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Designing a Model of Information System for Inland Fisheries

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Abstract – India is a vast country with huge biological resources. Of the varied resources fresh water bodies contain protein resources in the form of fish. Inland fish culture is carry out in different pockets of the country. Huge water bodies are used to culture fish. Both in the urban and rural settings inland fishery is carried out and involve a good amount of man power. It has a positive effect in the local, state and national economy. Through this paper an attempt has been made to design a model of information system.

Keywords: Aquaculture, Fisheries, Fresh Water Fisheries, Inland Fisheries.

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1. INTRODUCTION

Inland fishery is a field which involves a great deal of knowledge to be acquired through various sources of information. It is also a field where flow of information takes place both in the horizontal and vertical directions. In horizontal direction peer group of scientists, researchers, stake holders, decision makers and farmers involve themselves in acquiring and sharing latest knowledge about the field, to find out something new, through their research and development. Whereas in the vertical directions both upward and downward flow of information takes place where the researchers and scientists pass their latest scientific results downwards to the farmers for betterment and increase of their production and the farmers after implementing the latest scientific innovations in practical field pass the results upwards to the researchers and scientists. This way the field of knowledge advances and grows towards achieving better results both in terms of quality and quantity.

The pattern of seeking information is unique where experimental and tacit knowledge plays a pivotal role. Whenever they face problem in bridging the gap between their existing knowledge and the needed knowledge to overcome the problems they face, the role of a proper system of information appears to be most useful. If their problems be addressed properly, their problems can be solved through a model of information system which incorporates probable answers to their specific queries. It will enable them to find out their desired goals.

1.1 Statement of the research problem:

Fish is one of the major components in freshwater ecosystem because they provide good quality proteins.

Of all the fresh water fish species the breeding and culture of many of them bring a huge business and contribute to the GDP of the country. The contribution of fisheries to Gross Domestic Product (GDP) of the country at the current prices has reached to Rs. 57369 crores up to the financial year 2011-12. Contribution of fisheries sector to the current rate that has been measured is now of total 0.92% (Government of India.Ministry of Agriculture. 2012. *Hand Book on Fisheries Statistics.* New Delhi: Department of Animal Husbandry, Dairy and Fisheries).

Natural breeding takes place in the rivers, dams, estuaries and the like where the natural balance is optimum, biodiversity is well maintained and human pressure on natural resources is under control. But for water bodies which need special strategic planning for fresh water fish production cultivation is a must. This paper on "Designing A Model Of Information System For Inland Fisheries" will definitely help the planners of the field in bridging the gaps that remain by better use of the information pertaining to the field through better use of the model of information system.

1.2. Objective of the study:

Information has become an essential ingredient for the progress of civilization and society for all the times. Lack of information transfer and its effective means of communication are now widely recognized as being limiting factors in socio-economic development of the people. Basically small as well as large enterprises in the villages who are engaged in agricultural production constitute an integral part of our national economy and play an important role in the economic development of our country. The small establishments, such as the inland fish production and culture business of this research paper, are acting as ancillaries in the course of development planning and are playing a pivotal role in establishing the local, state economy as a part and country's economy as a whole (Shanta Meitei L. And Purnima Devi, Thoidingjam. 2007). Identification of information needs and the sources of information regarding production, procurement, preservation, marketing, emergence of new technology and technical know-how etc. are important if one has to plan for the development of enterprises associated with inland fisheries in different pockets of various districts of West Bengal in particular and different other Indian States and Union Territories in general. Keeping the above facts in view, a survey was conducted during this research work entitled "Designing A Model Of Information System For Inland Fisheries" to show the following:

i. To study the information needs of the people those who are engaged in Inland Fisheries.

ii. To examine whether there exists any Information Channels and Information Sources for the persons who are engaged in Inland Fisheries.

iii. To examine the use of Information Channels and Information Sources of the persons engaged in Inland Fisheries.

iv. To study about Information Seeking Behaviour of the persons engaged in Inland Fisheries.

v. To know about the factors responsible for information lacking, if any.

vi. To ascertain users' opinion regarding usefulness and adequacy of Information Channels and Information Sources of the persons engaged in Inland Fisheries,

vii. To show how inland fisheries can play an important role in augmenting rural as well as national economy of the country.

1.3. Scope of the present study:

Inland Fisheries in India has experienced a phenomenal growth during the last few decades. South India, mainly Andhra Pradesh, being the leader in production of Table Fishe always maintained its first position during this time. West Bengal being the second in production in Table Fish and first in production of Fish Seeds in the country has also contributed in various aspects of the field with tremendous support from the researchers and scientists of Central Inland Fisheries Research Institute (CIFRI) located at Barrackpore.

This paper on "Designing A Model Of Information System For Inland Fisheries**"** has been made surveying different people who are Farmers and Producers of Fresh Water Fishes located at different places of West Bengal including Rajendrapur Bat Tala, Naihati, Basirhat and Awalsiddhi from North 24 Parganas, Chakdaha from Nadia District and Ramsagar from Bankura District and researchers and scientists from CIFRI, Barrackpore and Guahati, W.B.University of Animal and Fishery Sciences, Kolkata.

1.4. Limitations of the study

Every research problem has its unique limitations. In facing the issues of a particular research problem a researcher faces various barriers which affect directly or indirectly his research. This study has also inherited some of the limitations as stated below.

-- This research has been carried out mainly based on survey method. The persons actually carrying out the entire activities starting from brooder maintenance, seed production, sperm generation to culture the production to make it table fish have almost nil academic background. Though some of them have attended short term training programmes that are done by various central and state funded organizations like CIFRI, the Fishery University and State Fisheries Department, they have mainly acquired their cognitive skills by way of experience about the production, farming and other aspects of the concerned field. Their experience is very much practical. The experience and skill vary man to man. The big farmers do have some better level of understanding of the entire field of knowledge in comparison to the small farmers. They can express their thoughts more clearly, without less fear and with more emphatic language. Whereas the fear of exposing their skills to the public deluges most of the small farmers. They mainly do not want to make the information available to others which they have acquired by long experience. On the other hand the researchers and scientists located at CIFRI, Barrackpore and Guahati and W. B. University of Animal and Fishery Sciences and other institutes are not accessible for direct contact as with the

farmers. They have been contacted through e-mails with a pre-designed Questionnaire, answers to which have been received with some irregularities. So there has been the limitation of information availability to the field which may be regarded as one of the limitations of this study.

-- The number of persons who are mainly from the farmers' community and researchers and scientists engaged in the field is vast and located at different places. Covering all of them to survey by a single research and within a time bound project is beyond the capacity of any individual researcher. So there has been a limitation of time.

-- This kind of research may be exhaustively done if a group of researchers carry out the entire task of surveying the entire field. So the issue of manpower may also be regarded as one of the important limitations of this research.

1.5. Hypothesis

The research sought to determine the factors related to the issues discussed in the previous sections. The issue of information management in general and dissemination of the same to fulfil the needs of the various groups involved in the market in particular has been considered for evaluation.

The research make use of survey the entire categories involved in the market to determine the information needs for that purpose following hypotheses are made:

1. Rjendrapur Bat Tala Fish Market has diversified activities, but despite this the businessmen have common information needs.

2. The wide variety of activities that are performed to carry out the million crore business of the market means that there exists a wide range of information needs.

3. Rajendrapur Bat Tala Fish Market appears not to have adequate internal information services to ensure dissemination of information.

4. Current system of information flow is not fulfilling the information needs of the businessmen associated with this market.

5. There is scope for establishing Community Information Service (CIS) in assuring and maintaining the flow of information for the businessmen associated with this market.

6. There is scope for improvement of the business as well as the market by the way of better information management within the market.

1.6. Methodology

In undergoing the research procedure and techniques of collection, organization, analysis and evaluation of data or facts, which has been followed in this research work entitled "Designing a model of information system for inland fisheries", various methods and techniques have been followed. One of such techniques applied was through Questionnaire or Schedule. In collection of latest information about the field a schedule was designed to study and collect the opinions of the persons engaged in the field, that is the farmers; who produce the fish seeds, rears them and culture to make the finish products for making the Table Fish and ultimately bring the end product to the market. Several persons who are engaged in this production and end product development and finishing activities have been categorized into four main groups. They have been interviewed thoroughly, as far as possible, using the schedule. The information collected from all these groups of persons were then gathered altogether and studied minutely for coming to inference about their various types of opinions which can add value to the research outcome.

On the other hand a Questionnaire was also sent to the Scientists of different levels via e-mails and in some case interviewed directly. Fortunately they were very generous in giving replies to contribute specifically about the research problem. Apart from designing questionnaire/ schedule and finding answers to the questions asked thereto, the CIFRI, Barrackpore, West Bengal University of Fisheries Science, Haringhata Kalyani were also visited to meet the Scientific Officers, Students, Teachers and others. Their valuable inputs to the topic have also been incorporated and analysed to make the research findings stand on more practicals.

1.7. Sampling

Samples were chosen from different Categories of people engaged in the field and the Researchers of the field. The number of different Categories of Researchers and Scientists are nearly 150 to 200 and the number of different Categories of people are nearly 3000.

Sampling of the population under study has been grouped under two main classes: (i) Probability sampling and (ii) Non-probability sampling. This research has followed the methods of Stratified Sampling which is a Probability sampling technique for the Questionnaire and Snowball Sampling for the Schedule which is a Non-probability sampling technique used to identify subjects or potential respondents of the field under study. This technique of Snowball sampling method has followed all the methods of linear Exponential Non-discriminative and Exponential Discriminative Snowball sampling methods.

2. LITERATURE REVIEW:

Freshwater fish fauna description starts only from the 19th century as Day (1865-1878) comments, the first Indian wrote on the Indian fishes is Bloch whose work entitled 'Auslandishe fishe' was published in 1785.

The works of different scientists have a direct impact in increase in production and restraining the biodiversity status of the country from further deterioration. But a very few work has been done yet to implement any kind of information and communication model concerning the field. No works have been found during the literature search of this thesis which has dealt with the topic of implementing any kind of information system for this sector. The work of P. G. Krishnamurty (Krishnamurty, P. G. 1974) discussed about setting up of a National Information Centre for Fishery Science. S. S. Dana (Dana, S. S. 2010) of West Bengal University of Fisheries Science wrote about 'Methods and communication strategies in inland fisheries development' in an issue of the Bulletin of the CIFRI, Barrackpore. In this paper we see that the Scientist has felt a genuine need for an information system for the field which is very appreciable. The other Scientist of CIFRI, Dispur, Guwahati, namely Ganesh Chandra (Chandra, Ganesh. 2010) in the same issue of the Bulletin of the CIFRI, Barrackpore had wrote on 'Dissemination of communication and information in inland fisheries'. These papers of the above scientists are of immense importance because they being the original persons from the field of research have already felt the dire need of an information system for this field and needless to say they have also approved the need for a model of information system for this field.

3.1. Data collection and analysis

This research topic encompasses different strategies in collecting data from various sources of information. All possible sources of information like bibliographical, human and institutional sources of information have been consulted in different phase of research. In gathering preliminary information various sources including basic books and journal papers available in the libraries of different organizations like CIFRI have been consulted. For cross verification of various data, available both online and offline, various online journal topics and e-books have also been consulted. As inland fisheries researches are carried out in its full fledge in CIFRI, Barrackpore, there are so many research scientists in this organization. Any research topic that is targeted towards inland fisheries cannot exclude those scientists of this organization. But as they are always busy in their research work, they can spend a very little time in answering questions of a researcher outside of their own field. They are also not in a position to discuss their own field of research to outsiders as they do not like their own topic of research get published at its initial stage or come out in public domain. Overcoming these research problems a great deal of time was spent in collecting opinions of scientists of this field though the number of such respondents is very low.

Various Central and State Government organizations publish information regarding freshwater fisheries research outputs in their respective websites and departmental journals. These types of information mainly are in statistical forms. For the better understanding, accuracy and updated information such sources have been consulted in gathering information about the field of knowledge.

3.2. Facts & figures analysis:

A Schedule/ Questionnaire was designed to gather data as the basis of an overview of the field by some general questions. To survey the information needs and information seeking behaviour of the target people forming different groups of information users, the Schedule acted as a tool of collecting information by this researcher directly from the respondents and the Questionnaire was sent to researchers of different State and Central Government Organizations via e-mails.

In some cases there are common questions for all but requirement of information is not common. It is case specific, area specific, method of culture specific, person and his/her research specific, person and his/her business specific so on and so forth. So some questions were common to all and some questions were specific to gather information that helps in drawing a conclusion.

A sample of several properties were selected on the basis of ensuring wide coverage of the field of knowledge and to endeavour to include the key variables of:

- Research topic
- Ownership
- Location; and
- Size

Consequently the subjects chosen were:

- ► Located in West Bengal (for interviewing directly)
  - Location specific (Located in both semi-urban and rural settings)
- ► Outside West Bengal (for sending Questionnaire)

- Not Location specific

► Ranged from farms with large production in the order of 50 Bawls to 500 Bawls per day; and

► Owned by a variety of individuals and farms.

The interviews took place in April-May-June-July of 2017 and May-June-July-August of 2018 in the setting of the seasonal markets and the individuals and farms focussing on the following aspects:

√ The individual and their situation

√ How they use information and what for

√ Wherefrom they collect their requisite information

√ How they keep their own information

√ Whether they face any barrier to the use of required information

√ Whether they have any plan to develop the use of information

The interview method chosen was that of semi-structured interviews allowing the interviewee to be familiar with, where the interview was headed without reference to, the questions at all lines.

To survey the information needs and information seeking behaviour of the field the subjects were first divided into Five different Categories namely Category-A (Consisting the Researchers/ Scientists), Category-B (Consisting the Farmers/ Producers of Fish Seeds), Category-C (Consisting the Buyers who directly or indirectly purchase the production of Category-B and play dual roles of Buyers and Sellers), Category-D (Who sale the production to the market and become Buyers too in some cases) and Category-E (Consisting the Movers/ Transporters who carry the production to remote areas of all the States and Union Territories of India where some kind of Freshwater Fish Culture take place).

The variety of other business persons like the Fish Medicine Sellers, the Fish Feed Sellers, the Fish Net Sellers, the Packagers, local Tea Stall Owners, local Hoteliers, etc. category of persons have been exempted from this interview as none of their activities directly influence the field though they consume a great deal of information.

3.2.1. Number of Interviewees and their population

From Table-1 we can have a clear picture of the persons engaged in the field. The Scientists/ Researchers located in CIFRI, Barrackpore or in West Bengal University of Fisheries Science, Kalyani have been interviewed directly through the Schedule but the same category of persons located at different parts of the country were generously answered to the Questionnaire sent through e-mails. The total number of such Scientists/ Researchers involved in Inland Fisheries Research throughout the country is almost 150 to 200. Out of this total number the number of respondents is only 42 which consist 21-28% of the total population of this particular Category. The number of total respondents who answered directly is 24, whereas total Researcher/ Scientists took part in answering the Questionnaire through emails is 18.

Table-1: Number of interviewees and their population

Categories	Their total no.	Total interviewed	% to the total population
A-Researchers/Scientists	150-200	42	21-28%
B-Farmers/Producers	70-75	42	60-65%
C-Buyers	5000	160	3%
D-Sellers	1500	60	4%
E-Transporters	550-600	38	6-7%

3.2.2. Issues arising from the survey data

The Schedule Survey reveals that whereas the Researchers/ Scientists have a clear understanding of what has been asked and this particular research will serve for the whole field of knowledge: there is no clear understanding of how to use information; what possible alternative sources of information are available; and how to manage the information to the best of effect for the other groups of persons associated with the field. The issues arose from the interviews are:

► Diversity of age, experience and educational level;

► Diversity of activities;

► Information needs of the persons engaged in the field;

► Adequacy/ non-adequacy of information;

► Improvement in the use of information; and

► Community collaboration.

The core requisite for the persons of above five categories had been minutely studied. The demand for various information needs have been structured, analysed and incorporated in a model of information system. Only the important aspects of the result of interviews have been taken into consideration to draw a final judgement so as to depict the model of information system.

3.2.2.a. Diversity of activities

Some questions of the Schedule containing basic questions to know about the diversity of activities of the Category-B persons (Farmers/Growers/Producers) revealed that the activities which are carried out throughout the year in the farms are of diversified nature. They require time, manpower, innovative management as well as culture techniques, so on and so forth. Questions regarding number of farmers in the locality, volume of the water land that they possess, hatcheries that they have and the seasonal time during which they operate were asked in addition.

Information of the business are of two types: (a) Latest information (newly generated information) which is tacit and depends on various conditions (like weather and climate, disease etc.) and (b) previous information (availability of water bodies, availability of glands, equipments etc.). Local and nearby Government Organizations in the Block, State and Central levels which could have helped the persons of the field by providing information for their business are almost absent, which is also revealed in the study. The Survey also confirmed another finding derived from the Literature Review: a large proportion of information required was for the purpose of conservation and preservation. While the highest priority of the management of the field is the supply of water to the vendors in one hand, on the other the highest priority to the Farmers/ Growers was the need for information regarding availability of workforce to help the maintenance of properties. As a member of Category-B put it in an interview:

"Maintenance of ponds, breeding pools etc. are the big things"-**(Interviewee Category-B)**.

The large number Farm Owners (Farmers/ Growers) interviewed indicates the complexity of Farm Property and Manpower Management.

Preparing Brooders, collection of Glands and preparation of Injection, educating the manpower to increase their skills received results of 90% (38 persons), 88% (37 persons) and 75% (32 persons). These are the three next most important activities at the Growing/ Farming Houses.

The Hypothesis-1 is thus become valid showing common information needs of the persons engaged in the market.

3.2.2.b. Information needs of the persons engaged in the field

In a question asking what type of information do they require carrying out their business, the respondents identified ten most important categories. The respondents of all categories have implored about absence of a system of information upon which they can place their demands. Productivity related information scored the highest percentage with 100% and Demand related information scored the second highest percentage with 95% whereas Feed (57%), Water Treatment (56.25%), Police and Medicine (55%) are other categories of most important information.

The Group Demands that the Four Categories (Category-B to E) may place before the information system (if there is any) are of immense importance. With 73.3% of such Group Demands Category-E becomes the most responsive of the four Categories and Category-B followed them with 67.2%, whereas Category-C (34.4%) and Category-D (25%) claimed the third and fourth positions in terms of their total percentage of demands from the information system.

Hypothesis-2 at this stage is thus tested and comes out to be valid.

3.2.2.c. Adequacy/ inadequacy of information

Among the expected results of the survey was that some respondents indicated that the information they had was too inaccurate, too costly or simply too old or out-of-date, inaccessible to be useful. It was also noted that analytical data from the parent bodies or membership organizations to whom they are linked would be welcomed.

In one question of the schedule all the respondents were asked to identify the useful information that they feel inadequate to carry out their business.

Table-2: Adequacy/ inadequacy of information

Responses	Number of Person	% of the total population
Well equipped office	126	50%
Yearly statistics of the business	72	42%
Setting up of Laboratory	33	19.4%
Availability of ponds	108	39.5%
Availability of net	122	70.9%
Breeding technology	38	22%
Technology transfer (Internationally)	25	14.5%
Water treatment technology	118	68.6%
Electricity	42	24.4%
Police	160	100%

In answering to this question they have identified 15 above specific information what they lack in the market which shows that the field appears not to have adequate internal information service to ensure dissemination of information (Hypothesis-3), current flow of information is not fulfilling the information needs of the businessmen associated with this market (Hypothesis-4) and there is scope for improvement of the business as well as the market by way of better information management within the market (Hypothesis-6).

3.2.2.d. Improvement in use of information

To test Hypothesis-5, three different questions were asked to the interviewees asking how many rupees they spend every month to keep contact with the various agents of the field? And do they feel any absence of timely information that could help them better running of their business? And if so what they think is the way to come out from this problem?

In answering the first question majority of the samples have reported to spend rupees 300 per months towards telephone, rupees 1500 per months towards travelling and rupees 2000 for other expenses. That means if we consider the number of persons actively participating in the market be 3000, an amount of rupees 1 crore14 lakhs is spend towards flow of market and business related information per month in an average.

Replies to the second question were not of direct nature. For the persons with a fare amount of educational background, the need for a CIS was explicit, whereas for others the meaning for a CIS was first explained for understanding. At this stage almost all of them emphasized the requirement for a CIS which would certainly help them if such service may be available through any means. So Hypothesis-5 is tested and comes out to be valid.

3.2.2.e. Credibility of information communication sources

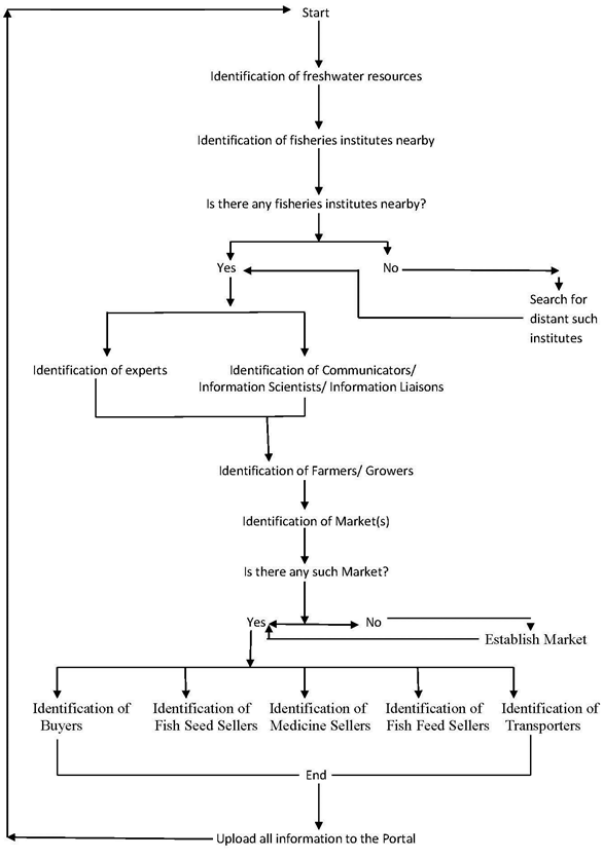
Researchers, Farmers/ Growers and other Category of respondents were asked about the credibility of different communication channels that they would prefer for better flow of information of the field. Field managers and Scientists are treated as the most credible sources for the interpersonal communication. Other than that Group communications (such as exhibition/ field days/ fish farmer day and demonstration) were assigned second and third rank. Mass media sources like Radio, TV, Newspaper and fisheries publication are ranked in between fifth to eighth revealing the mass media can cover a large area at one time, but it is not supposed to be credible enough in comparison to the interpersonal and group communication channels.

3.2.2.f. Implementation of Model of Information System for Inland Fisheries

Finally the respondents were asked for answering question regarding the implementation of the Information System which this researcher has taken for developing and which is the ultimate goal of his research. There was no difficulty with the Category-A and B respondents in answering this question. With utmost surprise it was observed that a handful of the respondents of all other Categories of C, D and E understood the subject and had not faced any difficulty in answering the question. But a major portion of the respondents from those Categories were unable to understand the question. So they have answered this question with the help of this researcher.

4. THE MODEL OF INFORMATION SYSTEM FOR INLAND FISHERIES

Inland Fisheries is already an established sector which contributes .92% to the total GDP of the country. There is ample scope to increase Inland Fisheries production further if the whole sector be provided with a System of Information bringing all the constraints of it within a Model of Information System. Such a model has been developed which incorporates all the sectoral key elements altogether.



5. CONCLUSION

Interview with all Categories of persons engaged in the field revealed interesting facts about the field. New experiences were gathered, new people were met. Persons of Categories C and D coming from remote district towns and villages with diversity of colloquial language and accent made conversations sometimes very interesting. The simplicity of the fish farmers was observed from a close compliance. They reach Naihati from afternoon before the night of purchase. Rajendrapur Bat Tala Fish Market starts operation at midnight from 12.30 a.m and continues up to morning. Buyers coming from outside buy their products as soon as they find their product of interest. Here product means baby fish. They are sold depending upon their size. Sometimes bowls

are used for counting for very small sized products and a balance is used to weigh the products which are comparatively big. Counting is done on the basis of how many fishes are there in a kilogram of weight. Some represent 1000 pieces in a kg and some represent 100 counts per kg. Rate is fixed mainly on this criterion. Farmers also minutely observe the quality of the product and after being satisfied with the quality of it take final decision of purchase. The same happens in other places of production of fish seeds in Bankura, Murshidabad, other parts of North 24 Parganas District, South 24 Parganas District. But as there is no such organised market like Rajendrapur Bat Tala Fish Market, all activities related to the field are carried out mainly in the day time with a limited exposure to the whole field of knowledge.

Category-A and B respondents are quite sure that if an information system be implemented for this field with various minute information be incorporated therein can augment the production as well as other aspects. Other Categories of persons representing Category-C, D and E partly are of the same opinion and partly needs more and better level of information handling and use of the same and education and training for them initiated from the part of the State and Central administration can surely bring change in this field which in turn can uplift the financial conditions of the persons engaged in the field thereby change in local, state or national economy.

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