Livelihood functions of fisher households under a cold-water production environment of Kashmir, Jammu and Kashmir, India

S. H. Baba\textsuperscript{a,}\textsuperscript{*}, Oyas Asimi \textsuperscript{b}, Ishrat F. Bhat\textsuperscript{b} and Irfan A. Khan\textsuperscript{a}

\textsuperscript{a}Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar, India
\textsuperscript{b}School of Agricultural Economics, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar, India
\textsuperscript{*}Corresponding author. E-mail: drshbaba@skuastkashmir.ac.in

ABSTRACT

This study comprehensively investigated the livelihood security scenario of fisher households (FHs) employing the CARE framework with little modifications, in Kashmir, India. Primary data for this study was collected from selected FHs, and a regression function was fitted to quantify the determinants of livelihood security. The findings revealed that fishing has been their dominant livelihood option. The landholding owned by the households was meagre enough to carry out farming or domesticate animals on commercial lines. Poor capital endowments place them at less livelihood security level; however, the respondents with diversified income have a relatively higher index value for livelihood. The regression estimates indicated that barring social and natural capital, all forms of capital have a significant role to play in securing their livelihood. Poor livelihood security, coupled with less income flow, has made their survival vulnerable to various distresses and health disorders, including the prevalence of Infant & Maternal Mortality. Their dietary intake was undesirably less than their dietary recommendations. The COVID-19 pandemic was perceived as a shock to their livelihood security. Further, public investment, which is pertinent for the growth of the fisheries sector, has shown a discouraging trend. The study concluded with a few policy suggestions for securing the livelihood of the fisher community.

Key words: Capital, Cold water, COVID-19, Fishers, Fishing, India, Kashmir, Livelihood security

HIGHLIGHTS

- Excessive fishing could have serious environmental impact, including the removal of target species.
- Absence of markets can lead to failure in harnessing livelihood opportunities.
- Emphasis should be on subsidiary occupation to supplement their income to uplift the living standards of these families.
- There is a need for convergence in the ongoing schemes and missions to have better results from their execution.

1. INTRODUCTION

Fish is one of the crucial sources of the bulk of essential nutrients, including quality proteins and micronutrients, in developing nations (Brautigam, 1999; Lorenzen et al., 2000; Jensen, 2001; Ravichndran et al., 2012). Bene & Neilland (2003) have identified the capacity of fishing to generate ‘immediate income’ to its stakeholders compared with crop cultivation. Fisheries provide livelihood or ‘economic safety-valve’ for the poor (Jul-Larsen & van Zwieten, 2002). Sale of little fish surpluses acts as a source of income, especially for poor fisher households (FHs), who cannot practice farming owing to less land (Garaway, 1999). Open-access fishing allows more people...
to overextract, which may have serious ecological concerns, including diminishing productivity per effort. Further, the fish catch from natural waters in India showed a declining trend, primarily due to the proliferation of water control structures, indiscriminate fishing, and habitat degradation (Katiba & Bhatta, 2002). Consistent with this, the preservation of aquatic resources and genetic diversity of fishes has been prioritized in various developmental plans (Planning Commission, 2001, 2002).

Fishing occupation is being practised in the territory of Jammu and Kashmir (J&K) since time immemorial and has been a viable livelihood option for a good proportion of the population. The state has earned an amount of about 10 lakh dollars as revenue from this sector in 2018–2019 (http://www.JKfisheries.nic), notwithstanding the fact that its contribution to states' domestic product is less than 1% (Baba & Wani, 2017). Within the state, Kashmir with its rich natural water bodies, possesses great potential for the development of varied types of fisheries like cold-water fisheries, warm-water fisheries, sport fisheries, reservoir fisheries, etc. The fisheries sector supports the livelihood of a large proportion of the economically underprivileged population in Kashmir (Baba et al., 2019) at the national level (Ayyappan & Krishnan, 2004). Further, the primary stakeholders in this sector remain a neglected class in society (Hannan, 1994; Rahman et al., 2002). They are destitute and their deprivation from basic necessities forces a percentage of them, especially younger ages, to out-migrate from the main occupation of fishing (Malik et al., 2013). Their miseries get accentuated with the declining stock/production and resultant less per capita availability of fish in Kashmir (Anonymous, 2014). Studies have observed that the poor fishers are likely to exit from fisheries in favour of alternative income-generating activities (Cinner et al., 2009) but not in totality, as they lack formal education, access to infrastructure links and permanent employment options. The absence of integrated policies or management approaches has led to immense pressure on water bodies and has created challenges for fisher livelihood.

Fishing is possibly the livelihood of a significant proportion of marginal fishers. Their livelihood security is based upon capital endowments, which, in turn, relies on the economic standard of households. Additional returns due to the efficient utilization of resources are spent on the generation of capital needed to secure their livelihood (Baba, 2018). The livelihood security scenario appears different across different sections of the society and is more insecure in the fisheries-dominated areas of the valley as indicated by the existence of around 40% of poverty in these regions (DE&S, 2015). The existing literature on the livelihood analysis of fishers in India characterized either the livelihood of coastal fisher communities who rely on marine resources (Divakaran, 2007; Pal et al., 2015; Dash, 2020) or the related livelihood with technology adoption in reservoir fisheries (Ekka et al., 2012; Pandit et al., 2019) and is restricted to a specific area (Madhuri et al., 2014). Salim et al. (2013) investigated the livelihood of fishers in diverse fishing ecologies across India. The conclusions of these studies could not be entirely emulated for fishers living in a cold-water environment. Accordingly, the primary focus of this study is to analyse the livelihood security scenario of fishers in relationship with capital endowments in the Kashmir valley of the state of J and K.

2. MATERIAL AND METHODS

The present study was broadly based on primary information on various indicators of livelihood collected from the sample FHs of Kashmir valley, Jammu and Kashmir, India. A total of 180 households were randomly selected from two districts, namely, Srinagar and Bandipora. While the famous Dal lake provides space for fishing in Srinagar district, Wular lake, Asia’s largest freshwater lake, is situated in Bandipora district. These two lakes have a maximum contribution to make to lake fisheries of the valley (Quereshi Neha et al., 2013; Qureshi & Krishnan, 2015). Both the lakes are eutrophic and subjected to anthropogenic activities like tourism, encroachment, domestic disposal, etc., although these may differ with respect to a number of features. Respondents selected, within and around only one location, cannot be a close representative of fishers in the valley; accordingly, these two
districts were selected for the present investigation to get a representative sample. Five villages within the close proximity of each lake were identified for the selection of the final sample of 90 FHs from each location, thus making a total number of 180 fishers for the present investigation. For clarity and presentation of results, the sample was later categorized into two groups, category one comprising 90 households, having fishing as the main occupation contributing >50% to their household income and, thus, captioned as FHs with Specialized Income, and another category of 90 households that mainly depend on other occupations for their living and earn <50% income from fishing, thus called FHs with diversified income (FHD). Households with diversified income are expected to have a relatively high income to secure their livelihood as compared with households with fishing as a specialized income source. Parametric or non-parametric statistics were employed to ascertain this presumption. Focused group discussion was carried out in each selected village to substantiate the primary data. The primary data on different aspects of capital accumulation and livelihood security indicators was obtained through the personal interview method with the help of a structured and pre-tested survey schedule during 2019–2020 under an Indian Council of Social Science Research (ICSSR), New Delhi, India–sponsored ongoing research project of the Division of Social Sciences, Faculty of Fisheries, SKUAST-Kashmir.

2.1. Conceptual framework

The conceptual framework followed for the conduct of this study was built on the basis of evidence available in the literature. The concept of household livelihood security (HLS) was eventually built up after Corporate Assistance and Relief Everywheres (CARE)’s approach, which initially evolved from the food crisis of the 1980s and theory on entitlement referring to the resources (Sen, 1981). CARE considers the HLS approach as an integral part of its livelihoods approaches of 15 development agencies presented by Hussein (2002) and defines it as an adequate and sustainable access to income and resources to meet basic needs. This concept of livelihood matches with Chambers & Conway’s (1991) definition, who conceptualize livelihood in terms of capacities and activities. Livelihood security refers to the ability of the household to meet its basic needs or realize its basic rights. These needs include adequate food, health, shelter, minimal levels of income, basic education and community participation (Frankenberger et al., 2000). The asset box (Frankenberger & Luther, 2002; CARE, 2004) includes resources to which household members have access, their capabilities and the ability to claim from relatives, the state and other actors. The production and income activities are a means to improving livelihoods. Accordingly, this framework allows investigating a diverse range of indicators of HLS. Other frameworks have also captured livelihood as a function of capabilities, assets and means of living (DFID, 1999). DFID/IDS (2000), DFID (2000) and Ghanim (2000) also viewed the livelihood security of fishers as a function of capital endowments. Divakaran (2007) modified their livelihood outline for fishers by including political capital (participation in politics) in his methodology. The FLIRES is a comprehensive framework to check the sustainability of the livelihood of fishers, including institutional capital, as the sixth distinct asset variable in it (Stanford et al., 2017). Our conceptualized framework for this study differs from these methodologies in that our approach has used quantitative indicators of different security areas with a greater degree of precision and grouped those under five security domains, namely economic capital security, physical capital security, human capital security, natural capital security and social capital security. Participation or membership in various organizations and institutional role has also been accommodated in it. The framework adopted in this study has investigated the livelihood of fishers within the environment created by institutions (including supporting/shocking factors like public investment). The interaction between these attributes defines what livelihood strategy a household will pursue to reach its desired outcomes. The outcome of a given endowment of different forms of capital at FHs and their interactions presents an entire livelihood scenario of any region. Therefore, the dietary intake and
vital statistics were taken into account as outcome indicators determined by their existing livelihood resources so that the inferences could be drawn for devising plans for their overall improvement.

2.2. Analytical tools

2.2.1. Construction of index

A set of indicators/variables were identified under each kind of capital. The weights of the indicators were calculated based on the method of Iyenger & Sudarshan (1982). The index for each variable/indicator determining each kind of capital was constructed and then aggregated to form a composite index for security in that capital. The indicators were standardized as an index following the procedure adopted in measuring Human Development Indices (Hahn et al., 2009) and other studies (Baba, 2018). Once each capital representing a particular livelihood security domain is standardized, then the relevant HLS index was constructed by averaging the standardized indicators. Livelihood security index (LSI) ranges from 0 to 1, while 0 implies livelihood vulnerability, the index value of 1 implies high livelihood security. In this way, our approach has employed an in-depth quantitative indicator of different security areas with a greater degree of precision.

2.2.2. Livelihood security function

In order to ascertain the relative influence of a different livelihood security domain on HLS, a regression function of following structural form was developed and estimated. These variables were specified in the model on the basis of their expected role on livelihood security as also hypothesized by a few previous studies (Rahman & Akhter, 2010; Baba, 2018; Baba et al., 2018; Bhat, 2018).

$$LSI = f(HSI, SSI, ESI, NSI, EDSI, PHSI, HLSI, FML, AGE, U)$$

where LSI is the livelihood security index, HIS is the human security index, SSI is the social security index, ESI is the economic security index, NSI is the natural security index, EDSI is the educational security index, PHSI is the physical security index, HLSI is the health security index, FML is the average family size (No.), AGE is the age of family head (years) and U is the random term.

A number of exogenous variables were attempted in the model; however, only those variables that gave best fit to the estimates were kept in final form.

3. RESULTS AND DISCUSSION

Secure households should have an affordability and access to both tangible and intangible assets that allow them to meet their needs. People use various kinds of capital to reduce risks of marketing, access services, protect themselves from deprivation and to acquire information to reduce uncertainties (Rahman & Akhter, 2010). The efficient utilization of capital goods needs a favourable policy environment that may come under institutional support (Baba, 2018). The government of J&K has always been proactive towards the betterment of the regions’ fishing community. A number of states and central-sponsored schemes have been launched from time to time to provide multi-dimensional factors supporting fish-based livelihood. A handsome amount has been spent under RKVY, NWSF, PM employment package, etc. to benefit the fishing community particularly targeting destitute and underprivileged sections. Within the given supporting environment provided by the government and voluntary agencies, this study has made an attempt to investigate the livelihood security scenario of FHs, considering the five types of capital which are presumed to have a prominent role towards livelihood security and have been discussed logically in the ensuing section.
3.1. Livelihood resources

3.1.1. Human capital

Economic progress holds a direct relationship with the family size and its structure, and, in turn, affects various factors relating to income, health, education and employment. Since human development and improvement in the quality of life are the ultimate objectives of planning, endowment of this capital carries weight in HLS. The family head in the study area has an average age of 52 years, and at this age, they are expected to refrain from taking any risk. They may be feeling satisfied with their own fishing occupation even if income from it is less. There was a very marginal difference in the age of family heads among FHs having a specialized income source and FHd. With an intention to have an idea about the proportion that falls within the age group having possibly more risk-bearing capacity in taking decisions regarding migrating out of fishing, adoption of technology, etc., family heads were categorized (Table 1). Family heads falling within 30–60 years age group were mature enough to take prompt decisions and were considered receptive to new protocols and extension advisories (Baba, 2018). The age-based categorization of family heads apparently indicated that a relatively less proportion of heads belongs to <30-year category and a relatively high proportion belongs to >60-year category. Less-aged households in FHd revealed that in future more heads (40%) will be engaged in economic activities. The head of a household has an experience of over 27 years in fishing and better experience in fishing made other members of FHs to get engaged in fisheries business. Cosmopoliteness indicates the level of exposure and linkages to the outside world, including their visits to other parts of the state or country to know about the fishing activities in other regions (say coastal) and get to know about various acts and regulations followed by them. This exposure is expected to make up their fishing efforts, take advantage of government schemes, etc. Only 4% of heads have acquired such exposure and it could be an important reason why the fishers could not move out for subsidiary occupation or could not attain better education and experience. A small percentage of respondents (6.75%) were found participating directly in markets, implying that a majority have sold their fish surplus to village traders or in village.

A bigger family size is a healthy sign, very often indicating an existence of the joint family system with pooled resources. The average family size among study fishers was 7.80, and we could see from Table 2 that FHd had a higher family size compared with FHs. The sex ratio was found favourable in both households, although it was more in favour of female members. There are a number of activities in fisheries that are female-dominated, like marketing, net preparation and preparation of equipment for fishing, and a better sex ratio is a desired attribute to

| Table 1. | Background information of heads at FHs. |
|---|---|---|---|
| S. No. | Particulars | FHs | FHd | Pooled |
| 1. | Age of family head (years) | 52.20 | 52.00 | 52.10 |
| | <0 years (%) | 34.44 | 40.00 | 37.22 |
| | 30–60 years (%) | 51.11 | 48.89 | 50.00 |
| | >60 years (%) | 25.56 | 22.22 | 23.89 |
| 2. | Experience in fishing (years) | 33.33 | 21.11 | 27.22 |
| 3. | Participation in extension activities (%) | 6.22 | 9.12 | 7.67 |
| 4. | Cosmo-politeness (%) | 4.00 | 4.00 | 4.00 |
| 5. | Market participation (%) | 6.50 | 7.00 | 6.75 |

Source: Field Survey, 2019–2020.
add to the human capital among fishers. Another important human capital is a worker who engages in economic activity and generates income. Only 39.30% members in fisher families were active in any occupation. The percentage of working members in a family among FHs was a little higher than that in FHs, and the two household groups differ significantly with respect to this variable. The FHs are characterized by their predominant dependence on fishing, and other occupations are seen to engage only 20% of the labour force. Since educated persons have a greater thinking power and can make better use of available resources, they could be taken as

Table 2. | Human capital endowments at FHs.

| S. No. | Particulars | FHs | FHs | Pooled |
|-------|-------------|-----|-----|--------|
| 1.    | Family details (No.) |
|       | Average family size ($t=1.003$) | 7.60 | 8.00 | 7.80 |
|       | 5–15 years | 1.33 | 0.92 | 1.13 |
|       | Upto 5 years | 0.23 | 0.26 | 0.25 |
|       | Female | 3.85 | 4.02 | 3.94 |
|       | Male | 3.75 | 3.98 | 3.87 |
|       | Sex ratio | 1,027 | 1,011 | 1,019 |
| 2.    | Workers (%) ($t=2.511^*$) | 36.52 | 42.07 | 39.30 |
| 3.    | Main occupation (%) ($\chi^2=6.951$) |
|       | Handicraft | 2.82 | 3.87 | 3.35 |
|       | Business | 8.33 | 17.20 | 12.77 |
|       | Service (govt./non-govt.) | 6.79 | 12.97 | 9.88 |
|       | Fisheries | 64.15 | 50.90 | 57.53 |
|       | Labourer | 17.91 | 15.06 | 16.49 |
| 4.    | Education (%) ($t=1.99^*$) |
|       | Illiterate | 62.48 | 55.55 | 59.02 |
|       | Literate | 37.52 | 44.45 | 40.99 |
|       | Primary | 58.93 | 50.6 | 54.77 |
|       | UG | 40.10 | 49.03 | 44.57 |
|       | Graduate | 0.97 | 0.37 | 0.67 |

Source: Field Survey, 2019–2020.
*This indicates significance at 0.05 probability level.

Table 3. | Natural capital endowments at FHs.

| S. No. | Particulars | FHs | FHs | Pooled |
|-------|-------------|-----|-----|--------|
| 1.    | Landholding (ha) ($t=1.00$) | 0.031 | 0.056 | 0.044 |
| 2.    | Cultivated land (ha) ($t=3.03^*$) | 0.015 (48.40) | 0.035 (62.50) | 0.025 (57.47) |
| 3.    | Livestock (ACU) ($t=1.28$) | 0.35 | 0.40 | 0.38 |

Figures within the parentheses indicate the percentage of landholding.
Source: Field Survey, 2019–2020.
*This indicates significance at 0.05 probability level.
powerful human capital. The incidence of illiteracy among fishers (59%) is more than the states’ average, and across groups, we can see that illiteracy is significantly higher among FH₆, and on the other hand, as high as 44.45% of members are literate among FH₇.

3.1.2. Natural capital
Among natural capital, land area and its quality form one of the crucial natural resources of any economy, and this may be more crucial for fishers. The way of using land resource is decisive for their social and economic well-being. The area of land and livestock possession has been taken as natural capital available with stakeholders. Respondents possess a meagre landholding of 0.044 ha, which they have used for the construction of residential houses. Less land does not allow them to raise crops. FH₄ possess relatively more land, which they have put under kitchen garden to raise vegetables and legumes. FH₅ make a few vegetable beds on 0.015 ha of land, although it may not even sustain their family demand for vegetables. Less holding size does not allow them to domesticate even animals, although a few sheep/goats or cows are visible in the study area.

3.1.3. Economic capital
Economic capital determines the position of current asset to be spent on day-to-day needs. It was seen that, on an average, a fisher family in the study area has a monthly income of 150$, which may be quite less for a family of about eight members. The average family income of FH₅ was almost half the income of FH₄, giving an idea that FH₅ may not be able to overcome all its needs, given their average family size of 7.60. Predominant engagement in fisheries was observed to generate only 57% of family income indicating poor labour productivity in this sector. By and large, income-generated through fisheries was the dominant source of income in FH₅. The obligation of applying for license and spending on fees to issuing authorities, combined with the costs of gear and repair of crafts, exclude FHs from an enhanced catch, termed ‘economic exclusion’ by Bene (2003), of fishers in general and FHs in particular. Contrary to this, business and services together generate over 38% of the total family income in the study area. A higher literacy status among FH₇ make their way to services and businesses in which these families earn a good proportion of income. It can be seen from the figures in Table 4 that they earn a meagre proportion of their family income from farming activities. As high as 51% of workers belong to <70$/month income category in FH₅ and only 13.33% of them fall in >140$/month income group. The income-based categorization of FH₄ members indicates over 52 and 34% falling in >140$ and >70$–140$ income category. As far as institutional credit is concerned, only 1.22% of FH₅ has an opportunity to obtain credit from formal sources, whereas the proportion is relative more at FH₄, and in aggregate only 1.62% of families have benefitted from formal credit. The respondents have relatively more access to informal agencies, including village traders, and the amount outstanding to these sources was around 168$ per family. Poor formal credit markets, coupled with the inability to offer any asset as collateral, left fishers indebted to informal lenders that worsen their condition, which are steered to meet repayment compulsions. The average per capita income per day in the study area was only 0.64$, which is much less than poverty norms. The test estimates imply that the two FH categories differ significantly with respect to various indicators of economic capital. It emphasized upon concerted measures to raise their cash income by encouraging subsidiary occupation among fishers. The lower economic capital at FHs is expected to have implications on their livelihood determining socio-economic overheads.

Within the given economic environment, the poor possibility of labour mobility for economic activities owing to their limited education, lifestyle preferences, satisfaction in chores they have been experiencing, expectations of good catch, etc. resulted in fisher income even less than labour opportunity cost. Among available options is
encouraging fishers to sell their marketable surpluses in fish-deficit areas, which would enhance their cash income.

3.1.4. Social capital

Societies are formed for a variety of services, including information needs, achieving scale economies, etc., although each member in a society has a common interest. It is surprising that households have a lower level of participation in all the kind of societies and the two categories of households make little difference. A comparatively better participation is observed in welfare committees. While 11.0% of heads of FH_D have participated in

Table 4. | Economic capital endowments at FHs.

| S. No. | Particulars                                             | FH_S  | FH_D  | Pooled |
|--------|---------------------------------------------------------|--------|--------|--------|
| 1.     | Household income ($/month) (t=3.21*)                    | 115.41 | 178.15 | 146.71 |
| 2.     | Sources of income (% of income) (P^2=11.28*)            |        |        |        |
|        | Agriculture                                            | 0.35   | 0.60   | 0.50   |
|        | Handicraft (needle stitching)                          | 4.35   | 4.86   | 4.65   |
|        | Business                                               | 12.05  | 18.47  | 15.86  |
|        | Services                                               | 14.33  | 28.20  | 22.55  |
|        | Fisheries                                              | 56.62  | 34.67  | 43.61  |
|        | Labour                                                 | 12.3   | 13.2   | 12.83  |
| 2.     | Income category (% workers) (P^2=36.71*)                |        |        |        |
|        | <70 ($/month)                                          | 51.11  | 17.7   | 34.41  |
|        | 70–140 ($/month)                                       | 35.56  | 33.3   | 34.43  |
|        | >140 ($/month)                                         | 15.33  | 49     | 31.17  |
| 4.     | Income ($/capita/day) (t=2.99*)                         | 0.51   | 0.74   | 0.64   |
| 5.     | Institutional credit obtained (% of fishers) (P^2=0.138)|        |        |        |
|        | Formal sources                                          | 1.22   | 2.01   | 1.62   |
|        | Informal sources                                        | 8.85   | 9.22   | 9.04   |
| 6.     | Outstanding to informal agencies ($) (t=3.66*)          | 126.06 | 198.84 | 162.46 |
| 7.     | Saving/cash balance ($/month) (t=2.00*)                | 10.13  | 14.78  | 12.46  |

Source: Field Survey, 2019–2020.

*This indicates significance at 0.05 probability level.

Table 5. | Social capital endowments at FHs (%).

| S. No. | Particulars                                      | FH_S  | FH_D  | Pooled |
|--------|--------------------------------------------------|--------|--------|--------|
| 1.     | Welfare committee                                | 9.93   | 10.99  | 10.46  |
| 2.     | Organizations (producers/consumer, etc.)         | 6.91   | 5.97   | 6.44   |
| 3.     | Civil societies                                  | 0.53   | 0.94   | 0.74   |
| 4.     | Other                                            | 0.53   | 0.94   | 0.74   |

Source: Field Survey, 2019–2020.

P^2=0.327
these committees, only 9.93% of family heads at FH_S are seen to be a part of these committees. Participation in producers/consumers’ organizations ranges from 6% among FH_D and 7% among FH_S. There is meagre participation of family heads in civil societies and other committees. The lower participation in societies indicates accumulation of meagre social capital in the study area, which leads to the isolation of this stratum and their confinement within the fisheries occupation.

3.1.5. Physical capital

Physical capital includes medium- and long-term assets having a long lead time to be productive (assets that render its services for a number of years) and contributes to securing livelihood or helping in securing it for a number of years. Of this capital, residential houses form an important asset. The residential houses possessed by each household on an average are less than one, indicating that few families are living together in a common house. It is observed that almost each family in the FH_D category possesses a house to live, whereas a few of the FHs are seen living together in a common house. Moreover, the houses are made of mud and raw bricks by fishers. FH_S are seen to be endowed with a few fisheries’ resources, including crafts, gears, etc. A few FHs are seen engaged in tourism activities; however, a few of them own a tourist ‘shikara’ (a tourist boat). In accordance with their interest in raising vegetables for family consumption on less landholdings, the endowment of farm implements ranges from 5 (FH_S) to 8 (FH_D). Endowments of physical resources will help them to use available resources more efficiently over the years and are expected to have a significant impact on the security livelihood.

3.2. Indices of livelihood security

In order to capture the livelihood security within the framework of different security dimensions, namely security in social, economic, physical, natural and human capital indices were constructed. The index was worked out by using the standardized values of these indicators by employing series-level maximum and minimum values. The capital indices were then averaged to construct a composite index that explains the livelihood security at the household level (Table 7). The security indices for different forms of capital possessed by the FHs were less. Barring a few, the two categories of households are different in the security of capital endowments, although the difference is wider for economic capital. This emphasized upon the need for a policy support for the augmentation of weaker aspects of livelihood, but definitely, the interventions have to be specific for each location.

Table 6. | Physical capital endowments at FHs (No.).

| S. No. | Particulars                                      | FH_S | FH_D | Pooled |
|-------|-------------------------------------------------|------|------|--------|
| 1.    | Residential house ($t=121$)                     | 0.6  | 0.92 | 0.76   |
|       | Concrete                                        | 43.2 | 50.12| 46.66  |
|       | Mixed                                           | 56.8 | 49.88| 53.34  |
| 2.    | Fisheries resource (gears, craft, etc.) ($t=311^*$) | 6.5  | 4.22 | 5.36   |
| 3.    | Shikara (tourist boat)                          | 0.0  | 0.34 | 0.17   |
| 4.    | Vehicles (carrier, etc.) ($t=101$)              | 0.2  | 0.45 | 0.33   |
| 5.    | Hand pump ($t=242^*$)                           | 0.10 | 0.18 | 0.14   |
| 6.    | Farm implements (hand operated) ($t=115$)       | 5.0  | 9.0  | 7.00   |

Source: Field Survey, 2019–2020.

*This indicates significance at 0.05 probability level.
A look at the livelihood capital web (Figure 1) revealed that the average indices for different kinds of capital endowments were lesser than the state average (Baba, 2018). However, it is apparent that the FHD are better placed than FHs with fishing as a dominant income source (FHS), as the livelihood pentagon for the former appears shifting towards the periphery. The difference among the two categories of FHs could be seen more significantly in economic capital, which is more likely a condition where they spend more on food and other items.

3.3. Estimates of livelihood security function

To grasp the relative influence of five kinds of capital, LSI was endogenized with seven security indices, the average family size and the age of family head, and the structural form of the functional model along with a specification of variables has been detailed in the methodology section. The estimates of the function revealed

| Capital       | FHs   | FHD   | Pooled |
|---------------|-------|-------|--------|
| Human         | 0.3275| 0.4012| 0.3644 |
| Natural       | 0.4058| 0.4337| 0.4198 |
| Physical      | 0.4332| 0.5001| 0.4667 |
| Economic      | 0.3082| 0.6002| 0.4542 |
| Social        | 0.2792| 0.3012| 0.2902 |
| Livelihood    | 0.3508| 0.4473| 0.3990 |

Source: Calculations made on data collected in Field Survey, 2019–2020.

A look at the livelihood capital web (Figure 1) revealed that the average indices for different kinds of capital endowments were lesser than the state average (Baba, 2018). However, it is apparent that the FHD are better placed than FHs with fishing as a dominant income source (FHS), as the livelihood pentagon for the former appears shifting towards the periphery. The difference among the two categories of FHs could be seen more significantly in economic capital, which is more likely a condition where they spend more on food and other items.

3.3. Estimates of livelihood security function

To grasp the relative influence of five kinds of capital, LSI was endogenized with seven security indices, the average family size and the age of family head, and the structural form of the functional model along with a specification of variables has been detailed in the methodology section. The estimates of the function revealed
that the households, which have a higher level of dependency ratio as captured in family size, have relatively high demands for basic needs, and this variable affects livelihood security negatively, putting other things constant and is in line with our hypothesis (Table 8). As expected, all security variables affect overall security positively, except for security in social and natural capital. Security in education and health are specified separately among a set of exogenous variables to capture their direct impact, and their regression coefficients are indicative of their significant and positive role in securing household livelihood. The overall model turns out to be statistically significant, wherein specified variables explain over 80% of the variation in the livelihood security of households.

3.4. Discouraging public development expenditure in fisheries

The public development expenditure made in the fisheries sectors creates capital stock having a long productive life and has a positive impact, direct as well as indirect, on the livelihood security of the fishing population (Baba & Wani, 2017). However, scholars are apprehensive about less and declining development expenditure in the fisheries sector of J&K, because in 2015–2016, only 10.90 lakh dollars have been allocated to this sector, which is much less than that in 2005–2006 (Baba & Wani, 2017). The calculations made on the data obtained from DS&E, 2018 indicated that the public investment in this sector has increased to 18.56 lakh dollars in 2018, but it is just 3% of the total investment in agricultural and allied sectors of the state. In terms of growth, the public investment in the fisheries sector has increased at a declining rate towards the recent decade (Baba et al., 2019). Public support is needed to mitigate the problems of the weaker sections, including that of the fisher communities. The flood of 2014 has badly hit the livelihood of the FHs of the valley, but they are yet to be fully compensated for their losses due to these floods (Malik et al., 2018). This scenario demands an enhancement of public development expenditure to this sub-sector of agriculture of the territory.

3.5. Outcome of stimulating and suppressing environment

The endowment of different kinds of capital translated in the form of a livelihood scenario wherein current income as a pivot determines their pattern of expenditure on living and to withstand the shock factor.

Table 8. | Estimates of the livelihood security function.

| Variable | Coeff. | St. error |
|----------|--------|----------|
| Constant | −0.011 |          |
| ESI      | 0.068* | 0.021    |
| SSI      | 0.031  | 0.033    |
| NSI      | 0.044  | 0.022    |
| HSI      | 0.177* | 0.011    |
| EDSI     | 0.149* | 0.016    |
| HLSI     | 0.157* | 0.018    |
| PHSI     | 0.188* | 0.020    |
| FMLY     | 0.132  | 0.210    |
| AGE      | −0.011 | 0.002    |
| Adj. $R^2$ | 0.8009 |          |
| $F_{cal}$ | 88.55 |          |

Source: Calculations made on data collected in Field Survey, 2019–2020.
3.5.1. Expenditure pattern and dietary intake

On average, the FH incurs an expenditure of 103.68$\$/month, of which 76.49% goes to food items. The expenditure when equated with family size gives an idea that each member of the family is living on 0.45$\$/capita/day, which appears to be much less than to come up with their essential needs. Since both the category of households has the same average family size, a major proportion of it goes to their food, although the proportion is little more at FHS. Poor health conditions (as discussed in the next section) of member at FHS made them to spend on medication for mitigating health distresses. FHS have less to spend on household appliances, while on the other hand, FHD involved in more income-earning activities in comparison have more resources to be spent on these appliances. Spending on education is crucial to delimit the younger generation beyond water-based life, and 2.92% spending on education of children would not suffice for the actual requirements on the overhead, although the scenario appears more unfavourable among FHS. The obvious role of government in provision of free education to their children could be the only option with given resources at their command. Notwithstanding their spending

| Table 9. | Expenditure pattern of FHs (%). |
|----------|--------------------------------|
| Item     | FHs   | FHo   | Pooled |
| Food     | 79.50 | 74.30 | 76.49  |
| Medicines and healthcare | 9.40  | 4.33  | 6.46   |
| Clothing | 0.50  | 3.22  | 2.08   |
| Household appliances | 3.37  | 6.11  | 4.96   |
| Education | 1.11  | 4.23  | 2.92   |
| Transportation | 4.00  | 5.50  | 4.87   |
| Other including entertainment | 2.12  | 2.31  | 2.23   |
| Total    | 100.00| 100.00| 103.68 |

Figures within parentheses indicate absolute expenditure in $/month.
Source: Field Survey, 2019–2020.

| Table 10. | Food intake at FHs (g/capita/day). |
|-----------|-----------------------------------|
| S. No.    | Item                 | ICMR Rec. | FHs   | FHo   | Pooled |
| 1.        | Cereals and millets   | 420       | 269.54| 283.44| 276.49 |
| 2.        | Pulses and legumes    | 40        | 19.32 | 21.44 | 20.38 |
| 3.        | Vegetables            | 125       | 87.21 | 90.06 | 88.64 |
| 4.        | Roots and tubers      | 75        | 50.21 | 60.19 | 55.20 |
| 5.        | Fruits                | 50        | 19.65 | 24.70 | 22.18 |
| 6.        | Meat                  | 25        | 10.55 | 13.11 | 11.83 |
| 7.        | Milk                  | 260       | 88.20 | 112.00| 100.10|
| 8.        | Fish                  | 26        | 26.60 | 25.50 | 26.05 |
| 9.        | Eggs (no./year)       | 180       | 39.25 | 51.33 | 45.29 |

Source: Field Survey, 2019–2020.
on miscellaneous items, including entertainment like payment of cable network fee, repair of TV sets, etc. was reasonable. This portion of expenditure has an essential role to play to take them out of the hectic routine, and it is desired, as the engagement with entertainment reduces domestic disputes and family tensions to a good extent. The rest of their monthly income was reported to be spent on capital accumulation, festival celebrations, repair and maintenance of houses, purchase of inputs, repayment of loans, making gears and repairing of fishing crafts.

In an assessment of the dietary intake of the two categories of households by employing four recall methods (one in each quarter of the year), we could observe that the nutrient intake was less than dietary recommendations prescribed by the Indian Council of Medical Research (ICMR). Although the consumption of food in both categories of FHs was much less than ICMR recommendations, the scenario was relatively favourable at FH_D. The deficiency was more pronounced in meat, eggs, milk and cereals. With their given income levels, it may not be possible for them to improve their dietary intake; therefore, central schemes that supplement nutrients to the children and lactating mothers have to be further strengthened to improve their health status. The fish intake in diets was a good part of their food basket owing to their own occupation, and the situation was relatively a little better at FH_S. The poor dietary intake at these households has made them vulnerable to a number of health-related disorders.

3.5.2. Distress

The poor economic conditions, poor endowments of capital and relatively more insecure livelihood options at FHs are observed to have discouraging influences on their outcome variables, as depicted in Table 11. These households have to bear an average of 46 food distress days every year, although this distress is more prevalent among FH_S because of their less family income. Families exclusively engaged in fishing to earn income are seen to have less than two diets per day, and the food distress days are as high as 61 per year. There is a widespread prevalence of micronutrient deficiencies in the study area, and the members of FH_S have reported relatively more diseases like beriberi, rickets, etc. The sickness among members of one category of FHs compared with others is in consonance with various supporting factors. The sickness among members prevents them from going to work even for a few days in a year, and the frequency is less at FH_D than at FH_S. The vital statistics, including the infant mortality rate (IMR) and the maternal mortality rate (MMR), is infavourably higher in the study areas and even more among fishers, which is a cause for concern for international agencies like UNESCO, UNDP, etc. The

| Particulars                          | FH_S | FH_D | Pooled |
|-------------------------------------|------|------|--------|
| Food distress (days/year)           | 61   | 28   | 46     |
| Meals (no./day)                     | 1.8  | 2.9  | 2.4    |
| Illness (days/year)                 | 46   | 21   | 34     |
| Unable to work (days/year)          | 35   | 12   | 24     |
| IMR (no. of infant deaths/000’ live births) | 16.40 | 14.45 | 15.42 |
| MMR (no. of mother deaths/000’ live births) | 11.52 | 10.22 | 10.37 |
| Cholera (% households)              | 2.5  | 2.2  | 2.35   |
| Diarrhoea (% households)            | 21   | 21   | 21     |
| Deficiency diseases (% households)  | 29.5 | 19.4 | 24.5   |

Source: Field Survey, 2019–2020.
sensitivity of vital indicators like infant deaths has to be perceived in a broader perspective to enhance the health profile of the community. The female members of fishers are seen to be suffering from a number of deficiency diseases like osteoporosis, anaemia, etc. (Arshika, 2019). All these health-related problems accrued to the residents of the study area on account of poor dietary intake. Therefore, rigorous measures are needed to mitigate their health-related miseries and to remove hunger from households and, of course, international agencies play their vital role.

The FHs are located within (in houseboats) or outside water bodies, namely lakes and rivers (in mixed or Kutcha houses). Owing to their locations and occupations, they are highly vulnerable to climate manifestations and geopolitical conditions. They were the key victims of 2014 floods in which their houses and assets were badly damaged. Their compensation claims have not been settled as yet, and their living conditions, especially in the Bandipora district, are pathetic. Successive advent of natural disasters like drought, heavy rains, windstorms, etc. has left them in more distress. This community is expected to get badly affected by the ongoing COVID-19 pandemic. Although fishing in lakes has been banned for the period from March to May every year to encourage breeding of fish in their natural habitat and the licensed fishers are compensated for no-fishing period. As such, the current COVID-19 outbreak and lockdown have apparently had no negative impact on capture fishing, but it may enhance the productivity of fish stock as it has strictly enacted the ban. Since a good proportion of them is engaged in labour jobs or self-business like running tea stalls, selling cigarettes, etc., the COVID-19 lockdown announced to curb the pace of spread of coronavirus, has drastically affected their livelihood. During lockdown, they could get only semi-skilled or unskilled labour work under the Mahatma Gandhi National Rural Employment Guarantee Act scheme, although they were not able to earn even equal to the opportunity cost of their own labour. Even the young female members of FHs may not be getting wages for their handicraft work. Moreover, they may not have resources to spend on food commodities or consumer goods due to less cash balance available with them. Inflation in sparsely opening markets would have serious implications on their livelihood. The various effects of COVID-19 lockdown as perceived by fishers are depicted in Figure 2. The aftermath of lockdown is associated with various uncertainties and any neglect in the prevention of contamination of water bodies with coronavirus may have long-term serious implications on their livelihood.

![Fig. 2. Effects of the COVID-19 lockdown as perceived by fishers during lockdown (%).](image-url)
4. POLICY SUGGESTIONS

This study pursued the primary data collected from respondents, namely fishers’ households in the Kashmir Valley, to investigate the livelihood security in relation to fishing and capital endowments. The study concludes that fishers with more dependence on fishing have poor endowment of resources at their command and remain distressed and marginalized owing to various constraints and poor public interventions in the form of investment. Although fishing is their important source of livelihood yet, it became less remunerative owing to various impediments, including poor marketing logistics and poor socio-economic overhead. On the basis of findings, this study puts forth the following few policy options for securing their livelihoods:

- Excessive fishing could have serious environmental impact, including the removal of target species (Welcomme, 2001; Pauly et al., 2002) and aquaculture, but in contrast, is likely to reduce dependence on natural ecosystems and may add value to it (Naylor et al., 1998; Baba et al., 2021). Therefore, the institutional support for the encouragement of fish culture would indeed raise the livelihood status of fishers. The provision of development subsidies for the construction of raceways or ponds and the provision of low-cost feeds have to be greatly increased. Moreover, there is a need to strengthen social relations and encourage the collectivization of farming and marketing activities of fishes in the valley.
- Promotion of formal education and generation of human resources among the fisher community through capacity building and skill development programmes on various aspects of livelihood, including subsidiary occupation, would enable them to strap up benefits from the available potential of aquatic resources, withstand shocks and uplift their living standards.
- The absence of markets can lead to failure in harnessing livelihood opportunities (Dorward et al., 2002); therefore, there should be institutional intervention in the form of market development and provision of cheap and easy institutional loan for capital accumulation to have positive impacts on productive activities.
- Poor regulation on access to water bodies for fishing allures more people to enter fishing, which leads to possible biological overexploitation of resources, erodes profitability and eventually impoverishes the fishing community. It demands strict prohibition of unlicensed fishers to enter and fixation of minimum eligibility criteria for the issuance of license. Community-based ecological conservation and adoption of enhancement technologies by way of ranching in water resources as per their carrying capacity may be taken up as a priority policy objective. Besides these short-term options for sustaining inland fisheries, the long-term income growth can be made possible by adding values through processing.
- There is a need for convergence in the ongoing schemes and missions to have better results from their execution. The declining trend in public investment in fisheries has to be reversed by increasing this support in absolute and proportionate terms. Pragmatic plans with regard to the creation of healthcare facilities are to be put in place to reduce IMR and MMR. The social welfare and health projects have to be strengthened; moreover, there is a need to revamp PDS, ICDS, mid-day meal and other schemes to supplement nutrient intake among the fisher community.

ACKNOWLEDGEMENTS

The authors are thankful to the anonymous referees for their creative comments on the earlier draft of the paper. We also thank the Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir for providing all the facilities to carry out the research work.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.
REFERENCES

Anonymous. (2014). *Economic Survey of Jammu & Kashmir*. Directorate of Economics & Statistics, Planning and Development Department, Government of Jammu & Kashmir.

Arshika (2019). *Health Status of Fisherwomen from Two Districts of Kashmir Valley*. PG Thesis. (Unpublished). Division of Social Sciences, Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Rangil, Ganderbal.

Ayyappan, S. & Krishnan, M. (2004). Fisheries sector in India: dimensions of development. *Indian Journal of Agricultural Economics* 59(3), 392–412.

Baba, S. H. (2018). *S&T Intervention in Agricultural and Allied Sectors for Strengthening Livelihood Security in Kashmir Division*. Final Technical Report of DST Sponsored Research Project. Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar Campus, Srinagar, J&K, India.

Baba, S. H. & Wani, S. A. (2017). *Growth of Fisheries Sector in J&K: Analysis of Structural Changes, Public Investment and Institutional Support*. Policy Brief #PRS 04. Directorate of Research, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar Campus, Srinagar, J&K.

Baba, S. H., Ali, G. & Wani, M. H. (2018). *Technological Interventions in Rice – To Double Farmers' Income in Kashmir Valley*. Policy Research Series/SKUAST-K/2018/01, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir.

Baba, S. H., Hussain, N., Zargar, B. A., Bhat, I. F. & Malik, I. (2019). Growth of fisheries sector in Jammu & Kashmir. *Journal of Pharmacognosy and Phytochemistry* 8(4), 909–912.

Baba, S. H., Asimi, O. & Khan, I. A. (2021). Technical efficiency and economic viability of fish culture under cold water production environment of Kashmir. J&K. *Indian Journal of Animal Sciences*. (In press).

Bene, C. (2003). *When fishery rhymes with poverty: a first step beyond the old paradigm on poverty in small-scale fisheries*. *World Development* 31(6), 949–975.

Bene, C. & Neiland, A. E. (2003). Contribution of inland fisheries to rural livelihoods in Africa: empirical evidence from the Lake Chad basin areas. In: *Second International Symposium on the Management of Large Rivers for Fisheries: Sustaining Livelihoods and Biodiversity in the New Millennium*, 11–14 February, Phnom Penh, Cambodia.

Bhat, I. F. (2018). *Empirical Study of Tribal Livelihood Around Forest Fringes in Central Kashmir*. M.Sc. Thesis. (Unpublished), School of Agricultural Economics & Horti-Business Management, Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Shalimar Campus, Srinagar, J&K, India.

Brautigam, A. (1999). The freshwater biodiversity crisis. *World Conservation* 30(3), 4–5.

CARE (2004). *Measuring Livelihood Impacts: A Review of Livelihoods Indicators*. Livelihood Monitoring Unit (LMU) Rural Livelihoods Program CARE Bangladesh, Prepared by TANGO International, Inc.

Chambers, R. & Conway, G. (1991). *Sustainable Rural Livelihoods: Practical Concepts for the 21st Century*. IDS Discussion Paper 296. IDS, Brighton.

Cinner, J. E., Daw, T. & McClanahan, T. R. (2009). Socioeconomic factors that affect artisanal fishers' readiness to exit a declining fishery. *Conservation Biology* 23, 124–130.

Cunningham, S. (1993). *Fishermen's Incomes and Fisheries Management*. Centre for the Economics and Management of Aquatic Resources, Portsmouth, p. 22.

Dash, R. R. (2020). Livelihood assessment of the fishermen community of Jagatsinghpur district of Odisha, India. *International Journal of Creative Research Thoughts* 8(7), 1812–1821.

DE&S (2015, 2018). *Digest of Statistics*. Directorate of Economics & Statistics, Planning and Development Department. Government of Jammu & Kashmir.

DFID (1999). *Sustainable Livelihoods Guidance Sheets*. Department for International Development, London.

DFID (2000). *Sustainable Livelihoods Guidance Sheets. Section 4: Methods*. Available at: http://www.livelihoods.org/info/guidance_sheets_rtf/Sect4-2.rtf.

DFID/IDS (2000). *Sustainable Livelihoods Guidance Sheet: Framework*. Section 2.1. Available at: http://www.livelihoods.org/info/guidance_sheets_pdfs/section2.pdf.

Divakaran, N. (2007). *Livelihood Assets and Survival Strategies in Coastal Communities in Kerala, India*. PhD Dissertation, (Submitted), Department of Geography, University of Victoria.
Dorward, A., Poole, N., Morrison, J., Kydd, J. & Urey, I. (2002). Critical linkages: livelihoods, markets and institutions. In *Seminar on Supporting Institutions, Evolving Livelihoods*, 29–30 May. Bradford Centre for International Development, University of Bradford.

Ekka, A., Katiha, P. K., Pandit, A., Barik, N., Salim, S. S. & Kumar, B. G. (2012). Socio-economic status of fishers of reservoirs in India. *Journal of Inland Fisheries Society of India* 44(2), 79–87.

Frankenberger, T. & Luther, K. (2002). *Household Livelihood Security Assessments: A Toolkit for Practitioners*. Prepared for the PHLS Unit of CARE by TANGO International Inc., Tucson, Arizona.

Hannan, M. B., Riederer, A. M. & Foster, S. O. (2009). The livelihood vulnerability index: a pragmatic approach to assessing risks from climate variability and change – a case study in Mozambique. *Global Environmental Change* 19(1), 74–88.

Hannan, M. (1994). Fisher folk organization in Bangladesh. In: *Socio-economic Issues in Coastal Fisheries Management*. Proceedings of the IPFC Symposium, November 23–26, 1993, Bangkok, Thailand. FAO Indo-Pacific Fishery Commission (IPFC), No. 8, pp. 216–222.

Hussein, K. (2002). Livelihoods Approaches Compared: A Multi-Agency Review of Current Practice. Department for International Development and ODI, UK.

Jensen, J. G. (2001). Managing fish, flood plains and food security in the lower Mekong Basin. *Water Science and Technology* 43(9), 157–164.

Jul-Larsen, E. & van Zwieten, P. (2002). African freshwater fisheries: what needs to be managed? *Naga, WorldFish Center Quarterly* 25(3&4), 35–40.

Katika, P. K. & Bhatia, R. C. (2002). Production and consumption of aquacultural products in India: past trend, present status and future prospects. In: *Presented at Special Session on Strategies and Options for Sustainable Aquacultural Development at World Aquaculture 2002*, Beijing, China, pp. 25–27.

Lorenzen, K., Nguyen Khoa, S., Garaway, C., Arthur, R., Kirkwood, G., Chamsingh, B., Litdamlong, D., Innes Taylor, N. & Siebert, D. (2000). *Impacts of Irrigation and Aquaculture Development on Small-Scale Aquatic Resources*. Final Technical Report, DFID Project R7255. Imperial College, London.

Madhuri, H., Tewari, R. & Bhowmick, P. K. (2014). Livelihood vulnerability index analysis: an approach to study vulnerability in the context of Bihar. *Journal of Disaster Risk Studies* 6(1), 13.

Malik, R., Rather, M. A. & Abubakr, A. (2013). Socio-economic status of fishermen community of Kashmir, India. *Journal of Extension System* 31(2), 67–79.

Malik, R., Wani, G. B., Hussain, N. & Kirmani, M. M. (2018). *Post-flood Impacts on Fishing Community of District Bandipora of Kashmir Valley*. Research Council Project Report. Division of Social Sciences, Faculty of Fisheries, SKUAST-K.

Naylor, R. L., Goldburg, R. J., Mooney, H., Beveridge, M., Clay, J., Folke, C., Kautsky, N., Lubchenco, J., Primavera, J. & Williams, M. (1998). Nature’s subsidies to shrimp and salmon farming. *Science* 282, 883–884.

Pal, V., Shiyani, R. L. & Ardesha, N. J. (2015). Livelihood status index: poverty and inequality assessment in Gujarat. *International Journal of Agriculture Sciences* 7(4), 863–870.

Pandit, A., Debroy, P., Chandra, G., Roy, A., Chakraborty, L., Das, B. K. & Biswas, D. K. (2019). Adoption of cage farming has enhanced livelihood security of the reservoir fishers: evidence from Jharkhand state of India. *Journal of the Inland Fisheries Society of India* 51(2), 184–189.

Pauly, D., Christensen, V., Guenette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., Watson, R. & Zeller, D. (2002). Towards sustainability in world fisheries. *Nature* 418, 689–695.

Planning Commission. (2001). *Report of the Working Group on Fisheries for the Tenth Five Year Plan* (2002–2007). Government of India, New Delhi.

Planning Commission. (2002). *Tenth Five Year Plan* (2002–2007). Planning Commission, Government of India, New Delhi, p. 576.

Pradhan, S., Naberia, S., Harikrishna, Y. V. & Jallaraph, V. (2020). Livelihood security of small farmers in Jabalpur District of Madhya Pradesh. *Indian Journal of Extension Education* 56(4), 98–102.

Quereshi Neha, W., Krishnan, M., Sundaramoorthy, C., Vashisht, A. K., Baba, S. H., Kumar, N. R. & Sharma, R. (2013). Truncated growth and compromised sustainability: the case of lake fisheries in Kashmir. *Agricultural Economics Research Review* 26, 57–66.
Qureshi, N. W. & Krishnan, M. (2015). Lake fisheries in Kashmir a case more undone than done. Economic & Political Weekly 1(2), 66–69.

Rahman, S. & Akhter, S. (2010). Determinants of Livelihood Security in Poor Settlements in Bangladesh. NAF International Working Paper Series. NAF-IFN, Natural Resources, Agricultural Development and Food Security. International Research Network. University of Plymouth, UK. Available at: http://economia.unipv.it/naf/.

Rahman, M. M., Haque, M. & Aktheruzzamani, M. (2002). Socio-economic features of a traditional fishing community beside the old Brahmaputra River, Mymensingh, Bangladesh. Asian Fishers Science 15, 371–386.

Ravichndran, S., Joseph, F. R. S., Kanagalashmi, R. & Ramaya, M. S. (2012). Variation in nutritive composition of two commercially important marine fin fishes. International Journal of Zoological Research 8, 43–51.

Salim, S. S., Sathiadhas, R., Narayanakumar, R., Katiha, P. K., Krishnan, M., Biradar, R. S., Gopal, N., Barik, N. & Kumar, B. G. (2013). Rural livelihood security: assessment of fishers’ social status in India. Agricultural Economics Research Review 26(1), 21–30.

Sen, A. K. (1981). Poverty and Famines. Clanderon, Oxford, UK.

Stanford, R. J., Wiryawan, B., Bengen, D. G., Febriamansyah, R. & Haluan, J. (2017). The fisheries livelihoods resilience check (FLIRES check): a tool for evaluating resilience in fisher communities. Fish and Fisheries 1–15.

Wani, M. H., Baba, S. H. & Bhat, A. (2019). Economic appraisal of water-Ecosystem in Jammu and Kashmir: India. International Journal of Environment and Climate Change 9(3), 193–203.

Welcomme, R. L. (2001). Inland Fisheries: Ecology and Management. Blackwell Science, Oxford.

First received 20 September 2021; accepted in revised form 17 December 2021. Available online 12 January 2022