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Scholarly communication among agriculture researchers in Mozambique

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Abstract: The article reports on a study of scholarly communication among researchers at IIAM, the leading agriculture research institute in Mozambique. It had two components: a bibliometric survey of Mozambican agricultural research publication and a questionnaire survey. The bibliometric survey found research output in terms of formal publication to be rather low. Of the 37 peer-reviewed journal articles related to agriculture in Mozambique in the years 2004 to 2010, only 11 had Mozambican authors. The second phase highlighted the dominance of reporting at conferences and in technical reports. Both phases reveal the importance of collaboration with partners outside Mozambique. The questionnaire survey suggests a number of possible reasons: the dominance of English in international reporting of research; the lack of journals in Mozambique; the more easy availability of funding from outside partners; and the lack of incentives.

Keywords: Agricultural research; Mozambique; Mozambican Researchers; IIAM

Comunicação acadêmica no âmbito da investigação agrária em Moçambique

Resumo: O artigo reporta sobre comunicação científica entre pesquisadores do IIAM, instituição que lidera a pesquisa agrícola em Moçambique. O artigo compreende duas componentes: a pesquisa bibliometrica de pesquisa agrária de Moçambique publicada e uma pesquisa por questionário. A pesquisa bibliométrica identificou que pesquisa formal é baixa em termos de número de publicações. De 37 artigos de revistas com revisões de pares publicado sobre agricultura em Moçambique entre os anos de 2004 para 2010 apenas 11 tinham autores moçambicanos. A segunda fase enfatizou a predominância de relatórios de pesquisas apresentados em conferências e relatórios técnicos. As duas fases revelam a importância de trabalho colaborativo entre autores moçambicanos e estrangeiros. O questionário sugere ainda como razão de pouca publicação: a dominância do inglês como língua internacional para relatar pesquisas; falta de revistas moçambicanas para publicação de pesquisa; pouca disponibilidade de fundos e falta de incentivos.

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Palavras-Chaves: Pesquisa Agrária; Moçambique; Pesquisadores; IIAM.

Mbulisanu mayelanu ni vutivi ndzeni vuxopaxopi la ta wurimi aMusambiki

Nkomiso hi Xichangana: Xitsalwana lexi xihlawutela tindlela ta mbulisanu mayelanu ni vutivi, ndzeni ka vaxopaxopi va IIAM, ndzawula leyi hirhangeleka vuxopaxopi la ta wurimi a Musambiki. Axitsalwana lexi xini sviyenge svimbirhi anga lesvi: bibiliyometika la vuxopaxopi la wurimi a Musambiki ni vuxopaxopi leli liyendliweke hi xivutisela. Vuxopaxopi la bibiliyometika likombise Lesvaku ntsego wa svitsalwana lesvisvipaluxiweke i yitsongo svinene. Ka 37 wa svitsalwana sva ta wurimi tikweni lesvi svipaluxiweke ka marevhixta ya vuhlelingatsimbirhi mahelanu ni ka malembe ya 2004 kuafika ka 2010, ntsena 11 wa svona svitsaliwile hi vaxopaxopi va Musambiki. Nakona wuxopaxopi likombise ngopfungopfu, maphepharungula ya mintirhu ya wuxopaxopi, lawa makombisiweke eka tinhlengeletanu nkombiso ni le ka maphepharungula ya vutshila. Sviyenge há svimbirhi svikombise hi ntshima, lisima la kutirhisana ndzeni ka vatsali va Musambiki ni vale handle ka tiko. Xivutisela xixungeta kutirhisiwa svinene Xinghiza emitikweni ya misava, akutsaleni ka svitsalwana; kupfumaleka ka marevixta ya kupaluxa ka wona aMusambiki; kupfumaleka ka timale tosapota wupaluxi la svitsalwana, tani svivangelo sva wupaluxi litsongo aMusambiki.

Marito-nhloko: Tidjondzo ta wurime; Musambiki, vaxopaxopi va vitivi; IIAM

Introduction

The article reports on a study of scholarly communication among researchers at IIAM, the leading agriculture research institute in Mozambique. It rests on three premises: that agriculture could be playing a stronger role in socio-economic development in Mozambique; that research plays an important part in development; and that research needs to be validated in scholarly circles.

Mozambique is listed among the poorest countries of the world (Infoplease 2007), although in recent years its GDP has improved to 7.1% (Worldfact book 2012). According to the National Institute of Statistics of Mozambique (INE) (2016), the agricultural sector in Mozambique contributes around 30% of the gross domestic product (GDP). It includes about 81% of the labour force. However, Carrilho, Benfica, Tschirly and Duncan (2003) argue that the low level of development of agriculture has been one of the principal causes of poverty.

The sector offers exciting opportunities for development with INE reporting that 47% of unused land in Mozambique is appropriate for agriculture and that the climate is suitable for diversification of crops. In her study of communication in a community of crystallographers in South Africa, Smith (2007) argues that effective communication of

scientific and technological information is crucial to the success of technological innovation and sustained economic growth. If this is true in South Africa, it must apply to its neighbour, Mozambique.

1 Scholarly communication and publishing

Scholarly communication is about creating, disseminating and preserving scientific knowledge. It uses diverse channels. There is comment in the literature on the differences between the basic or pure sciences and the applied. For example, Souza, at the Brazilian Company for Agriculture Research (EMBRAPA), found that only 20% of its knowledge is represented within formal communication, with the rest lying in informal channels (2003). Smith's survey of research in communication patterns in basic and applied sciences (2006) suggested that communication in applied science is often what she calls "vertical", between the researcher and a sponsor.

The publication of research findings is a fundamental aspect of research dissemination. Scholarly publishing exists to promote scholarship and research. To ensure the quality of publications, scientific publishing over the years has developed methods of verification and quality control such as double blind peer review (Mueller 2006; Rockwell 2007; Ocholla, 2011). Smith (2006, p.30) argues, however, that the most important part of research work is the information transfers which come from collaboration among researchers *before* formal publication.

The theoretical frame for the study is the long-standing model of communication developed in the field of telecommunications by Shannon and Weaver in the 1940s. In his discussion of scholarly communication in Africa, Lor (2007) observes that this model is still useful. However, it has to be said that the linear nature of Shannon-Weaver's "transmission" model does not allow for the initial cyclical communication among researchers. Figure 1 is an adaptation of the model to allow for the verification or validation which comes before the peer reviewing of formal publication. The focus of the study in Mozambique was the early phases of the model – on researchers' choices of channels to publish their work.

Table 1: Shannon & weaver communication model

COMMUNICATOR	MESSAGE	*Verification*	CHANNEL	*User*	*Effects*
Researcher	Research fin	Informal feedbacl Peer review Accreditation	Report Journal WWW Research repository Email, Wikis, Blogs		

Source: Shannon & Weaver (1949).

A brief review of existing research

The review of literature paid particular attention to African countries, Brazil, because of its common colonial history with Mozambique, and to India, which with South Africa and Brazil is a partner in the IBSA Dialogue Forum. Distinct, but often interwoven, threads in this literature include:

(i) Patterns and trends in author collaboration (Jacobs 2007; Sharma 2009). Collaboration across institutions and disciplines is a growing and positive trend. Anwar's bibliometric survey of scientific publication in India (2006) found a huge growth in agriculture research publication in the 1990s and 80% of outputs coming from co-authorship; (ii)Challenges for scientific communication in Africa arising from shortcomings in the research environment (for example Teffera 2003, p. 12; Azzi 2005; Lor 2007, p. 305; Okafor 2010). The result is that African researchers tend to report on their research at local seminars and in other informal channels. Their research thus remains less visible to the outside world; (iii) Questions around quality control. Established researchers still distrust open-access journals (Fullard 2007; Koltay 2010). Writers like Sarmento (2006) and Rockwell (2007) stress the importance of the traditional mechanisms like double blind peer review. But another thread of writing points to the biases in the traditional mechanisms, for example against new and non-English speaking authors (Koltay, 2010); (iv)The impact of ICTs on scholarly communication. Here there are two key themes: the rise of electronic publishing with open access journals and research repositories offering new possibilities (Fullard 2007); and the changes in scientists' behaviours (Smith 2006, 2007). The electronic media have transformed research communication in Brazil (Pinheiro, 2003; Souza, 2003; Bertin, Fortaleza and Suhet, 2007). They now share their preliminary findings in blogs and online discussion groups, meaning that research is open to scrutiny at an earlier stage.

In 2006 Ocholla and Onyancha published a bibliometric study of research output in agriculture in Africa in the years 1991 to 2004. The study revealed that South Africa and Kenya were the leaders in agriculture research output in Africa. It found 15 documents relating to Mozambique in the period 1991 to 2005.

Research questions and design

The authors' study was partly motivated by Ocholla and Onyancha's comment on the weak research output of agriculture in Mozambique (2006,p. 230). The questions that guided the study include: How is Mozambican agriculture research communicated? What factors influence researchers in choosing channels to disseminate their research? What do they perceive to be the main barriers in the way of their research? How have ICTs impacted on the dissemination processes of their research? Two approaches were used to explore these questions: a bibliometric survey of Mozambique's agriculture research; and a questionnaire survey of researchers at IIAM, the major centre of agriculture research in Mozambique.

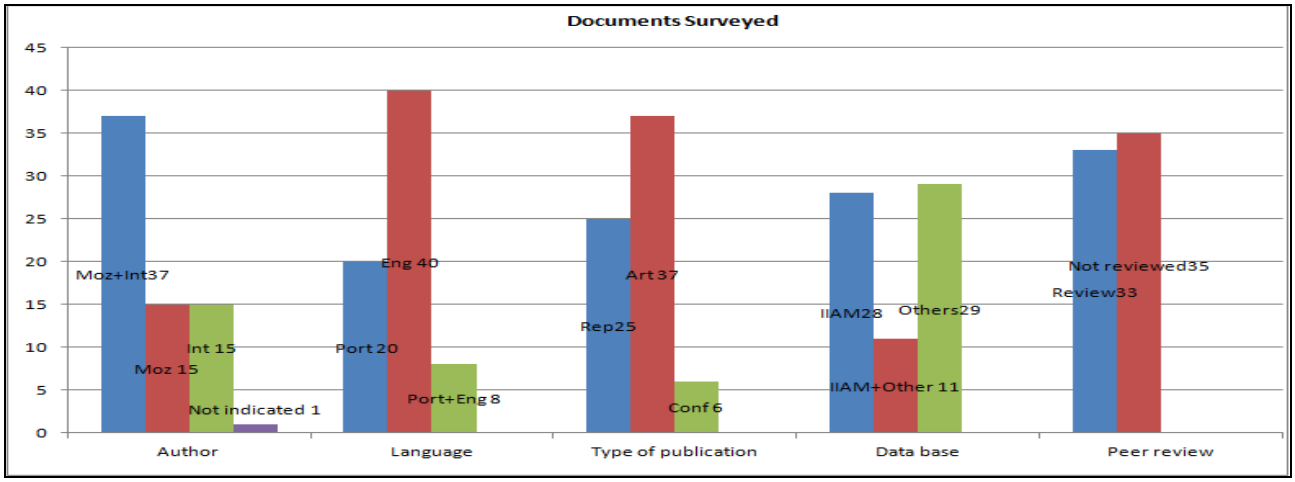
The first bibliometric phase comprised searches of bibliographic databases for records referring to agriculture in Mozambique from 2004 to 2010. This period was chosen as there are other studies of African research output covering the years before that which include Mozambique (for example Ocholla and Onyancha 2006). The databases included Scopus, ISI Web of Knowledge/Science, Agricola and Science Direct, as well as the IIAM institutional repository and Google Scholar. There was no attempt to include blogs, wikis, and other informal online communication channels in the first phase of the project but they were alluded to in the later questionnaire survey of IIAM researchers.

IIAM has about 120 researchers with 30 at its head office in Maputo. It falls under the Mozambican Agriculture Ministry, its mission being to develop and disseminate research in agriculture. After a preliminary pilot survey in Cape Town, South Africa, the questionnaire (in Portuguese) was sent out by email in 2011 to 70 researchers randomly chosen from the list of 120 names provided by the IIAM directorate. The eventual total number of respondents was 43.

Discussion of findings, Phase 1: Bibliometric survey

Sixty-eight unique valid records were downloaded. The records were tabulated according to attributes key to the project. The differences in scope and policy are clear when looking at the difference in results between Google and IIAM Repository, on one hand, and the databases, on the other. Google picks up, for example, anything put out by Eduardo Mondlane University and Mozambican Agriculture Ministry. And the IIAM repository includes many seminar proceedings and administrative reports. Theses are not covered in the databases, a limitation of the project. Figure 2 summarises the data according to the five key aspects deemed to be relevant.

Figure 1: Document surveyed (N= 68)



Source: Research data **(**Data; bibliometric table of Mozambique research output)

Table 2 indicates how many publications were retrieved across the various databases.

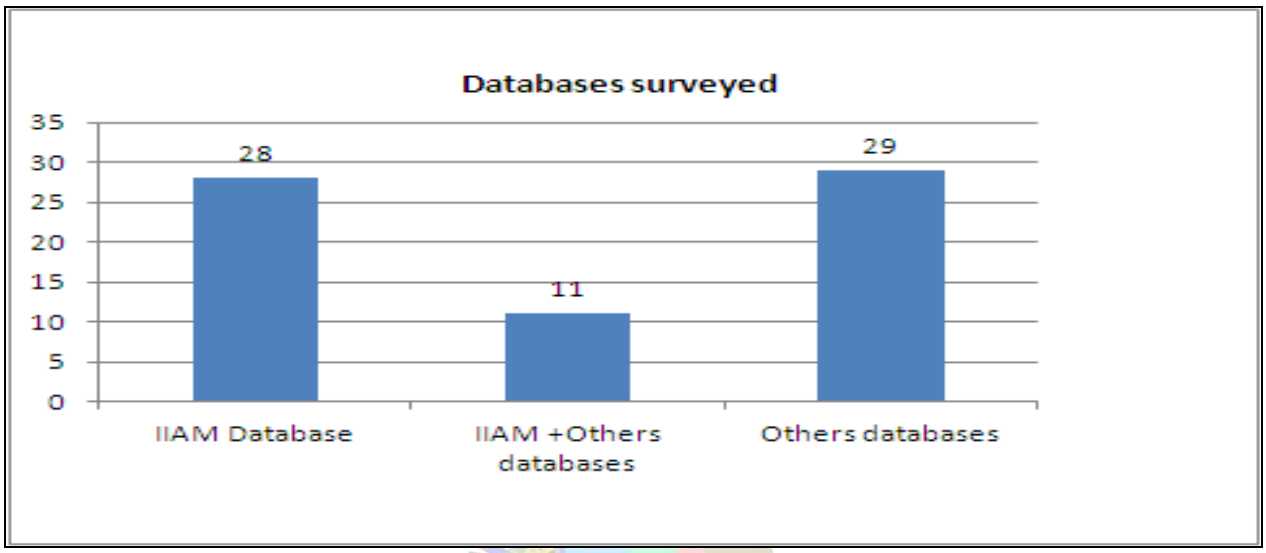
Table 2: Publications by Database 2004-2010 (N=109)

Years	Scopus	ISI Web Science	Agricola	Science Direct	Google Scholar	IIAM Repository	Totals
2004	3	2	1				**6**
2005	2	2	3	1	1	2	**11**
2006	4	1	1	1	1	2	**10**
2007	4		1	2	2	6	**15**
2008	4	4	3		3	9	**23**
2009	5	4	1	2	5	10	**27**
2010	3	2		1	1	10	**17**
Totals	**25**	**15**	**10**	**7**	**13**	**39**	**109**

Source: Research data

Figure 3 isolates IIAM publications. It shows that 28 of the 68 unique records in Table 1 belong only in the IIAM Repository, 11 appear in it *and* elsewhere, and 29 do not appear in the IIAM repository. The implication is that IIAM publications are often not included in the more scholarly journals.

Figure 2: Data bases surveyed (N=3)

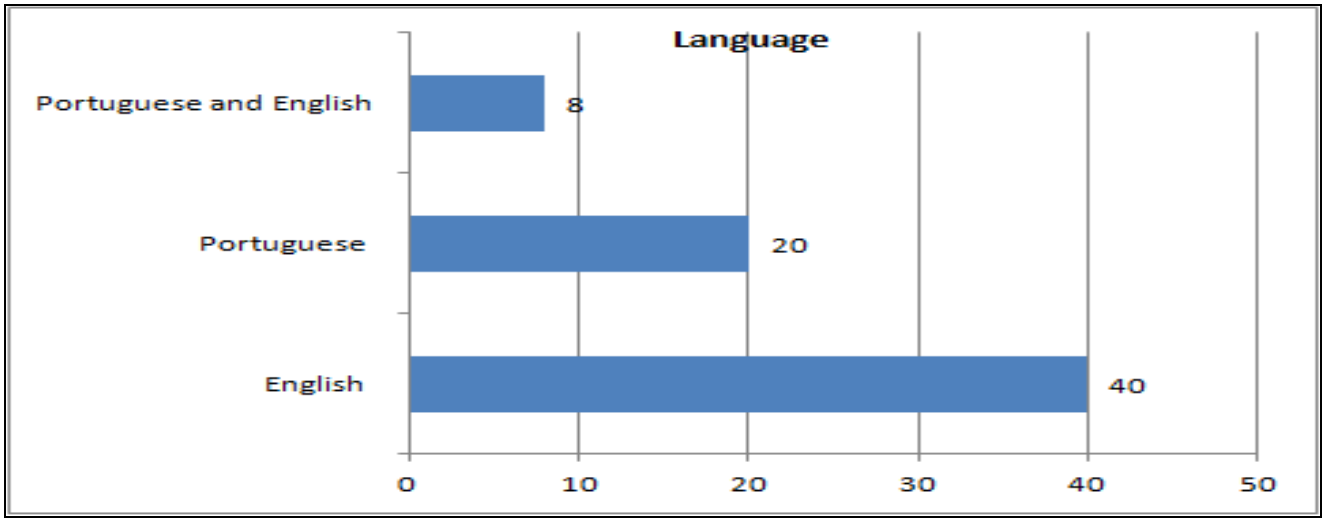


Source: Research data 2011

Figure 4 shows that collaborative authorship between Mozambican authors and international authors dominates. Most are in English, as is seen in Figure 5. The Portuguese items can be assumed to be largely conference papers and reports.

Although Mozambican official language is Portuguese but the predominance of English is high as is seen in the figure 5. The Portuguese item can be assumed to be largely conference papers and reports.

Figure 5: Language (N=68)



Source: Research data

The table 2 illustrate the distribution of documents per year and type of publication.

Table 2: Distribution by Type of Document 2004-2010 (N=68)

	2004	2005	2006	2007	2008	2009	2010	Total
Conference paper		1			1	2	2	**6**
Scientific article	3	3	2	8	8	7	7	**37**
Research report		1	3	2	7	7	5	**25**
Total	3	4	5	10	16	15	15	**68**

Source: Research data

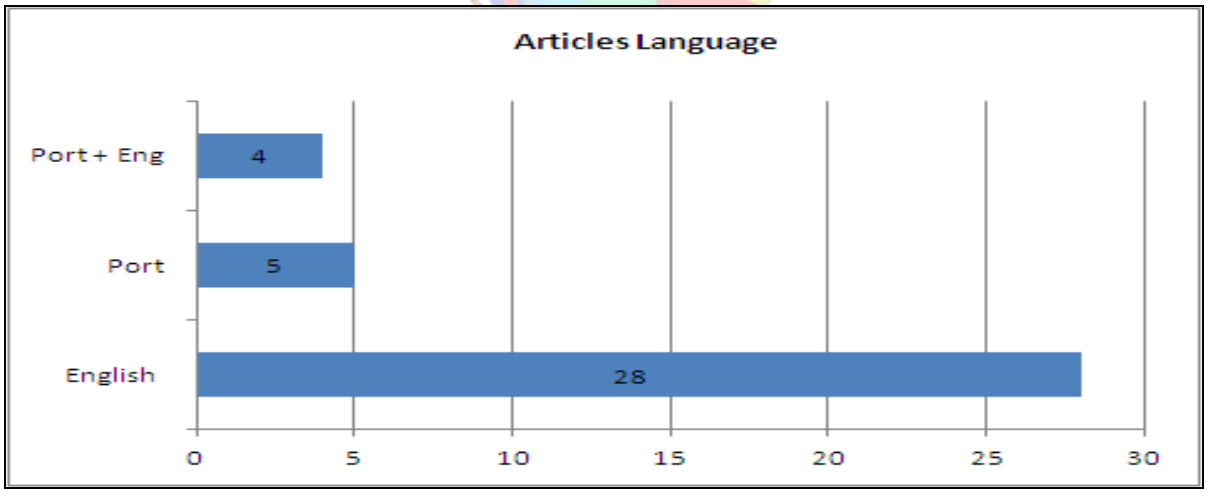
From 37 articles retrieved in this research only one article has Mozambican authorship. As can be seen in the figure 6, large number of article share the authorship between Mozambican and international researchers, by the other hand, 11 articles has only non-Mozambican authorship

Figure 6: Journal Article Authorship (N= 37)

Source: Research data

In term of language of articles, four articles are in both language, five articles are in Portuguese and large number from 37 articles are in English, as figure 7 illustrate.

Figure 7: Article Language (N=37)



Source: Research data

Phase 1 concluded that research output of agriculture in Mozambique is rather low. Mozambican authors publish mostly with international authors and mostly in English, perhaps owing to the collaborative writing. The IIAM Institutional Repository holds the highest number of documents. However, of the 37 journal articles, only eight are listed in the IIAM institutional repository. It has a large number of reports and conference papers, rather than scientific articles. The bibliometric survey thus might indicate that agricultural

research in Mozambique is communicated largely by means of research reports and seminar or conference papers.

Phase 2: Questionnaire survey of IIAM researchers

The questionnaire had five sections: Section A gathering background information, Section B exploring respondents' informal sharing of research-in-progress, Section C documenting their formal communication patterns, Section D gathering their views on quality control procedures, and the last section just asking for a final comment. All respondents were Mozambicans: 24 male and 19 female. Table 3 summarises their educational qualifications. Seven were studying for higher degrees.

Table 3: Highest Formal Qualifications (N = 43)

Highest formal education level	
Honours	9
Masters	25
PHD	9

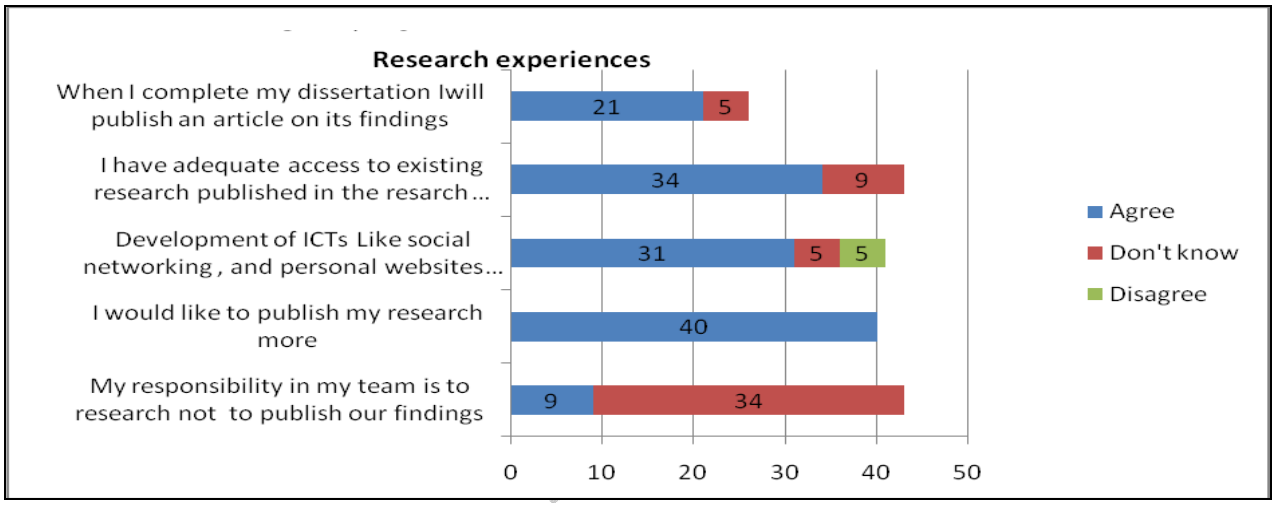
Source: Research data

Respondents had been working at IIAM from three to 21 years. Eighty-five percent of the respondents reported that they work in collaborative teams inside IIAM; and 18 reported that they work with institutions outside Mozambique. Sixteen of these are universities, mostly in Europe, but also in the United States, Brazil and South Africa. Further evidence of the outside connections of the IIAM researchers is the high number who reported that they consult for bodies outside IIAM, both inside and outside Mozambique. These answers lend support to comment that agrarian research activity in Mozambique and other former Portuguese colonies in Africa is commonly undertaken outside of official employers (Zimba, 2008, p. 11).

Answers to the question on sources of funding reveal a wide variety of funders. Not surprisingly, the Agriculture Ministry in Mozambique is shown to be the dominant funder, followed by the Ministry of Science and Technology. International bodies include the International Fund for Agricultural Development, the Food and Agriculture Organization, the International Crops Research Institute for Semi-Arid Tropics, the International Institute

for Tropical Agriculture, the Alliance for Green Revolution in Africa, the Forum for Agriculture Research in Africa, and the United States Agency for International Development. The last question in Section A tried to gain insight into respondents' views on publishing through a series of Likert scale statements. Figure 8 shows general agreement on the desire to publish more. The high agreement that access to research databases is adequate is noteworthy, given the contradictory comment on African access to ICTs (for example Lor 2007, p. 304).

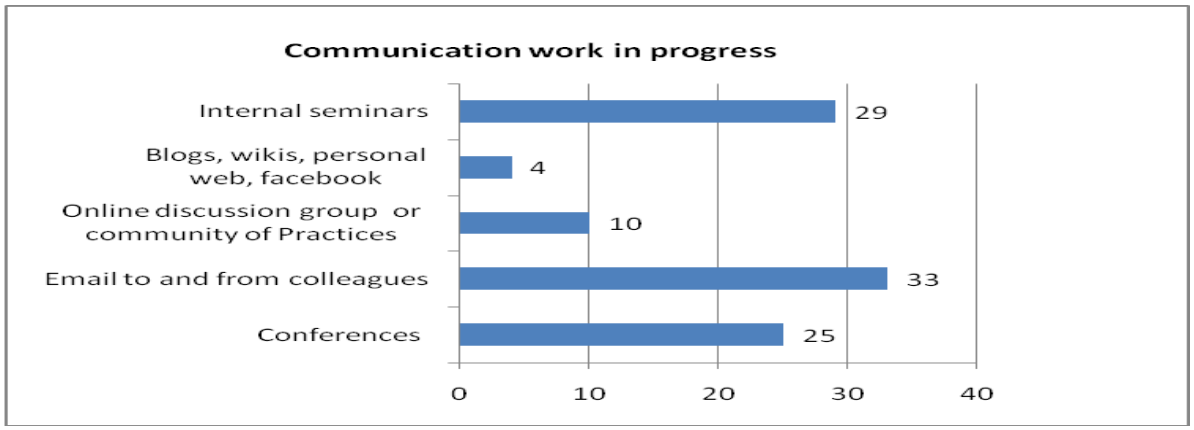
Figure 8: Views on Publishing Research



Source: Research data

Section B explored the communication of work-in-progress. Responses give an impression of active talking and sharing of work in the course of a project, by means of emails and regular team seminars. There was rather low response to the option of online channels such as communities of practice and even lower support for the other social media.

Figure 9: Informal Channels for Work In Progress



Source: Research data

Section C of the questionnaire examined formal publication. The total number of formal publications in the previous three years by all the respondents together was found to be 94 – with the three respondents with a PhD responsible for 46 of these. Figure 10 summarises the answers to the question asking why people had not published. The most common answer that sponsors restricted publication is understandable as the findings might well be of commercial value. The "other" reasons enrich the picture, for example:

"[Too] much management work rather than research"

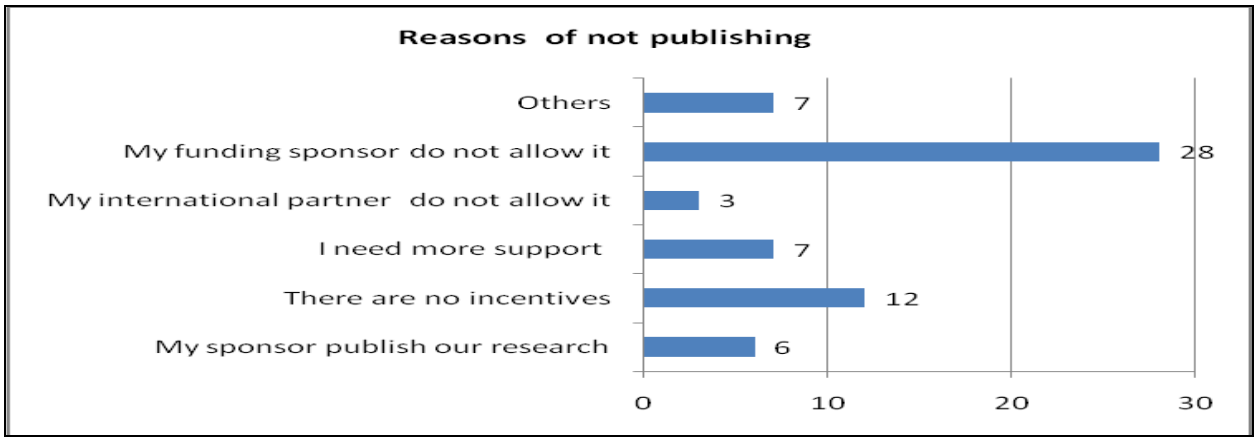
"Lack of information and possibility to publish"

"No equipment and funds"

"Peer review journals are very strict in their requirements for scientific publications"

"Senior partner not focused on publishing".

Figure 10: Reasons for Not Publishing



Source: Research data

Table 4 shows in which channels published authors had published. The high number for the IIAM repository and the strong response for IIAM newsletters and annual reports (10) show the importance of what might be called IIAM's self publishing as well as its online publishing.

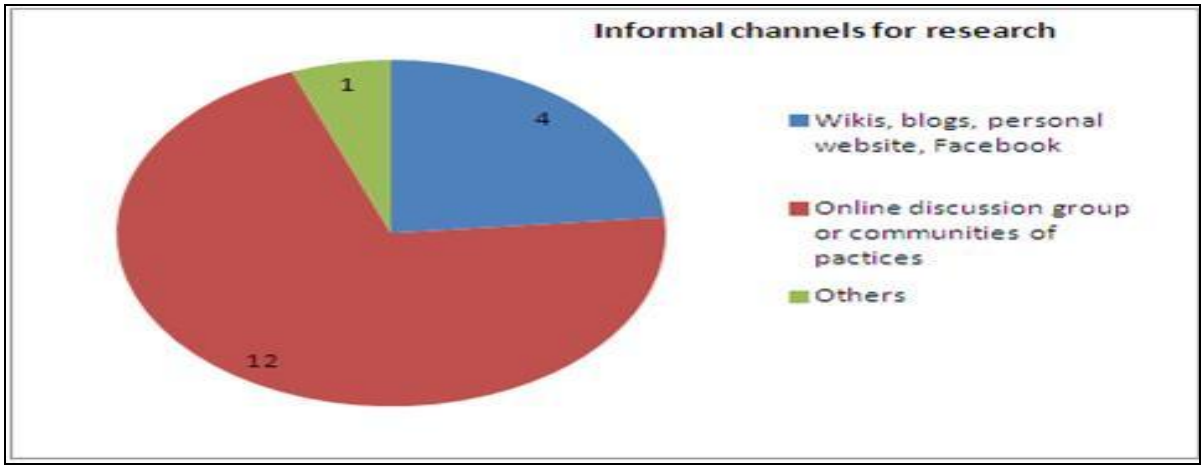
Table 4: Publishing Channels

Where you published your research findings	
In a peer review journal	11
In a journal that does not have peer review	9
As peer reviewed chapter of book/monograph	2
As whole book (monograph)	3
In the annual report of my sponsor	3
On the IIAM website	12
In conference proceedings	12
In the IIAM newsletter or annual report(printed or online)	10
Elsewhere, please specify	3

Source: Research data

Figure 11 shows the low use of informal channels to communicate research among IIAM researchers to communicate theirs research output.

Figure 11: Informal Channels for Communication of Research (N=17)



Source: Research data

The open-ended question that followed returned to respondents' challenges by asking them simply to describe what was getting in the way of their publishing. The answers are shown in Table 5.

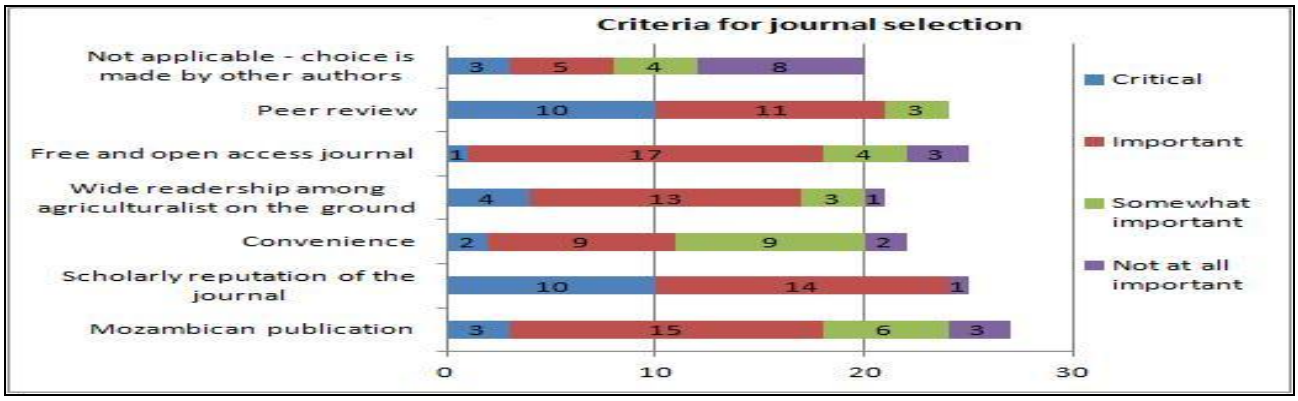
Table 5: Barriers that Hinder Publishing for Published Authors (N=14)

Problems or barriers that hinder publishing		
Unit of meaning/theme	**Selected quotations**	**Questionnaire**
Lack of incentives	"Publication still not have weight for professional and competencies evaluation in Mozambican system" "There is no research policy"	Q 1,Q 5,Q 6, Q 19, Q 12, Q 14,
Technical support issues	"Price of editing and review" "Shortage of people to proof read work" "Requirements of journals too difficult" "Inadequate access to the literature"	Q 10, Q 24, Q 27, Q 32, Q 23, Q 40
Time constraints	"Management activities"	Q 4, Q 18

Source: Research data

Respondents' priorities in choosing a journal are revealed in Figure 12. Peer review in scholarly prestigious journals is regarded as crucial among the IIAM researchers who are publishing; but the Figure also shows some support for "free and open access" and for Mozambican publication. Respondents were asked to consider the separate statement "I have a better chance of being published if I have a co-author outside Mozambique". The fact that 24 of the 30 who answered agreed on the advantage of having a foreign co-author is noteworthy.

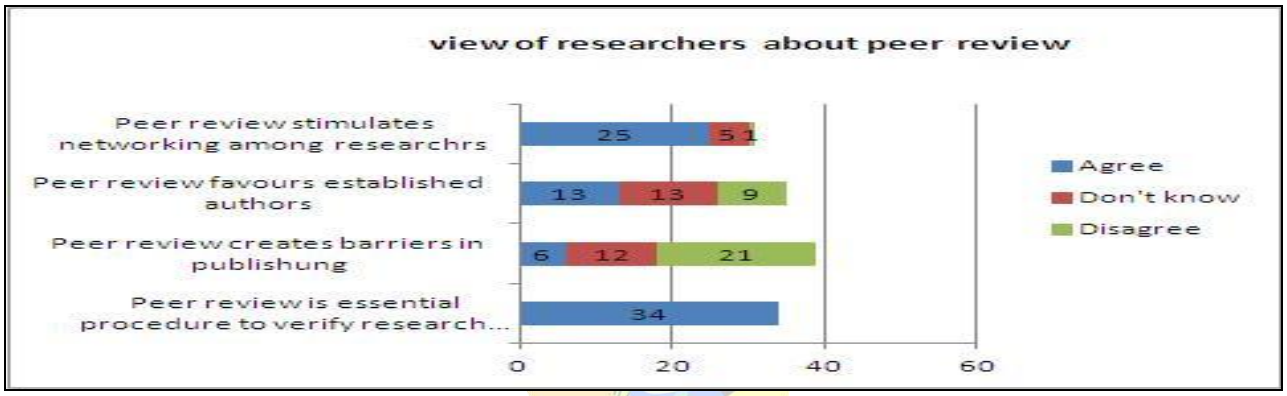
Figure 12: Criteria for Journal Selection



Source: Research data

Section D addressed the respondents' perceptions of quality control. Four strategies can be detected in the 21 replies to the open-ended question on how they ensure the quality of their research findings: internal vetting, reviewing by sponsors, cross referencing in the literature, and sending drafts to experts. The unanimous agreement shown in Figure 13 that peer review is essential to quality assurance is striking, as is the strong belief that it encourages networking. There is some support, however, for the suggestion that peer review might disadvantage new authors as Koltay (2010) argues.

Figure 13: Opinions on Peer Review



Source: Research data

The concluding comments from just six respondents express dissatisfaction over inadequate incentives and resources. One refers to the pressure to produce quick results for sponsors. Key findings of the second phase questionnaire survey are: a) Respondents are involved with many other agriculture research institutions inside and outside Mozambique and many are involved in private consultancy activities; b) IIAM researchers exchange ideas and work in progress through email with colleagues, technical meetings, and short presentations in informal meetings. The use of personal blogs, wikis and social media, as well as virtual communities of practice, is still weak; c) IIAM researchers' research outputs are published mostly in conference proceedings; d) Almost all say they would like to publish more often. The three people with PhDs are responsible for 46 of the 94 publications in the last three years; e) The main reasons for not publishing research outputs are the need to get permission of sponsors and lack of incentives for research; f) Scholarly reputation and peer review are valued highly by the researchers.

Convergence of findings across both phases

Both phases confirm the importance of collaboration among researchers in the applied sciences. There is strong agreement among the respondents in the questionnaire survey that they need a foreign co-author to be considered for publication in the established journals. The two sets of data show the dominance of informal reporting at conferences and of technical reports. Two-thirds of respondents' publications in the past three years are found in the form of technical reports. There are some comments in the questionnaires that agriculture relies on technical reports and so should not be judged by the criteria of other fields. These comments throw into question the bibliometric studies and assessment of countries' research outputs so common in the literature.

The profiles of the respondents in the second phase give some insight into choices of channels of communication. Most are funded by sponsors and many are involved in private consultancy activities. Many of the respondents have degrees from or are enrolled for degrees at universities outside Mozambique. The scholarly reputation of journals is valued highly by the researchers who have published articles in the past three years. But at the same time, there is a desire for open access and for Mozambican publication. The responses suggest the potential for open access publishing once researchers are sure of its quality control mechanisms. There is consensus among respondents on the value of peer review. However, some (37%) perceive bias in the formal peer review system, saying that it favours established authors. The survey suggests that ICTs and social media have not, as yet, had a large impact on the communication of Mozambican agrarian research, as compared with Brazil. The IIAM IR is clearly important but there are suggestions that it is poorly maintained.

Conclusions

Agriculture is a crucial economic activity for Mozambique; its growth depends on the dissemination of knowledge acquired through research. The study suggests that IIAM should reinforce its human capital and research policies and should create more incentives to research rather than work in consultancies. ICT's capability to stimulate collaborative research among researchers in Mozambique and internationally should be recognized. The study was limited to the field of agriculture and focused on a small group of researchers. It is restricted to only the first part of what might be called the communication

chain. It would be valuable to follow the project with an investigation of the communication infrastructure across the IIAM regions and with one of the communication between IIAM field workers and community farmers.

As indicated in the literature, the little communication of research output hinders development of the country. Mozambique as a country is not developing strong research policies to promote research and its communication; hence there are no research journals in the country, which leads to Mozambican researchers having to rely on international publishing instruments. As per the objective to analyze how agricultural research is done and communicated in Mozambique, it can be concluded that this is primarily done in the English language and in cooperation with international authors. It should also be noted that due to the lack of publishing instruments, Mozambican researchers use seminar and conference papers rather than journal articles to publish theirs research.

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