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RESEARCH ARTICLE

EXAMINING LOCAL COMMUNITIES' SOURCES OF INDIGENOUS KNOWLEDGE FOR MANAGEMENT OF AGRO-BIODIVERSITY IN MASASI AND NACHINGWEA DISTRICTS, TANZANIA

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ABSTRACT

The study was carried out in Masasi and Nachingwea districts to provide empirical evidence of how local communities access indigenous knowledge (IK) on management of agro-biodiversity surrounding them. The paper specifically sought to determine how local community's access and share indigenous knowledge related to agro-biodiversity at local levels. The study employed a mixed method approach (case study and cross sectional survey). The research findings of the present study showed that farmers mainly relied on the local (internal) sources of knowledge to acquire IK, as compared to external and formal sources of knowledge. In terms of frequency of access, the responses showed again the predominance of the parents/guardian/family, neighbour/friends, social groups and village meetings as primary sources of IK they most frequently consulted. Finally the study suggests some recommendations as detailed in the paper.

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INTRODUCTION

IK is said to be knowledge that is tacit, orally communicated, experiential, unique and embedded in the heads, activities and practices of communities with long histories of close interaction with the natural environment across cultures and geographical spaces. IK is largely used by local communities for decision-making (Du Plessis 2002; Ngulube 2002; Ellen and Harris 2000; World Bank, 1998). Agro-biodiversity comprises the whole plant resource diversity that human societies use and manage for agriculture, food, healthcare, and livelihood. It includes the enormous diversity of crops and crop varieties that small-scale farmers conserve and cultivate, representing both the basis for their subsistence and a source of income (Gari 2002). It also embraces wild food and medicinal plants that rural populations use for nutrition, healthcare and livelihood purposes. The maintenance and use of agro-biodiversity relies on extensive indigenous knowledge systems, which address aspects such as cultivation practices, uses, and genetic resource management of such plant species (Gari 2004). It is said that due to domination of processes of globalization in the present era, millions of marginalized rural people face a set of economic, social, environmental and health crises that impair their lives and development prospects. Thus, Food insecurity and malnutrition distress countless rural households and communities globally (Gari 2004).

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Further research indicates that the majority of rural populations remain trapped in poverty and social exclusion, whilst policies and investments tend to focus on urban areas, industrial endeavors and agribusiness development (Gari 2004). It has been said that the knowledge harnessed by farmers is not accorded the same importance as conventional knowledge despite its overwhelming potential in improving agricultural productivity and livelihoods among local communities. Consequently, what farmers know in most developing countries are not recognised as formal and reliable sources of knowledge (Kilongozi, Kengera and Leshongo, 2005). The transfer of IK from generation to generation is mostly done through oral tradition and demonstrations. Similarly IK is not equally shared among communities due to power and cultural differences. Instead, IK is stored in the minds of people who may die with the knowledge accumulated over a long period of time (Ikoja-Odongo 2006; Meyer 2003).

In most developing countries including Tanzania, IK remains undocumented (Mascarenhas 2004; Dube and Musi, 2002, Magara, 2002). Therefore, the present study sought to provide empirical evidence of how local communities in Masasi and Nachimgwea districts access indigenous knowledge on management of agro-biodiversity surrounding them. The paper specifically sought to determine how local community's access and share indigenous knowledge related to agro-biodiversity at local levels.

METHODOLOGY FOR THE STUDY

The study was carried out in Lindi (Nachingwea district) and Mtwara (Masasi district). These districts are located in southern part of Tanzania, being approximately 600 km from Dar es Salaam. The research employed a mixed research design, using cross-sectional design which involves collecting data at one point in time, utilizing a combination of activities, including an extensive literature review, consultations with experts and local communities to provide socio-economic oriented findings (Bryman 2004). A case study (small communities in villages) was drawn to enable description of features (indigenous agro-biodiversity knowledge and management approaches) in detail (Bryman 2004). The study population included the following two categories of respondents: (i) Local communities – small holder farmers, and village leaders; (ii) IK intermediaries (extension officers and forest officers). A four-stage sampling was used to draw a sample for this study. Multi-stage sampling was adopted because the population is scattered over a wide geographical area and a survey was made within a limited time and financial resources. A non-probability, purposive sampling technique was used to select two districts, and 4 villages from the two districts for the study. The final sample consisted of 8 villages, 4 villages from each district. Respondents who were interviewed were selected using systematic random sampling. Their names were selected from the village government register of households. Purposive sampling was used to select other categories of respondents in the study, including key informants and participants for focus group discussions (FGD). 230 heads of households were interviewed using questionnaire. In addition two key informants were interviewed in each village. Between 8 and12 people participated in one FGD discussions in each village.

RESULTS AND DISCUSSION

Access to agricultural indigenous knowledge

The sources of indigenous agro-biodiversity knowledge

The respondents were asked to mention sources of indigenous knowledge (IK) used for management of agro-biodiversity, frequency of accessing that knowledge and type of IK obtained from the sources of knowledge. On the access of IK, Table 1 indicates that the primary sources of indigenous agro-biodiversity knowledge were predominantly tacit and local, which included personal experience 205 (89.1%), parents or guardian or family 202 (87.8%), neighbours, friends and relatives 131 (57.0%). Other major sources of IK were also local sources, which included social group gatherings 55 (23.9.5%), village meetings 31 (13.5%), village leaders 30 (13.0%) and farmers groups 19 (8.3%). Farmers made little use of formal sources of knowledge such as books, posters, newspapers, seminars and agricultural shows as indicated in the Table 1 above. The study findings are opposite to what several KM processes that deal with knowledge acquisition suggest. The KM models posit that the acquisition of knowledge involves the importation of substantial amounts of knowledge from the internal and external sources of the organisation (Bouthillier and Shearer, 2002; Earl 2001; Probst, Raub and Romhardt 2000). However, the research findings of the present study showed that farmers mainly relied on the local (internal) sources of knowledge to acquire IK, as compared to external and formal sources of knowledge. IK was mainly acquired through local sources as listed in the Table 1 above. Farmers rarely used formal sources of knowledge (public and private extension services) and printed materials to acquire IK. These findings were supported by the results of other studies in developing countries, such as Uzbekistan (Wall 2006) that local sources were the major sources of agricultural IK as compared to formal sources of knowledge. Similar observation were made in other African countries such as Nigeria (Nathaniel-Imeh 2004; Olatokun and Ayanbode 2008), Tanzania (Nathaniels and Mwijage 2000; Lwoga *et al*. 2010), and Uganda (Akullo *et al*. 2007), that informal sources were the dominant sources of agricultural IK as compared to formal sources of knowledge. These findings are also supported by various authors who contended that face-to-face communication is the major mechanism for acquiring knowledge in the organisations and local communities (Earl 2001; Meyer and Boon 2003).

The frequency of accessing agricultural indigenous knowledge

For each of IK sources, the respondents were asked to indicate frequency of accessing IK from tacit and explicit sources of knowledge. The responses highlight again the predominance of the parents/guardian/family, neighbour/friends, social groups and village meetings as primary sources of IK they most frequently consulted as depicted in Table 2. The frequencies were 69.6% for parent/guardian/family, 40.0% for neighbours/ friends, 30.4% for social group gatherings, and 10.4% for village meetings. Farmers were in less contact with the printed materials, conferences, seminars and workshops.

Types of indigenous agro-biodiversity knowledge obtained from different sources

The respondents were asked to indicate the types of agro-biodiversity knowledge they frequently sought from tacit and explicit sources of knowledge. The majority of respondents obtained knowledge on new crop varieties, methods of crop planting, harvesting, processing, storage, utilization of non timber forest products and soil fertility improvement from tacit and explicit sources of knowledge. It was reported that parents and experience were the major tacit sources of indigenous knowledge for the management of agro-biodiversity followed by friends, relatives and exogenous sources such as mass media/extension/farmer groups (Table 3). It is apparent from the findings that the communities lack reliable sources of exogenous knowledge. There is therefore a need to integrate IK with exogenous knowledge to strengthen the local knowledge system. A further analysis was done to find out the means of acquisitions of knowledge on wild food plants. Specifically, the communities were asked to state how they acquired knowledge on preservation of edible wild plants, processing of edible wild plants, use of edible wild plants and knowledge on seasons of availability of edible wild plants. The major means of acquisitions in descending order were accompanying relatives during harvesting seasons, initiation rites during adolescent, training by elders and direct observation as indicated in Table 4 below. The findings from this study support observations done by Gari (2003), who found that local communities among Gogo people in central Tanzania hold local knowledge of uses of over 40 wild food plants and that some of these grow during food shortages (during dry seasons) and that they have knowledge on how to

Table 1. Sources of indigenous agro-biodiversity knowledge

Source	Frequency	Percent
Personal experience	205	89.1
Parents/ guardian/family	202	87.8
Neighbour/Friends/relative	131	57.0
Women meetings	5	2.2
Wild product gathering	2	0.9
Demonstration and observation	10	4.3
Magazines	1	0.4
Newsletters	1	0.4
Posters	0	0.0
Church/mosque	9	3.9
Social group gatherings	55	23.9
Village leaders	30	13.0
Farmers' groups	19	8.3
Village meetings	31	13.5
Newspapers	2	0.9
Books	2	0.9
Conference/workshops/seminars	4	1.7
Agricultural shows	2	0.9

Source: Field survey, 2012

Table 2. Tacit and explicit sources of indigenous knowledge on agro-biodiversity management and the frequency of access

Source	Frequency of access (%)				
	Very often	Often	Probably	Seldom	Very seldom
Parent/guardian/family (N=222)	69.6	19.1	1.3	0.9	5.9
Neighbour/Friends (N=186)	40.0	26.1	2.6	2.7	12.4
Social group gatherings (N=162)	30.4	20.0	3.9	3.7	19.1
Religious leader (N=95)	7.0	8.3	3.5	3.2	51.6
Women meetings (N=78)	7.0	3.9	3.5	2.6	55.1
Farmers' groups (N=87)	8.7	4.8	2.6	4.6	52.9
Herding livestock (N=70)	4.8	2.6	1.7	1.4	68.6
Village meetings (N=117)	10.4	5.2	4.3	3.4	57.3
Agricultural shows (N=66)	2.2	1.3	0.9	4.5	80.3
Newspapers (N=59)	1.3	0.4	0.9	3.4	86.4
Magazines (N=55)	1.3	0.4	0.9	3.6	89.1
Books (N=56)	2.2	0.4	0.9	3.6	85.7
Newsletters (N=45)	0.4	0.4	0.4	0.0	93.3
Conference/workshop/seminars (N=44)	0.4	0.4	0.0	0.0	95.5
Posters (N=45)	0.4	0.4	0.4	2.0	91.8

Source: Field survey, 2012

Table 3. Indigenous agro-biodiversity knowledge sources

Kind of IK	Indigenous agro-biodiversity knowledge source											
	Parents		Experience		Ancestors		Friends		Parents/friends/relatives		Mass media/farmer groups/Input shops/meetings	
	n	%	n	%	n	%	n	%	n	%	n	%
New crop varieties	31	24.80	29	23.2	29	24.80	14	11.20	8	6.40	14	11.20
Crop planting	33	23.91	57	41.30	3	2.20	30	21.74	6	4.35	9	6.52
Crop harvesting, processing, storage	37	27.82	55	41.35	2	1.50	17	12.78	15	11.28	7	5.26
Crop diseases/pests	29	19.73	44	29.93	2	1.36	7	4.76	43	29.25	22	14.95
Utilization of Non Timber Forest Products	38	28.79	49	37.12	2	1.52	16	12.12	16	12.12	11	8.33
Soil fertility improvement	34	24.28	48	34.29	2	1.43	20	14.29	24	17.14	12	8.60

Source: Field survey, 2012

Table 4. Means of acquisition of indigenous knowledge on edible wild food plants among the surveyed communities

Kind of IK	Means of acquisition							
	Accompany relatives during harvesting seasons		Training by elders		Direct observation		Initiation rites during adolescent	
	n	%	n	%	n	%	n	%
Preservation of edible wild plants	91	50.30	29	16.10	30	16.70	31	17.10
Processing of edible wild plants	89	49.40	29	16.10	30	16.70	32	17.80
Uses of edible wild plants	96	49.40	23	12.80	30	16.70	31	17.20
Seasons of availability of edible wild plants	146	67.30	48	22.10	20	9.30	3	1.40

Source: Field survey, 2012

Table 5. Identification and integration of exogenous knowledge and indigenous agro-biodiversity knowledge

Inquiry (N=228)	n	%	Example of integration (N=21)	n	%
Inquired on IK	33	14.50	Participatory sowing/planting	11	53.38
Methods of inquiry (N=26)			Design of intercropping	4	19.05
Interviews during field and household surveys	21	80.77	Looking soil quality in the farm	2	9.52
Interviews during meetings	5	19.23	Advise on pest control and planting	1	4.76
Integration with exogenous knowledge (N=228)			Participatory design of savings/credit associations (vicoba)	1	4.76
Information providers integrate IK	24	10.50	Operation of cassava processing machine	1	4.76
Meet farming requirements (N=230)			Training on proper weeding and spraying	1	4.76
IK met farming requirements	151	65.70			
Willing to share IK with development partners (N=230)	185	80.40			

Table 6. Perceptions on usefulness of indigenous knowledge in management of agro-biodiversity

Perception	Frequency	Percent
Very useful	73	32.7
Useful	89	39.9
Somehow useful	50	22.4
Not useful	11	4.9
Total	223	100.0

Source: Field survey, 2012

process and preserve some of these wild foods. Moreover, it was reported that such knowledge is transmitted between generations when children accompany their relatives in harvesting activities. Similar findings were also reported by Somnasang *et al*. (1998) in north-east Thailand.

The integration of agro-biodiversity exogenous and indigenous knowledge: The respondents were asked to provide details if they were satisfied with the agricultural IK that existed in their communities, their willingness to share their IK for agricultural development purpose, and if rural knowledge providers identified their agricultural IK.

Identification of indigenous knowledge in the rural areas by information providers: The respondents were asked to indicate if they were involved by knowledge providers in an effort to identify their IK when developing and disseminating agro-biodiversity technologies in their communities, and the methods used by knowledge providers to identify their knowledge. Thirty three (14.50%) respondents indicated that rural information and knowledge providers had involved them in an effort to identify their IK when developing and disseminating agro-biodiversity technologies. Those 33 (14.50%) respondents were asked to provide details of the methods of inquiry about their agro-biodiversity indigenous knowledge. Twenty one (80.77%) respondents stated that the information providers inquire about IK during field and household surveys on farming, while 5 (19.23%) stated that they are inquired during meetings (Table 5). The findings indicated that few farmers were involved in the participatory research activities in the surveyed communities to generate knowledge. Thus, these findings indicate that knowledge was mainly created within the social paradigm more than the scientific paradigm in the surveyed communities.

The need to integrate agricultural exogenous and indigenous knowledge in the local community: The respondents were asked if the existing agricultural IK in the local community was sufficient to meet their farming requirements. One hundred and fifty one (65.7%) respondents reported that IK was sufficient to solve their farming problems (Table 5 above), 57 (24.8%) were not satisfied with the IK that existed in their communities, and 22 (9.6%) respondents did not have any opinion. Those farmers who indicated that IK was not sufficient to solve their farming activities state the following reasons which are arranged in descending order of importance:

- **Low agricultural production:** The respondents reported that they experienced low agricultural production due to the use of IK. Thus, farmers suggested a need to have access to external knowledge in order to improve their knowledge base and agricultural productivity;
- Unreliable weather such as rainfall. They stated that local landraces were not able to perform well when rains came late and or diminished earlier in the season;
- Lack of extension services to train farmers on how to integrate exogenous knowledge and technologies with indigenous knowledge and technologies. Hence their IK remained ineffective in solving some problems such as animal and plant diseases, soil fertility decline, marketing information, and sources of credits.

This study further sought to establish farmers' willingness to share their knowledge to the development agencies for improved farming practices. On whether farmers were willing to share their knowledge for developmental purposes showed that the majority of the respondents 185 (80.4%) were willing to share their knowledge, 17 (7.4%) were not willing, and the remaining 28 (12.2%) did not have an opinion on that (Table 6). When asked to state their opinions on usefulness of IK in the management of agro-biodiversity, 212 (95.0%) stated that the knowledge was useful and only 11 (5.0%) stated that the knowledge was not useful.

Conclusion and recommendation

Conclusion

This study found that the primary sources of agricultural IK were predominantly tacit and local, which included personal experience, parents or guardian or family or neighbours, friends and relatives. Other sources of IK were also local sources, which included social group gatherings, village meetings, village leaders, and farmers groups. Farmers made little use of formal sources of knowledge such as books, posters, newspapers, seminars and agricultural shows. Farmers rarely used formal sources of knowledge (public and private extension services) and printed materials to acquire IK. These findings were supported by the results of other studies in developing countries such as Uzbekistan (Wall 2006) that local sources were the major sources of agricultural IK as compared to formal sources of knowledge. These findings are also supported by various other authors such as Earl (2001) and Meyer and Boon (2003) who contended that face-to-face communication is the major mechanism for acquiring knowledge in the organisations and local communities. Overall, it can be concluded that the identification of IK types was important to determine and understand what farmers knew and how that knowledge could be located to add value to the agricultural activities. Agricultural development would best be served by educating researchers and extensionists in the significance, complexity and usefulness of local knowledge. The findings agree with the socialization sub-process of Nonaka and Konno's (1998) knowledge creation model (socialization, combination, externalization, and internalization) that these were practiced by the local communities to create new knowledge for farming purposes, but the externalization, combination and internalization processes were practiced at a low rate. On the whole, it can be concluded that knowledge was mainly created, accessed and shared within the social paradigm more than the scientific paradigm in the surveyed communities.

Recommendation

Based on the findings, the study recommends the following, especially for knowledge intermediaries like extension staff and information professionals:

- The study recommends that it is important to identify the existing knowledge for effective KM practices and to assess how knowledge can add value to the agro-biodiversity activities. The knowledge intermediaries such as extension staff and NGOs staff should carry out regular user studies to identify IK in order to determine areas that need intervention, and to enable the local people to locate knowledge they need in their communities. Thus, mapping of the communities' knowledge would also be feasible.
- The knowledge intermediaries should involve the local communities at every step of the knowledge identification process to bring the sense of ownership, to empower them to manage their own knowledge, and adapt to other knowledge systems.
- It is further recommended that information professionals should prepare inventories and registers of traditional knowledge systems, taking into account the intellectual property rights implications. Similarly, they should market IK especially to young people, using effective marketing strategies. In addition, they should create IK collection development policies, standardized indexing and cataloguing and should also compile bibliographies of identified IK materials.

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