Chapter 7

CONCLUSIONS AND POLICY RECOMMENDATIONS

In this chapter, a brief summary of general features of small-scale motorised fishermen and their crafts, the trend of ICT tools and trend and influencing factors of adoption of all the selected coastal districts are discussed. Various suggestions and recommendations for effective use of new technologies are also briefly discussed. Finally, the future work possible in this field is also explained.

7.1 Conclusions of the Study

The use of ICTs has resulted in a tremendous impact on the progress of Kerala fisheries’ community and the economy. Understanding the present usage of ICT tools and its benefits is necessary during this era of technological revolution particularly in the marine sector of the State. The advanced Information and Communication Technology tools have helped the small-scale fishermen to enhance their fish catch, income and safety and also they began to adopt new gadgets from the beginning of the 21st century. The study focused on when and how the new advanced ICT tools were used by motorised outboard (OBM) and inboard (IBM) boats for improving their catch and safety. The main thrust of the study was to analyse how adoption took place and what were the factors that influenced the adoption process to improve the products and productivity of fishing.

Fishing operation of Kerala marine fisheries sector is heterogeneous in nature. This heterogeneous type of fishing crafts and gears caused an optimum level of fish caught but caused deterioration of sea resources. Adoption of the ICT tools in the sector helped the traditional fishermen in life and society. In this background, the present study focuses on examining the application of ICT tools in the overall development of the marine sector of Kerala, collecting information from Northern (Kozhikode and Malappuram), Southern (Alappuzha, Ernakulam), Central (Kollam and Thiruvananthapuram) coastal districts of Kerala. The study found that adoption of ICT tools increased the fish catch in the deep
sea. The study claims also that, ICT tools do not contribute to any direct role in overexploitation of fish resources, rather it helps to go offshore, helps to stay more days at sea, improves communication among fishermen and enhances safety measures during fishing. The study observed that use of ICT tool for fishing by small-scale motorised fishermen helps the fishermen in various ways and the effective use of tools can be considered as the initial stage of blue revolution in the state.

GPS, echo sounder, wireless set (marine VHF), mobile phone and beacon have a huge potential for providing information on fishing and it’s related activities to the fishermen, which justifies the results of a few previous studies. The present study focused on both the role of ICT Tools and the capability of fishermen for using these new gadgets and it contradicts with some past studies which have studied only the role of mobile phone in the fisheries sector. Overall, the role of ICT tools was found important in the marine sector, particularly in the case of increasing income and reducing the information asymmetry. Use of mobile phone helped to reduce information asymmetry and price dispersion in the sector. GPS & wireless set helped the fishermen to improve income and efficiency of crafts. However, ineffective use of GPS for collecting PFZ data by the motorised fishermen creates less utilisation of the tools in the sector due to its lack of awareness and lack of proper infrastructure facilities in the landing centres. A two-way process of communication for sharing ideas and knowledge using a range of communication tools and approaches that empowered fishermen and their communities to take immediate actions to improve their fish catch and lives. Kerala marine sector has adopted an approach that integrates the best elements from several models, while also ensuring that maximum participation of traditional fishers, types of crafts, and government management.

The observed sigmoidal shapes of diffusion of ICT tools from the data of the marine fisheries sector supports its theory. It shows an evidence that, unorganised sector like marine fisheries sector also follows the features of the sigmoidal shape curve. The confirmation of perfect fit of logistics growth function also reveals and supports the different stages of the adoption process of ICT tools by traditional fishermen in Kerala. It implies that, whatever be the category of adopters, the adoption process follows the theoretically sigmoidal shape in any manner. Study segregated the stages of adoption of ICT tools of the sector into three; early phase adopters, maturity phase adopters, and rapid
phase adopters according to the degree of adoption of small-scale fishing crafts. The period 2007-2012 is considered as the rapid growth phase in the sector. Ernakulam coastal district of the Central zone was observed to have the fastest penetration rate of the ICT tools, due to the substantial influence of mechanised trawling boats and fast developing infrastructure facilities in the district. The slowest penetration of ICT tools was observed in Alappuzha coastal districts due to the different nature of fishing methods, gears and geographical features. Based on different perspectives and diffusion models, epidemic rank effect was confirmed as major adoption perspectives of adoption of ICT tools in the sector. Communication among fishermen, various government policies, and accessibility of tools are the major determining factors of adoption in the sector.

Communication among fishermen, various government policies, and accessibility of tools are the major internal and external determining factors of adoption in the Kerala marine fisheries sector. Meanwhile, size of crafts and crew, distance of fishing, age of fishermen, education, and revenue per trip are the main socio-economic factors that affect the adoption of ICT tools. It revealed that internal, external and organisational factors are equally responsible for the adoption of ICT tools in the fisheries sector.

The use of ICT tools helps the traditional fishermen of small-sized outboard crafts to sustain in the society and to compete with other types of fishing crafts in the community. The socio-economic status of small-scale motorised fishermen community is low compared to the state as a whole. The study found the conditions of social factors such as education, type of house, access to drinking water and electronic gadgets poor, compared to the state average. The average earnings of the motorised single day (SD) and multi-day (MD) OBM fishermen is also low and MD IBM motorised fishermen earn a better income than the former, due to their traditional skills of fishing, more distance of fishing and large size of fishing craft. The fishermen’s income depends upon the seasons, even get worse in off-season months. Use of new gadgets helps the fishermen to reduce such worse condition to a certain level.

The study also showed a positive relationship between the revenue per trip of small-scale motorised crafts and adoption level of ICT tools in the sector. It means that when there is an increase in the use of ICT tools, revenue per trip also increases. This finding
was achieved by comparing adoption of ICT tools and average revenue per trip of the boats. It is possible to segregate the impact of ICT tools alone with help of advanced econometrics models and methods in further research.

Finally, in many countries, the concerns over digital divide or ICT-divide is more in the poor and uneducated section of the society than wealthy or educated people. There are many avenues opening up in the fisheries sector of Kerala like free information dissemination of new techniques of production, combining traditional knowledge with innovative ICT tools and use of innovative best practices among poor and uneducated fishers. The fisheries sector focused on the effective communications and information access between advanced crafts and traditional crafts and showed a clear evidence for eradicating ‘digital divide’ with the aim of accelerating the positive impact of ICT tools among fishers. A huge amount of risk in using such innovated ICT tools is reduced now. Adopting policies for the effective use of ICT tools by all types of crafts can be beneficial for all stakeholders in the industry. Fisheries cooperative such as MATSYAFED and NGOs such as SIFFS contributed significantly to the development of credit facilities to reduce financial barrier for adoption. Along with this, Fishermen-Scientist-Political leaders (FSP) participatory approach for future policies and collective follow-up action of fisheries is very much important. Timely diffusion of serious information on fishing-related activities and safety of fishers are important in the marine sector. In this regard, NGOs and various Departments are an indispensable part of the effective use of new technologies and necessary for policy management decisions of ‘Sustainable Fishing’. Proper usage of new advanced technologies along with restrictive policies on the physical capital inputs of fishing enhance the welfare and productivity of fish in the sector. The greater ICT-driven inclusive growth, highlighting specific policies and programs to enhance the income effects of ICTs on such marginalized populations is necessary for economic growth and development.
7.2 Policy Implications for Enrichment of Small-Scale Motorised Fishermen

Traditional small-scale fishermen are the most vulnerable section of the state. They face many problems in the society as well as in the sector. Development of new technologies in the sector has helped the fishermen to cover some social and economic problems of the society. But, to use the new technologies efficiently in a sustainable manner, certain policies are to be followed in the sector.

Increasing technological dynamism has created sustainability issues in the sector. New policies of this will help the traditional small-scale fishermen to overcome these sustainability issues. Systematic and effective use of ICT tools and use of allowed gears of fishing will reduce this issue to an extent. For this purpose, new management policies to be taken up. Recommendation of policies and its effective implementation are two important and necessary steps for the future sustainability of the fisheries sector and its allied sectors. The present study suggests some policy corrections in five categories; fishing management, increasing productivity or production, adoption of new ICT tools, and recommendations for the safety of fishermen. These issues need to be incorporated in the local development plans and policies.

**Fishing management**

1. Create Smart Training Centres in all the fishing villages’, Smart Fishermen Cooperative Societies to train traditional fishermen in the usage of Information and Communication Technology tools.

2. Conduct workshops, seminars, and symposiums each year, under the guidance of various NGOs or fisheries research institutions for imparting the technical know-how and various skills to use technology to all the fishermen for proper handling and operating of Information and Communication Technology tools.

3. Each fishing harbour or village should be maintained with sufficient infrastructure facilities for the easy dissemination of information about fish resources, seasons,
and emergency messages instantly.

4. Present kerosene subsidies are not sufficient since it lasts only for a single trip (40 litres). The volume of kerosene should be increased to reduce the burden of income loss in fishing per trip.

5. Restrict the registration and entry of foreign vessels into the Indian maritime territories.

6. Small-scale fishermen are capable of going deep into the sea. Therefore, we can make use of experienced traditional fishermen and their traditional knowledge of the sea for an effective fish catch in the deep sea.

7. Avoid unscientific construction of the landing centres in the beach shore. It is observed that construction of unscientific landing centres is used for other purposes than fishing related activities.

8. In order to increase employment opportunities, programmes for its generation in the non-fishery sectors must be designed with the help of various religious or autonomous NGOs.

**Increasing production/productivity**

9. Each fishing villages or harbours should have sufficient infrastructure facilities to disseminate the Fish Potential Zone (FPZ) data to small-scale fishermen and it should be presented in an electronic display board in a local language.

10. Prediction for pelagic fish resources is to be encouraged. This can be done with the help of innovative satellite technologies and more R&D work.

11. Trawling ban system should be introduced twice a year and direct the mechanised fishermen to use traditional fishing methods during these periods.

12. Introduce fine for catching juvenile fishes by any crafts.

13. Spread awareness among the fishermen about the maximum fish size available in the Arabian and Indian sea.
Adoption of new tools

14. New communication and information tool called *Mesh-routers* can be installed in all the crafts for live communication and get accessibility of internet, even at deep-sea area.

15. Solar system for engine and lights in the crafts should be encouraged to reduce the cost to save income

16. Digitalise the fishing selling auctions and supplying procedure for reducing middlemen exploitation and getting a reasonable market price.

Safety measures

17. With the help of GPS, Vessel monitoring system should be introduced in all crafts, which helps in sustainable development of marine resources, and for monitoring the crafts in the sea.

18. Introduce unique painting for each type of crafts and introduce glazing colour which illumines at night. This will help to reduce accidents in the sea.

19. Introduce *blue ID cards* to all the active fishermen and *red ID cards* to middlemen/agents for systematic calculation of the fisher population and allied activities in the sector.

7.3 Future Scope of Work

The present theoretical and empirical study raises some important questions for further research. What remains unaddressed by the present study is to evaluate mathematically the impact of ICT tools alone with other influencing parameters of fish catch or productivity in the sector. This can be done with advanced econometrics models which will provide us with a perfect picture of the impact of ICTs in the marine fish catch.