Perceived skill gaps of fisheries extension officers *vis-à-vis* shrimp aquaculture

M. KUMARAN, D. D.VIMALA AND S. NAGARAJAN
Central Institute of Brackishwater Aquaculture, 75, Santhome High Road, R. A. Puram
Chennai - 600 028, Tamil Nadu, India
e-mail: mkumaran@ciba.res.in

ABSTRACT

Efficient and effective fishery extension officers (FEO) are expected to keep themselves updated on the subject matter they deal and related aspects. A skill gap analysis was carried out with 33 important competencies required for the fisheries extension personnel on a dichotomous importance *vs* competence continuum. The results indicated that higher level of skill gaps were expressed in shrimp disease diagnosis and management, conducting farm demonstrations, preparation of extension aids using information communication technologies (ICT), monitoring of soil and water quality parameters and selection of quality shrimp seeds. The respondents were of the perception that research and extension linkage which is vital for capacity enhancement of extension personnel, technology refinement, dissemination and feedback is to be improved in fisheries sector. In the absence of an efficient mechanism to coordinate research and extension systems, the study suggested that the research institutions may develop appropriate capacity building modules by incorporating both technical and extension subjects for training the FEOs in all the maritime states so that location-specific technological issues could be focused. The study also recommended that ICT aided tools like expert systems may be developed and employed for enhancing the capacities of the fishery extension officers.

Keywords: Capacity building, Fisheries extension, Skill gap, Technology transfer

Introduction

Farm extension services have reaffirmed their essential role in agrarian development, poverty reduction and rural prosperity (Regina Birner and Anderson, 2007). Extension personnel ought to possess sound technical knowledge and extension skill in order to be efficient and effective in disseminating relevant technologies for ultimate adoption by the farmers. The success in agricultural extension services largely depends on extension skills of extension workers (Kashem *et al.,* 2001; Ahamad, 2002). Continuous updation of these twin pre-requisites is must and an inbuilt opportunity for the same is absolutely essential. In-service trainings and strong linkage with research are the mechanisms to fulfill this requisite. Training need assessments at appropriate intervals help in identifying the training needs and designing suitable training module. Youdeowei and Kwarteng (2006) defined training need as the difference between the required level of individual competence and his present level of competence. Allo (2001) pointed out that one of the main factors limiting the development of effective training programmes for agricultural professionals in developing countries is the inadequacy of information on their training needs. Therefore, if extension agents are to improve their on-the-job effectiveness, they must receive continuous in-service training in line with their training needs (Tladi, 2004; Chizari *et al.,* 2006)). When the in-service or on-the-job training is not given or weak, deficient competencies can be expected (Olajide-Taiwo and Akinsorotan, 2006).

Aquaculture of shellfishes and finfishes is an important farming component and recognized as an important means for livelihood, rural development, food and nutritional security (Ayyappan and Diwan, 2007). Coastal aquaculture is an important farming system which contributes immensely for the socio-economic transformation of small scale fish farmers in the maritime states. Aquaculture technology is continuously getting improved to cope up with the emerging scenario and accordingly the aquafarmers are to be educated on the Better Management Practices (BMP) to adjust themselves to the changing environments. It has been proved elsewhere that without the spread of these aquaculture innovations from research systems to client system, the problems of aqua farmers remain unsolved (Maguswi *et al.,* 2004; Omoyeni and Yisa, 2005; Udo *et al.,* 2005). Fisheries and aquaculture, being the state subject, the maritime states have the major responsibility in providing the key support. Fisheries extension personnel are the key facilitators of the farming

community to access quality farm inputs, farm machinery, technical counselling, institutional credit, better price and mobilise them for a collective compliance of farm practices to achieve sustainability. In today's world, information is indeed a unique prerequisite for making wise decisions. Hence, the extension personnel are expected to be the rigorous information seekers to keep themselves updated in every aspect of on-farm and off-farm aspects (Wilson, 2000; Meho and Hass, 2001). Therefore, assessing the training needs of the Fishery Extension Officers (FEO) at regular intervals and conducting capacity enhancement programmes to address their knowledge and skill gaps is essential. In this context, the present study was conducted to identify and prioritize the training needs of FEOs so that necessary measures would be suggested to develop suitable capacity building modules and conduct capacity enhancement programmes for the FEOs.

Materials and methods

The present study is concerned with training needs, which is defined as the difference between desired and actual status of learners (Popham, 1993). The present study adopted the Borich Need Assessment Model (Borich, 1980) which relies on the extension agents' judgments about their own performances. A set of 33 competencies essential for the FEOs were identified based on focus group consultations with subject matter specialists which were grouped in to four components *viz*., skills for conducting extension programmes, skills on development and use of extension materials and methods, communication and management skills and technical subject matter skills. A dichotomous importance *vs* competency five point continuum, from least important to most important and least proficient to most proficient was developed. A score of 1 on the scale signified the least important competency/least proficient and number 5 denoted the most important competency/most proficient. The FEOs were asked to give their self perceived responses on the identified 33 competencies for both importance and competency.

Fishery extension personnel of the Departments of Fisheries (DOF) were the respondents of the study. A random sample 90 fishery extension officers, 30 each in three coastal states *viz*., Andhra Pradesh, Gujarat and Tamil Nadu were selected for primary data collection. Data were collected using a structured questionnaire and to ascertain the reliability of the questionnaire, pilot testing was done. Reliability as a measure of internal consistency was established using Cronbach's alpha and the values were 0.73 for the importance level and 0.81 for the competence level. The data collected were analyzed using the Statistical Package for the Social Sciences. A Mean Weighted Discrepancy Score (MWDS) was calculated to describe the overall rankings for each competency. A discrepancy

score was calculated for each individual on each competency by taking the importance rating minus the ability (competency) rating. A weighted discrepancy score was then calculated for each individual for each of the professional competency by multiplying the discrepancy score with the mean importance rating. A mean weighted discrepancy score for each of the competencies was calculated by taking the sum of the weighted discrepancy scores and dividing by the number of observations. Using the mean weighed discrepancy scores, all the 33 competencies were then ranked as suggested by Alibaygi and Zarafshani (2008).

Results and discussion

Personal profile of FEOs

The personal characteristics of the respondents (Fig. 1) indicated that nearly three fourth of the respondents (72%) were aged above 40 years. Among the states, Gujarat had relatively more young extension officers. In Andra Pradesh, all the respondents were in the above 40 years category while in Tamil Nadu, nearly three fourth were in above 40 years of age. Half of the respondents were post-graduates and more than one-fourth of them were graduates. In Tamil Nadu, about 43% of the respondents were fisheries post graduates. As far as experience is concerned, about 40% of them had more than 10 years and 20 years of experience, respectively in the fisheries departmental activities. About 60% of the respondents had online access, though their frequency of use varied from weekly to monthly once in all the three states. This indicated that they can be reached online for knowledge updation and communication to obtain field level information. Majority of the respondents (59%) had undergone training in communication, and other extension methods.
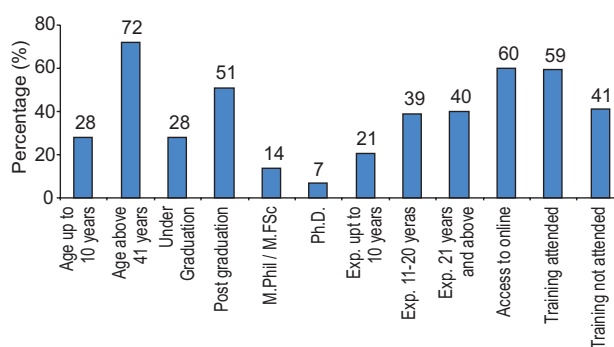

Fig. 1. Personal profile of fishery extension officers (n=90)

Results on information sources of fisheries extension officers given in Fig. 2 indicate that printed publications like technical-cum-popular journals, reports, bulletins, manuals and extension pamphlets were the major information sources for 79% of respondents. Departmental

staff training institutions of the respective states was the information source for majority (57%). About half (48 and 47%) of the respondents respectively and expressed that fishery researchers and internet were their information sources. This has clearly shown that there were no regular information and feedback flow from the research to extension and *vice versa*. However, printed publications from the research institutions as part of their extension outreach were sent to DoFs for wider dissemination to the end users. Hence, the printed publications constituted the major source of information for the FEOs.
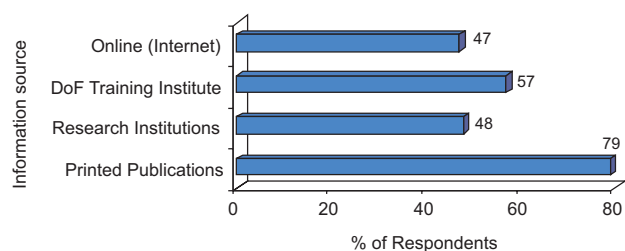

Fig. 2. Perceived information sources of fishery extension officers (n=90)

Perception of FEOs on the organisational capacity of Department of Fisheries (DoFs)

The Departments of Fisheries (DoFs) should be equipped adequately in terms of infrastructure, manpower, resources and funds to function as an effective extension organization. Accordingly, the FEOs were asked to give their perception about the organizational attributes and the responses are presented in Table 1. Majority of the respondents (66%) perceived that though the DoF had basic infrastructure such as buildings, transport, laboratories *etc,* it was grossly inadequate. About half of the respondents (49%) felt that the DoF had no adequate linkage with research which is very essential for the development and transfer of farmer centered technologies. The limited linkage existed between them was of routine in nature like participation of officials in general meetings related to official pre-requisites. About 55% of the respondents expressed that they spent only 50% of their time on extension activities and about additional 40% of the respondents felt that they could spent hardly 25% of their working time for providing extension service and activities. The respondents informed that welfare schemes for the fishermen and their related administrative works consumed their time. Majority of them (72%) felt that the existing manpower at the field level to provide extension service was insufficient and funds available for extension work was also insufficient as felt by 59% of respondents. Eighty five per cent of them felt that they had followed group contact methods like farmers meetings and field training to reach the farming community however, their contact with

the end users was not frequent. Fifty per cent of the respondents felt that need based delegation of authority was given to the field level officers to take decisions to plan and execute field level extension activities. On the whole, the findings have shown that the DoFs whose primary mandate is to provide extension service was poorly equipped in terms of manpower, funds, extension materials and equipments, poor linkage with research institutions and inadequate infrastructure.

Table 1. FEOs perception on the organizational capacity of DoF

Organizational attribute	% of responses (n=90)
Infrastructure	
• Does not exist	17
• Exist inadequate	66
• Adequate	17
Linkage with research	
• Does not exist	14
• Exist inadequate	49
• Adequate	37
Nature of linkage with research	
• Regular and focused	15
• Occasional and general	50
• Rare	35
Extension role primacy - as % of time spent for extension work	
• 75% time spent for extension work	5
• 50% time spent for extension work	55
• 25% time spent for extension work	40
Manpower availability	
• Insufficient	72
• Manageable	22
• Adequate	6
Delegation of authority	
• No delegation	17
• Need based delegation	58
• Fully delegated	25
Opportunity for capacity enhancement	
• Need based	35
• Once a year	29
• Once in 2-3 years	36
Frequency of contact with Farmers	
• Once a week	38
• Once a month	32
• Occasional	30
Method of contact with farmers	
• Individual contact	15
• Group contact	85
Funds for extension work	
• Insufficient	59
• Manageable	22
• Adequate	19

Skill gap analysis of FEOs

The results of the skill gap analysis of fishery extension officers using mean weighted discrepancy score (MWDS) and their subsequent ranking are presented as per the thematic component in Table 2 and Fig. 3. Shrimp disease diagnosis and their management (MWDS = 4.82) was their important felt need and lack of adequate knowledge on diseases, their etiology, probable causes and their management were the foremost skill gap of FEOs. Disease is the single most formidable problem in shrimp aquaculture and every year about 30% of the shrimp farmers had to incur loss due to diseases. Better management practices and farm bio-security practices were developed to prevent and manage the disease threats in shrimp farming. Publications with relevant pictures and video films on the better management practices in vernacular languages need to be prepared and distributed to all the DoFs to create awareness among the farmers (Table 2). Further, it is very important that field oriented practical training on the shrimp disease diagnosis and their effective management is to be organised for the FEOs in each maritime state. Application

Table 2. Skill gap analysis of fishery extension officers

Extension management and subject matter skill	Weighted mean discrepancy score		Mean importance score	Std. dev.	Mean competency score	Std. Dev.
Extension methods and materials		Rank				
Production of educational/teaching materials	4.21	3	4.46	0.82	4.29	0.94
Using audio-visual aids and equipments	4.01	4	4.29	0.94	3.37	1.13
Farmers information needs assessment	3.71	9	4.27	0.71	3.41	0.88
Identification and selection of beneficiaries	3.90	6	4.61	0.66	3.77	0.93
Developing programmes based on farmers needs	3.04	21	4.47	0.73	3.79	0.93
Writing for mass media	3.57	10	4.05	1.03	3.18	1.27
Mobilizing farmers to form groups	3.35	14	4.17	0.97	3.38	0.97
Using computers for preparation of extension aids	3.75	8	4.22	0.89	3.34	1.05
Participatory rural appraisal techniques	2.75	25	4.16	0.88	3.51	0.91
Identification of farmer problems and their causes	2.52	27	4.50	0.72	3.95	0.88
Preparation of data collection tools	2.90	23	4.07	0.78	3.36	0.93
Research methodology and interpretation of results	3.51	12	4.15	0.81	3.32	0.97
Conducting extension programmes						
Conducting result and method demonstrations	4.39	2	4.21	0.87	3.17	1.04
Conducting programmes for sub-ordinates	3.27	17	4.38	0.72	3.64	0.87
Conducting field trainings for farmers	3.56	11	4.63	0.61	3.87	0.80
Conducting field days at demonstration/trial sites	2.96	22	4.49	0.72	3.84	0.82
Conducting focus group meetings with farmers	3.35	14	4.35	0.79	3.59	0.88
Conducting on farm research and trials	3.28	16	4.09	0.85	3.29	0.96
Conducting effective interviews for data collection	2.97	22	4.03	0.86	3.38	0.89
Communication and management skills						
Motivating farmers and fellow workers for work	3.10	19	4.40	0.76	3.71	0.97
Effective communication with fellow farmers	3.24	18	4.40	0.74	3.67	0.95
Effective interpersonal relations	2.38	28	4.25	0.85	3.70	0.89
Effective communication with other officials	2.80	24	4.39	0.80	3.76	0.91
Report writing for official purposes	2.52	27	4.33	0.73	3.75	0.82
Effective presentation of the technical topics	3.08	20	4.45	0.64	3.75	0.87
Preparation of aquaculture projects	3.43	13	4.11	0.80	3.28	0.99
Preparation of research and extension articles	3.33	15	4.15	0.85	3.36	1.06
Technical subject matter skills						
Selection of quality shrimp seeds and other inputs	3.87	7	4.63	0.74	3.80	1.05
Feed rationing and feed management for shrimps	3.10	19	4.48	0.84	3.79	1.03
Measuring soil and water quality parameters	3.95	5	4.49	0.81	3.62	1.08
Shrimp disease diagnosis and their management	4.82	1	4.57	0.76	3.52	1.21
Filling of CAA applications and reports	2.61	26	4.66	0.68	4.11	0.94
Post harvest handling of farmed shrimps	2.97	22	4.51	0.82	3.86	0.99

of front line information communication technologies (ICT) like video conferencing, expert systems and on-line extension, sending of pictures from the field for diagnosis and immediate advise to tackle the problem between the FEOs and researchers are essential to help the farmers to save their crop.

Skills for conducting demonstrations at the farm level (MWDS = 4.39) is the second important training need identified. Since majority of the FEOs were from general zoology/biology background, they were not exposed to extension concepts and methodologies. The fishery extension workers need adequate training on conducting extension programmes and preparation of extension materials. Further, production of extension materials (MWDS = 4.21) and audio-visual aids (MWDS = 4.01) were the other two skill gaps identified. Therefore, winter/summer school on extension methodologies, production of extension materials and audio-visual aids need to be planned to build the skills of the FEOs.

Management of soil and water quality in ponds are the basic requirement in shrimp farming. Soil and water quality parameters like pH, salinity, dissolved oxygen, nutrient load in the pond are to be monitored on day to day basis and the farmers need to be educated on this. It is a critical need and hence, this was expressed as the skill gap by the respondents (MWDS = 3.95). Selection of quality shrimp seed would ensure 40-50% of success in the farming. Shrimp seed quality characteristics, tests and procedures need to be followed to identify quality seeds. Hence, the FEOs required knowledge and skill updation in shrimp seed selection (MWDS = 3.87).

In the era of computers and information technology, ICT aided extension aids in the form of video films, power point presentations and multi-media aided information dissemination are found to be effective (Mahalakhsmi et al., 2008; Sivakami and Balasubramaniam, 2009) in transfer of aquaculture technology. Hence, use of computers for extension material preparation was identified as a skill gap (MWDS = 3.75). Besides, methods to be adopted to assess the information/training needs of farmers, writing for mass media like news papers, preparation of radio talks, developing scripts for televisions etc. were the other skill gaps identified from the responses of the FEOs. The results based on the mean weighted discrepancy rating indicated that FEOs need training on technical subject matter, especially shrimp disease diagnosis and management, soil and water quality management and selection of quality shrimp seeds and inputs. Skills for conducting demonstrations, preparation of extension materials using computers and use of audio-visual aids for effective extension were other important felt needs requiring immediate attention.
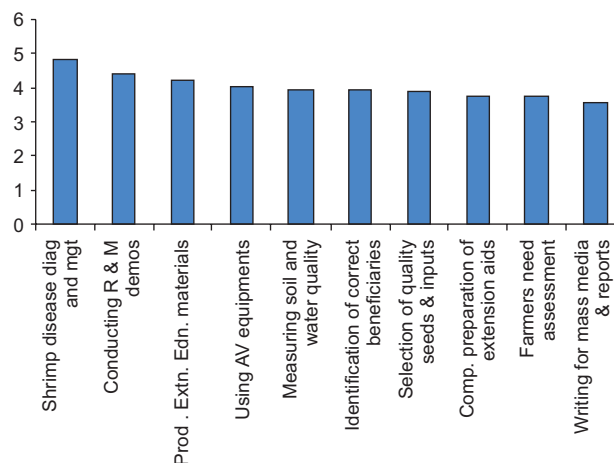

Fig. 3. Skill gaps of fishery extension officers

The research extension linkage is very vital for any farming sector to build the capacity of field extension personnel and demand based technology development, dissemination, adoption and feedback for further refinement of farming practices. Nevertheless, the results indicated that the fundamental link was missing and fisheries sector lacked established mechanisms like zonal workshops and pre season-post crop workshops to coordinate the research-extension-farmer linkage. In this juncture, the ICT aided solutions like expert systems, video-conferencing which could provide interactive two way information exchange may act as an alternative means of capacity building and technology transfer. Hence, efforts need to be paid in development and evaluation of ICT based tools in transferring know-how and capacity enhancement.

The skill gap analysis of FEOs has indicated that they require subject matter skills which are on demand at the field and extension education skills to transfer the subject matter to the farming community. It is pertinent that technical subject matter skills are very important to position themselves to counsel the farmers and for that they need extension skills for preparation of extension materials and to conduct extension programmes. As success of extension services is largely depends on extension agent's skills and lack of extension skills lead to unsatisfactory extension services to farmers (Ahamed, 2002; Kashem et al., 2001). Hence, research institutions need to develop a capacity building module incorporating both subject matter and extension education capacities as a trainers training programme and conduct trainings at the respective maritime states so that location specific issues could be included for capacity building. The National Fisheries Development Board (NFDB) has been extending its full support to build and enhance the capacities of the state level extension functionaries and their services could be used for the capacity building programmes in all the maritime states.

At the same time, the DoFs are to be energized with men, material and funds to function as an effective extension organization. Further, a national level initiative to integrate research-extension-farmer-inputs and market systems is long due in fisheries which needs to be taken up for the betterment of fisheries and aquaculture sector of the country.

Acknowledgements

References

Ahmad, R. 2002. Constraint in Implementing New Agricultural Extension Policy (NAEP) in Bangladesh. *Proceedings of the national workshop on "Implementation of the new agricultural extension policy: achievement and constraints"*, January 26-28, 2002.

Alibaygi, A. and Zarafshani, K. 2008. Training needs of Iranian extension agents about sustainability: the use of Borich's need assessment model. *African J. Agric.Res.*, 3 (10): 681-687

Ayappan, S. and Diwan, A. D. 2007. National Fisheries Development Board and Fisheries Policy. In: Vijayan, K.K., Jayasankar, P. and Jayagopal, P. (Eds.), *Indian fisheries: A progressive out look*, CMFRI, Cochin, p. 1-11.

Birner, R. and Anderson, J. R. 2007. How to make agricultural extension demand-driven? The case of India's agricultural extension policy, *IFPRI Discussion Paper 00729,* International Food Policy Research Institute, Washington, DC, USA, 48 pp.

Borich, G. 1980. A needs assessment model for conducting follow-up studies. *J.Teach. Educ.*, 31(1): 39-42.

Chizari, M., Alibaygi, A. H. and Breazeale, D. 2006. Analysis of the training needs of multi-functional extension agents associated with sustainability. *J. Int. Agric. Ext. Educ.*, 13(1): 51-58.

Duncan, W. D., Ricketts, J. C., Peake, J. B. and Uesseler, J. 2005. Identifying teaching and learning in-service needs of Georgia agriculture teachers. *Proceedings of the 32nd Annual National Agricultural Education Research Conference*, p. 91-102.

Edwards, M. C. and Briers, G. E.1999. Assessing the inservice needs of entryphase agricultural teachers in Texas: A discrepancy model versus direct assessment. *J. Agric. Educ.*, 40(3): 40-49.

Garton, B. L. and Chung, N.1996. The in-service needs of beginning teachers of agriculture as perceived by beginning teachers, teacher's educators, and state supervision. *J. Agric. Educ.*, 37(3): 52-58.

Kashem, M. A., Hossain, M. A. and Islam, M. S. 2001. Factors responsible for determining communication behaviour of the block supervisors. *Bangladesh J. Ext. Educ.*, 13(1&2): 137-142.

Layfield, K. D, and Dobbins, T. R. 2000. An assessment of South Carolina agriculture teachers' in-service needs and perceived competencies. *Proceedings of the 27th Annual National Agricultural Education Research Conference*, San Diego, CA.

Maguswi, C. T., Brummett, R. E. and Pouomogne, V. 2004. Aquaculture extension in Zambia. In: Coche, A.G. (Ed.), Aquaculture extension in sub-Saharan Africa. *FAO Fish. Circ. No.* 1002: 43-48.

Mahalakshmi, P., Deboral Vimala, D. and Krishnan, M. 2008. Development of e-learning module on mud crab fattening. *Indian J. Ext. Educ.,* 44 (3&4): 22-26.

Meho, L. I. and Hass, S. W. 2001. Information seeking behavior and use of social science faculty studying stateless nations: A case study. *Library Inform. Sci. Res.*, 23: 5-25.

Mundt, J. P. and Connors,. J. J. 1999. Problems and challenges associated with the first years of teaching agriculture: A framework for pre-service and in-service education. *J. Agric. Educ.*, 40(1): 38-48.

Newman, M. E. and Johnson, D. M .1994. Inservice education needs of teachers of pilot agriscience courses in Mississippi. *J. Agric. Educ.*, 35(l): 54-60.

Ngugi, C. C., Manyala, J. O., Brummett, R. E. and Pouomogne, V. 2004. Aquaculture extension service in Kenya. In: Coche, A. G. (Ed.), *Aquaculture extension in Sub-Saharan Africa*. *FAO Fish. Circ*, no. 1002: 35-42

Niven, S. M. 1993. Work-based learning: Professional training for teaching vocational education. *Int. J. Vocat. Educ. Train.,* 1(2): 5-19.

Olajide-Taiwo, L.O and Akinsorotan, A. O. 2006. In-service training needs of extension workers in pineapple technology transfer in southwestern Nigeria. *Moor J. Agric. Res.,* 7: 114–120.

Omoyeni, B. A. and Yisa, J. J. 2005. Enhancement of fish production in Borno State with Extension services. In*: Araoye, P.A. (Ed.), Proceedings of the annual conference of the Fisheries Society of Nigeria (FISON)*, p. 658-662.

Phuong, N. T., Long, D. N., Varadi, L., Jeney, Z. and Pekar, F. 2002. Farmer-managed trials and extension of rural aquaculture in the Mekong delta, Vietnam. In: Edwards, P., Demaine , H. and Little, D. C. (Eds.), *Rural aquaculture*, Wallingford, UK: CABI Publication, p. 275-284..

Popham,.W. J .1993. *Educational evaluation*, 3rd edn., Needham Heights, MA: Allyn and Bacon.

Sivakami, S. and Karthikeyan C. 2009. Evaluating the effectiveness of expert system for performing agricultural

extension services in India. *Expert Systems with Applications*, 36: 9634-9636.

Tladi, F. M. 2004. Job content and training needs of agricultural extension agents in south-central Botswana, *J. Internat. Agric. Ext. Educ.,* 11(3): 33-39.

Udo, M. T., Okon, A. O, Lebo, P. E. and Ikpe, G. B. 2005. Improving aquaculture through increased fisheries extension research. In:

Araoye, P. A. (Ed.), *Proceedings of the 19th Annual conference of the Fisheries Society of Nigeria*, p. 54-57.

Wilson, T. D. 2000. Human information behavior. *Inform. Sci.*, 3 (2): 49-55.

Youdeowei, A. and Kwarteng, J. 2006. *Tool kit for the production of agricultural extension materials- Guide book*. CTA Wageningen, the Netherlands, 50 pp.