RESEARCH PAPER | Agriculture | Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X


# Natural Resources and Environmental management: Is there a need for special emphasis for Priority setting in fisheries research

KEYWORDS: Natural resources Environment Sustainable Development fishery enterprise breeding

| Anil Kumar Singh | S.P.Singh | M. C. Dwivedi |
|---|---|---|
| Department of Agricultural Economics, SVBPUAT, Meerut (UP) | Division of Agril. Econ. & Stats., SKUAST-Jammu (J&K) | Division of Agronomy, SKUAST-Jammu (J&K) |

| Harminder Singh | Poonam Parihar |
|---|---|
| Division of Agril. Econ. & Stats., SKUAST-Jammu (J&K) | Division of Agril. Extension Education, SKUAST-Jammu (J&K) |

**ABSTRACT** *This paper dealt with different type of research problems in fisheries sector faced by the different community and other related persons involved in fisheries. First of all collection of different type of research problems with the help of scientific and other related community was performed. Second step involved estimation of economic surplus, consumer surplus and producer surplus with the help of different variables. Then we estimated surplus for different research problems in social welfare and prioritize in descending order, all the research problems. Some of more important citations are bio-diversity conservation and quarantine measures shifted from serial number 13 to 44, impact of Farakka barrage on breeding and production of Hilsa and Mahasheer, shifted from serial number 29 to 3, impact of Tehari Dam on breeding and production of fish species shifted from serial number 30 to 10 is an equally important research problem which is a concern of environmental scientist all over the country. Similarly the priority genetic engineering for evolution of new fish species of economic and medical importance shifted from serial number 4 to 5 which indicates nominal change on priority list, showing its high importance for research.*

**Introduction**

Institutionalizing Fisheries Research Priority Setting, Monitoring, and Evaluation (PME) in the National Research System aims to promote resource allocation among alternative research problems in an efficient manner. The process of institutionalization should be objective and based on scientific principles. Enhancing production and productivity was the main challenge before the scientist in early seventies. Research managers had a relatively simple task of allocation of resources for research. The recent decade has added complexities, regional balance, sustainability, trade technology links, shift in demand (preference pattern), efficiency, equity, health, nutrition, energy are a few of the many new challenges confronting fisheries scientists today. With time, these complexities will grow further. On the other hand, availability of public funds for fisheries_research is declining. Research managers are finding it difficult to address all the challenges and pursue all scientific options to tackle them. These factors necessitate more analysis using decision rules along with technical information applying optimization techniques for allocation of scarce resources on research disposal among alternative research possibilities. Research planning and prioritization has thus become a complex and specialized task. Institutionalization of this process is therefore much more challenging; prioritization is required at different levels. The Indian Council of Agricultural Research (ICAR) lays out broad institutive priorities taking into account national needs and objectives. It also had to take a long-term view of natural resource conservation and sustainability issues. Such ex -ante judgments require analysis of expected costs and benefits. The subjective and institutive judgment, thus, are inadequate in context of the contemporary complexity .The formal analysis has to be built and, what is more important, Institutionalized at all levels in the NARS.

The choice parameters for decision making are income, employment, productivity growth, efficiency, sustainability, ecology, biodiversity, trade and equity which interact among themselves while deciding research priorities. Institution and subjective judgment happens to fail in capturing these complexities. Research manager need more information and analysis in order to make decisions for priority setting and allocation of scarce resources.

The current capacity at various levels is inadequate to address the information and various need of systematic prioritization of work. Almost all constituents unit of NARS recognize the need for planning unit. Such exercises usually driven by a supply side orientation emphasizing technical/scientific parameters and there is no analysis of socio- economic justification, impact (trade of) the main determinants of a demand driven research agenda.

**The main objectives were undertaken as fallow:**

1. To characterize ecology, productivity and policy related research problems in Fisheries
2. To estimate the economic surplus (consumer surplus, producer surplus and total surplus) of the research problems.
3. To prioritize the research problems in fisheries

**Methodology**

In this section several methodologies were adopted of the Central Inland Fisheries Research Institute Regional station at Allahabad was purposely selected for prioritization of fisheries research. In order to characterize research problem with which inland fisheries confronting to, the scientific survey was conducted using well design questioner containing the parameters of demand for and supply of research. All the scientists, technical staff of the center and also the fisheries department of Allahabad University, officers of state department of fisheries Lucknow, extension officer, field officer of Fish Farmer Development Agency and other scientist holding research management positions including retired scientist of the regional station were intensively interviewed, using a scientific questioner fully design for the purpose. Scientific survey questioner was comprised of two parts (a) the information relating to personal details of the scientific

Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

community directly link to scientific productivity were farming component of the part one (b) the information relating to each research problem regarding parameters of demand for research and supply of research were gathered. The parameters of demand for research are VIZ; percentage increase in productivity, percentage decline in cost of producing, probability of success, effect on income, employment, equity, trade, ecology and bio-diversity. The parameters of supply of research are VIZ; magnitude of scientific and technical manpower; infrastructure facilities, monitory budget, time and equipments are component of supply of research.

**Analytical tools**

The economic surplus model served the basis of computation of economic surplus for research priority setting. This model is also referred a literature as benefit cost analysis as discounted benefit and discounted are computed for solving an research problem into consideration. The economic surplus is comprised of consumer surplus as well as producer surplus. The total economic surplus approach estimate returns to investment by estimating the benefit from research in terms of the change in consumer and producer surplus that result form the technological changes. Ex ante analysis usually incorporate expert opinion to determine project research impacts. Adoption rates and project research impacts. Adoption rates and probability of research success, and provide estimates of the economic efficiency and distributional implications of fishery research resource allocation.

The formula for computation of economic surplus. Consumer surplus and producer surplus are given below :

$T.S = P_0 Q_0 K a (1+0.5 nZ)$

$C.S. = P_0 Q_0 K a (1+0.5 nZ)$

P.S = T.S. - C.S.

$Z = Ke (e+ n )$

T.S. = Total surplus

C.S = Consumer Surplus

P.S. = Producer Surplus

Po = Price of fish

Qo = Quantity of fish

e = Elasticity of supply

n = Elasticity of Demand

K = Reduction in per unit cost of production

a = Rate of adoption

The elasticity of supply and elasticity of demand were estimated, used for computation of economic surplus. The magnitude of supply The magnitude of supply shifter reduction per unit cost of production K and rate of adoption a in the formula are the overage value computed based on scientific survey.

The research priority setting was carried out the shorting out the research problems in descending order based on absolute value of economic surplus of research of problem.

**Discussion**

The exercise was made to prioritize the research problems solely on ground of economics surplus values. Afterwards the economic surplus values were combined together with other factors like cost of production to set the priority in a broader perspective.

Thorough brain storming discussion related to researchable problems were made with research scientists, technical officers, fishery extension officers, state department of fisheries, fisheries development agencies, fisheries development managers and NGOs working in the field. A list of 63 problems relating to productivity research, ecological research and policy research were assimilated and summarized in table.

The magnitude of economic surplus for individual problems was computed by using the formula motioned in analytical tools. The values of elasticity of demand and supply were estimated by using formula given in analytical tools. The values of rate of adoption and decline in per unit cost of production as generated through scientific survey was used for computing the total economic surplus. The values of total economic surplus, consumed surplus and producer surplus for each problems are given in table. The values of total economic surplus, consumed surplus and producer surplus for each problems are given in table. The average value of total economic surplus, consumer surplus and producer surplus were computed to be 4.19 E + 09, 60385008 and 4133301190, respectively. The total economic surplus was found to be ranging from minimum of 4224431 to maximum of 1.43 E + 10 . Similarly the consumer surplus was found to be ranging from minimum of 422 44 31 to maximum of 1.85 E + 09, further the producer surplus was found to be at minimum of 1.4154 E + 10. These economic surpluses in further sections were used to priority setting the research problems in descending order of sequence. The other parameters considered for priority setting of research problems were also combined so as the find the cumulative effect of different factor taking all together. The priority setting of research will provide useful information to understand the importance of different research problems relating to productivity, ecology and policy research.

The priority setting of fisheries was carried out by to ways. The exercise was made to priority setting the research problems solely on ground of economic surplus values was combined together with other factors like cost of production to set the priority in a brooder perspective. The priority setting in both ways are presented in table.

It can be observed form the table the five research problems after priority setting are

1. Methodology for diversification of fish culture. This problem was originally at serial number of 48, which is occupying at the first place.
2. Cause and cure of mass mortality of fish species of river Ganga during flood season. This problem was originally at serial number 32 now appearing at serial number 2. This problem is really an important issue causing immediate concern of scientific community.
3. The problem number 29 now placed at serial number 3. The problem is impact of Farrakhan barrage on breeding and production of Hilsa and Mahasheer. This is also to be taken up at priority basis.
4. Similarly the problem at serial number 58 now placed at priority list of 4. The problem is Development of value added products through biotechnological intervention.
5. Surprisingly a problem at serial number 4 now placed at priority list of 5. It is amply clear that the problem, because of being important, could not be replaced at lower scale. The problem is Genetic engineering for evolution new fish species of economic and medical importance.

**Appraisal of five research problems based on priority list of lower scale are:**

1. problem at serial number 45, biology of important fish species with special reference of habit and habit in relation to dynamics of environmental changes in aquatic ecosystem. Is now placed at serial number 63, because of their lower importance in social welfare.
2. The problem at serial number 28, investigation of envi-

Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

ronmental impact of biotic community in river and associated ecosystems, in placed on priority list 52.

3. Similarly, the problem at serial number 38, investigation of degradation (damage) of Niche and its effects of production and productivity of riverine fisheries, is placed on priority list of 61.
4. The problem at serial number 14, legal issues related to quarantine measures of important foreign fish species migrating into India, is now placed that serial number 60, showing its lower important given by scientific commodity.
5. The problem at serial number 51 , eradication of aquatic weeds (eichornia) form lentic systems, is placed at serial number 59 because of its lower importance.

Some more important citation are bio - diversity conservation and quarantine measures (serial number 13), develop of cropping strategy appropriate for water logging soils and shifted from serial number 24 to 08, impact of Theatrical on breeding and production of fish species shifted form serial number 30 to 10 is an equal important research problem causing concern of environmental scientist all over the country. Similarly the research problem possibilities of culture and breeding of thigh mangur through modification of cannibalistic habit remains unchanged on priority list, showing its high importance for research.

**Conclusion**

It can be concluded that first five research problems were shifted from serial number 48 to 1, 32 to 2 , 29 to 3, 58 to 4 and 4 to 5 put under high priority list requires immediate solution. Appraisal of five research problems based on priority list of lower scale are 45 to 63, 28 to 62 , 38 to 61, 14 to 60 and 51 to 59 put under low priority list may be postpone for future.

**Implication including recommendation**

Priority setting of research will provide useful information to understand the importance of different research problems related to productivity, ecology and policy research.

The research problem of high priority list, requires immediate attention and those problem put on low priority list may be postponed for future.

**Table : List of prioritize research problems based on economic surplus generated by different Research problems under list.**

| S. No. | S.No. of prioritize research problems | List of research problems | Total Surplus | Consumer Surplus | Producer Surplus |
|---|---|---|---|---|---|
| 1 | 48 | Methodology for diversification of fish culture (new species) | 14338227959 | 184556596 | 14153671363 |
| 2 | 32 | Cause and cure of mass mortality of fish species of river Gaga during flood season. | 14248115508 | 142641878 | 14105473630 |
| 3 | 29 | Impact of Frakka barrage on breeding and production of *Hilsa* and *Mahasheer* | 11081867617 | 142641878 | 10939225739 |
| 4 | 58 | Development of value added products through bio - technological intervention. For example imititation crab sent in low value fish (selfish.) | 11081867617 | 142641878 | 10939225739 |
| 5 | 4 | Genetic engineering for evolution new fish species of economic and medical importance | 10599192482 | 106111487 | 10493080995 |
| 6 | 12 | To study the possibility of breeding culture of Tengra species. | 9421504428 | 106111487 | 9315392941 |
| 7 | 18 | Effect of introduction of alternative fishes development polices in India | 9421504428 | 106111487 | 9315392941 |
| 8 | 24 | Development of appropriate croppin strategies under water logging soils and around the canals of India | 9421504428 | 106111487 | 9315392941 |
| 9 | 44 | Pen culture as a tool of enhancement of productivity of Bheel. | 9421504428 | 106111487 | 9315392941 |
| 10 | 30 | Impact of Tehari dam on breeding and production of fish species | 8924085262 | 123703642 | 8800381620 |
| 11 | 33 | Investigation on ecology and habitat for production of ornamental fisheries | 8243816375 | 106111487 | 8137704888 |
| 12 | 46 | To enhance fish from reservoir and lakes. | 8243816375 | 106111487 | 8137704888 |
| 13 | 15 | Possibilities of culture and breeding of thai mangagur through modification in its calanabolistic habit | 7066128321 | 106111487 | 6960016834 |
| 14 | 59 | Legal issues related to quarantine measures of important foreign fish species migrating into India | 7066128321 | 106111487 | 6960016834 |
| 15 | 55 | Development of kit for rapid detection of fish borne pathogens by molscular techniques. | 6656084835 | 74965422 | 6581119413 |
| 16 | 23 | Investigation of depletion of natural resources for inland fisheries and measurement of environmental efficiency. | 6240079533 | 74965422 | 6165114111 |
| 17 | 21 | Investigation priority setting for fishing research in India | 5888440267 | 106111487 | 5782328780 |
| 18 | 37 | Development for technology for culture & breeding of wild species of natural resources (River) namely sour and channa. | 5824074230 | 74965422 | 5749108808 |
| 19 | 9 | Assessment of Environmental degradation (Industrial effluents) on aquatic life of important canal of India. | 4992063626 | 74965422 | 4917098204 |
| 20 | 40 | Investigation of production capacity of water ecosystem and constraints there of or factor responsible for production capacity in natural resource ecosystem. | 4992063626 | 74965422 | 4917098204 |
| 21 | 47 | To develop methodology for conservation of threatened fisheries resources. | 4992063626 | 74965422 | 4917098204 |

Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

| | | | | | |
|---|---|---|---|---|---|
| 22 | 53 | Research related to engineering component of fish catch like development of new type of net, Happa, mechanized boat, gears and similar other type of mechanical innovations. | 4992063626 | 74965422 | 4917098204 |
| 23 | 6 | Assessment of Environmental degradation (Industrial effluents) on aquatic life of important Jheel of India. | 4710752214 | 106111487 | 4604640727 |
| 24 | 3 | Investigation and dynamics of disease problems in fishes through gene mapping. | 4368732784 | 49203684 | 4319529100 |
| 25 | 22 | Measuring scientific productivity in ICAR system and investigation of constraints remedies. | 4368732784 | 49203684 | 4319529100 |
| 26 | 55 | Environmental Impact Assessment of reservoir, canal and interlinking rivers. | 4368732784 | 49203684 | 4319529100 |
| 27 | 5 | Assessment of Environmental degradation (Industrial effluents) on aquatic life of important River of India. | 4160053022 | 74965422 | 4085087600 |
| 28 | 1 | Bio-technological investigation on growth in important fish species in India. | 3822641186 | 49203684 | 3773437502 |
| 29 | 26 | Documentation of Bio - diversity of fish species in India | 3822641186 | 49203684 | 3773437502 |
| 30 | 57 | Detection of antibiotics in fish and fishery product by HPLC. | 3617102843 | 38341938 | 3578760905 |
| 31 | 8 | Assessment of Environmental degradation (Industrial effluents) on aquatic life of important Lake of India. | 3533064160 | 106111487 | 3426952673 |
| 32 | 17 | Development of management practices for Jheel and reservoirs | 3276549588 | 49203684 | 3227345904 |
| 33 | 42 | Conservation of endangered fish species. | 3003503789 | 49203684 | 2954300105 |
| 34 | 50 | To develop methodology for rehabilitation migratory fishes like Hilsa. | 2766019821 | 38341938 | 2727677883 |
| 35 | 16 | Impact of dam construction on rivers on ecology, water velocity (siltation) and breeding of fish species. | 2730457990 | 49203684 | 2681254306 |
| 36 | 02 | Studyh of biochemical compound of medical importance in various fish species of India. | 2719413792 | 28826273 | 2690587519 |
| 37 | 7 | Assessment of Environmental degradation (Industrial effluents) on aquatic life of important reservoir of India. | 2496031813 | 74965422 | 2421066391 |
| 38 | 39 | A study to somatic and genital development of Catala and Rahu in river ecosystem. | 2496031813 | 74965422 | 2421066391 |
| 39 | 19 | Constraints analysis of extension programme for development of fishes in India. | 2239517241 | 28826273 | 2210690968 |
| 40 | 27 | Impact of pollution on nutrition value of fish species in relation to adverse impact on human health. | 1919586206 | 28826273 | 1890759933 |
| 41 | 41 | A comparative analysis of productivity and production potential of different fish species in natural system and culture based system. | 1914936799 | 38341938 | 1876594861 |
| 42 | 10 | Assessment of bio-diversity changes in different rivers of India. | 1638274794 | 49203684 | 1589071110 |
| 43 | 11 | Investigation of habitat degradation in relation to fishes ecology of different rivers of India. | 1599655172 | 28826273 | 1570828899 |
| 44 | 13 | Bio - diversity conservation and quarantines measures in Indian water ecosystem. | 1599655172 | 28826273 | 1570828899 |
| 45 | 49 | Method for eradication of exotic species form riverine system. | 1375561012 | 20656690 | 1354904322 |
| 46 | 31 | Development of management strategies for different inland aquatic ecosystems. | 1279724137 | 28826273 | 1250897864 |
| 47 | 35 | Projection and fore casting of demand for supply of fisheries in India. | 1279724137 | 28826273 | 1250897864 |
| 48 | 61 | Impact of interlining rivers in India on ecology and biodiversity. | 1279724137 | 28826273 | 1250897864 |
| 49 | 63 | Investigation of suitable ownership pattern and property right. | 1074702395 | 13833189 | 1060869206 |
| 50 | 34 | Data base management in inland fishery | 1063853777 | 38341938 | 1025511839 |
| 51 | 25 | Possibilities of pen and cage culture of prawn and corps species in water ecosystem. | 959793103 | 28826273 | 930966830 |
| 52 | 36 | Investigation on causes and cure of disease against in aquatic ecosystem. | 921173481 | 13833189 | 907340292 |
| 53 | 43 | Management strategy for improvement productivity of reservoir can cage culture be alternative. | 917040674 | 20656690 | 896383984 |
| 54 | 60 | Impact of interlinking rivers in India and its impact of production of inland fisheries. | 537351197 | 13833189 | 523518008 |
| 55 | 54 | Detection of food borne pathogenic bacteria from fish and fishery products. | 460586741 | 13833189 | 446753552 |

Volume : 3 | Issue : 12 | Dec 2013 | ISSN - 2249-555X

| | | | | | |
|---|---|---|---|---|---|
| 56 | 56 | Detection of marine tonics form fish and fishery product by rapid molecular method. | 460586741 | 13833189 | 446753552 |
| 57 | 62 | Investigation of impact of interlinking in India on soil helth. (Soil flora, fauna and physico- chemical parameters of soil in relations to rise in ground water level). | 460586741 | 13833189 | 446753552 |
| 58 | 20 | Study of energy flow in various water ecosystem of India. | 458520337 | 20656690 | 437363647 |
| 59 | 51 | Eradication of aquatic weeds (eichornia) from lentic systems. | 383822284 | 13833189 | 369989095 |
| 60 | 14 | Legal issues related to quarantine measures of important foreign fish species migrating into India. | 375081883 | 4224431 | 370857452 |
| 61 | 38 | Investigation of degradation (damage) of Niche and its effects of production and productivity of riverine fisheries. | 307057827 | 13833189 | 293224638 |
| 62 | 28 | Investigation of environmental impact of biotic community in rivers and associated ecosystems. | 185474538 | 8355769 | 177118769 |
| 63 | 45 | Biology of important fish species with special reference of habit and habitat in relation to dynamics of environmental changes in aquatic ecosystems. | 93770470 | 4224431 | 89546039 |

**REFERENCE** Daya Nath Jha, Praduman Kumar, Mrathyunjaya, Suresh Pal, S. Selvarajan and Alka Singh (1995) Research priorities in India Agriculture. Policy paper (3). National Center for Agricultural economics and policy Research. May 1995. | Franzel, S.H., R.E. Evenson, R. Herdt and M. Hossain, Jaenicke, and W. Janssen (1996), Choosing the Right Trees: Setting Priorities for Multipurpose Tree Improvement, Research Report 8, ISNAR, The Hague. | Joshi P.K. and M.C.S. Bantilan (1997). Intitutionalisation of research prioritization monitoring and evaluation. Paper resented in the workshop on institutionalization or research prioritization monitoring and evaluation. Held on 21-23 July 1997. At NCAP New Delhi. | Modayil Mohan Joseph (2003) Prioritization of research in marine fisheries. National Workshop under NA TP recognize by National Academy of Agricultural Research Management Rajendranagar, Hydereabad. Nov. 10-11,2003. | Mc Calla, A.F. and Ryan, J.G. (1992). Setting Agricultural Research Priorities: Lessons from CGIAR Study. American Journal of Agricultural Economics, 74 (5): 10951100. | Nagireddy M.V.S.(2003). Aquaculture in Andhra Predesh with respect to emerging crisis. National workshop under NA TP "Methodology for Prioritization of fisheries research in India." November 10-11,2003. | Norton, G.W. Pardey, P.G. and Alston lM. (1992). Economic Issues in Agricultural Research Priority Setting American Journal of Agricultural Economics, 74 (5): 1089-1094. | Reddy G.P., Santakki B.S. et al (2003) Metholodology for prior it ization of fisheries research in India. National Workshop under NATP recognize by National Academy of Agricultural Research Management Rajendranagar ,Hydereabad . Nov.lO11,2003. | Shumway, C.R.(1973). Allocation of scarce resources to agricultural research: review of methodology, American Journal of Agricultural Economics, 55 (4) ; 547-58. | Sompo Ceesay et a1.(1989). Analysis of Agricultural Research Priorities in the Gambia. Paper prepared for the National Agricultural Research Board of the Gambia, March 1989.