employment opportunities, education and skill development need to be promoted. Tailor-made training programs could be arranged for rural workers to enhance their likelihood of gaining employment in non-farm activities. Thre is sufficient scope for alleviating agricultural productivity by improving infrastructural facilities in the state, particularly in the banking, education, communication, and health sectors.

Climate change causes major challenges in the agriculture sector, and farmers change occupation for a sustainable livelihood. However, a lack of experience and knowledge in their new field means that they have many struggles to face in achieving their goal. Since previous research studies measured only livelihood diversification patterns, this study aimed to identify the specific constraints and suggestions. The study aims to answer the following questions: What are the consequences faced by farmers following livelihood diversification? and how to solve these constraints by modification?

1.1. Theoretical Framework

Makate, Wang, and Makate (2016) found that crop diversification is a good strategy to overcome climate risks and significantly increase crop productivity and farmers' economic status. Also, they recommend wider adoption of diversification practices for greater adaptation to the ever-changing climate.

Non-farm income-generating activities provide an important source of primary employment in the rural areas of most developing countries, and it is assumed that as farm size due to population pressure becomes smaller, the percentage of non-farm income becomes larger (Hilson, 2016). Non-farm activities have the potential to play a crucial role in reducing vulnerability to poverty by providing households with a form of insurance against the risks of farming

and reducing reliance on natural resources (Cinner & Bodin, 2010; Lohmann & Liefner, 2009; Martin & Lorenzen, 2016; Rigg, 2006).

In addition, livelihood diversification is an effective way of solving the problems caused by poverty and environmental degradation. Therefore, livelihood diversification can be used as an efficient indicator to evaluate the success and sustainability of the rural community, which is, for instance, true in China (Liu & Liu, 2016).

Kabir, Cramb, Alauddin, and Roth (2016) studied farmers who changed their farming system to shrimp cultivation; after 5 years they were facing issues like increased soil salinity, reduced profitability and altered rice crop cultivation.

Multiple motives prompt households and individuals to diversify assets, incomes, and activities. Diversification may be derived by limited risk-bearing capacity in the presence of incomplete or weak financial systems that create strong incentives to select a portfolio of activities in order to stabilize income flows and consumption, by constraints in labor and land markets, and by climatic uncertainty (Kassie, Kim, & Fellizar Jr, 2017).

Livelihood diversity helps to reduce households' dependence on environmental resources, thereby helping environment restoration. Off-farm employment causes the outflow of the rural population and reduces regional population and environmental pressures, which is beneficial for maintaining rural development achievements. This is consistent with the results of the study on ecological restoration in the Wuyi Mountain Area of Fujian, China (Wang, Wang, Li, & Qin, 2016).

In developing countries, farm households allocate their labor to off-farm income diversification activities for the following reasons: to reduce income risk by diversifying ex ante; to maintain food security (income and consumption) in the face of low farm productivity and income shocks such as drought, by diversifying ex post, in the face of insurance market failure; and to earn cash income to finance farm investments, in the face of credit market failure (Kassie, 2017).

Kassie (2017) found that the proportion of family members who had been attending school during the survey season, either in the rural area where their family lives or in some other urban areas, was found to have a negative impact on non-farm and off-farm household income levels. As the proportion of students increased by 1%, the income level of off-farm and non-farm diversification activities declined by 0.93 and 1.02% units, respectively. These results are likely due to the fact that schooling withdraws a rural labor force from livelihood diversification activities, so household farm income will decline. Thus, shortage of family labor may push the household to concentrate only on subsistence and on-farm agricultural activities. However, in the long run, investment in education may increase remittances, which will, in turn, increase household non-farm income.

Mango, Makate, Tamene, Mponela, and Ndengu (2018) revealed that households with higher crop diversification intensity were more likely to have diversity in terms of food crops that can be consumed within the household, thus justifying the positive relationship. This implies that crop diversification improves food consumption in central Malawi.

2. METHODOLOGY

The study followed an *ex post facto* research design and purposive sampling method. The study was conducted in the western zone of Tamil Nadu state, India. The study area was selected based on maximum area under agriculture. The districts and villages were selected purposively based on area under cultivation. From the villages, sample farmers were selected using a purposive sampling technique. Samples were selected from two different situations: irrigated and nonirrigated. In each category 120 farmers were selected, with a total sample size of 240. Socio-economic variables and consequences and suggestions were collected from previous studies. Relevant papers for the study were collected and variables were identified by thorough understanding. After that, the identified variables and other items like consequences and suggestions were sent to 100 adjudicators for rating; these are all experts in the research area. After acquiring ratings from the adjudicators, the variables were finalized and used for interview schedule preparation. For data collection purposes, a well-structured interview schedule was prepared with the help of scientists' opinions, before a pilot study was launched to test the interview schedule. An interview schedule was modified and finalized as per the pilot study report. The survey was conducted in the selected area by the authors and the collected information was coded and cumulated for analysis. The data were grouped by low, medium, and high based on the median and standard deviation value and simple percentage method (Equation 1) used for analysis:

$$\text{Percentage (value/total value)} \times 100\% \quad (1)$$

Opinions on perceived constraints due to livelihood diversification was collected and the Garrett ranking method was used for ranking. Ranking is done to determine the most significant factor from the respondent's answer. Ranking of alternatives using the Garrett method is done by calculating the respondent's data as a factor of the percentage position value, using Equation 2:

$$\text{Percentage position} = 100(R_{ij}\text{-}0.5)/N_j \quad (2)$$

where R_{ij} is the value of variable i given by the respondent to j, while N_j is the number of variables assessed by as many as j respondents. The results of the percentage position are then converted to Garrett values using the Garrett ranking conversion table. The value of R_{ij} is then multiplied by the Garrett value to determine the total Garrett score. The average Garrett score is then calculated by dividing the total Garrett score by the number of alternatives. Alternative ranking is done based on the highest average value.

The Z test is used to test the difference between respondents in irrigated and nonirrigated areas with respect to each variable. The formula used to calculate Z value is given in Equation 3:

$$Z = (\bar{x} - \mu)/(\sigma/\sqrt{n}) \quad (3)$$

Here, $\bar{x}$ is sample mean, μ is population mean, σ is standard deviation of population, and n = number of observations.

3. FINDINGS AND DISCUSSION

Among the 240 respondents, an equal (120) number were in irrigated and nonirrigated areas. The collected responses were analysed and the results and discussion presented below.

The findings and discussion are grouped in two parts:

- Profile of respondents.
- Consequences and suggestions encountered by the farmers due to livelihood diversification.

3.1. Profile of Respondents

The collected responses on the respondent's profile were analysed, and the findings presented in Table 1.

Table 1. Profile of the respondents.

S. No.	Variable	Category	Irrigated (120) (%)	Nonirrigated (120) (%)	Total (240) (%)	Z value
1	Age	Young	4.200	5.800	5.000	2.002*
		Middle-aged	40.800	22.500	31.700	
		Old	55.000	71.700	63.300	
2	Education	Illiterate	16.600	4.200	10.400	0.808*
		Functionally literate	4.200	18.200	11.300	
		Up to primary school	26.700	34.200	30.400	
		Up to middle school	10.800	15.000	12.900	
		Up to secondary school	24.200	11.700	17.900	
		Up to higher secondary school	8.300	12.500	10.400	
		Collegiate education	9.200	4.200	6.700	
3	Level of income (in Rs.)	≤25000	5.000	14.200	9.600	6.096**
		25001-50000	30.800	60.800	45.800	
		50001-75000	20.800	14.200	17.500	
		75001-100000	14.200	4.200	9.200	
		≥100001	29.200	6.600	17.900	
4	Occupation	Farming as sole occupation	16.700	9.200	12.900	1.796*
		Farming +agricultural labor	32.400	28.300	30.400	
		Farming + business	9.200	14.200	11.700	
		Farming + service	41.700	48.300	45.000	
5	Entrepreneurial motivation	Low	11.700	15.000	13.300	0.558^{NS}
		Medium	83.300	73.300	78.400	
		High	5.000	11.700	8.300	
6	Perception of livelihood diversification	Low	6.700	14.200	10.400	3.918^{NS}
		Medium	60.800	73.300	67.100	
		High	32.500	12.500	22.500	
7	Attitude of farmers towards farm diversification	Unfavorable attitude	11.700	20.800	16.200	0.599^{NS}
		Favorable attitude	88.300	79.200	83.800	
8	Awareness on climate change	Low	14.200	15.800	15.000	2.664**
		Medium	76.600	56.700	66.700	
		High	9.200	27.500	18.300	

Note: * -Significant at 5 percent level; ** - Significant at 1 percent level and NS- Non significant.

3.2. Age

Little more than three-fifths (63.30%) of respondents belonged to the old age group, followed by 31.70% middle aged and 5.00% in the young age category. These findings are in accordance with the study conducted by Kassie (2017).

With regard to category-wise distribution, based on age more than half (55.00%) of irrigated respondents belonged to the old age group followed by 40.80% middle-aged and 4.20% were in young aged group.

Among the nonirrigated respondents, nearly three-fourths (71.70%) belonged to the old age group followed by 22.50 and 5.80% in the middle-aged and young groups, respectively.

The Z value indicated that there was a significant difference between irrigated and nonirrigated respondents at the 5% level of significance. Hence, the null hypothesis was rejected and an alternate hypothesis accepted. This might be due to the fact that the majority of nonirrigated respondents were in the old age group compared to irrigated respondents and, among irrigated respondents, an almost equal percentage belonged to the old and middle-aged groups.

The above observation leads to the inference that more than half of the respondents were in the category of the old age group, with more knowledge and experience of both traditional and modern farming systems. During the survey it was observed that the wards of the farmers were not interested in agriculture, and those farmers who had farming as a traditional occupation were also not interested in putting their children into a career in agriculture. This may be the reason for a smaller number of respondents in the young age category

3.3. Educational Status

Education is the process of bringing about desirable changes in human behaviour. Educational status is one of the factors that may influence the farmer in adopting diversified farm practices. It is generally presumed that the higher the educational level, the higher the rate of livelihood diversification. The distribution of respondents based on their educational status is presented in Table 1.

It is evident from the Table 1 that less than one-third (30.40%) of respondents could claim schooling up to primary level, followed by 17.90, 12.90, and 11.30% up to secondary, middle school level and functional literacy, respectively. An equal number (10.40%) of respondents had attended higher secondary school or were illiterate. About 6.70% of respondents had collegiate education.

Among irrigated respondents, almost equal numbers could claim schooling up to primary (26.70%) and up to secondary level (24.20%), followed by 16.60% who were illiterate. The other levels reported by respondents were up to middle school (10.80%), collegiate education (9.20%), and higher secondary education (8.30%). A very small proportion (4.20%) had a functional literacy level.

Among nonirrigated respondents, 34.20% claimed up to primary school education followed by 18.20% functionally literate and 15% up to middle school. Around 13 and 12% of respondents had up to higher secondary level and secondary level, respectively. Equal numbers (4.20%) were of collegiate or illiteracy status.

The Z value indicated that there was a significant difference between irrigated and nonirrigated respondents at the 5% level of significance. Hence, the null hypothesis rejected and an alternate hypothesis accepted. This might be due to the fact that among irrigated respondents nearly one-fifth were illiterate while others were educated up to middle school. Very few respondents had attended higher education. In nonirrigated respondents only a very small number were illiterate or had collegiate education. The remaining irrigated respondents claimed from primary up to a higher level of education.

Most of the villages in the study area had education facilities up to primary school level. This may be the reason the majority of the respondents claimed literacy up to the primary school education level. Few orespondents would have studied in the colleges situated in nearby towns. Also, these results explain why more nonirrigated respondents had at least functional literacy than irrigated respondents, because the majority of irrigated respondents came under the old age group and had not attended school in their lifetime.

3.4. Annual Family Income

Family annual income decides the status of an individual in the social system. It influences the decision of farmers to change occupation. The distribution of respondents according to their annual income is presented in Table 1.

A cursory look into the Table 1 little more than two-fifths (45.80%) of respondents had an annual income of 25001–50000 rupees, followed by 17.90% with 50001–75000 rupees and 17.50% with more than one lakh. Nearly 10.00% of respondents had below 25000 or 75001–100000 rupees.

Regarding irrigated respondents, less than one-third (30.80%) of respondents had 25001–50000 rupees, followed by 29.20% with more than one lakh. Around 21.00% of respondents had 50001–75000 rupees, followed by 75001–100000 rupees. Only a very small number (5.00%) of respondents had below 25000 rupees.

Among nonirrigated respondents, 60.80% had an annual income of 25001–50000 rupees while 14.20% respondents had either below 25000 rupees or 25001–50000 rupees. Nearly 7% had above one lakh. Only a very small number (4.00%) of respondents had an annual income of 75001–100000 rupees.

The Z value indicated that there was a significant difference between irrigated and nonirrigated respondents at the 1% level of significance. This might be due to the fact that majority of irrigated respondents had a maximum annual income of up to 75000 rupees whereas nonirrigated respondents' maximum annual income was up to 50000 rupees.

It was observed that irrigated respondents in the study area were engaged in diverse agricultural activities. During investigation of annual income, it was shown that diversified crop cultivation was considered as the main means of getting higher income in the irrigated area. In the nonirrigated area, the respondents followed only mono crop cultivation along with animal husbandry. These might be the reasons for variation in income between irrigated and nonirrigated conditions.

3.5. Occupational Status

Occupational status determines the extent of involvement of a farmer in farm operations. Agriculture as a full-time occupation means that an individual allocates more time in farming. Hence, the respondents were asked about their occupational status and the related data are presented in Table 1.

Table 1 reveals that 45.00% of the respondents had farming plus service as their main occupation, followed by 30.40% with farming plus agricultural labor as an occupation. Nearly 13% of respondents had farming as their sole occupation. About 11.70% of respondents were involved in farming plus another business. These findings are contradictory to the study of Theodore and Theodore (1999), who reported that two-fifths (60.00%) of respondents had farming as their sole occupation while 5.00% gave farming plus service as their occupation.

Among irrigated respondents, little more than two-fifths (41.70%) reported farming plus service as a main occupation, followed by farming plus agricultural labor (32.40%). About 16.70% of respondents were involved in farming as a sole occupation while nearly 10 gave farming plus business as their occupation.

Regarding nonirrigated respondents, nearly half (48.30%) reported farming plus service as their main occupation, followed by farming plus agricultural labor (28.30%). About 14.00% of respondents were involved in farming plus business. Only 9.20% of respondents considered farming as their sole occupation.

The Z value indicated that there was significant difference between irrigated and nonirrigated respondents at the 5% level of significance. In the study area the respondents depended on more than one occupation as opposed to a single occupation.

During the survey it was observed that respondents were engaged in more than one farm activity, such as farming plus agricultural labor/business, rather than farming alone for overcoming agricultural climatic risks. To some extent young respondents mainly depend on service sector employment outside of farming. The above factors may explain the low number of respondents with farming as their sole occupation.

3.6. Entrepreneurial Motivation

It has been referred to as a process of transforming an ordinary individual into a powerful businessman: someone who can create opportunities and help to maximize wealth and economic development. The collected data were analysed and grouped and are presented in Table 1.

It can be inferred from the Table 1 that about 78.40% of respondents had a moderate level of entrepreneurial motivation, followed by 13.30% at a low level. Less than one-tenth (8.30%) of respondents had a high level of entrepreneurial motivation.

With regards to irrigated respondents, the majority (83.30%) were in the medium category with 11.70% in the low category. Very few (5.00%)% of the respondents had entrepreneurial motivation at a high level.

Regarding nonirrigated respondents, the majority (73.30%) belonged to medium level of entrepreneurial motivation, followed by low (15.00%) and high (11.70%).

The Z result showed that there was no significant relationship between irrigated and nonirrigated respondents. This might be due to the fact that both type of respondents had same level of entrepreneurial motivation.

Recently respondents have faced huge agricultural risk due to climatic variation, and also earn only a low income from farming. In this context, the majority of respondents showed interest in starting agricultural ventures, while respondents showed only a medium level information-seeking behavior or had membership in any of the organisations. This might be why the majority of the respondents come under the 'medium to low' level of entrepreneurial motivation.

3.7. Perception of Livelihood Diversification

A perceived idea of respondents about livelihood diversification is essential for measuring the extent of livelihood diversification at the farm level. Hence, an attempt was made to measure the perception of irrigated and nonirrigated respondents of livelihood diversification. The collected data were analysed and grouped and are depicted in Table 1.

It can be seen from the table that about two-thirds (67.10%) of the respondents had a perception of livelihood diversification at a medium level, followed by high (22.50%) and low (10.40%) levels.

Pertinent to irrigated respondents, around 61.00% fell within the medium category. The remaining respondents had high (32.50%) and low (6.70%) levels of perception towards livelihood diversification.

Regarding nonirrigated respondents, nearly three-fourths (73.30%) had a medium level of perception about livelihood diversification. Almost an equal percentage of the respondents fell under low (14.20%) and high (12.50%) levels of perception.

The Z value indicated that there was no significant difference between irrigated and nonirrigated respondents. This might be due to the fact that both type of respondent fell within the medium level of perception about livelihood diversification.

3.8. Attitude Toward Farm Diversification

An appropriate mindset and predisposition are essential ingredients very much needed for the development of a favorable attitudinal condition. Hence, an attempt was made to measure the attitude of irrigated and nonirrigated respondents towards farm diversification. The relevant data were collected, analyzed and grouped in two categories: favorable and unfavorable attitude. The results are presented in Table 1.

From Table 1, among the respondents nearly 84% had a favorable attitude towards farm diversification. These findings are similar to those of Theodore and Theodore (1999).

Among irrigated respondents, the vast majority (88.30%) declared a favorable attitude towards farm diversification.

Regarding nonirrigated respondents, about four-fifths (79.20%) of respondents had a favorable attitude.

The Z value indicated that there was no significant difference between irrigated and nonirrigated respondents. The respondents' attitude was similar in both areas.

On the whole it will be noted that a greater number of irrigated respondents had a favorable attitude towards farm diversification than nonirrigated respondents, due to availability of irrigation and the high land value of wetland. Besides, irrigated respondents were willing to engage in various non-farming activities like coir manufacture, power looms, hand looms and construction of apartments, hotels, schools, ginning factories etc.

3.9. Awareness of Climate Change

Climate change is one of the reasons for diversification of existing farming practices. Hence, this variable was selected and studied. The findings are analyzed and presented in Table 1.

It will be seen from the table that 66.70% of the respondents were aware of climate change at a medium level, followed by 18.30% with a low level of awareness. About 15.00% had a low level of awareness of climate change.

Regarding irrigated respondents, more than three-fourths (76.60%) were aware of climate change at a medium level and 14.20% at a low level of awareness. Only 9.20% of respondents were aware of climate change at a high level.

Among nonirrigated respondents 56.70% had a medium level of awareness followed by 27.50% at a high level. About 15.80% of respondents had a low level of awareness on climate change.

The Z value indicated that there was significant difference between irrigated and nonirrigated respondents at the 1% level of significance. Hence, the null hypothesis was rejected. This might be due to the fact that irrigated respondents had a medium to low level of awareness about climate change but nonirrigated respondents had a medium to high level.

Respondents' age and their information-seeking behavior may have motivated them to be more aware of climate change issues. This could be the reason for a medium to a high level of awareness among respondents about climate change.

4. CONSEQUENCES AND SUGGESTIONS ENCOUNTERED BY FARMERS REGARDING LIVELIHOOD DIVERSIFICATION

A consequence in general means the effect of accepting or rejecting an innovation at the individual level. The objectives of this study were to identify the consequences encountered by farmers in adopting livelihood diversification, and suggestions to enhance diversification. The related findings and discussion are presented under the following sub-sections.

4.1. Consequences Encountered in Livelihood Diversification

4.1.1. Suggestions to Encourage Livelihood Diversification

Identifying the consequences would project the field-level problems faced by the respondents in integrating and gaining success from different components. Details of the consequences encountered by both irrigated and nonirrigated respondents were collected and collated, and the Garrett ranking method used for ranking the constraints the results aispresented in Table 2.

It can be seen from the Table 2 that lack of previous experience (score of 152.22) ranked top. Due to adverse climatic effects, respondents moved to new employment. However, the respondents can't overcome the management issues in new employment.

Poor family support (135.23) was in second position. Discussions revealed that youth and second-line generations felt that farming was not remunerative and hence they started looking for other occupations and careers.

Other consequences, such as involvement of risk factors (133.37), fear of failure of mixing enterprises (132.60), and lack of confidence (131.49) were in third, fourth, and fifth positions respectively. Once respondents had adopted diversification, it is natural that factors such as risk, fear of failure, and reduced confidence hamper them in driving diversification to the higher/next level.

Complex procedures required to secure a loan (128.52) was in sixth position. In the study area, the respondents were interested in getting loans to extend farm diversification. However, the stringent rules and regulations of credit agencies impeded respondents' aims.

Indebtedness (127.31) was in seventh position. During interactions, it was noticed that crop and livestock loans had been obtained by small farmers. There was greater confusion in the minds of small farmers as to whether their livelihood activities could be extended as they were already in debt.

Table 2. Consequences faced by respondents due to livelihood diversification.

(N = 240)			
S.No	**Factors**	**Average score**	**Rank**
1	Lack of technical support	124.41	8
2	Lack of previous experience	152.22	1
3	Poor family support	135.23	2
4	Heavy investment in starting new enterprise	92.34	15
5	Poor access to resources	104.55	13
6	Livestock disease management	104.96	12
7	Involvement of risk factors	133.37	3
8	Frustration due to failure of enterprises	123.18	9
9	Lack of confidence	131.49	5
10	Fear of failure in mixing enterprises	132.6	4
11	Indebtedness	127.31	7
12	Complex procedures to acquire loans	128.52	6
13	Poor economic status	106.13	11
14	Poor investment capacity	98.74	14
15	Rural migration	108.35	10

Lack of technical support (124.41) ranked eighth. Upon observation, it could be seen that the respondents were highly dissatisfied about the inadequate technical support received from extension officials and scientists of KVK. Also, the centers was less accessible due to their physical proximity.

Frustration due to failure of enterprises (123.18) ranked ninth. In the study area, to overcome climatic risks the respondents had adopted livelihood diversification without having previous experience, while they faced hurdles during enterprise management and were unable to overcome these issues. This might prevent respondents from extending their enterprise.

In tenth position was rural migration (108.35). A few agricultural laborers had migrated to nearby towns to work as laborers in shops and textiles because of the attractive wages offered. Both categories of farmer shared the view that diversification involves integration of several components that demand labor for maintaining and carrying out such activities.

The remaining consequences, including poor economic status (106.13), livestock disease management (104.96), poor access to resources (104.96), poor investment capacity (98.74), and heavy investment to start new enterprises (92.34), were ranked 11th to 15th, respectively. These factors affected the diversified respondents at lower levels only.

4.2. Suggestions to Encourage Livelihood Diversification

Further attempts were made to elucidate suggestions regarding strategies to enhance livelihood diversification. The related findings are given in Table 3 and Figure 1.

From the results, almost an equal proportion of respondents expressed the view that farmers need specific training (77.92%), encourage livestock management (77.50%), and provide subsidies for agricultural allied enterprise development as a strategy to encourage livelihood diversification. This might be due to the fact that both irrigated and nonirrigated respondents experienced adverse effects due to unpredictable climatic variation. Hence, the respondents felt the need for training and additional income-oriented business startups to overcome agricultural risks and promote their livelihood standards.

The respondents gave facilitation of easy administrative procedures for accessing loans (74.58) and encouraging small-scale enterprise development (73.75) as factors to encourage livelihood diversification. The respondents in the study area expressed that they wanted to become entrepreneurs. Hence, the respondents look for easy ways to access loans and subsidies for small-scale enterprise development.

About 68.75% of the respondents felt that creation of wider market opportunities is one of the factors to enhance livelihood diversification. Respondents look forward to wider market opportunities for overcoming marketing risks.

Table 3. Suggestions to encourage livelihood diversification in irrigated and nonirrigated land ecosystems.

S. No.	Suggestions	Total respondents (n = 240)*	
		No.	%
1	Facilitating easy administrative procedures for accessing loans	179	74.58
2	Ensuring Minimum Support Price for dryland crops	152	63.33
3	Expanding the coverage of crop insurance	124	51.67
4	Providing subsidies for agricultural enterprise development	182	75.83
5	Encouraging farm mechanization in both irrigated and nonirrigated areas	139	57.92
6	Extending subsidies for agricultural development	156	65.00
7	Encouraging group approaches (i.e., FPO, CIG, FIG)	137	57.08
8	Creating wider market opportunities	165	68.75
9	Creating better road connectivity	120	50.00
10	Farmers need specific training	187	77.92
11	Encouraging small-scale enterprise development	177	73.75
12	Encouraging livestock management	186	77.50
13	Implementing an exclusive program for diversification	150	62.50
14	Creating a model farm village to enhance understanding	153	63.75
15	Creating non-agricultural ventures in nearby areas	127	52.92

Note: *Multiple responses.

More than 60.00% of respondents said that extending subsidies for agricultural development (65.00%), creating a model farm village for better understanding (63.75%), ensuring minimum support price for dry land crops (63.33%), and implementing an exclusive program for diversification (62.50%) were the key strategies for livelihood diversification. During the survey the respondents said that the creation of a model farm village in a nearby area should be promoted to adopt new technologies soonest. Furthermore, they pointed out that implementation of a minimum support price for nonirrigated crops will help to overcome economic risks; and also, implementing an exclusive program for diversification will help to encourage respondents to adopt livelihood diversification on a large scale.

Around 57.00% of respondents stated that encouraging farm mechanization in both irrigated and nonirrigated areas, and encouraging group approaches, will support livelihood diversification. The respondents perceived that, to overcome labor shortages it will be necessary to create much greater awareness about farm mechanization and implements in both irrigated and nonirrigated areas. Also creating awareness about the benefits of group approaches facilitates wider crop cultivation.

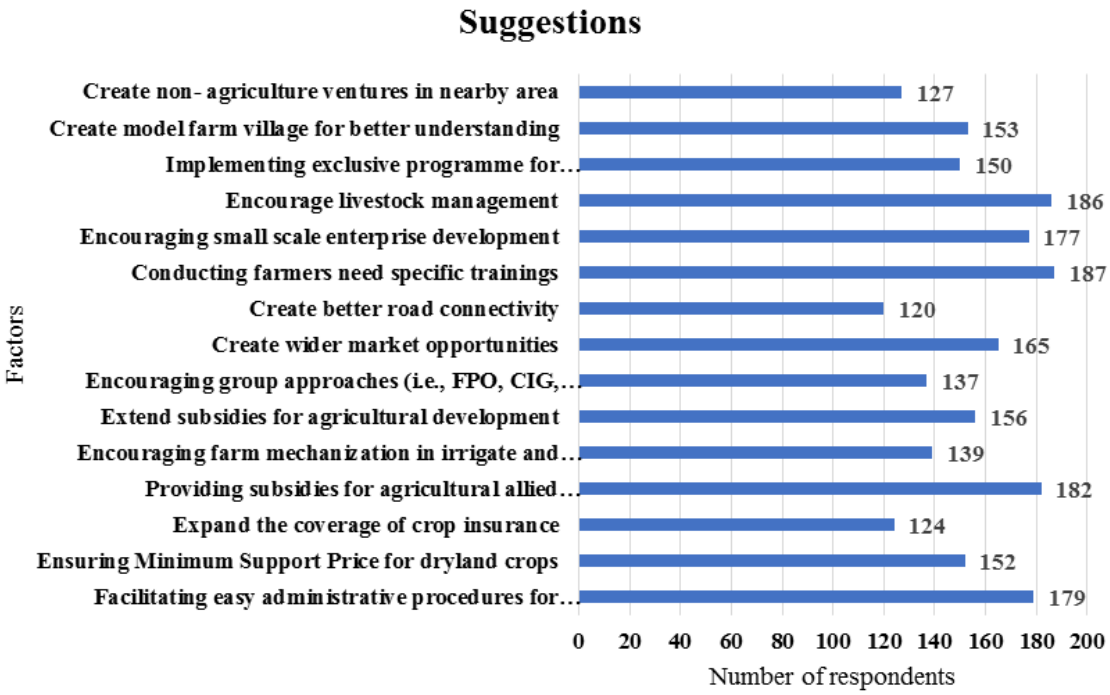

Figure 1. Suggestions to overcoming the consequences of livelihood diversification.

More than half (52.92%) of the respondents mentioned the creation of non-agricultural ventures in nearby areas to enhance livelihood diversification. Increased family expenditure had forced respondents to involve high remuneration-oriented non-agricultural work, whereas some respondents who had migrated to non-agricultural work. Other respondents had left farming. To overcome this, the respondents suggested that creating non-agricultural ventures in nearby areas would control migration and encourage respondents to participate in, at least, part-time agriculture.

Expanding the coverage of crop insurance was mentioned by 51.67% of respondents.To overcome climatic risks and their livelihood security, respondents were looking for crop insurance.

Exactly half (50.00%) of respondents expressed the view that creating better road connectivity is among the factors for livelihood diversification. Better road connectivity encourages respondents to cultivate crops rather than sell land.

5. CONCLUSION

Current climate change influences agriculture to a greater exrent. Hence the farmers have changed occupations to overcome the situation. At that time, they were affected due to constraints like lack of experience in the new sector, lack of family support to do the new work and lack of knowledge in managing the multiple cropping system in their field. The study indicated future suggestions to overcome the consequences, such as providing specific training to farmers and encouraging them to rear cattle; and also they expect a region-specific subsidies program to support their livelihood options. Hence, the study concluded that policymakers must concentrate on this area and may implement new, area-specific policies.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study.

REFERENCES

Cinner, J. E., & Bodin, Ö. (2010). Livelihood diversification in tropical coastal communities: A network-based approach to analyzing 'livelihood landscapes'. *PloS One*, *5*(8), e11999.

Hilson, G. (2016). Farming, small-scale mining and rural livelihoods in Sub-Saharan Africa: A critical overview. *The Extractive Industries and Society*, *3*(2), 547-563.

Kabir, M. J., Cramb, R., Alauddin, M., & Roth, C. (2016). Farming adaptation to environmental change in coastal Bangladesh: Shrimp culture versus crop diversification. *Environment, Development and Sustainability*, *18*(4), 1195-1216.Available at: https://doi.org/10.1007/s10668-015-9697-z.

Kassie, G. W. (2017). The Nexus between livelihood diversification and farmland management strategies in rural Ethiopia. *Cogent Economics & Finance*, *5*(1), 1275087.

Kassie, G. W., Kim, S., & Fellizar Jr, F. P. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia. *Cogent Social Sciences*, *3*(1), 1369490.Available at: https://doi.org/10.1080/23311886.2017.1369490.

Liu, Z., & Liu, L. (2016). Characteristics and driving factors of rural livelihood transition in the east coastal region of China: A case study of suburban Shanghai. *Journal of Rural Studies*, *43*, 145-158.

Lohmann, C., & Liefner, I. (2009). Location, non-agricultural employment, and vulnerability to poverty in rural Thailand. *Erdkunde*, *63*(2), 141-160.

Makate, C., Wang, R., & Makate, M. (2016). Crop diversification and livelihoods of smallholder farmers in Zimbabwe: Adaptive management for environmental change. *SpringerPlus*, *5*, 1135 Available at: https://doi.org/10.1186/s40064-016-2802-4.

Mango, N., Makate, C., Tamene, L., Mponela, P., & Ndengu, G. (2018). Adoption of small-scale irrigation farming as a climate-smart agriculture practice and its influence on household income in the Chinyanja Triangle, Southern Africa. *Land*, *7*(2), 1-19.

Martin, S. M., & Lorenzen, K. (2016). Livelihood diversification in rural Laos. *World Development*, *83*, 231-243.

Rigg, J. (2006). Land, farming, livelihoods, and poverty: Rethinking the links in the rural South. *World Development*, *34*(1), 180-202.

Theodore, M. K., & Theodore, L. (1999). Major environmental issues facing the 21st century.

Wang, J., Wang, Y., Li, S., & Qin, D. (2016). Climate adaptation, institutional change, and sustainable livelihoods of herder communities in Northern Tibet. *Ecology and Society*, *21*(1), 5.