ICT in Agriculture Extension and Marketing
in Malawi and Mozambique

Centre Technique de Coopération Agricole et Rurale ACP-UE
Technical Centre for Agricultural and Rural Cooperation ACP-EU

CTA

Research Report
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Marcel Werner
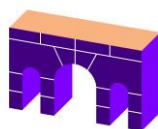
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1 Acknowledgements

2 Abbreviations

CBO	Civil Base Organisation
CTA	Technical Centre for Agricultural and Rural Cooperation ACP-EU
FEW	Frontline Extension Worker
ICT	Information and Communication Technology
ICT4D	Information and Communication Technology for Development
IP	Internet Protocol
ISP	Internet Service Provider
MAI	Ministry of Agriculture, Irrigation & Food Security (Malawi)
MINAG	Ministério da Agricultura (Mozambique)
NGO	Non Governmental Organization
P2P	Peer-to-peer communication
POP	Point of Presence (Internet)
PRO-AGRI	Programa Nacional de Desenvolvimento Agrário (Mozambique)
TO	Telecommunication Operator
VoIP	Voice Over Internet Protocol

3   Executive Summary

This report is the result of a study carried out for CTA on "ICT in Agricultural Extension and Marketing", in Malawi and Mozambique between August 2004 and March 2005. The study involved surveying agricultural and rural development stakeholders, as well as consultations among those stakeholders to bring out views on information needs and perceptions on the possible role of Information and Communication Technology (ICT). The state of development of the ICT industry in the countries concerned was reviewed as well. Below is a summary of findings.

3.1.1   Adoption of ICT

The adoption of ICT by agricultural sector stakeholders shows results from headquarters level up to branch office level (provincial, regional offices). From branches further upstream to rural localities there is minimal adoption. In this study, we use the term 'ICT Readiness' to express the level of adoption and potential for rapid ICT-enabled service enhancements. Two ICT trends are relevant to the rural localities: easy adoption and spread of SMS (Short Message System of mobile telecommunications networks) and Community Radios. SMS is important as it represents keyboarding and datacommunication exposure to users. Survey participants operating at branch and rural level show SMS usage at above critical levels: 59% in Malawi and 50% in Mozambique, suggesting opportunities for service development targeting rural based actors. The SMS service providers are beginning to pursue introduction of value added services, such as SMS banking. The Community Radios are beginning to deploy Internet technology capable of supporting quality programming. At the same time, Community Radios are benefiting increasingly from favorable public policy expressions and regulation.

3.1.2   Internet activity

Internet activity is at a low level of technological sophistication, but widespread, with 84% of Mozambican participants using Internet at headquarters against 44% in Malawi. At branch level these figures drop to 55% and 26%, respectively. Updating websites is often poorly or not at all taken care of; and organisation's websites are rarely being used for service delivery which is only seen in very exceptional cases. Few stakeholders in this study have websites: 22% in Malawi and 34% in Mozambique. Beyond those in the public sector and parastatals, few of these sites target operators within the country.

ICT adoption disparities between branches (rural, province) and headquarters (capital city) are less marked in Malawi than in Mozambique. The explanation lies in the one hand in the challenge caused by great geographical distances in Mozambique in achieving high network coverage. In the other hand, Maputo scores relatively high in ICT, this being an economic centre attracting much activity from South Africa, Portugal and other developed countries. ICT services costs are relatively high in the countries under review. Indexed against service usage baskets, Malawi scores highest costs with index 84, Mozambique index 75 and Kenya 46.

3.1.3   Use of information and media

Stakeholders in agricultural and rural development, acknowledge that sharing of information and distribution of resources is underdeveloped in both countries, despite

the obvious economic necessity. This concerns both sourcing of information and media productions, as well as distribution and dissemination networks. Sector statistics are collected annually but parallel work is being done by various stakeholders. Most service providers develop their own materials (print, radio). Quality of information materials including broadcasts is often subject to criticism by stakeholders. The adaptation and packaging of information for extension (field) purposes is poor. Mozambique boasts more examples of service providers using mass media houses for information dissemination than Malawi. Operational collaboration between government extension services and NGO's is common in Mozambique, with some good examples in Malawi. Print extension materials often seem to have arbitrarily set circulation volumes, usually far from enough copies to occasionally far too many. The distribution of print news media is very low in both countries: our evidence suggests as little as 0.51% of rural population in Malawi and an optimistic 0.34% in rural Mozambique (few data available for Mozambique). In rural Malawi, there are 4 radio receivers per 100 population (Mozambique figure not available). Television broadcasting presently has relatively little potential for agricultural development, the main reason being network coverage. Even in a relatively small country as Malawi coverage is not higher than 20% of national territory. There are no signs that TV networks will expand soon.

Telecentres were surveyed on their usefulness for agriculture and rural development agents. We found hardly any evidence of visitors searching for agricultural information. This is in spite of many voices, again at the roundtables organized for this study, calling for the establishment of telecentres in rural areas. In addition, most telecentre visitors use the Internet almost exclusively for webmail. Web access tariffs charged by the operators are between two to three times higher in small rural based telecentres than in urban centers.

3.1.4   Outreach

The problem of quality and outreach of agricultural extension services is undisputed by any of the study's participants. The limited effectiveness of the extension services is most pertinent in Mozambique: the Ministry of Agriculture employs no more than 500 Frontline Extension Workers (FEW) in the entire country. Even with the collaborative programmes in place with NGO's and private sector, there is a large vacuum in service delivery. The challenge is confounded by lack of ICT access (see above), large distances to regional centres, lack of information materials and human resources education levels. In Malawi, high casualties of HIV-AIDS have an impact on the performance of the ca. 2,000 extension staff work-force. The distribution of extension materials appears not to be in line with demand and demographics. In both countries, the government creates agricultural statistics once per year, but with considerable time delays and limited depth and detail. Stakeholder's websites are often not targeting outreach functions, and if they do, they are not being used for this, judging from surfing habits of participants in this study. Email based bulletins are however being used already in reaching farmers and traders.

Annexed to this study is a searchable database Inventory of Agricultural Service Providers and Inventory of Telecommunication Operators (Telco's or TO's) and Internet Service Providers (ISPs), for Malawi and Mozambique, containing basic profile and contact data.

4   Introduction

This report is the result of a study commissioned by the Technical Centre for Agricultural and Rural Cooperation ACP-EU (CTA), carried out between July 2004 and March 2005. The objective of the study was to: analyse the use of ICTs in rural areas of southern Africa by organisations with a mission in agricultural and rural development; assess how ICT might play a bigger role in agricultural extension and marketing. The countries selected to conduct the field study were Malawi and Mozambique.

The study may provide some answers to issues raised at CTA's Observatory on ICTs 6th Consultative Expert Meeting, Wageningen 23-25 September 2003. The momentous conclusion regarding the potential for ICT in agricultural extension is: "Technology and the Internet will not make it happen" The Meeting concluded that "connectivity constraints are still enormous and will remain so in the foreseeable future, and that there was therefore not very much to develop in terms of Internet-based knowledge sharing, market information services, Q&A services, etc." Other conclusions were: "Rural development organisations have insufficient technical know-how to develop relevant content." "ICT experts are not tuned to creating solutions in the context of extension work and rural organizations lack the skills to find solutions using ICTs." "There have been almost no ACP-specific, technological developments in ICTs that support rural and agricultural development work. A lot of bright people have seriously looked at it, but it simply hasn't happened yet."

A key observation of the Meeting was that "the role of extension will have to change, from a focus on transferring technological innovations from research to farmers, to brokering and facilitating a wide range of information and services (information on technology, markets and prices, weather, etc.)." This offers a clue for ICT-enabled service design activity. Manobi in Senegal (www.manobi.net) appears to be among the few services employing the combination of Internet and mobile telephony, in fact, the only operational service from a new school of interactive, commercial oriented extension service approaches. It would be essential to assess Manobi's impact on farmers' welfare. There are more agricultural service providers who have turned to combinations of mobile telephony, SMS and the Internet. An example is Kenya Agricultural Commodity Exchange (www.kacekenya.co.ke) currently being cloned in Malawi (IDEAA, see below, chapters on Malawi).

This report may give rise to cautious optimism in the potential for ICT in agricultural extension and marketing. This optimism is based on the existing penetration of ICT among service providers, the dynamics in the mobile telecommunication industry, and the proliferation of local or community radio broadcasting stations.

The report is organised in three sections. The first two sections are reports on findings in Malawi and Mozambique. These reports follow the same structure: inventory of relevant organisations; ICT-readiness of these organisations; information service approach of relevant organisations; description of the ICT industry. The third section is a synthesis of findings with recommendations for action. References and listings are provided at the end.

5   Methodology

The methodology of this study comprised inventory compilation of agricultural and rural development service organisations as well as ICT service providers; conducting an ICT-readiness assessment among agricultural and rural development service organisations; conducting workshops to discover common views and perspectives; and conducting focus group discussions and interviews on information creation and usage. The study presents a situation analysis but not a trend analysis, as we did not create or use baselines and time series.

5.1   Selection criteria

The aim was to balance the number of organisations from the four different classes of organisations, (a) public, including parastatals; (b) NGOs and CBOs; (c) private companies and co-operative societies; and (d) trade associations, based on actual rural development activities undertaken. It was found that the number of private sector companies in agricultural and rural development support, does not match the number of NGOs. In the public sector, the larger number of relevant organisations was found among parastatals (eg. agricultural extension, research, meteorology, statistics, etc.).

5.2   Research activities

1. Inventory of Agricultural Service Providers, selected from organisations and groupings whose primary function is agriculture and related rural development support activities. This inventory is at different levels: national – district – village and comprises different classes of organisations: (a) public ,including parastatals; (b) NGOs and CBOs; (c) private companies and co-operative societies; and (d) trade associations. At the national level, the aim was to have an exhaustive inventory, while at the decentralised level, a sampling procedure with the help of local intermediary organisations was used. The instruments used to compile the inventory included desk research and fact finding visits to key organisations. The aim was to balance the number of organisations based on actual rural development activities undertaken.
2. Inventory of Telecommunication Operators (Telco's or TO's) and Internet Service Providers (ISPs); television and radio broadcasting organisations; print mass media; web-based information service providers. Details included network coverage, tariffs, circulation, technical parameters, web-based activities, as well as development plans of the operators.
3. Assessment of ICT-readiness among service providers. In this study, we take the liberty to use the term 'ICT-readiness' to express the level of adoption and potential for rapid ICT-enabled service enhancements. We did not apply any of the internationally accepted definitions of e-readiness (see eg. www.bridges.org): these definitions work well in an environment with a significant installed base of Internet-enabled services. However, Malawi and Mozambique are countries where the Internet is thinly spread, both in terms of number of users and of sophistication of applications. Furthermore, we are keenly interested in access and adoption of ICT in *rural* environments. Their ICT scores are lower than anywhere; at the level of the 'last intermediary' that offers services to farmers. We used a set of indicators that will assist in determining how at this point in time ICT may get a foothold in establishing and delivering information services. The organisations in this survey were sampled from public, private and civil society sectors, both at capital city headquarters level and at branch office level in provinces and rural zones. Only those organisations with core activities in agriculture or closely related activities for

example in Education were selected for the survey. The survey yields some indicators on ICT installed base; ICT recurrent expenditure; and print and electronic media production. Almost all interviews were conducted face-to-face. Whenever possible, PDAs were used to run questionnaires. A test-run of the questionnaire was done in Malawi, September 2004.

4. One-day workshops were held in both Malawi and Mozambique, with approximately 30 representatives from the organisations sampled in the Inventory of Agricultural Service Providers and they discussed information needs as well as the potential and constraints of integrating ICTs into existing communication systems. The role of participating Telco's and ISPs was to facilitate understanding of relevant ICT issues. Break-out grouping and focus groups techniques were employed.

5. Information exchange point interviews were conducted in provincial and rural centres, where both service providers and their clients were interviewed. The objective of these interviews was to understand information collection, information needs and information useage, by both service providers and their clients. Information exchange points included the 'last intermediary' (eg. farm extension officer; farmers' group leader). Survey tools were individual interviews and focus group discussions.

6   Malawi

A new government took office in early 2004 and is providing new policy direction, shifting emphasis from subsistence farming to bolster food security, to profitable farming to bolster national income. Agriculture contributes 40% to national income. Key indicators for Malawi are: Gross National Income per capita USD170; total adult literacy rate 60%; life expectancy 38 years. Source: http://www.unicef.org/infobycountry.

6.1   Overview of agricultural service providers

Agricultural extension and marketing services are provided by public and private sectors including NGO's. The practicability of providing services depends on the degree of farmer mobilization and organisation. The degree of farmer organisation is estimated by the Ministry of Agriculture and Irrigation - Department of Agricultural Extension Services to be approximately 20%. However, sources in the private sector, Farmers Union of Malawi (FUM) and Horticultural Development Organisation of Malawi (HODOM), estimate the level of effective organisation at much lower, not above 10%. Whereas this is significantly larger than in Mozambique (see chapter 7), it is still only a minority. This implies that the majority of Malawi farmers have limited access to service providers. This majority relies on retail suppliers, radio broadcasting, farmer field days, and infrequent village visits by extension officers, veterinarians and other service providers, for its information needs.

6.1.1   Ministry of Agriculture

The Ministry of Agriculture, Irrigation & Food Security (MAI) does not have an adopted ICT strategy. The roll-out of email addresses is a spontaneous development not yet supported by a coordinated budget and guidelines. A MAI website is in place, to be characterised as a documentary site, not having interactive applications. The site is not being updated. See www.malawi.gov.mw/agric/agric.htm (Fig. 1).

Fig. 1 – Ministry of Agriculture, Irrigation & Food Security - home

6.1.2   Extension services

Agricultural extension services are provided by the government, MAI - Dept of Agricultural Extension Services, as well as private sector including NGO's. The

government service employs approximately 2,000 staff, divided over eight Agricultural Development Departments (ADD's) nation-wide. Each ADD is divided into District Agricultural Offices (two staff, only a few with minimal ICT facilities), which in turn look after Extension Planning Areas (EPA's) from where FEW offer service to farmers in their zones. The ADD's have office facilities with telephone lines, but no Internet access. The facilities are used for regular seminars offered to extension staff. The government extension department has a media and communication service programme, with its own studio, printing facilities, megaphones, videocassette systems and other equipment, together with eight 4x4 vans, which are based in the capital city Lilongwe. All media equipment and systems are analog, legacy systems. There is approximately an installed base of less than 30 personal computers in the MAI extension service to date. Print materials are produced in large volumes of up to 1 million copies (fig 2), however, there is a limited number of titles. Popular titles are sheets on typical subsistence farming lines of activities. There are also print materials on how to establish farmer associations and monthly radio broadcasts are transmitted through Malawi Broadcasting Corporation (MBC). The service is afflicted by a high attrition rate: up to 30 staff withdraw each month, believed as a result of HIV/AIDS. Management priority is in (a) upgrading the knowledge level of staff; and (b) introduction of computers across the service.

What measures would you take if you could lay your hands on additional funds?

1. Upgrade staff
2. Introduce email and PC's at HQ, currently there are no PC's with Internet access at HQ, not mentioning at sub-stations.
3. Cinematic materials to be converted into digital format
4. Acquire video cameras (the current one is never available as it moves around with the Head of State)

Source: C.M. Kanyenda, Director Agricultural Extension Services, Ministry of Agriculture, Lilongwe 2004.

Fig. 2: leaflets Ministry of Agriculture - Dept of Agricultural Extension Services, Malawi

Government extension service leaflets Malawi: subsistence farming advice, in two languages; two pages A4, black & white; volumes from 100,000 to one million copies.

In Dedza (Central Region) a Regional Development Programme (RDP) is in place modeled on a mechanism of two-way communication between farmer groups on the one hand and government or NGO service providers on the other. Seven NGO's are supporting the programme. Since 2002, farmers have been organised into 66 groups, each comprising at least 10 members, gender balanced. Each group was given a solar powered and hand-driven radio. The radio is used in listening groups for agricultural programmes. Groups discuss issues that pop up. The RDP has a mechanism in place to communicate specific problem to higher authorities for action, through the District Development Officer (DDO). There is a paper trail with fortnightly reports documenting the process. The RDP Media Officer in Dedza work with the 'yellow vans' on hire from the MAI extension service, for video viewing and production. All print materials received are distributed and no stocks are left behind. Drama groups are in place in each of the 10 EPA's (Extension Planning Areas). Note: out of the eight Agricultural Development Departments (ADD's), the Dedza ADD is the only one with an active and varied media programme in operation since 2002.

The MAI Department of Agricultural Research and Technical Services (DARTS) operates a documentary website www.agricresearch.gov.mw that cannot yet be regarded as a convincing information resource for the sector. It is not being updated, eg. 'Technologies Released' most recent example 1996 without specs or hyperlinks; announcement for a conference in November 2002 features under News Update. DARTS also publishes an 8 page quarterly with research news, in 2,000 copies sent to Ministry staff nation-wide. MAI creates agricultural statistics once per year, but with considerable time delays and limited depth and detail.

The private sector operates a few extension programmes, the most important one being Agriculture Research and Extension Trust (ARET), which is an operation of the Tobacco Association of Malawi (TAMA). It employs 15 FEW, who are supported by professional staff like a communications officer. Interestingly, this service has started offering services on more crops than tobacco. Promotion of the adoption of new technology requires intensive support: in one crop demonstration cycle, *no less than six farm visits* by the FEW are required (fig 3, Ligadzi Estate). Dimon (Malawi) is private tobacco production and marketing multinational, with its own extension service. This service makes extensive use of radio listening groups. Dairybord offer extension service to its 12 milk producers associations of 50 – 400 members. The emphasis is on seminars and farm visits. They do not produce print materials. Only one videocassette has been produced with no plans to make additional productions. NGO's with activities in farmer support include: CARE International, Action-Aid and NASFAM. The quality of advice from sales staff at points-of-sale can not readily be relied upon. Spot-checks suggest that the differences between three types of maize seed could not be explained to buyers (fig. 4 - Input Outlet).

Fig 3 - Malawi, Ligadzi Estate - To help introduce a new tobacco seedling technology takes 6 extension visits to a farm. How many farmers can get this kind of support?

Fig. 4 - Little technical information at Input Outlets

6.1.3 Farmer focus groups

Extension at the farmers' end: in a small-holder farmers 40-member focus group in Dzaone Village, Thondwe, Zomba (fig. 5). The village is under the supervision of an Agricultural Extension Development Officers unit (AEDO's, MAI) who directly educate farmers on Crop Production. They are also taught eg. how to make local pesticides using local herbs and shrubs e.g. Mthuthu, scientifically known as Trephozia Vulgelli. In addition, villagers listen to radio in a listening group, which was discontinued after a few seasons. However, "we now know how to use pesticides through radio programmes especially MBC 1." Finally, the role of the local chief in decision-making is important in farming. However, discussions revealed that counseling and education is incomplete, as in the case of Dzaone contributing to the phasing out of livestock keeping as a result of uncontrolled disease. Dzaone farmers: "We are taught by our advisers on how to identify these pests and diseases by observing their physical structure, features, signs and symptoms" "we are not taught on control measures as a result we lose our livestock and when crops are affected/infected, often we uproot the infected crops." Decision-making on planting timing is not based on any modern way. Dzaone farmers: "We discern changes in environment and when we are convinced with the first starting rains we know that this is the time to plant." The weather forecast broadcasts are being rejected. Farm input offerings are heard from radio bulletins by National Smallholder Farmers of Malawi (NASFAM) and ADMARC (parastatal trading company). One of the villagers is in possession of a mobile telephone. A few radio sets are present, but far from in every household.

Fig 5 - Dzaone Village – Extension information is incomplete which causes damages and failures

From interviews with individual small-scale commercial farmers (November 2004, Northern, Central and Southern Region) we made the following observations. Many do not have a telephone line, neither a cell-phone and have never heard anything about the Internet. Instead, they often visit the phone bureau at the trading centre
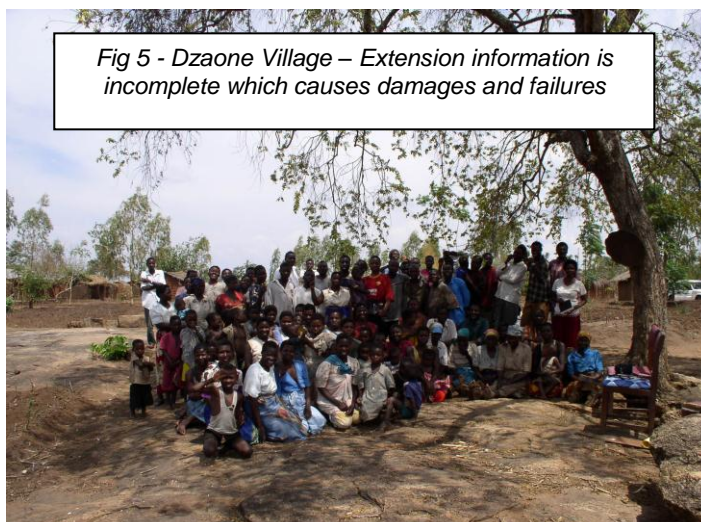
for communication. They also join farmer field days. In some areas (eg. Kasungu near Mchinji District) farmers report that there is neither radio nor cell-phone coverage. Some farmers distrust tobacco auctions and complain of lack of marketing and input availability information. Frequent change of production technology as required by markets is a challenge. Farmers interviewed at one tobacco estate (Kasungu) said that information services are provided at group level. And include technical advice and education from agricultural advisers. The interviewees normally request such information on time, however, they complain that often advice to change technology comes suddenly. Pertinent suggestions were to improve information delivery time, seen as a major problem especially when it comes to the introduction of new technologies eg. the use of trays to grow tobacco.

6.2   ICT-readiness service providers

The level of exposure to ICT was researched through a survey among over 75 organisations through 83 interviews of staffers or representatives. The organisations in the survey are sampled across Malawi and from public, private and civil society sectors. Only those organisations with core activities in agriculture were selected for the survey.

Table 1 shows the results of ICT-readiness at branch offices, usually found in small towns, as opposed to city settings. As more facilities are added to the ICT-readiness basket, starting from electrical power access from the national grid, to a combination of power, SMS usage, PC's, Internet access and a live website, fewer branch offices remain on the ICT-readiness list. There are only three cases out of 34 worthy of being called an ICT-ready rural branch office. In percentage this would be 5.9%, although we concede that the sample is too small to employ percentages.

Table 1   ICT readiness rural based branch offices service providers - Malawi

n =	34
Power on grid	31
Power + SMS	24
Power + SMS +PC's	17
Power + SMS + PC's + Internet	9
Power + SMS + PC's + Internet + website	3

6.3   Information service practice

Management perceptions of ICT in extension and marketing were explored in two roundtable meetings. ICT holds a promise for most of the participants, whose organisations have little exposure to ICT in general. In both meetings, the demand side of information services, including market pull effects, was explicitly recognised as inadequate. Likewise, capturing feedback information from the grassroots level is seen as inadequate. The problems of lacking ICT infrastructure and lack of attendant financial resources received much attention in the first roundtable, however, these are clearly factors *beyond the powers of* the agricultural stakeholders to offer remedies. Agricultural stakeholders argued their case for improving the emerging National ICT Policy, with a view to introduce incentives for rural ICT development. The national ICT Policy coordinator was an active participant. A second roundtable was convened with participants drawn from the first, this time to focus more on the functions of sourcing, processing and producing information, by agriculture stakeholders themselves through their own effort and initiative. In this discussion, we found a lack of stakeholder coordination coupled with a lack of exposure to information management and ICT

awareness. This event yielded an explicit expression of interest in developing stakeholder linkages.

6.3.1 Roundtable 1: ICT, Content and Culture

A roundtable workshop was held in Lilongwe on 25th November 2004 with 22 representatives from the private sector, the public sector and civil society (list of participants in annex 10.1) (fig. 6). The majority was drawn from organisations with agricultural and rural development as their core business, however, there were also delegates from academia, the (micro)-finance and the mobile telecom industries, as well as from the government's ICT policy unit. The keynote presentation was delivered by Prof Dr David Rubadiri, Vice Chancellor of the University of Malawi. He observed that social transformations must accompany adoption of modern and practical agri-based information flows, and argued that early ICT learning in rural areas should therefore start at Primary School level.

The main viewpoints expressed and agreed were:

A. Opportunities and constraints of ICT
- ICT is an untapped resource for supporting productivity and marketing in agriculture, challenging a traditional but sub-optimal agricultural and rural development approach and culture.
- There is a vicious circle of the agricultural sector leadership not being aware of the benefits of ICT and its lack of access to technical and commercial information including conceptual ICT information.
- The government ICT policy currently being drafted, does not yet articulate rural needs. The very fact that national food security has not yet been achieved, calls for serious consideration to addressing the ICT gap. Grassroots input and rural interests are underrepresented in the policy-making process. The ICT policy could call for fiscal measures to facilitate rural access.
- The government ICT policy currently being drafted does not reflect ongoing rural development plans, as being promoted by leading rural stakeholders in the country.
- Rural roll-out of telecom networks is expanding, already covering agriculture production zones, thus providing opportunities for minimal information access. However, telecom network operators have left a number of important agriculture production zones un-served.
- Virtually all rural-based agricultural service access points lack ICT facilities; both public and private investments must be made to address this gap. Public Internet access points like cyber cafes are not available in the farming zones, and where these are present the costs of using them is high. This is caused by the scale of operation of a rural cyber: below the size of 10 workstations on-line, connectivity per workstation becomes too costly. Internet access in rural based service providers' offices is a rarity.
- Utilisation of relevant radio broadcasts is low, caused by (a) lack of radios and batteries/power, and (b) gaps in the coverage area of the broadcasting transmitters.
- Technical support for ICT in the rural zones is lacking, posing an additional constraint to the adoption of ICT by rural based service providers, amongst whom ICT knowledge is less than minimal.
- Capacity building in ICT skills for rural based staff is a necessity of the first order but at the same time a challenge, in view of the absence of sufficient technical support including quality training in the rural zones.
- Rural based ICT-enabled centres should be established, for instance in schools, libraries, district assembly halls and agricultural extension support offices. Some of these centres should also offer ICT capacity building.

- Rural extension officers and farmer group leadership require stronger general literacy levels, followed by basic ICT skills. Without adequate general literacy, they may not be able to utilise ICT.

Fig. 6 - Roundtable Lilongwe November 2004

B. Content and culture
- The prevalent mode of information sharing in the farming communities is peer-to-peer (P2P) communication. This is the strongest and most effective mechanism in terms of behavioral change. Current experimental outreach schemes focus on model-village-to-neighboring-village approaches, farmers' schools, etc. However the impact in terms of scale is weak. The hope is that the model-villages approach will yield a more powerful ripple effect.
- There is a need to capture farmers' interests at grassroots level and work with the results. Collection and appraisal of grassroots information is poor and patchy.
- Market and information is the single biggest gap in the provision of information to farmers and rural based entrepreneurs.
- There is no strong reading culture, therefore information services must adapt to the realities on the ground, not in the least at the level of first line service providers and group leaders.
- Service providers, whether public, private or civil society, usually have not yet put in place a coordinated programme of developing literature in support of outreach programmes. Exceptions are in private sector segments such as tobacco where media planning and production are well managed.
- Radio and Video Clubs are an attractive solution for reaching many farmers with quality information, coupled with the opportunity to make group decisions. Such clubs may well tap into organised farmers' groups.
- Market pull has not been a powerful factor in developing information and support services. The example of cotton was examined, as a promising crop with a ready export market. Cotton production has so far not received extension support. ICT centres within cotton growing areas would help to rectify this gap. Public-private partnership approaches should be explored.

6.3.2   Roundtable 2: Information and Outreach

A follow-up roundtable discussion was held in Lilongwe on 16th February 2005, with a group of participants selected from the 25 November Roundtable, senior professionals in agricultural information programmes and services. The objective of this discussion was to examine further the role of service providers against their information sources, information output, as well as quality and depth of outreach to clients (farmers). The

selection was done to ensure that public and private sectors including civil society service providers were represented, as well as higher education and research. The main viewpoints expressed and agreed were:

A. Sources and feedback
- The economic benefits of technical information, especially new technologies, should be clarified to the farmers. This is currently not being done adequately.
- Collection and sharing of planning data lacks coordination, resulting in duplication of efforts. Existing data and information are under-utilised.
- Reliable market and production timing information are extremely important.
- Demand responsiveness of government extension service has been inadequate to date, with emphasis on subsistence farming: new crops rice and sorghum have emerged successfully, without government extension support.
- Feedback from farmers is inadequate: it is often not understood why a certain new technology is not adopted.

B. Products
- Packaging of information to make it of practical use for farmers is being done poorly. This is in part a media capacity building issue.
- Illiteracy is a challenge but should be well understood: FEW's are not illiterate. Usage of cartoons in explaining technology is not necessary. Technical drawings are useful.
- There is a need for information networking in agriculture in Malawi. The current CTA sponsored roundtables were praised as a first step.

C. Outreach
- Distribution of information products (print) in outreach schemes is a challenge, mainly because of lack of funds, but partly also because the potential for collaborative schemes remains largely untapped.
- The reach and uptake of farmer radio programmes is not as strong as hoped. Independent radio is not yet exploited much by stakeholders.
- Recruitment of agricultural input suppliers to disseminate extension information through their distribution channels has met with disappointing response to date.
- Literature should be made available in the government extension service offices nation-wide, as well as in public libraries and at NGO-managed centres.
- Improved ICT-enabled information services can follow the ongoing rural electrification programme.

6.3.3 Survey results

Media usage: Over one-third of the interviewed organisations produce print materials for circulation, the majority of which produce more than five different titles per year. Circulation is usually in small numbers that fall far short of the target client population. Close to 25% uses radio-broadcasts to sensitise the public. Almost 80% of all interviewed operatives listen to radio for work-related information. Video screenings are hardly being used: less than 2% of respondent organisations use video.

Television broadcasting by the agriculture stakeholders under review is virtually not being used, with costs and inadequate signal coverage most commonly cited as inhibiting factors. Radio broadcasting is practiced more, by 19% of stakeholders. These include MAI, through Malawi Broadcasting Corporation. The quality and content of the broadcasting programmes were not analysed in this study.

A total of 22% of surveyed organisations have a website in place. The service providers in the NGO sector with websites seem to aim at global partnership promotion, rather than service delivery, whereas public and private sector websites seem to target domestic users. We have not seen websites of agricultural stakeholders that are updated regularly and frequently, leave alone integrated with operations thereby updated automatically. In

other words, it is common practice with websites to provide organisational background and limited product information.

The Internet shows a penetration of 42% among the organisations under review, however, it is almost entirely absent at the level of the 'last intermediary'. Of all interviewed organisations, 61% have computers in place. Interestingly, 51% of agencies interviewed at branch or agency level have computers installed as well. This percentage drops to 26% for Internet access at branch level.

The above results suggest that publishing and radio broadcasting are important outreach supports. Of all organisations surveyed, 35% distribute some literature. The survey scored the number of different titles produced or distributed and used an indicator for the size of print volumes. The highest scores in publishing activity are seen in government and parastatals; the lowest scores are in the private sector. Trade Associations and NGOs are positioned in between. For the Trade Associations, this may suggest a degree weakness in membership services delivery and outreach capacity. For instance, the Horticultural Development Organisation of Malawi (HODOM), umbrella organisation for 18 producers associations with a combined 10,000 members, does not have publishing activities. Qualitative observations on publishing activities were not made systematically, as this is beyond the scope of this study. However, we have come across instances of technical shortcomings in public service information sheets. The effectiveness of distribution of materials by both public and private sector players can be questioned: often the size of a print run is far below the size of qualified readership. Some indications on the effectiveness of the publishing activities are derived from the focus groups with farmer producers. In response to growing demand, one commodity price information service is available: IDEAA Malawi Agriculture Commodity Exchange (MACE), launched in 2004, maintains a commodity price list for 42 commodities in three Malawian markets and is accessible by SMS and Internet (fig. 7). This is an initiative sponsored by the Ford Foundation that must be self-sustainable in a few years. We tried the IDEAA SMS commodity price information service and although the service is operational, access was often blocked, probably due to an under-dimensioned messaging server resulting in message queuing problems at SMS operator Telekom Networks Malawi.

Fig. 7 - Malawi Agriculture Commodity Exchange online

The penetration level of computers and the Internet, as modest as it is, combined with the fairly widespread practice of publishing activities, suggests that some potential exists for stakeholders to improve on the quality and effectiveness of their publishing efforts, by (a) sourcing more titles on-line; and (b) producing more titles.

6.4   Description of the ICT industry

6.4.1   ICT Sector Regulation

The regulatory environment for the ICT industry can be characterised as liberal. The regulatory authority is Malawi Communications Regulatory Authority (MACRA), established 1998. Under its regulatory activity, competition in mobile telecommunications has opened up. Internet and data services are fully liberalised. Postal services fall under its authority. In October 2004, MACRA (its website www.macra.gov.mw is not available) removed heavy restrictions on the licensing of Community Radios, thereby opening the way to increased initiative and investment in this ICT segment. Freedom to offer Voice-over-IP, currently the litmus test for ICT liberalisation in Africa, is not addressed in regulation, but in practice restricted to the licensed fixed line and mobile telecom operators who enjoy a protected voice services market. However, the Information and Tourism Minister announced early 2005 that Government will start issuing Voice Over Internet Protocol Licences (VoIP) as a way of improving access to ICT.

A new draft Priorities of the Media Policy (March 2005) calls for promoting "the use of information and communication technologies and encourage the use of interactive communication; establish in the media, departments or programmes catering for special-interest groups; set up community media, especially rural radio stations and multi-media centres in languages spoken in communities where such stations and centers will be established." A national ICT Policy has not been finalised yet. Table 2 gives tariffs (in USD) for basic services.

6.4.2   ISPs

Internet – There are 24 licensed ISPs but only five are operational. The number of people using the Internet in Malawi is estimated at approximately 35,000. This estimate is based on information offered by ISPs and we find it consistent with statistics and observations collected for this study. The percentage of people using the Internet outside the four main cities Blantyre, Lilongwe, Mzuzu and Zomba is estimated to be closer to 5% than to 10%, i.e. around 5,000 people.

Globe Internet
Globe Internet is also providing wireless Internet. Late in 2004, the company has started a business portal on the web. Audio- and video streaming can be supported, but file sizes of over 500Kb are discouraged. See www.globemw.net.

Malawi.net
Market leader Malawinet offers retail and corporate Internet services. Wireless Internet is available from 32 - 256K. In addition, it provides leased line access including VSAT connections of up to 56 Kbps. There are several VSAT services. Subscribers can uplink to the Internet at speeds of 64,128 or 256kbps and downlink from the Internet on a shared return link capable of up to 45 Mbps. On dedicated links; subscribers can link to the Internet at speeds up to 8Mbps. Audio- and video streaming through dial-up access can be supported, but file sizes of over 250Kb are discouraged. See www.malawi.net.

Malawi SDNP Services
The Malawi Sustainable Development Network Programme (SDNP) is the pioneer ISP in the country. Its web portal hosts much government and civil society information. SDNP manages the mw Top Level Domain. Registrants pay a registration fee of USD100 "as consideration for the registration of each new domain name" (!) or USD50 to renew an existing registration. See www.sdnp.org.mw.

Table 2 Telecommunication and Internet Services - basic tariffs - Malawi

MALAWI	fixed/mobile	SMS/msg	pre-paid/min	Internet/min	ISP/month	cybercafe/hr	leased line acc
MTL	fixed	n/a	0.10	0.03			
Telekom Networks Malawi	mobile	0.05	0.24	n/a			
CelTel	mobile	0.08	0.20	0.17	35.00		
MalawiNet (5 users)					66.67		333
Globe Internet Ltd (5 users)					56.25		600
SDNP (50 hrs/week)					85.00		650
capital city cyber-café						2.50	
provincial town cyber-café						7.50	
all tariffs business hours peak rates							
CelTel offers 40% discount on 5 frequently dialed numbers							
SMS tariffs given for traffic within same operator							
Leased line accounts: estimates provided based on specs ranges							
source: published rates local operators, 2005							

CelTel Malawi
The mobile telecommunication operator CelTel Malawi is also in the market as a full fledged ISP, retailing Internet accounts, hosting websites and managing url registrations. It offers both mobile and leased (fixed) line access. Email and WAP (Wireless Access Protocol) services for mobile phone terminals were introduced late 2004. See http://www.mw.celtel.com.

6.4.3 Mobile Telecommunication Operators

Mobile telephony - There are two mobile GSM operators in Malawi: CelTel, since 1999, with around 90,000 customers; and Telekom Networks Malawi, since 1997, with about 70,000 customers. Both allow for pre-paid and post-paid contracts, however, over 95% of the customers are in pre-paid mode. Both operators supply voice and data over the voice channels. Both operators support WAP, however, no further advanced services are provided yet. Most development effort goes into voice products and network expansion to cater for traffic growth. There is no information, nor are there signs of 3G cellular network investments coming to the country.

Active mobile telephone subscriptions represent 2.19% of the total population. Coverage of national territory can be estimated at about 50%, growing at about 5% per year. This estimate is based on the distribution of base stations with their transmission power as well as terrain conditions. This is significantly less than the coverage figures made public by the two operators Telekom Networks Malawi and CelTel, who are not in a position to divulge such commercially sensitive information. The coverage areas of the two operators are largely overlapping. These networks presently miss two important agriculture zones, one in Central Region namely Mchinji and two in Northern Malawi, namely Mzimba and Chitipa.

Telekom Networks Malawi
This is the first mobile telecommunication operator, started in 1997. Partly owned by state Telco MTL. Network coverage can be estimated at about 50% of national territory (fig. 8), based on limited data provided by the company. No value added services have been

launched yet. Investment activity is focused on improving the quality of the existing infrastructure, rather than on developing new products.

Fig. 8 – Network coverage TNM, 2004-2005. Source: TNM
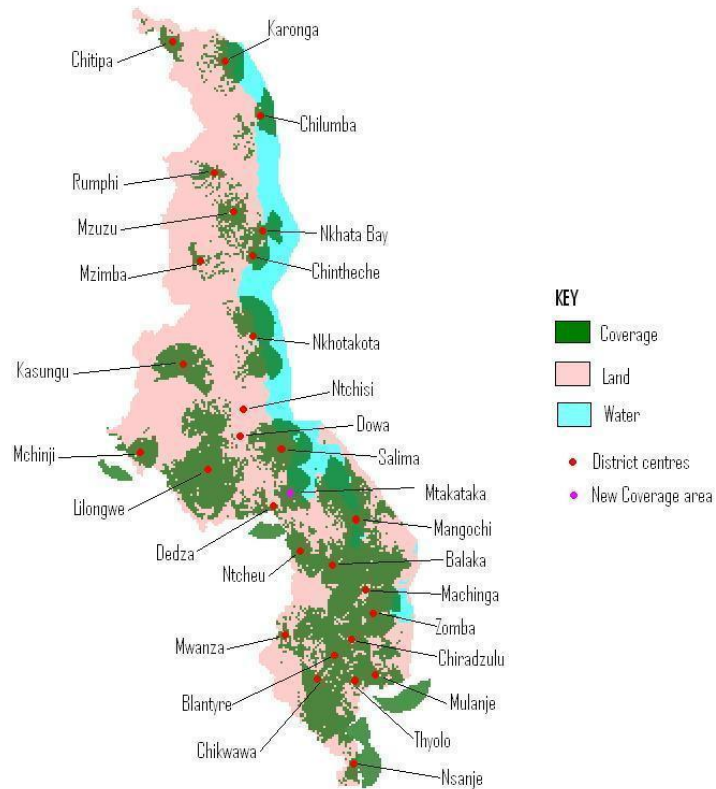
CelTel (Malawi) Ltd
Celtel offers high-speed Internet access and other data solutions for business customers. We deliver business data communications, provide domain registration and hosting and help companies to build virtual private networks. Importantly, Celtel actually owns the microwave, radio and satellite systems that deliver its services. CelTel offers Internet access via its mobile network, at a speed of 9.6 kbps and a tariff of USD0.17/minute. The coverage map of CelTel is shown in Fig 9. Investment activity is focused on software support for subscriber voice and SMS packages, as well as reinforcing the existing transmission network.

Take note that a third mobile network provider called Malawi Mobile is expected to be commissioned in early 2005. The ICT regulator Malawi Communications Regulatory Authority (MACRA) has announced that failure to roll out this new network will mean withdrawal of licence that was given to the company in 2002.

6.4.4   Fixed Line Telecommunications

MTL (Malawi Telecommunications Limited) is to date the sole fixed subscriber line operator. However, provisions for competition have been made in the regulatory framework. MTL has a customer base of about 70,000 fixed line and slightly over 200 data line customers. Growth in fixed line telephony has slowed down to about 2% of installed base year-on-year. For Internet access, the vast majority of users rely on the

public fixed line network, either dial-up or leased line solutions. The switching network is not fully digitalized, with some rural zones relying on analogue exchanges, which are reported to have difficulty in passing IP traffic. MTL is not expected to invest in upgrading of the switching network, until the intended privatization has materialized. Significantly, MTL offers a uniform national dial-up tariff of USD0.03 per minute. Industry players believe however, that this is posing a disincentive to installing Internet PoP's in provincial towns, while throughput on this MTL dial-up infrastructure is narrow. MTL owns 40% and 36% of shares in Telekom Networks Malawi Limited (mobile operator) and MalawiNet Limited (Internet Service Provider) respectively. MTL is due for privatisation. Currently, the Government holds 99% of stock.

Fig. 9 – Network coverage CelTel 2004-2005. Source: CelTel

Key
- Celtel coverage
- New coverage areas
- Main towns
- Water areas

M-streams is a strategic Business unit of MTL, but only deals with provision of data communication services: digital leased lines; VSAT; Internet gateway services. It is important to note that MTL / M-streams are willing in principle to accommodate clients wishing to extend a line beyond the MTL coverage area, allowing co-location of private antenna's. MTL will only charge electricity consumption on a cost-based principle.

6.4.5   Mass media

Television – Broadcast television is not widely available in Malawi. It is estimated that Malawi Broadcasting Corporation (MBC) transmitters cover less than 20% of national territory. MBC does not have a mechanism in place to measure its population coverage. A reliable indicator for territorial coverage was not available. It estimates a pool of 50,000 TV sets is installed nation-wide.

Radio broadcasting – An estimate by Malawi Broadcasting Corporation mentions a pool of 1,060,000 radio receivers distributed country-wide. Network access is estimated to be in the order of 80% of national territory. The distribution of receivers is estimated to be 1 : 5 population in urban areas and 1 : 20 in rural zones.

Newsprint – Daily newspapers are read by 1.37% of the population. Calculated over the rural population, the percentage of newspaper dailies readers drops to 0.51%. Male readership outnumbers female readership in a ratio of 73 : 27. The leading dailies are: (a) The Nation with a national circulation of 17,750 copies (weekdays) and 44,850 (weekend edition); (b) Daily News with a national circulation of 9,800 copies daily. A copy of The Nation is shared by 6 readers; Weekend Nation is shared by 9 readers. The largest section of readers are employed and urban based (see Table 3). The amount of copies of The Nation distributed outside the four main towns Lilongwe, Blantyre, Zomba and Mzuzu is 30%. The sources of these figures are the publishers themselves. Their statistics are reportedly audited. The Nation intends to strengthen its product by recruiting more vendors especially in the rural areas and by improving its web presence. Fig. 10 shows the present style of the website (http://www.nationmalawi.com) which does not feature interactive applications. The publisher is interested in strengthening its web product.

Table 3 The Nation – Reader Profile (in %)

	Weekday edition	Weekend edition
Employed	42	32
Self employed	15	22
Unemployed	17	12
Students	14	28
Other	12	6
Largest age bracket 21-25	43	42
Male	73	
Female	27	

Source: Nation Publications Ltd, Malawi 2002

6.4.6 Community radios

Community radio activity in Malawi is gaining momentum after a slow development during the period 1999 – 2004, with new initiatives emerging in religious communities. Regulatory constraints have inhibited growth. In October 2004, the licensing regime of community radio stations has been made easier to comply with, by removing programming prescriptions and restrictions. There are 10 community radios operational and applications for a further 19 are pending (February 2005).

Radio Maria Malawi in Mangochi is a leading example with a large network and using digital technology, offering exclusive religious programming with no advertising slots. At first Radio Maria denied syndicated programmes. Later they allowed NGOs and professionals to broadcast through them for various Developmental Programmes. These partners also assist in bringing programmes in local vernacular languages, beginning with Chichewa which is spoken by 80% of the Malawian population. Agricultural programmes include: (1) Ulimi Wa Phindu (Profitable Agricultural Methods), for which farmers create items and submit these to Radio Maria editors for broadcasting; (2) Agriculture Research and Extension Trust (ARET) has a regular timeslot on tobacco farming. The license issued by MACRA allows broadcasting of cultural and developmental programmes that are incorporated into local programming. The license fees amount to close to USD100,000 per year; the operator is charged for each of its nine FM transmitters (USD720/transmitter/year). The network layout is as follows: transmission technology the Studio Transmitter Links (STLs) operating at unique and uninterrupted frequencies of 365MHz, 358MHz. Transmission power rating is 1 to 2Kw. Transmitters are supported by 24kVA generators for backup power and are monitored from headquarters in Mangochi. Radio Maria will be the first community radio in Malawi to use satellites for studio

broadcasts. IP technology will be introduced, eg. audio streaming, see
http://www.radiomaria.org. The radio station has received 9 satellite dishes through the
World Family Support Programme, Italy.

The most recent community radio start-up is the International Christian Centre of the
Assemblies of God, Lilongwe, which has opened an FM channel in November 2004,
broadcasting 17 hours/day in English and Chichewa.

Fig. 10 - The Nation Online

6.4.7   Telecentres

Telecentres in our definition are public places for Internet access, often called cyber
cafes. The mobile telecommunication operators are running a few telecentres, but only in
the main cities Blantyre and Lilongwe. Also PostNet, a mail and courier service with
outlets in Zambia, Zimbabwe, Malawi, has opened a first telecentre in Lilongwe. The
charges are between USD2.50 – 3.00 per hour. In the province towns, the charge per
hour typically rises to a range of USD4.00 - 7.50. Province town telecentres are often
small-scale operations with two to four desktop PC's and Internet connectivity by dial-up.
Some operators in the larger towns have managed to share a leased line with another
user in an office block building. That way they can offer connectivity though leased line
access. Common constraints noted by operators among this type of telecentres are poor
and expensive connectivity and unreliability of electrical power. With less than 10 PC's,
leased line connectivity becomes uneconomic. Web searching proficiency among client
support staff can be considered as poor to non-existent. Technical layout is often wanting,
with not even UPS power backup installed, despite the fact that power disruptions are
cited as the biggest operational constraint at the provincial telecentres. One professional
telecentre is Icon Cyber Café, Blantyre, with stable Internet quality and professional user
support, but this is not Malawi's benchmark telecentre.

Note: The Malawi National Library Service is aiming at establishing ICT facilities at its
seven establishments in main cities and province towns. Interestingly, Malawi National
Library Service is working on creating an "extramural service" whereby third parties can

collaborate with the public libraries in providing books inventory as well as Internet content and access.

Usage of telecentres and information centres

The most frequently seen telecentre visitors are college students and last-year secondary school students, mean age range 18 – 30 years with an even distribution between males and females. Surfing habits are very limited with most activity being web-mail. We estimate that over 90% of web traffic is web-mail, judging from track records logged on the workstations we examined. In the small telecentres, non-web-mail traffic can be qualified as incidental at most. Searching for agricultural information is reported only exceptionally. Visitor numbers are not overwhelming, with an estimated average of 25 (small towns) to 50 (main towns and cities) visitors per day. Peak hours are lunch-time and end of working day hours 5 – 7PM. There are cases of employees visiting telecentres on official business for web-mail activities. In an incidental case, an employer issues regular imprests for Internet access in a nearby telecentre.

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7   Mozambique

A new government that took office in early 2005 is continuing the agricultural policy line established since the previous five years. An agricultural sector reform programme "Pro-Agri" focused in its first period 1999 - 2004 on infrastructure investments. The current, second phase of the programme focuses on productivity and commercialisation. Key indicators for Mozambique are: Gross National Income per capita USD210; total adult literacy rate 44%; life expectancy 38 years. Source: http://www.unicef.org/infobycountry. Most - about 60% - of the population of 18 million live on the coastal strip and the Beira corridor. Agriculture is the mainstay of the country's economy since it accounts for 40% of the GNP, 60% of export revenues and involves almost 80% of the active population. It is estimated that half of the total land area of 78.6 million hectares is suitable for arable use but that only 10% is currently cultivated. Real GDP growth since 1993 averaged over 8%. Annual inflation decreased from over 54% in 1995 to 13.5% in 2003, and it is projected at 12.9% in 2004 (source: World Bank, http://web.worldbank.org).

7.1   Overview of agricultural service providers

Agricultural extension and marketing services are provided by the public and private sectors including NGO's. The practicability of providing services depends on the degree of farmer mobilization and organisation. The organisation level of agricultural producers in Mozambique is only a trickle, in comparison to other countries in the region. The Government estimates that 3% of producers are organised in groups.

7.1.1   Ministry of Agriculture

The Ministério da Agricultura (MINAG) is a distributed organisation with provincial (SPA - Serviços Provinciais de Agricultura) and district establishments. At least in theory, it has the potential to deliver service at a wider scale than any other player in the industry. Most of MINAG's distributed offices have Internet email addresses. Pro-Agri is a 2x5 year framework programme under MINAG to modernise the agriculture sector. The development partners are helping to fund the programme. In the current 2004 – 2009 plan period, emphasis is on commercialisation, rural financing, and roads networks. In the analysis of Pro-Agri leadership, the major challenge of the government system is coordination at local levels, lack of human capacity and conservative attitudes.

MINAG does not have an ICT strategy in place, although the interest to develop one is there. The roll-out of email addresses is a spontaneous development, not yet supported by a coordinated budget and guidelines. A simple and static website for MINAG is live, with no interactive features. However, a collection of downloadable materials is available, such as policy documents and regulations (eg. on fertilizers, pesticides). The Centro de Documentação Agrária e Informação do Sector Agrária (CDA) at MINAG is the department where web development is being spearheaded. The production of quality content is a concern for CDA management, as the creation of materials suitable for release on the web demands staff capabilities that have yet to be developed. In fact, judging from the date of release of official documents, release onto the website is slow. Between June 2004 and April 2005, the site has not been updated. In line with a government directive of 2001, MINAG has established a 'green line' or a telephone number for the public to make inquiries and suggestions. Information on the usage of this facility is not available. CDA publishe a monthly newsletter Folhas Verde (8 pages) and every quarter a Boletim Bibliográfico. CDA has been evaluated by MINAG itself. It was seen to lack funding to acquire and distribute literature while depending on donations. Also lack of qualified staff was cited. MINAG has recognised the need to rethink the type

of documentation that research institutions can produce for dissemination. It decided that CDA must work with research institutions to identify documentation, whereby departments must make use of databases beyond FAO. CDA must set up documentation centres in the provinces. (Source: Conselho Tecnico de Investigação Agrária (CTIA) - Proceedings Reunião Nacional de Investigação Agrária, MADER Hq, Maputo 15-19 Sep 2003)

The Direcção Nacional de Agricultura (DINA) is the central strategic unit in MINAG, reporting directly to the Minister. Part of DINA is the Secretariado Técnico de Segurança Alimentar e Nutrição (SETSAN, 1998) a coordination programme to facilitate food security. SETSAN coordinates with numerous ministries and development partners. It publishes bulletins in support of decision-making and regional coordination. The distribution of these bulletins has not been effective. MINAG creates agricultural statistics once per year only, but with considerable time delays and limited depth and detail.

The Direcção Nacional de Extensão Rural (DNER) is a very small operation, in the light of the vastness of national territory and the underdeveloped state of farming in the country. DNER employs not more than 500 FEW and with central support the department has about 700 staff, working with around 10,450 farmers groups nation-wide (statistics 2002). At provincial level, Serviços Provinciais de Extensão Rural (SPER), a distributed organisation is in place with up to three agricultural districts in each of the ten provinces. Each district has up to three extension teams comprising eight FEW. The FEW have limited resources, including limited transport. They often collaborate with locally established NGO's and CBO's, who in turn often facilitate the work of FEW.

Curiously, the fishing industry appears to revolve in a world of its own. It is a small but growing industry, served by its own Ministerio de Pescas. In the course of this study, we have not come across any linkage whatsoever with the other agricultural segments and their operators and stakeholders.

7.1.2   Parastatals

The Instituto Nacional de Investigação Agronómica (INIA) is a research parastatal with 10 stations across the country. It runs a website with downloads (fig. 11). Some titles are locally produced, others are sourced from eg. ICRISAT. Most titles are not released as downloads. Site visitors are encouraged to request to be sent hardcopy publications (mailto function), available to government staff. INIA has multiple partnerships, locally and internationally. Among them is the International Institute for Geo-Information Science and Earth Observation (Netherlands). The Instituto Nacional de Investigacão Veterinária (INIVE) performs a similar function as INIA.

There are four parastatal service providers worth referencing although they are not exclusively serving the agricultural sector. Instituto Nacional de Estatística (INE) is the national statistics institute. Since the reformulation of their website, what turned it into a portal and improved the access to information and the quantity of available information, INE is one of the most important content providers in Mozambique. The site includes a statistics database, flexible and with a powerful search engine. English and portuguese versions are available. See http://www.ine.gov.mz.

The Instituto Nacional de Meteorología (INAM) is the national weather forecast institute. Their website still uses old technology (HTML based, no content management system). The site is updated every weekday with the different forecasts (daily forecast, 48hrs forecast, 72hrs forecast and seasonal forecast). The seasonal forecasts are provided to the Ministry of Agriculture, which advises farmers based on those. The English version of

the website is expected in the near future. All web development is based on support from Finland. See http://www.inam.gov.mz.

Fig 11. – Downloads from INIA

The Instituto de Comunicação Social is a parastatal that regulates and supports the community radio business. ICS operates a few stations itself as well. It is supported by the Government and international NGO's including the Ford Foundation and UNICEF.

Although not an agricultural agency, the Instituto Nacional de Gestão de Calamidades (INGC) has not implemented ICT solutions in a manner that would be expected of such an agency: no radio programming, no SMS broadcasts, web presence limited to general information without interactive features. Regular calamities that are visited upon Mozambique are floods and famine.

7.1.3   NGO's and Private Sector

Action-Aid, CARE International, World Vision International (WVI) and Adventist Development and Relief Agency - Mozambique (ADRA) are among the NGO's with large, nation-wide programmes. They usually work with locally established government departments such as MINAG and CBO's for service delivery. They have Internet access in all regional offices but usually not in small sub-offices within operation zones.

7.1.4   Farmer focus groups

A focus group drawn from a farmers association was organised with clients of WVI and MINAG in Licuar, Nicuadala district, Zambezia. The farmers grow horticultural crops and cereals. WVI supports the group with technical know-how, commodity price information and inputs. This particular group has been affected by loss of members. The effectiveness of the support was questioned by the group. Drought conditions tend to erode profitability, therefore they regarded establishing credit facilities, access to market information and channels as well as technology advice as measures that require more solid support than had been realised. A second focus group was organised with 15 farmer clients of WVI and MINAG in Vilela, Zambezia. This group appreared to be a more solid

farmers association than the former. Whereas the group expressed similar priorities like credit facilities, market access and information on inputs, they expressed satisfaction with the technical advisory services and reported wealth improvement at household level. Three focus group sessions held in Vilanculo (Inhambane) explained the paucity of extension services, given that two FEW must serve an entire district. The farmers would like to receive more relevant radio programmes. Feeder roads, transport means ("motobombas") and input depots were other needs. Broadcast signals reportedly do not reach their area and need to be strengthened. Lack of market information was highlighted by all groups.

7.2   ICT-readiness service providers

Telecom and Internet are routinely used by the majority of the interviewed service providers. Significantly however, the majority is unable to use these facilities in the delivery of service to farmers, for reasons of absence of infrastructure: electrical power, radio broadcasting coverage; telecommunication access. The facilities are used for co-ordination between headquarters and sub-stations, and between headquarters and partners (notably sponsors). Surfing activity is limited: most users are not adventurous or inquisitive and rarely access more than 5 sites regularly, whereby the most common hits are on Hotmail, Yahoo and their own organisation's site. Radio telephone is tuned to limit communication between field workers and sub-stations.

Table 4 shows the results of ICT-readiness at branch offices, usually found in provincial and district towns as opposed to capital city settings, but *not* in villages. As more ICT facilities are added to the basket, starting with electrical power access from the national grid, to a combination of power, SMS usage, PC's, Internet access and a live website, fewer office sites remain on the ICT-readiness list. There are nil cases out of 22 of a networked rural branch office.

Table 4   ICT-readiness rural based branch offices service providers - Mozambique

n =	22
Power on grid	20
Power, SMS	10
Power, SMS, PC's	9
Power, SMS, PC's, Internet	6
Power, SMS, PC's, Internet, website	0

7.3   Information service practice

7.3.1   Roundtable : ICT, Content and Culture

On 24 March 2005 a roundtable was held in Maputo with 30 representatives from stakeholders in agriculture and rural development, spread across public and private sector including civil society and trade associations (list of participants in annex 10.1). Rural and up-country based agencies were represented as well. The keynote presentation was delivered by Engº Helder Gemo, Director Nacional de Extensão Rural - MINAG. He argued that improved national outreach for extension services calls for an assessment of ICT, as available resources and prevailing methods are unable to meet demand. In his view, "communication within the extension service at the level of localities is zero." He suggested investing in computer equipment accessible for all FEW's, which equipment should serve to both disseminate and collect information and data at provincial

level. Although optimistic about the potential of radio broadcasting, he raised a critical note about the quality of agricultural radio programmes.

Other participants commented on the usefulness of agricultural broadcasts as well, citing quality and access issues. Part of the problem was seen in centralisation of broadcasting programme productions. In particular, participants from rural zones highlighted the dual constraint of lack of access roads and non-coverage of broadcast and mobile telecom signals. The Ministry of Health (MISAU) representative explained how a programme to establish off-line libraries has started.

Some organisations reported that either their office Internet access was down or they had to visit NGO's or Cyber cafes to access Internet. In the case of the Estação Agrária de Sussundenga staff travel 12 km to visit a telecentre in Chimoio. Oral communication with mobilised groups was seen as the most powerful medium at grassroots level, supported by radio where-ever available. Video was considered as effective, but quite costly, whereas screening can only happen at centres with electricity. Illiteracy was seen as a common factor to reckon with in dealing with farmers through extension work.

The debate on information and ICT resulted in the following common problem catalogue:
  o Communication within the extension service at the level of localities
  o Community radio is not well understood
  o Limited coverage mobile telecom networks
  o Limited coverage radio broadcasting stations
  o Recurrent costs of ICT maintenance and connectivity
  o Lack of cooperation and information sharing among stakeholders
  o No coordination in information processing and publishing
  o Websites are developed based on wrong needs diagnosis (no web vision)
  o First-line ICT support needed, with improved second-line outsourced support

As a way forward, participants agreed that the private sector should be more involved in extension and marketing services. Specialised agencies should find ways to collaborate. Existing content should be analysed on quality and the need for translation into local languages. Programming quality should improve, bearing in mind languages, time-tabling and serialisation, technical soundness. Deeper understanding is needed about the flow of information in communities. New arrangements should be explored for group Internet access. Three types of intervention were debated:
  o Collecting information – implies looking for synergies between organisations;
  o Processing of information - critical phase of proper implementation of ICT solutions;
  o Dissemination – making databases accessible on the Internet.
For mode of delivery, three technologies were reviewed: Internet; radio broadcasting (community radio); and SMS (mobile telecommunications).

The roundtable expressed great interest in continuing to share knowledge and information on ICT in agriculture and in receiving feedback from CTA.

7.3.2   Survey results

Television broadcasting by stakeholders under review is practiced little, with some airtime utilised by 7% of stakeholders. The main reason of this situation is the very limited signal coverage, making broadcasting ineffectual. Radio broadcasting is practiced more, by 14% of stakeholders, with MINAG now broadcasting 35 hours per month through state broadcaster Rádio Moçambique. The quality and content of the broadcasting programmes were not analysed in this study – we refer to the relevant comments raised in the roundtables, described in the previous paragraphs.

A total of 34% of the interviewed organisations have a website in place. The service providers in the NGO sector with websites seem to aim at global partnership development, rather than service delivery, whereas public and private sector websites seem to target domestic users. Only in exceptional cases are websites updated regularly, leave alone integrated with operations, thereby updated automatically.

The Internet shows a penetration of 69% among the organisations under review, however, it is almost entirely absent at the level of the 'last intermediary'. It is noteworthy that MINAG has issued email addresses at Provincial and District levels. However, the survey reveals concern among province- and district based MINAG staff about Internet quality and lacking computer skills among staff.

In view of the above results, publishing and radio broadcasting are important outreach support activities. Of all organisations surveyed, 64% distribute some literature. The survey scored number of different titles produced or distributed, and used an indicator for the size of print volumes. The highest scores in publishing activity are found in parastatals and the private sector; the lowest scores are in the Trade Associations segment. Government and NGOs are positioned in between. For the Trade Associations, this may suggest some weakness in membership services delivery and outreach capacity. These are quantitative observations derived from questionnaire results, on the number of different titles of print materials, circulation volumes, and radio broadcasting activity. Qualitative observations are not made in a comprehensive way as this is beyond the scope of this study. However, it can be observed that much editorial space is being used for political news rather than agricultural technology. The effectiveness of distribution of materials by both public and private sector players can be questioned: often the size of a print run is far below the size of qualified readership. Some indications on the effectiveness of these publishing activities are derived from the focus groups with farmer producers. For once, farmer groups receive little literature. Most materials remain within the service providers' own staff networks and is not distributed externally.

There are two commodity price information services available: Quente-Quente – Sistema de Informação de Mercados Agrícolas (SIMA) published by MINAG is released by e-mail. Infocom, Boletim Mensal de Comércio Agrícola, has a sub-regional outlook and is published weekly by Ministério da Indústria e Comércio - Direcção Nacional do Comércio and sent by email to a list of 500 addresses. The daily newspaper Notícias publishes prices tables from both. This FAO-supported project is working on an initiative to relay commodity market information through community radio operators.

The average ICT-readiness among Mozambican stakeholders is 25%, and minus an organisation's own website, this figure climbs to 59%. Survey results suggest that the penetration of computers and the Internet, combined with the fairly widespread practice of publishing activities, could help stakeholders improve the quality and effectiveness of their publishing efforts, by (a) sourcing more titles on-line; and (b) creating more titles independently. Lack of networking and information sharing was widely regarded as an issue calling for improvement.

7.4   Description of the ICT industry

7.4.1   ICT Sector Regulation

The regulatory environment for the ICT industry can be characterised as liberal. The regulatory authority Instituto Nacional das Comunicações de Moçambique (INCM), established 1997. Under its regulatory activity, competition in mobile telecommunications has opened up. Internet and data services are fully liberalised. Postal services fall under

its authority. Freedom to offer Voice-over-IP, currently the litmus test for ICT liberalisation in Africa, is not addressed in regulation because in practice voice telephony is restricted to licensed fixed line and mobile telecom operators. INCM has two regional branch offices. The website www.incm.gov.mz is not up-to-date. Table 5 shows tariffs for basic services.

Table 5 - Telecommunication and Internet Services - basic tariffs - Mozambique

MOZAMBIQUE	fixed/mobile	SMS/msg	pre-paid/min	Internet/min	ISP/month	cybercafe/hr	leased line acct
TDM	fixed	n/a	0.11	0.04			
mCel	mobile	0.09	0.29	0.04			
Vodacom	mobile		0.17	0.05			
Teledata					20		425
TVCabo					90		
capital city cyber-café						2.40	
provincial town cyber-café						6.00	
all tariffs business hours peak rates							
SMS tariffs given for traffic within same operator							
Leased line accounts: estimates provided based on specs ranges							
source: published rates local operators, 2005							

7.4.2 ISPs

There are 18 Internet Service Providers (ISPs) registered with the national ICT regulatory authority Instituto Nacional de Comunicações de Moçambique (INCM). However, most of them are inoperational as access providers. Those that are operating and most significant are referenced in this section.

Centro de Informática da Universidade Eduardo Mondlane (CIUEM)
CIUEM is a department of Universidade Eduardo Mondlane and the first provider of dial-up Internet in Mozambique, back in 1995. Their access node is located in Maputo. They provide support to the telecentres project in Mozambique (1998). CIUEM manages the Mozambique Top Level Domain mz. CIUEM's mission is Internet services delivery to the academic community and government (eg. Ministério da Educação). They offer web design (from USD275) through ISCD[1], web hosting (@ USD30/month up to 10Mb disk space), e-mail and webmail (@ USD25/month). In practice, CIUEM competes with the private sector in the above services. Information about dial-up, leased lines, wireless or VSAT users was not disclosed. See http://www.ci.uem.mz.

GS-Telecom
GS-Telecom is a private multi-country VSAT operator. In Mozambique it has access nodes in Beira, Nampula, Zobué, Pemba, Temane, etc. GS_Telecom works exclusively in the C-Band with dedicated access, thus providing Virtual Private Networks (VPNs) to customers. Their VSAT connection is made through Maputo, where it uses 2.4GHz/5.8GHz to provide wireless connectivity between their hub and their customers. Tariffs for these wireless connections are USD5,000 per installation (including equipment, network access, helpdesk and control software) plus USD800 – 1,000/month for 32kbps or 64kbps guaranteed bandwidth. The 2.4m C-band VSAT installations (including all

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[1] Another Universidade Eduardo Mondlane unit

equipment and installation) costs around USD17,500. On top of this, there is a monthly charge of USD360/month for 16kbps uplink/32kbps downlink, USD970/month (32u/64d) or USD2,110/month (128u/128d). The equipment supports 512u/9Md. GS-Telecom provides technical support from Maputo or the country nearer to the location in question (Zimbabwe or Kenya) and maintenance (another USD150/month). They provide their customers with IP addresses and domain registration and claim to have the largest bandwidth to the Internet available in the country (19.5Mb from Maputo to USA). Any customer connected to the Internet has only one satellite hop to the Internet. See http://www.gstelecom.net.

Satcom
Satcom is a private VSAT operator in Maputo, part of the Brithol group[2]. Satcom also has operations in Angola. They provide shared Internet access through low-cost terminals. See http://www.satcom.co.mz.

Teledata Lda
Teledata is a private company owned by TDM and Portugal Telecom. Teledata had the first data network established in Mozambique, based on the X25/X28 protocol and later Frame Relay. This infrastructure was the basis for the first online bank branch networks, as it served all main cities. Later, Teledata started providing Internet services, starting in Maputo and gradually installing POPs in various locations (typically, where there were X25 or F/R nodes serving corporate customers). At this stage, Teledata has 20 POPs (Points of Presence that allow Internet dial-up through local calls) in Maputo, Matola, Machava, Xai-Xai, Chokwé, Inhambane, Vilanculos, Beira, Chimoio, Tete, Songo, Quelimane, Mocuba, Gurué, Nampula, Nacala, Lichinga, Cuamba, Pemba, Mocímboa da Praia. They also have and manage VSATs in Songo, Cuchamano, Morrumbala, Moma, Ribaué, Massingir (2), Marropino, Milange, Espungabera, Mussacama, Alto Molocué, Ulongué, Chimuara, Mandimba, Niassa where they provide, or can provide Internet access @ USD900/month (typical). Teledata has about 4,000 to 5,000 subscribers @ USD20/month (bandwidth limited to 56kbps) and about 90 leased line accounts from 64kbps to 512kbps, using xDSL technologies and costing USD250 - 600/month. The X25 or Frame Relay service is assured at 19.2kbps or 64kbps available where there are POPs, together with X28 (used for Point-of-Sale terminals). Other services provided are not regular and sometimes offered through a third party, such as web design and web hosting, through Sislog. E-mail and webmail are included in the dial-up accounts. Teledata also has 3 Internet Cafés, in Maputo, Beira and Nampula. They plan to offer high speed ADSL-grade retail service, depending on TDM's roll-out plans. See http://www.teledata.mz.

Virtual Connection
Virtual Connection is the most successful private ISP with mozambican roots. Part of the success is due to support from USAID's Leland Initiative. They have access nodes in Maputo, Beira, Chimoio, Nampula, Quelimane and Pemba. They have around 1,000 dial-up users, paying USD10/month (night users) or USD20/month (regular users). They have around 50 customers for leased line or wireless access, with 64 to 512kbps bandwidth for USD600 - 4,400/month. Wireless customers are part of an USAID project and are served over 2.4GHz, in Maputo. Services provided include:
- web design (active and involving databases)
- web hosting (with CGI) from USD120/year (less then 5Mb) to USD480/year (less then 20Mb). If more space, negotiable
- server hosting rack mounted (from USD150)
- e-mail, webmail with the accounts
- free webmail service (mocambique.net)

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[2] More known due to its hotels and graphic/printing services.

- web advertising – from USD20/month for 1 year contracts.

They are planning to offer VoIP PABX, enter the HotSpot business in hotels and restaurants, as well as providing a Vodacom mobile number for Internet access. See http://www.virconn.com.

Intra

Intra is based in Maputo, providing wireless Internet in the Maputo and Matola area. They use a licensed radiofrequency and wireless modems to provide services at 64kbps. They have direct connection to the Internet via their own VSAT gateway and have started providing so-called bushmail. They provide other services like web design through free-lancers and web hosting (Linux based). E-mail/webmail is included in customer accounts. See http://www.intra.co.mz.

TVCabo

TVCabo is the only cable Internet provider. High bandwidth (in excess of 64kbps) is available in selected geographical areas. The (networked) access nodes are located in Maputo and Matola, with Beira being planned since a while. In Maputo and Matola they have around 4,000 Internet customers. Minimum tariff is USD90/month (VAT included) for the residential package[3]. Internet customers have to be cable TV customers. There is an entry allowance for obtaining the cable modem (caution fee about USD100). Other services include: web design, web hosting (starting @ USD200/month, VAT included), e-mail, webmail. Additional accounts 15Mb @ USD5/month. TVCabo is the service provider to most of the Internet Cafés in Maputo. See http://www.tvcabo.co.mz.

TropicalWeb

Tropicalweb is based in Maputo, where their access nodes are located. They provide dial-up, leased line and wireless Internet access, as well as web design, web hosting, e-mail, webmail and advertising space on their home-page. However, until the time of compiling this report, they did not provide details on their operations. See http://www.tropical.co.mz

Fig. 12 – News portal Imensis

Imensis/Sislog

Although registered as ISP, Sislog (a private company) does not provide access to the Internet. However it owns and operates the main portal in Mozambique (Imensis, fig. 12), publishing adverts and news on a daily basis. Imensis has around 2,000 unique visitors/day, more than 70% of which coming from within Mozambique. They provide a free webmail service (imensis.net) based on the everyone.net service. The company also provides professional and advanced web design services and active web hosting (with

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[3] Non local traffic limited to 1.5Gbytes/month download, 1Gbyte/month upload.

support for ASP, PHP, MySQL, SQLServer, Access, e-mail and webmail). Hosting prices start at USD10/month, depending on requirements. Advertising banner (468x60) prices start at USD120/month+VAT, depending on frequency of display.
See http://www.sislog.com and http://www.imensis.co.mz.

7.4.3 Mobile Telecommunication Operators

There are two mobile GSM operators in Mozambique: mCel, since 1997, with around 700,000 customers; and Vodacom, since December 2003, with up to 100,000 customers. Both allow for pre-paid and post-paid contracts (95% of the customers are in pre-paid mode) and only supply voice, data over the voice channels and SMS. No GPRS, WAP or more advanced services are provided yet. However, mCel is preparing to offer data and multimedia services over GSM (GPRS or better) by 2006. There are no signs of investment activity in 3G mobile networks. Vodacom is already able to provide value added SMS services. It is worth to note that mCel, before December 2003, had around 400,000 customers, meaning that it is consistently getting a bigger share of new customers than Vodacom.

mCel
The coverage map for mCel is shown in Fig. 13. 'Cobertura' stands for coverage, 'Futura cobertura' stands for future coverage and 'Cobertura Rodoviária' stands for Road Coverage.

Post-Paid - Tariffs are multiple in mCel, having two basic packages in the post-paid contract:
- Economic – a monthly fee of USD 12[4] + 0.1 to 0.17/minute (depending on time of the call) or 0.00215 to 0.00365/second[5].
- Executive – a monthly fee of USD25 + 0.1 to 0.15/minute (depending on time of the call) or 0.00215 to 0.0032/second.

In the post–paid contract one SMS costs USD0.05. Cost of calls from mCel to Vodacom and to the fixed network are significantly higher (at least USD0.25/minute, working hours).

Pre-paid tariffs are significantly higher than post-paid. However pre-paid cards can be acquired almost anywhere, with

Fig. 13 – network coverage mCel (source: mCel 2004)

small amounts of money (as low as USD2.00). Tariffs in the mCel network are from USD0.1375 to 0.29/minute or 0.0037 to 0.0059/second, depending on time of day. Cost of calls from mCel to Vodacom is USD0.29/minute, during working hours, but to the fixed network is significantly higher (USD0.44/minute, during working hours). An SMS cost varies according the time of the day from USD0.05 to 0.0875. For up-to-date tariffs, see http://www.mcel.co.mz.
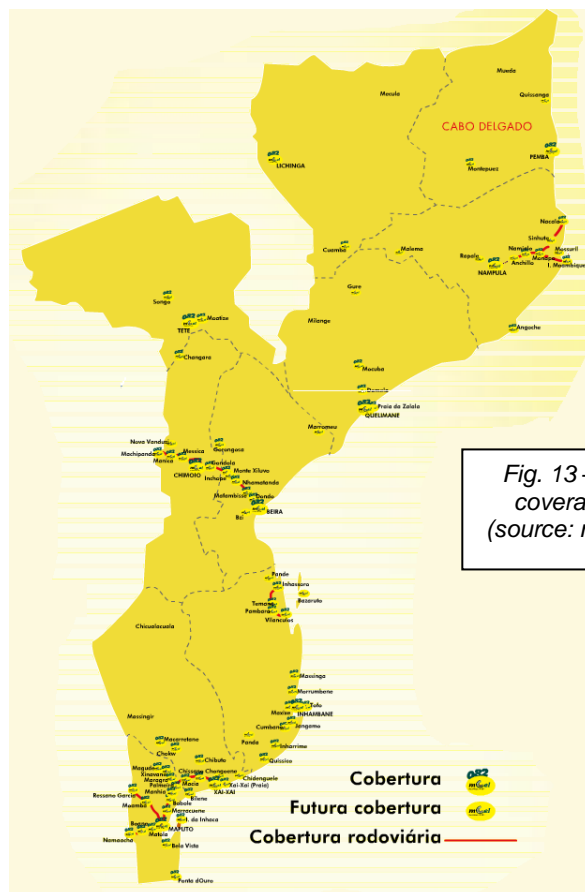
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[4] 1 USD = 20,000 MZM. MCel tariffs inclusive of VAT.
[5] Customer chooses if he wishes to be billed by the second or by the minute. Cost of 1 minute on the tariffs per second model is higher than on the tariffs per minute model.

Vodacom coverage mimics mCel coverage, though more limited. The reason for this is simply economics – in the absence of any ruling from INCM, both operators are where the business potential is. Tariffs are more complex in Vodacom, having three basic packages in the post-paid contract:

- Fale50 – a monthly fee of USD20[6] (including 50 minutes) + 0.12 to 0.225/minute (depending on time of the call) or 0.0024 to 0.00415/second.
- Fale100 – a monthly fee of USD35 (including 100 minutes) + 0.12 to 0.21/minute (depending on time of the call) or 0.0024 to 0.00355/second.
- Fale150 – a monthly fee of US47 (including 150 minutes) + 0.12 to 0.15/minute (depending on time of the call) or 0.0024 to 0.003/second.

In the post–paid contract one SMS costs USD 0.05. Cost of calls from Vodacom to mCel is equal to the cost of calls Vodacom/Vodacom. Calls to the fixed network are significantly higher (at least USD 0.25/minute, during working hours, Fale150 package[7]). Pre-paid tariffs are significantly higher than post-paid. However, pre-paid cards can be acquired almost anywhere, with small amounts of money (as low as USD2.50). Tariffs in the Vodacom network are from USD0.21 to 0.29/minute or 0.0047 to 0.0059/second, depending on time of call – the maximum at working hours. The cost of calls from Vodacom to mCel is equal to the cost of calls Vodacom/Vodacom, but calls to the fixed network cost significantly more, USD0.44/minute during working hours. SMS cost varies according the time of the day from USD0.06 to 0.0875. Vodacom is planning to implement a mobile number for Internet access. For up-to-date information see http://www.vm.co.mz.

7.4.4 Fixed Line Telecommunications

TDM – Telecomunicações de Moçambique (TDM) still owns the national telecommunications infrastructure. This consists of a network covering the ten main cities and 108 districts out of 130, which are linked through satellite, fiber optics (Maputo/Beira) or microwave (eg. Beira/Chimoio). The least covered provinces are Tete and Niassa, where less than 60% of the districts have access to a line. Through its network, TDM provides national and international fixed services, ISDN services, national and international leased circuits (analog and digital), Internet services to ISPs, the Trrim service (receive-only telephony), audio/video transmission services (limited to Maputo, Beira and Chimoio) and also Green lines (lines that are free to call and paid by the destination user).[8] Through leased lines, either copper or fiberoptics, TDM provides digital data services in multiples of 64kbps (Multibit) to banks and other corporate customers – namely other ISPs, as TDM was the first Internet gateway in Mozambique. Main indicators for TDM are the number of dial-up lines, leased lines, basic ISDN and primary ISDN. By the end of 2004, they had around 70,000 dial-up lines, 1,500 leased lines, 800 basic ISDN and 100 primary ISDN subscribers. Maputo represents about 60% of the market, except for primary ISDN where it is 90%. Nampula, Zambézia and Sofala provinces account for 30% of the market and the remaining provinces account for about 10%. Telephone directories (yellow and white) are available on the Internet since 1998. See http://www.paginasamarelas.co.mz and http://rovuma.tdm.mz/.

Tariffs: TDM tariffs for dial-up calls are divided into 4 groups (local to 50km distance, more than 50km, fixed/mobile, Internet) and three periods (normal, from 6 to 19h, economic, from 19 to 23h and weekends, super-economic, from 23 to 6h everyday). Minimum cost is USD0.08 to 0.12 + VAT @ 17% for any call and depending on time of the day. Each additional minute, billed by the second, costs USD0.057 (local), USD0.11

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[6] 1 USD = 20000 MZM. Vodacom tariffs inclusive of VAT.

[7] The cheapest one

[8] Internet is not supplied by TDM but by other ISPs. TDM only supplies bulk Internet to them.

(more than 50km), USD0.375 (mobile) or USD0.036 (Internet). Internet call prices are halved during the off-peak period (to USD 0.018) and halved again during the super-economic period (to 0.009). TDM tariffs for analog leased lines vary from a minimum of USD40/month (up to 1km) to USD400/month (up to 50km) or USD65/month to USD600/month (if 2 pairs instead of 1 pair). Digital circuits are available from 64kbps to 2Mbps and tariffs vary from USD135/month (64kbps/1km) to USD4,850/month (2Mbps/50km). If multiples of 2Mbps are required, prices vary from USD700/month/2Mbps, 1km up to USD30,000/month/34Mbps, 50km with a setup fee of USD850. All leased lines and digital circuits have a setup fee of around USD300, except where indicated otherwise. For other tariffs or detailed breakdown, see http://www.tdm.mz/.

Roll-out plans - TDM is a partner in the RASCOM project initiative where multiple VSAT will be deployed all over the country during 2006. They plan to introduce voice-mail and the virtual telephone number, to continue to expand the backbone from Quelimane to Niassa through Cuamba and are actively involved in different rural projects, namely in Tete (a project they called CEE phase 2). They also plan to introduce Fixed Wireless Access in some areas of the country (eg. Vilankulos) soon.

TDM recently launched a pre-paid card, which can be used in any fixed phone to call another fixed phone and is now launching the 800 line, in which the call is paid by the receiver and free for the caller. TDM plans to launch ADSL services based on chinese technology in 2005. The business model or tariffs is not defined yet. TDM has been adversely affected by the growth of the mobile operators and the number of dial-up lines has been steadily decreasing during the last three years (being today around 75,000, of which 60 to 70% in Maputo). See http://www.tdm.mz. Observation: TDM has financial interests in ISP's Teledata and TVCabo.

7.4.5   Mass media

RTP África is an international TV station based in Portugal and broadcasting 24/24 in portuguese (being seen in all portuguese speaking African countries). It has limited production facilities in Mozambique. RTP África has transmitters in Pemba, Quelimane, Ilha de Moçambique and Maputo, being available in Tete as a local private station. It is waiting for the government's permission to install more transmitters – in Beira and Nampula. It has an agreement to operate through TVM transmitters after this one closes its broadcasts. Transmission of sponsored programmes already occurs and it may be free of charge if the station considers it of interest to its audience.

Televisão de Moçambique (TVM) is the public television broadcaster and it covers a large percentage of the country (no estimate figure available). The network of transmitters is shown in Fig. 14. Information about future plans was not disclosed. At present TVM have only one channel, with some of the main centres (Nampula/Beira) having local
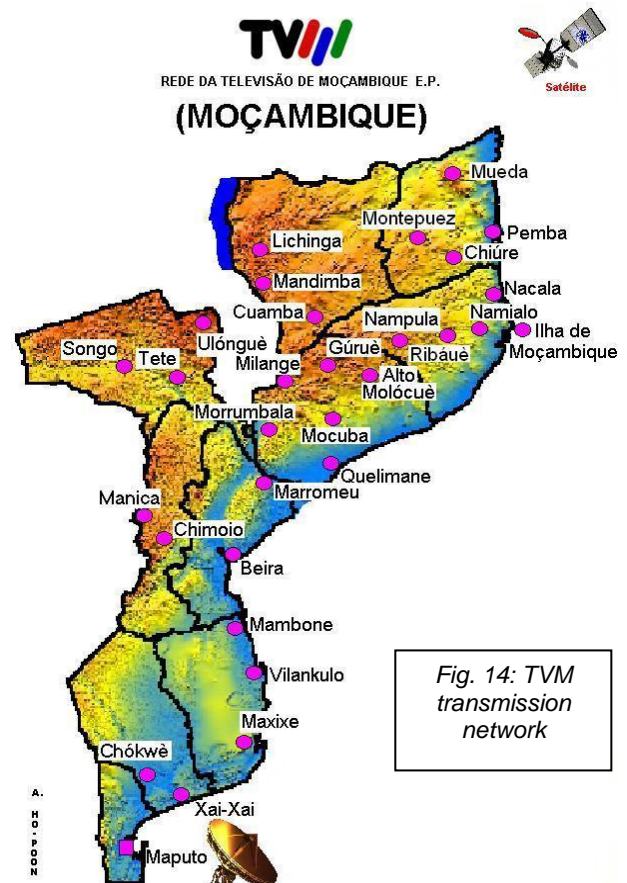

Fig. 14: TVM transmission network

programming during parts of the day. Their commercial policy to run sponsored programmes is favorable in relation with their commercial tariffs, as programmes with a social objective have a reduced tariff (which can be negotiated depending on the number and duration of the series). For example, a single programme of 30 minutes could cost USD575. With a serialised programme, significant discounts can be negotiated. TVM has a web presence, updated daily with news. They plan to develop this presence into a more interactive TV/Web channel but resources to implement that are limited. See http://www.tvm.co.mz.

Rádio Moçambique (RM) has 12 AM transmitters (one per province, three in Maputo) and 17 FM transmitters (5 in Maputo, 2 in Beira and Nampula, one per remaining province). Any of the AM provincial transmitters has its own program in local languages, while there are two national channels (Rádio Cidade (Maputo, Beira and Nampula only) and National Antenna), mostly available in FM and also available in AM in Maputo. In Maputo, Maputo Corridor Radio (in English) and RM Desporto are local specialized FM channels. Information about plans to increase coverage or channels was not disclosed. Commercial policy to run sponsored programmes was not available. RM are reformulating their web presence through inside development. See http://www.rm.co.mz.

Savana is a weekly newspaper. Sales distribution is estimated (by the publishers) to be 40% in Maputo, 60% in the remaining of the country (Beira 10 to 15%, Nampula 5 to 10%, others (7) around 5%). Each edition prints between 10,000 and 15,000 copies (no audited data, source Savana). They had a website several years ago but have no on-line presence at this stage (except e-mail service). Savana intends to reformulate its web presence and are looking for ways of turning it into a profit center, however, they are worried about the negative impact on newsprint advertising.

Notícias is the main newspaper in the country but national distribution is far from even. Sales distribution, according to the publishers, is 75% in Maputo and 25% in all other 9 provinces (from 3.5% to 0.4% per province). The newspaper is published daily except Sundays in a print run of around 12,500 copies (source Notícias). Rural distribution, even with the provincial capitals included, works out to an estimated 0.11% of the population. The circulation volume is more or less constant, showing no growth. There are plans to establish a web presence but there is a concern about their capability to feed it everyday, while benefits from an on-line edition or the impact on the paper edition are unclear.

Diario de Moçambique is based in Beira and printed/distributed simultaneously in Beira and Maputo. This paper is published every day except Sundays, although the publishers are considering to stop the Saturday publication due to low sales. They print around 10,000 copies in every edition (source: Diario de Moçambique). Sales distribution is 50% Sofala, 20% Maputo, 10% Tete, 10% Manica, 2% Zambézia and 8% in Niassa, Cabo Delgado and Nampula. There are no sales in Gaza and Inhambane, but there are plans to establish a distribution network there. A crude estimate for rural readership is 0.24% of the rural population. There is a website that should be updated daily but the updating process is an obstacle. They plan to change the design, the technology and update process (with news published as it gets in) and to insert adverts to make the online edition self-sustainable. See http://www.dmoz.co.mz.

Mediafax is the long-standing fax newspaper of Mozambique. It is published every weekday and sent by fax or e-mail (PDF version) to subscribers only. According to the publishers, there are approximately 400 subscribers and 80% receive the newspaper by fax. Sales distribution is concentrated in Maputo (80%), with 1 or 2% of subscribers in each province. It is common practice in many organizations to photocopy the fax newspapers and distribute them internally or if they have a network, to place it in their Intranet or network. This means that their audience size is much larger than their sales

numbers suggest. Mediafax is owned by Mediacoop, like Savana. They have discontinued their website several years ago, only e-mail service remains in use. Mediafax intends to reformulate its web presence, looking for ways of turning it into a profit center, while protecting the fax newspaper.
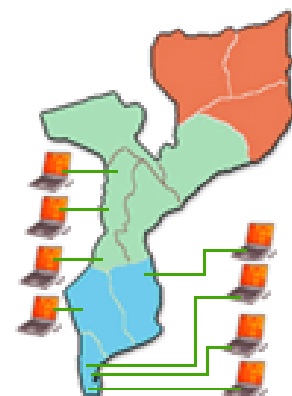
7.4.6 Community Radios

Fig. 15 – Community radios

Mozambique has a lively community radio industry. Fig. 15 shows localities with operators. By March 2004 there were 43 community radios in Maputo (3), Namaacha, Moamba, Manhiça, Xai-Xai, Homoíne, Vilankulos, Búzi, Beira, Sussundenga, Dondo, Chimoio, Manica, Marromeu, Quelimane, Morrumbala, Mocuba, Alto Molocué, Milange, Tete, Gurué, Nampula, Namialo, Ribaué, Cuamba, Ngauma, Nacala (3), Mandimba, Maua, Marrupa, Chiúre, Mueda, Pemba, Lago/Metangula (2).

Fig. 16 – Telecentres CIUEM 2000

7.4.7 Telecentres

There is a group of telecentres established around 2000, under a donor programme coordinated by CIUEM. The telecentres are established at Manhiça, Namaacha, Chokwé, Sussundenga, Gondola, Macequece, Matola, Tete and Inhambane. The approximate geographical location is shown on the map, Fig. 16. There are also the so-called CPRDs (Digital Resources Provincial Centres) in Tete and Inhambane. See http://www.telecentros.org.mz/. In addition, there are various (semi)public telecentres with Internet access. In Quelimane we sampled: Centro de Informatica IMAP (Instituto do Magisterio Primario de Quelimane) (10 workstations; no usage charges); Centro Informatico do Clube de Benfica de Quelimane

(US$0.10/minute). Surfing tariffs range from USD2,00 - 6,00 per hour. Usually, small rural telecentres charge highest due to their highest connectivity costs. Some telecentres are established with donor support but most without (fig.17).

Usage of telecentres and information centres

In Quelimane (Zambezia) two telecentres (with Internet access) and two libraries (without Internet) were analysed, through interviews and focus groups with visitors. In the telecentres, no client performed agriculture related searches. In the municipal library, no titles related to agriculture were present, although visitors in our focus group of 10 persons (age 15 – 19 years) expressed an interest in using such literature. In a secondary school library, a focus group with 12 students (age 13 – 19 years) explained that the absence of agricultural literature discouraged them from pursuing this subject area. The most frequently seen visitors are college students, and last-year secondary school students, age range 15 – 25 years with an even distribution between males and females. Surfing habits are limited, with most activity being web-mail. Searching for agricultural information is reported only exceptionally. Visitor numbers are not overwhelming, with an estimated average of 30 (provinces) to 50 (main cities) visitors per day.

In Vilanculo (Inhambane) telecentre visitors in province towns were interviewed on their interests. The centres were located in a shop, a school library and a municipal cultural centre; two of the three had Internet access. Visitors mostly run webmail and minimal surfing. The largest visitors segment is students, followed by teachers; no visitors working in agriculture were met. Most were focused on work related to the school curriculum. Some visitors expressed interest in having a reading room attached to the telecentre. Visitors to one centre cited studying English as the main reason for coming. Gender distribution men – women is about 70 – 30%. Several visitors were more keen on having a good photocopier in town rather than Internet access. Visitors travel to the centres from within a radius of 20kms. Computer and income generating skills were in high demand by our focus groups. An interesting suggestion was to establish a partnership with multimedia publishers Pandora Box for privileged access to multimedia CD's.

The Telecentros project was owners in 2000 and again in the Manica and Namaacha operations", CIUEM, Maputo "all think that the telecentres need." It was found that the aged 17 – 25. Internet users, compared to self-evaluated by the project 2002, "Evaluation study of Telecentres after 3 years of December 2002. The users are meeting a community largest user group is males services have relatively few telephone and photocopy services, although growth of consumption of ICT services is notable.

Fig. 17 – Telecentres built with donor support (left) and without support (right)

8   Comparisons between Malawi and Mozambique

Malawi and Mozambique rank among the poorest countries in the world. Malawi compares favorably with literacy rates, Mozambique with growth rates. See Table 6 below.

Table 6 - Demographics Malawi and Mozambique

Demographics	Malawi	Mozambique
Population (2003)	12,105,000	18,863,000
Agriculture/GNI	40%	40%
GNI/capita (2003)	170	210
Life expectancy at birth, years (2003)	38	38
Total adult literacy rate (2000)	60%	44%
Adult literacy rate - male (2000)	75%	60%
Adult literacy rate - female (2000)	47%	29%
Annual economic growth 2002 - 2004	2%	8%
source: UNICEF; World Bank. 2004		

The adoption of ICT shows different patterns between the two countries. Reliable estimates about growth in neither mobile telephony nor Internet were available, however, all service providers expect continued strong growth. See Table 7 for key indicators.

Table 6 - ICT Demographics

ICT demographics	Malawi	Mozambique
Internet users/100 population - local industry estimate	0.289	0.318
Mobile telephone users/100 population	1.322	2.651
Radio receivers/100 population, rural	4.131	n/a
source: based on estimates offered by local industry, 2005		

8.1   Service Providers Quality of Service

The quality of expert advice offered by agriculture extension and marketing agents is often low. Spot checks in our survey revealed that sales personnel in a farm store in Lilongwe (Malawi) was unable to explain the difference between three types of maize seed; and in Tete (Mozambique) unable to make soil preparation recommendations for common seeds. CARE International (Malawi) reported that an effort to run their extension messages through input marketing agents did not work.

In Malawi, the relatively low penetration of computers and the Internet, combined with a fairly common practice of publishing activities, suggests modest potential for stakeholders to improve on the quality and effectiveness of their publishing efforts, by (a) sourcing more titles on-line; and (b) producing more titles independently. Mozambique shows higher penetration rates for computers and the Internet, combined with a more widespread practice of publishing activities. This also suggests that Mozambican stakeholders could even more successfully improve on the quality and effectiveness of their publishing efforts.

8.2   Network Sharing

Sharing of resources is an underdeveloped practice. This applies to both sourcing of information and media productions, as well as to distribution and dissemination networks.

Table 8 - ICT tariffs

Telecommunication and Internet Services - basic tariffs							
MALAWI	fixed/mobile	SMS/msg	pre-paid/min	Internet/min	ISP/month	cybercafe/hr	leased line acct
MTL	fixed	n/a	0.10	0.03			
Telekom Networks Malawi	mobile	0.05	0.24	n/a			
CelTel	mobile	0.08	0.20	0.17	35.00		
MalawiNet (5 users)					66.67		333
Globe Internet Ltd (5 users)					56.25		600
SDNP (50 hrs/week)					85.00		650
capital city cyber-café						2.50	
provincial town cyber-café						7.50	
MOZAMBIQUE	fixed/mobile	SMS/msg	pre-paid/min	Internet/min	ISP/month	cybercafe/hr	leased line acct
TDM	fixed	n/a	0.11	0.04			
mCel	mobile	0.09	0.29	0.04			
Teledata					20.00		425
TVCabo					90.00		
capital city cyber-café						2.40	
provincial town cyber-café						6.00	
all tariffs business hours peak rates							
CelTel offers 40% discount on 5 frequently dialed numbers							
SMS tariffs given for traffic within same operator							
Leased line accounts: estimates provided based on specs ranges							
source: published rates local operators, 2005							

Mozambique boasts more examples than Malawi, of service providers using mass media houses for information dissemination: daily newspaper Notícias publishes commodity prices compiled from multiple sources; community radios broadcast market information from various regular sources. Infocom, a project of Ministério da Indústria e Comércio - Direcção Nacional do Comério / FAO Mozambique, is working on an initiative to relay commodity market information through community radio operators.

8.3 ICT affordability challenges

Two commonly observed challenges among both public sector and NGO operators are: knowledge of staff; and transport and communications. Affordability of service is an issue quoted by a large number of respondents. Table 8 shows tariffs for basic telecommunication and Internet services.

Some Internet tariffs show inflated patterns that don't reflect real operator costs, where monthly charges climb in proportion with speed and registered users. For example, an account with 5 users in Malawi may cost USD5.40 per user, but with 30 users the cost drops only to USD3.82 per user. We consider SMS charges high by African standards, as well as leased line and mobile Internet access in Malawi. On the whole, ICT tariffs in Malawi and Mozambique are not very far apart and do not show much variation. Calculated on a basket consumption of ICT charges for an office with 10 staff (of which 4

with computer), the ICT expenses index figures are high with 84 for Malawi and 75 for Mozambique, working out to monthly ICT costs per senior staff of USD209 and USD186, respectively. For Kenya, these figures would be index 46 with staff costs USD115.

Mass media consumption is low in both countries. For Malawi we have the most reliable data on newsprint: daily newspapers are read by 1.37% of the population. Calculated over the rural population in Malawi, the percentage of newspaper readers drops to 0.51% and for Mozambique our calculated estimate is 0.34%. There are no signs that TV networks will expand soon to reach a larger rural audience. The emphasis of commercial operators is on improving existing services, even introducing or improving web presence, whereas public operators lack investment capital.

8.4   ICT-readiness

The ICT-readiness in Malawi and Mozambique is not high, with Malawi scoring 13% and

Fig. 18 - ICT Readiness Headquartes and Branch Offices
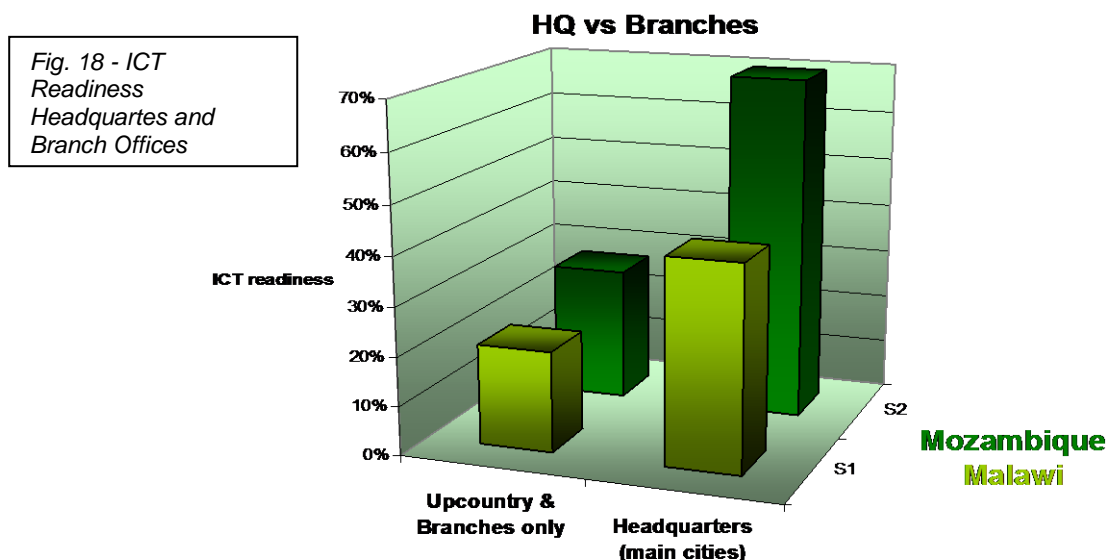
Mozambique 25%. These indicators are computed with five factors: electrical power on the grid; habitual SMS usage; presence of PC's; Internet access; the organisation having its own website. As explained in chapter 4, this ICT readiness indicator does not follow models commonly used around 1999-2001 (eg. OECD), but is merely a pragmatic indicator with practical use. The ICT readiness situation between Malawi and Mozambique shows interesting differences (Table 9). Whereas the level of ICT development and adoption by agricultural stakeholders is higher in Mozambique than in Malawi, we observe a more even spread of ICT between city-based headquarters and provincial or district sub-offices in Malawi (Fig. 18). We attribute this to two factors: (1) network coverage is higher in Malawi than in Mozambique; (2) the Mozambican capital Maputo is a relatively sophisticated city attracting international technology, against the challenge of a large, thinly populated national territory with little infrastructure.

The use of the world wide web is limited in both countries. We observed that the surfing habits of operatives are narrow, restricted to less than a handful of url's, which are rarely specific for agriculture. Especially in Mozambique, respondents complain about extremely low throughput of web traffic, frustrating surfing activity. Many websites of the locally active organisations do not target the local operatives. This is especially the case with NGO's. In other words, these websites are usually not integrated with operations on the ground. E-mail is being routinely used between headquarters and branch communications, for management purposes. If the existence of an organisational website

is removed from the organisation's ICT-readiness basket, the indicators gauged at headquarter level rise significantly: from 17% to 42% in Malawi and from 33% to 70% in Mozambique (fig. 18). At branch level if web-presence is not counted, the ICT-readiness indicators jump steeply: from 6% to 21% in Malawi and from 0% to 27% in Mozambique (table 9).

Table 9 – ICT-readiness in Malawi and Mozambique

Headquarters + Upcountry & Branches	Malawi	Mozambique
ICT Readiness %	13%	25%
ICT Readiness minus www %	37%	59%
PC's + Internet %	44%	84%
SMS %	65%	72%
Upcountry & Branches only		
ICT Readiness %	6%	0%
ICT Readiness minus www %	21%	27%
PC's + Internet %	26%	55%
SMS %	59%	50%
Headquarters (main cities)		
ICT Readiness %	17%	33%
ICT Readiness minus www %	42%	70%

8.4.1   Telecentres

The existing telecentres and information centres or public libraries rarely attract agricultural operators. Ironically, agricultural stakeholders clamor for establishing telecentres or information centres around the country at every opportunity, such as the CTA roundtables reported on above.

Fig 19 - telecentre shop in Dedza, Malawi

A few participants in our survey mentioned that they occasionally go visit a telecentre to run some official email, for which a 20kms radius appears to be acceptable. In an exceptional case, an employer issues regular imprests for Internet service at a telecentre. Most rural telecentres are simple outfits with limited Internet facilities, attracting visitor

tariffs of up to three times urban telecentre tariffs. A typical expensive telecentre is shown in Fig 19 - telecentre shop in Dedza, Malawi. In this context, it is stressed that few stakeholders in this study have websites: 22% in Malawi and 34% in Mozambique. Beyond those in the public sector and parastatals, few of these sites target local operators within the country, thereby removing an incentive to make use of telecentres.

8.4.2 Smart Cards

Industry first in banking: Finance Bank Malawi Ltd has introduced Smart Card Services. The card functions as an Electronic purse with fingerprint technology that allows the customer to carry the money on the card; withdraw money from the account at the ATM; pay merchants at their establishment customer account is debited. Smart card or magnetic strip card technology is seen as a facilitator for farmers association services development. In Mozambique, the Government through MINAG has started an initiative in March 2005 to issue farmers with ID cards. This is also a first step in the direction of membership services to groups until now excluded from most financial and subscription-type services. A pilot will start in the province Maniça. SMS banking services have only started in Malawi with one bank; in Mozambique some banks are exploring possibilities. Again such initiatives are likely to trigger value added services for trade including agriculture, as well as news services, etc.

9 Recommendations

o **Networking between agriculture stakeholders should capitalise on different strengths such as research, dissemination, distribution, marketing, broadcasting, publishing.**

o **Management of exising websites should be improved, with the support of the organisation's leadership.**

o **Low cost mobile and portable ICT solutions should be employed at the level of the 'last intermediary' and FEW.**

o **Community Radios and Agricultural Service Providers can complement each other in the market.**

o **Editorial skills for electronic publishing (web design principles; web pages; SMS services/editing; etc) should be developed urgently.**

Organisations that have operational partnerships in place within the agriculture sector, combined with an above-average ICT-readiness score, can seize the opportunity to explore avenues to create new, powerful ICT enabled agricultural extension and marketing services that make a difference to agricultural producers in the first place.

10 Annexes

10.1 Listings participants in the study

10.1.1 Roundtable Malawi 25 November 2004

1) David Rubadiri (Prof Dr) - Vice Chancellor - University of Malawi - University Office – Zomba
2) B.W. Malenga – Dpty Registrar - University of Malawi - University Office – Zomba
3) Dr. Luhanga – Deputy Director – Planning Dept - Ministry of Agriculture - Lilongwe
4) Joseph Chikagwa - Director of Engineering - Malawi Broadcasting Corporation - Blantyre
5) Brenda Mulele - Information systems Co-ordinator - Action Aid Malawi – Lilongwe
6) Webster Mbekeani - Head of Information Technology - Opportunity International Bank Lilongwe
7) Sandy Kachale - Director of Commercial Services - Malawi Industrial Research and Technology Development Centre - Blantyre
8) Mary Mbekeani - Communications Officer - National Smallholder Farmers Association of Malawi [NASFAM] – Lilongwe
9) Towani Manda - ICT Manager - National Smallholder Farmers of Malawi [NASFAM] – Lilongwe
10) Elizabeth Manda - Project Coordinator - Initiative for Development and Equity Agriculture - Lilongwe
11) Andy Safalaoh (Dr) - Senior Lecturer, Chairperson of Research and Publications Committee - Bunda College of Agriculture – Lilongwe
12) Brave Mandula - IT Manager - Auction Holdings Ltd – Kanengo-Lilongwe
13) Dan L.Yona - Chief Communications Officer - Dept. of Agri. Extension - Ministry of Agriculture – Lilongwe
14) Boniface P. Chikabadwa - Department of Agriculture Extension. - Ministry of Agriculture – Lilongwe
15) Steve Chapola - MIS Specialist – MASAF – Lilongwe
16) Booker Matemvu - Office Manager Executive Directors Office – MASAF – Lilongwe
17) Ibrahim Phiri (Dr) - Deputy Director - Agricultural Research Extension Trust [ARET] – Lilongwe
18) Francis Nkoka - Technical Coordinator - SPLIFA project - CARE Malawi – Lilongwe
19) Olive T. Chikankheni - Dept. of Information Systems and Technical Services – Lilongwe
20) G. Chavula - Department of Agriculture Extension Services – Lilongwe
21) Daniel B. Makata - Products & Marketing Manager - Telekom Networks Malawi – Lilongwe
22) Charles Kamoto - Acting Director of Marketing - Telekom Networks Malawi – Lilongwe
23) Chomora Mikeka - Lecturer of Physics & Electronics - University of Malawi - Chancellor College / dpty research coordinator CTA Project Zomba
24) James Chikopa – Librarian – Chancellor College / Research Team Member CTA Project – Zomba
25) Misheck Kabango - Research Team Member CTA Project – Zomba
26) Marcel Werner – research coordinator CTA Project – Archway - Nairobi

10.1.2 Roundtable Malawi 16 February 2005

1) Higher Education: Dr Andrew Safalaoh, Bunda College
2) Private Sector: Mr Lewis Msasa, Agriculture Research and Extension Trust (ARET)
3) NGO: Mr Sylvester Kalonge, CARE Malawi
4) NGO: Ms Elizabeth Manda, Initiative for Development and Equity in African Agriculture (IDEAA)

5) Public Sector: Ms Dr Grace M. Malindi, Ministry of Agriculture - Dept of Agric. Extension Services
6) Public Sector: Dr A.R. Saka, Ministry of Agriculture - Chitedze Research Station
7) Chomora Mikeka, Lecturer of Physics & Electronics - University of Malawi - Chancellor College / dpty research coordinator CTA Project Zomba
8) Marcel Werner – research coordinator CTA Project – Archway - Nairobi

10.1.3 Roundtable Mozambique 24 March 2005

1) Helder Gemo (Eng), Director, Extension Services Dept., MINAG
2) Júlio Fernando, Action Aid International Mozambique
3) A. Jorge, ADRA
4) Vitorino Chinekane, Associacião Kutlatleka, Inhassoro
5) Luís Lifanissa, Associação dos Tecnicos Agropecuarios (ATAP)
6) Centro de Formação Agrária, Maputo
7) Eduardo Joaquim, Jefe de Estacão, Estacão Agrocultural de Sussundenga
8) Rui dos Santos, CEO, FRUTISUL – Ass. de Fruticultores de Sul de Moçambique
9) Amilcar Mujovo Ubisse, Fundo do Fomento Agrário
10) Jorge Tinga, Consultor, Gabinete de Promoção do Sector Comercial Agrário
11) Instituto de Comunicação Social (ICS), Coordinador do Gab. de Estud.
12) C. Machungo, DG, Instituto Nacional de Fomento de Cajueiros (INCAJU)
13) Instituto Nacional de Investigacão Agronómica (INIA), Chefe de Comunicação
14) M. Hamaga, Chefe do Centro de Doc., MISAU
15) Caroline Ducolle, Coordinadora, Kulima
16) Inocencio Banze, coordinator, Sistema de Informação de Mercados (SIMA)
17) MINAG DDA (Quelimane)
18) M&E Dept., MINAG DDA (Quelimane)
19) Elvira A. Timba, Chefe do Dept MINAG - CDA
20) JoaoTsandzana, Chefe do Dept, MINAG - CDA
21) Pedro Manhepero, Chefe, Radio GESOM
22) Rui Almeida, commercial director, Teledata
23) Joao Lameiras, Partnerships, Action Aid International Mozambique
24) MINAG _ DNER
25) Hermenegilda Ruth Motses Thumbo, AMODER
26) Jose Vilanculo, Librarian, MINAG – CDA
27) Marcos Massas, Archway
28) Gil Manuel Vilankulos, Links.org
29) Vitor Pinto Amaral, Director, Imensys & Sislog, Maputo
30) Marcel Werner – research coordinator CTA Project – Archway - Nairobi

10.2 References

In this section, selected references from Malawian and Mozambican organisations are provided. Note that all relevant url's are provided in the database of inventories (see 10.2.3).

10.2.1 Web url's

Diario de Moçambique	http://www.dmoz.co.mz.
Instituto Nacional de Comunicaçoes de Moçambique (INCM)	www.incm.gov.mz
Instituto Nacional de Estatística (INE)	http://www.ine.gov.mz
Malawi Communications Regulatory Authority (MACRA)	www.macra.gov.mw
Ministério da Agricultura (MINAG)	www.map.gov.mz
Ministry of Agriculture, Irrigation & Food Security	www.malawi.gov.mw/agric/agric.htm

10.2.2 Literature selection

1) Programa Agrícola de Fomento de Fruteiras e Processamento de Fruta, Direcção
   Nacional de Agricultura, MADER, Maputo (year of publication: n/a)
2) CTA's Observatory on ICTs 6th Consultative Expert Meeting, Wageningen 23-25
   September 2003

10.2.3 Database Malawi and Mozambique

A database of ICT Service Providers and Agricultural and Rural Development
Stakeholders in Malawi and Mozambique is provided as a separate annex, on CD-Rom.
The database format is MS Access and allows running queries.