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Developments in computerised information systems in agriculture

W J. Harding

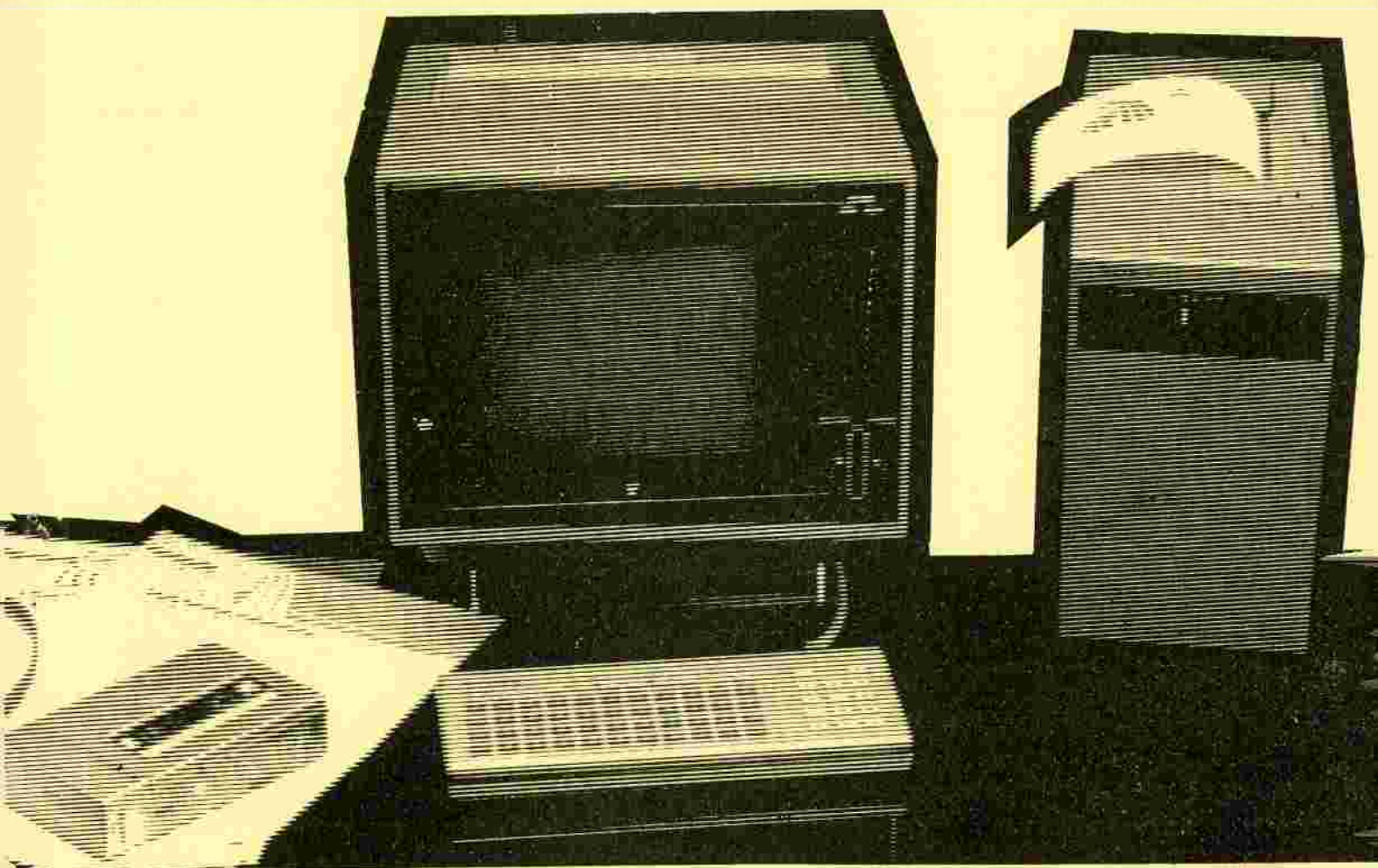
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DEVELOPMENTS IN COMPUTERISED INFORMATION SYSTEMS IN AGRICULTURE



W.J. HARDING

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Perth

DEVELOPMENTS IN COMPUTERISED INFORMATION SYSTEMS IN AGRICULTURE

The author: W.J. Harding, Adviser
Information Branch

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Includes findings from Standing
Committee on Agriculture workshop
Victoria, June 1983 and personal
observations from study tour of
United Kingdom, Canada and U.S.A.,
April - June 1983.

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DEVELOPMENTS IN COMPUTERISED INFORMATION SYSTEMS IN AGRICULTURE:
Findings from the Standing Committee on Agriculture (SCA) Workshop,
Melbourne, Victoria, June, 1983

I. BACKGROUND

A national workshop on "Developments in computerised information systems", under the auspices of the Standing Committee on Agriculture, was held in Melbourne, June 1983. While recommendations from that workshop have yet to be presented to the Standing Committee on Agriculture, conclusions from the papers and discussion at the workshop have been drawn. Personal observations from a study tour of videotex developments in Canada, U.S.A. and U.K. in April-June of this year are also made. The tour was awarded by the Rotary International Foundation and part-financed by the Regional Extension and Research Fund.

I.1 Standing Committee on Agriculture (SCA)

The Australian Agricultural Council (AAC) is the body responsible for the development of internal agricultural policy and division of constitutional responsibilities between the Commonwealth and State Governments.

The Council consists of the Commonwealth Minister for Primary Industry and the State Ministers of Agriculture/Primary Industry.

The Council is supported by a permanent technical committee called the Standing Committee on Agriculture (SCA). It consists of the permanent heads of the Commonwealth Department of Primary Industry and State Government Departments of Agriculture/Primary Industry and representatives from CSIRO and the Commonwealth Departments of Finance, Trade and Resources, and Health.

A number of technical committees and ad hoc specialist committees have been set up to advise Standing Committee in particular fields. The Agricultural Information Liaison Group was established in August 1979 and now has the following terms of reference:

- ° to maintain a record of the status of agricultural information systems in Australia
- ° to maintain contact between the Principal Officers responsible for developing the information systems
- ° to investigate and document overlap between Australian agricultural information systems in areas where greater co-ordination may be in the interest of SCA and advise on efficiencies that may be achieved.

I.2 The Workshop

This was the second national workshop on agricultural information. The first, in 1979 (Melbourne), emphasised developments in the areas of bibliographic databases and management information systems.

While the proposal that led to this workshop came from the Western Australian Department of Agriculture, support from all Departments of Agriculture was rapidly received.

Staff in all organisations were aware of the rapid developments in, and growing importance of, computerised information systems in agriculture. Developments in a number of areas had been accelerating and there were a number of important aspects where co-operation and co-ordination could be possible.

While the Workshop was designed to review the range of systems that have developed, emphasis was placed on developments in the field of videotex. In particular, trials by some Departments of Agriculture would give a useful lead to the potential of this medium in agricultural extension.

Consideration was also given to areas of possible integration/co-ordination of various systems to achieve uniform or complementary approaches to the development of these systems.

The objectives of the Workshop were:

- to review progress in the development of various information systems in agriculture
- to examine the use and potential of videotex in the provision of agricultural information in Australia
- to define further possibilities for the use of computer-based systems to service information needs in agriculture
- to consider opportunities for the integration/co-ordination of various systems
- to encourage uniformity/complementarity of approach in the development of information systems in Australia

II. CURRENT INFORMATION SYSTEMS

Since the late 1970s, there has been rapid growth in the field of computer-aided bibliographic and management information systems in Australia.

The Australian Bibliography of Agriculture (ABOA) and the Australian adaption of Agdex are two examples of systems that have been developed and are being maintained by all States and the Commonwealth in co-operation.

However, the national co-ordination of such systems has revealed problems which need to be addressed. Inadequate staff resources, funding and control have limited the growth, marketing and expansion of systems.

In addition, compatibility problems have also been identified as a result of the proposed development of separate databases covering closely related fields, such as soil conservation, forestry and fisheries. The problems involved in indexing the same items for more than one database and the difficulties in searching using different formats have emphasised the need for totally compatible primary industry databases.

The 1983 Guide to Australian Agricultural Information Sources and Systems⁽¹⁾ groups 106 information systems currently in Australia under the categories of bibliographic, factual or non-bibliographic and management information systems (see Appendix).

The Guide includes only systems that have emphasised the provision of information rather than manipulation of data. A national inventory of computer management aids and electronic data processing programs used in agriculture contains 230 programs and is maintained by the Queensland Department of Primary Industries⁽²⁾.

III. VIDEOTEX

Videotex is an electronic information retrieval system that is an easy-to-use, relatively inexpensive (compared to existing on-line computer systems), and effective method of information handling.

Based on technology that links a television set with a terminal keyboard, a low cost business terminal or an adapted micro computer to a remote central computer, communication is made via broadcast signal, telephone lines or two-way co-axial cable.

Broadcast videotex or 'teletext' transmits coded text and graphics by inserting digital signals in the normal television signal.

An adapted TV set with simple keypad control provides access to pre-recorded information including news, weather, finance, sports, home and general interest. Teletext has limited page storage and access time can be lengthy depending on the sequentially transmitted information. Apart from initial hardware costs the system is free.

Interactive videotex is an on-line information service offering instant page access, virtually unlimited page storage and two-way information flow for a wide variety of applications - information provision, consultancy, electronic transactions and data processing.

Videotex uses a central computer to store information, the packet-switched telephone network to distribute the information, and modified TV sets, adapted micro computers or videotex terminals for display. Using a numeric keypad or alpha-numeric keyboard, videotex users access the database according to a menu selection, numbered directory or keyword search.

Videotex was designed to be 'user friendly' and offers advantages over existing computer information services. Terminal cost is significantly lower than conventional computer terminals and the cost of using videotex is kept low by the use of the dial-up telephone connection versus leased lines.

The 'gateway' facility also allows videotex terminals to be connected interactively with other computer services. This interface provides immediate access to host computers of information providers as well as to existing services which may not have originally been designed for access by videotex terminals.

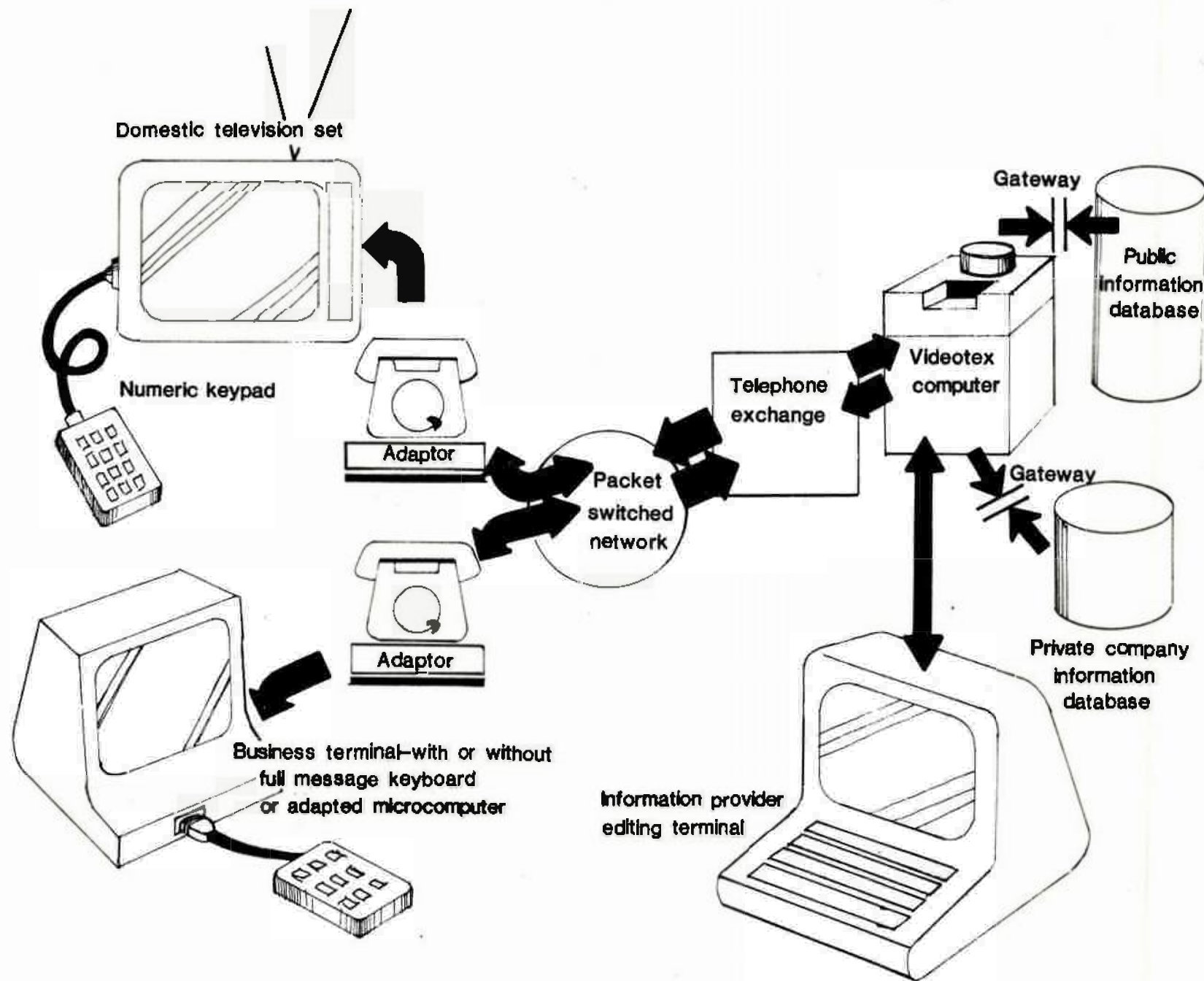
Apart from just retrieval of information on an extensive range of topics from business information to lifestyle or general interest, videotex offers interactive tele-shopping, tele-banking, tele-education, tele-software etc.

In addition, the facility of being able to limit access to certain information within the videotex database offers security for internal communication within a closed user group.

III.1 South Australian Videotex Evaluation

The South Australian Department of Agriculture agreed to co-operate with the Department of Industrial Affairs and Employment, the Department of Services and Supply and the Advertiser Newspapers as an information provider for a six month trial in May 1982.

The trial was designed to simulate as closely as possible the establishment and maintenance of a full scale operational videotex database, to assess



Elements of a videotex system

the resources and skill required and to demonstrate videotex widely in the agricultural community. A report by Allison and Graham⁽³⁾ details the trial.

A 200 page database was created with selected information based on timeliness, currency, breadth of interest and availability. The information included seasonal and topical technical information, market prices, futures, best fruit and vegetable buys, weather reports, farm costs and returns.

The following points have been extracted from reports of that trial (3, 4):

- Of the farmers who attended videotex demonstrations, about half said that they would immediately make use of such a service. The S.A. estimate is that if the service cost about \$500 per farmer per year, 1,500 farmers would subscribe.

- Prices, weather and topical agricultural information were the subjects in greatest demand. Information that changes most frequently lends itself best to the medium.

- Shortcomings revealed during the trial included the need for quicker access to the base, simplified response pages, more computing power, printing facilities and full text keyword searches.

- The high cost of servicing farmer enquiries by advisers and the opportunity of generating revenue through videotex were two reasons identified by S.A. for current interest in videotex. Using assumptions contained in a report by Richardson⁽⁴⁾, the cost of servicing each farmer through publications is \$26 per farmer, through videotex it would be about \$62 and in-person enquiry servicing costs would be about \$153 per farmer.

- Options for the use of videotex were identified:

- public system for farming and non-farming sectors
- farming database only
- specific farm sector database
- internal communication system

- Options for the involvement of the S.A. Department were identified:

- become a sub-information provider to the Victorian agricultural videotex service
- operates its own agricultural videotex service
- provide agricultural information to a public service
- provide agricultural information to private service(s)

III.2 Victorian Videotex Trial

The Victorian Department of Agriculture conducted a two-phase pilot project to evaluate videotex as a communication medium for agriculture.

The Department's approach to its project began with Phase 1 in early 1982 - publishing on videotex. Videotex was considered a medium with a peculiar limitation of screen size, limited colour combinations, database design and information suitability.

Phase 1 involved the construction of a preliminary database and was designed to develop the understanding and skills in the design and use of a videotex system. Detailed findings on the development of a house style, information flow and responsibility, database maintenance and cost of publishing are contained in Phase 1 report by K. Collard⁽⁵⁾.

The database developed in the first phase of the project was expanded for Phase 2 and ten Gippsland beef producers were given access for five months to December 1982. The trial service contained over 750 frames of information which beef producers had previously stated would be important. The service was fully maintained with daily amendments.

The following points have been extracted from the full report of Phase 2 by K. Collard⁽⁶⁾.

- * The ten farmers used the service to view an average of 260 frames per month or eight to nine frames per day. Usage patterns varied with an average use of about five minutes per day.
- * The major use of the service (81 per cent) was to access market information. It appears that the information most suited to videotex is information that requires constant updating for informed decision making. This type of information includes markets and news, weather and coming events.
- * Market information was used about 60 per cent of the time to make decisions. Eight of the ten farmers had made decisions and could recall making 14 selling decisions based on the information.
- * All farmers indicated the major videotex advantage was its readily available and up-to-date information. Others included its interactive services and home shopping potential.
- * Some of the disadvantages of videotex nominated during the trial included headaches when reading for longer than 30 minutes, operating cost and difficulty of recalling information.
- * A test of the database design indicated that farmers were able to locate 92 per cent of information that they sought.
- * Eight of the ten farmers indicated that interactive services would be of use. The most common were gross margins for alternative enterprises, feed budgeting, financial budgeting and record keeping.
- * Nine of the ten farmers said that they benefited from the videotex service. On average, they were willing to pay between \$335 to \$450 per year.
- * For a future videotex service to be viable, annual costs would have to be reduced below \$400 per year per farmer.
- * It could be assumed that videotex is unlikely to have had any effect on producers' use of existing information services during the trial. It appears that videotex was seen as supplementing other sources of information rather than replacing them.

III.3 World Videotex

Videotex was invented by the British Post Office and after two years of market trials was introduced in the United Kingdom in 1979 under the trade name of 'Prestel viewdata'.

The Prestel service was the first public videotex service and has been sold to countries such as Switzerland, Austria, Hong Kong, Belgium, Italy, Netherlands and West Germany.

Other countries such as Sweden, Norway, Finland and Denmark have adapted the Prestel standard while countries such as Japan, France and Canada have developed their own systems.

Videotex trials conducted overseas, particularly in France, Canada and England and in Australia by the South Australian and Victorian Departments of Agriculture have demonstrated the potential of videotex to provide information and data processing services to rural producers.

England

Prestel has over 200,000 pages of information with 4,000 pages of agricultural and horticultural interest. The service includes a wide range of topics from livestock prices, agri-political news, farm machinery auction prices and finance to local Weather reports.

Users pay initial hardware costs to access the service plus telephone charges, page access charges when required and computer time charges when logged-on.

Agricultural information is principally supplied by the Ministry of Agriculture, Food and Fisheries. IPC Viewdata provides a service called Agriview which concentrates on market prices. The National Farmers Union provides a news service but also uses the closed user group facility for members and country branches. The Meteorological Offices provides 3, 7, 24 day forecasts as well as soil moisture deficit reports.

Agra Europe has a small highly specialised database on EEC commodities and CAP matters while the British Veterinary Association runs an information service for members.

The initial marketing of Prestel is generally considered to have been mis-guided and after four years there are about 25,000 Prestel sets in use of which only about 800 are used for agricultural access.

Better packaging and cross-referencing of information within the agricultural database plus an expansion of the number of farmers having local telephone call access will improve penetration.

MAFF is not developing interactive farm management programs for use on Prestel; however, tele-software (down-loading of programs from the central computer) for personal computers is available.

France

The decision by the French Ministry of Postes, Telecommunications and Telediffusion to develop an electronic telephone directory has given enormous impetus to the establishment of agricultural videotex services in that country. The terminals not only replace the printed directory but provide access to continuously updated telephone numbers plus over 150 other videotex services.

In 1982, 300,000 terminals were installed and 800,000 have been ordered for 1983. By autumn 1984, 5,000 to 10,000 farmers are expected to have terminals with access to 50 to 60 agricultural services.

Services already available not only include a wide range of agricultural information but provide interactive processing power for decision making in areas such as machinery selection, crop protection, finance proposals, machinery operating costs, fungicide recommendations and financial control programs.

The mass production of terminals and TV adaptors has led to extremely low unit costs. In addition, the development of a "smart card" involving the implantation of a micro chip into a plastic card has improved security and confidence in the system, particularly in the banking industry and electronic transactions.

Canada

Two Canadian newspapers formed an electronic publishing company called Infomart and launched the first commercial application of Telidon videotex in the world in Manitoba in mid-1981.

The communications standards for Telidon videotex is different from the U.K. or French systems as is the improved quality of presentation of pictures and graphics (alpha geometric versus alpha mosaic).

This agricultural database and services called "Grassroots" has over 20,000 pages providing both agricultural and lifestyle information as well as an increasing number of interactive services for farm management calculations.

Grassroots has over 800 users in Manitoba including 600 farmers who have purchased terminals. By the end of 1983, 2,000 users are expected to be accessing Grassroots (90 per cent being farmers) with over 200 information providers.

Some of the applications available on Grassroots include tele-shopping, keyword access, farm management information, electronically updated news and market information. Major sectors are also being developed in finance, education and entertainment.

Three important characteristics of the 'Grassroots' service have enhanced the adoption of videotex by Canadian farmers.

Firstly, full keyword search offers greater access to the database while reducing the time spent locating particular information and thus computer access charges.

As a commercial venture, Infomart have tried to reduce the costs to the user. The higher resolution of the Telidon graphics has been more attractive to the advertising industry. This 'sponsorship' of information has shifted the cost of the service from the subscriber to the advertiser and provides a very cheap service to farmers through subsidisation. An arrangement with the provincial telephone company has also helped to lower operating costs.

Thirdly, the provision of interactive services for farm management decision making is in increasing demand. The ability of farmers to input individual data to determine feed rations, calibrate boomsprays or calculate the cost effectiveness of feedlotting, weed control or machinery replacement is important.

Farm management computer programs include:

- Feedlot profitability analyser
- Wheat comparative analyser
- Sprayer calibrator
- Hog finishing profitability analyser
- Land rental versus purchase calculator
- Farrowing returns calculator
- Machinery selection calculator
- On-farm grain storage cost calculator
- Herbicide usage planner
- Term loan, personal loan, mortgage calculators

IV. OVERVIEW

The explosive impact of the communications revolution is still to be felt within the agricultural community. Departments and businesses gearing up for the onslaught of in-home or on-farm tele-shopping, electronic banking and information processing will be affected by this explosion.

Advances in telecommunications and information technology have the potential to greatly improve rural producers' access to technical, marketing and farm management information.

Undoubtedly, the personal computer has had its own impact on data handling and processing. Nearly 15,000 were sold in Australia last year, 58,000 are expected to be sold this year and 150,000 are projected for delivery in 1984.

By the end of the decade, personal computers, electronic games, direct satellite broadcasting, pay television, videotex and other technologies will be increasingly integrated.

This convergence of computers, telephone-based communications and television will dramatically change the way farmers and people living in remote areas receive, manipulate, store and retrieve information.

However, while the personal computer is being hailed as the latest tool for management and decision making on the farm, computerised information services and electronic mail systems have suffered from the high cost of terminals.

Videotex, by combining the existing technologies of telephone and television or using cheap hardware access, has emerged as a worldwide technology that overcomes the problem of communication terminals by creating an enormous base of potential users.

Operating Standards

Public access videotex systems are being established in at least 17 countries. However, while the trials and services of all these systems share the common objective of trying to establish an easy-to-use, low cost information service with a competitive range of additional services for the mass market, the regulatory environments and involvement of Governments of each country are of greater significance.

In the United Kingdom, where the Government bore the brunt of financial losses suffered during Prestel's launch, videotex is becoming increasingly attractive. Better packaging of information, provision of interactive services and improved marketing will increase its penetration into the domestic sector.

In France, the Government ambitiously adopted one national standard and the offer of an electronic telephone directory has given great impetus to the videotex industry now flourishing in that country.

In Canada, the Department of Communications developed the Telidon technology and the Government has committed resources of the Department of External Affairs to the active marketing of the system. The use of Telidon by the Department of Supply to maintain "Cantel", a 55,000 page public database on Government information including an electronic job bank, social welfare and pension details, has lent further support to the use of the technology.

The involvement of Government is crucial to the successful development of videotex. In particular, the Australian Government has left the issue of a national videotex standard to be resolved by market forces. Overseas, videotex standards (codes for videotex characters) have evolved into a three-way split between the North Americans, Europeans and Japanese. Terminals that can accept one standard cannot decode others and for this reason, as well as giving hardware manufacturers a clear lead, most countries have opted for one national standard.

While the Austrians have claimed to have developed a terminal which was made to handle both the CEPT (European) and the NA-PLPS (North American) standards, it is likely in Australia that private enterprise groups will opt for differing standards requiring users to purchase terminals with more than one decoder or be limited in the range of services they can access. The possibility of the creation of a computer 'railguage' problem over the incompatibility of videotex standards within Australia or, even within an industry is very real.

Government lead

Although it is likely that Telecom Australia will be involved in videotex, the decision of the Federal Government in 1981 to prevent Telecom Australia from establishing a national videotex system, while giving a lead to private enterprise, has done little to help this industry establish.

The major role of Government is to create the best environment for this industry to develop. In France, the adoption of one standard and Government support for its national use, and the establishment of industry infrastructure, promotion of public awareness by providing free videotex access terminals in public places, and ongoing marketing, as has been done in Canada, are examples of Government support for what appears highly successful ventures.

Up to now, videotex, like any new medium, has suffered a classic 'chicken and egg' situation whereby growth is hindered until the number of users increases beyond a break-even point. Government can do much to overcome this hiatus and in an active role through its Departments can provide the lead to industry. As an information provider, Departments can use videotex to provide much wider public access to government information as well as improve internal communication both within and between Departments.

The formulation of an overall information policy statement for Australia identifying the involvement of the Government in the establishment and support of information services in Australia is long overdue.

Now is a particularly interesting time in the history of information systems development in Australia. At least half a dozen separate groups or companies are involved in discussion or actively participating in videotex systems at this time. Even more recently, negotiations are being finalised on the sale of software and hardware rights of the Canadian Telidon technology in Australia.

Trials by the South Australian and Victorian Departments of Agriculture have seen the approach to videotex move from mere speculation and experiment. The challenge in the future for Departments of Agriculture will be to structure operations so as to be able to realise the potential of computerised information systems.

The Australian Guide to Agricultural Information Sources and Systems⁽¹⁾ has attempted to document progress in the field yet it has not addressed itself to the problem of identifying the benefits or constraints to the increased use of information technology, nor has it facilitated the development of compatible systems.

Community standards

Little consideration has been given to the legal and social issues common to the provision of new computerised information services.

° Copyright: While regulations exist for the print media, test cases involving videocassette and other electronic recording are being held. Laws governing the reprinting of text are inappropriate for computer generated text.

° Litigation: The legal responsibility of the Common Carrier, Systems Operator or Service Provider for information that is rendered inaccurate through interference experienced during transmission is still unclear.

° Privacy: Most computerised information systems have the capability to provide feedback on usage patterns and generate a profile of information needs of users. Laws are needed to protect privacy and ensure security.

° Equity of information services: Policies are required to determine whether the provision of information through a computerised information service discriminates against those people who are not willing or unable to pay for such a service, particularly where that information has traditionally been provided free of charge.

National co-ordination

The need for a national approach to developments in computerised information systems to overcome the unco-ordinated growth currently arising was a consensus of the Workshop. The agreement that State Computer Co-ordinators should liaise on areas of mutual benefit was a definite step in the right direction.

To also ensure complementarity of approach in the development of computerised information systems, proposals for new services should be circulated within Australia before development is instituted. A co-ordinating body could be responsible for identifying compatible systems, liaising between participating Departments or organisations, establishing standards, advising on database structure and systems operation, information flow and be responsible for on-going co-ordination.

Agricultural videotex services are at this stage of development and it is now that we should be pressing for complementarity of approach. For example, the establishment of a national agricultural videotex service with a steering body at national level should receive a major consideration.

The national body, whether it be a Government body including farmer representatives or a national company or body within the agricultural community, would be responsible for the initiation and co-ordination of the videotex project, liaison with State steering committees, negotiation with national rural suppliers and advertisers, and to operate as an information provider to supply parts of the national database accessible by all State systems.

While the State videotex services would be the basic operating level for access and retrieval of local information, additional national information would be available through the same system. A national agricultural videotex service would provide information of national and international interest such as statistics, world currency markets, international grain markets.

Such a service would not only provide national agricultural information to all State systems, thus saving on resources needed to duplicate and maintain such information, but would ensure the establishment of a single videotex operating standard, consistent database design and uniform entry and access procedures for any user terminal anywhere in the agricultural community in Australia.

V. APPENDIX

BIBLIOGRAPHIC INFORMATION SYSTEMS

Agriculture (inclusive)

ABOA (Australian Bibliography of Agriculture)
Bibliography of Publications (Department of Agriculture, Victoria)
QBOA (Bibliography of Publications, Agriculture Department, N.S.W.)
CSIRO INDEX (CSI)
Australian Science Index (ASI)
AGRIS Current Awareness Service
CAB Abstracts
BIOSIS Previews
CSIRO Retrospective Search Service
Science Citation Index (SCI and SCISEARCH)
BIBLOS (Bibliographic Listing System)
AVID (Victorian Department of Agriculture Information Data Base)
BSES Library Information System
GLOBE-PASS (N.S.W.)

Animal Production and Protection

Pasture Nutritive Value (Minson's Data Base)

Aquatic Sciences and Fisheries

Selected Water Resources Abstracts (SWRA)
VIMSIS (Victorian Institute of Marine Sciences Information Systems)
REEF

Natural Resources

WATR

Food Science

Food Science and Technology Abstracts (FSTA)

Auxiliary Disciplines

CLANN (College Libraries Activities Network, N.S.W.)

NON-BIBLIOGRAPHIC INFORMATION SYSTEMS - FACTUAL

Education, Extension and Advisory Work

Videotex Service (Victoria)

Economics, Development and Rural Sociology

Cost of Agricultural Items (Tasmania)
Property Identifications Scheme Tasmania (PIST)
BAE Time Series Data Base
AAGIS Survey Tables (Aust. Agricultural and Grazing Industries Survey)
AAGIS Worktape (Aust. Agricultural and Grazing Industries Survey)
ADIS Survey Tables (Australian Dairy Industry Survey)
ADIS Worktape (Australian Dairy Industry Survey)
AHIS Survey Tables (Australian Horticultural Industry Survey)
AHIS Worktape (Australian Horticultural Industry Survey)

Plant Science

HERBRECS (Queensland Herbarium Records System)
Census of the Vascular Plants of Western Australia
Northern Territory Plant Catalogue
HERBFILE (Northern Territory Herbarium File)
Northern Territory Herbarium Collection Points
Northern Territory Introduction Records
Northern Territory Plant Performance
Northern Territory Seed Stocks
Northern Territory Bulk Seed Stocks
Northern Territory Seed Analysis
FERTLIST (Registered Agric. Fertilisers, Victoria)
Registered Fertilisers (Tasmania)
ASEHIS (Areas of Soil Erosion Hazard Information System, Qld.)

Protection of Plants and Stored Products

PESTLIST (Registered Agric. Chemicals, Victoria)
Pesticide Use (Tasmania)
W.A. Pesticides Registration System
Registered Herbicides (Tasmania)

Animal Production and Protection

Dairy Herd Recording System (Tasmania)
N.S.W. Herd Improvement Program
Dairy Herd Health and Management Program (Victoria)
ANADIS (Australian National Animal Disease Information Service)
Mastitis Advisory Service (N.S.W.)
Queensland Bluetongue Data Recording System
Queensland Animal Disease Recording System
LABTESTS (Animal Health Laboratory Recording System, W.A.)
Abattoir Pig Disease Monitoring (N.S.W.)
Swine Brands Register (N.S.W.)
Apiaries Register (N.S.W.)
W.A. Animal Quarantine System
Northern Territory Cattle Movements
Slaughtering Statistics (Victoria)
Condemnation Reports (Victoria)
Condemnation Reports (N.S.W.)
Hydatids Survey (Victoria)
W.A. Stock Brands Register
Registration of Stock Brands: Large Stock Brands (N.S.W.)
DPISPS (Stock Permit System, Queensland)
COBRA (Computer Operated Brand Recording and Acquisition System, Qld.)
Sheep Brands/Earmarks (N.S.W.)
STOCKLIST (Registered Stock Feeds, Victoria)
Stock Foods Registrations (N.S.W.)
Australian Feeds Information Centre
Least Cost Feed Formulation System (LCF)
Stock Medicines Data
Agricultural Chemicals and Stock Medicines System (S.A.)
W.A. Veterinary Preparations Register

Aquatic Sciences and Fisheries

AMRIP (Aust. Marine Research in Progress)

Natural Resources

Land Resources Surveys - N.T.
WARIS (Western Arid Resource Inf. System, Qld.)
Insect Occurrences in S.A.

Auxiliary Disciplines

AGDEX - Adapted for Use in Australia

MANAGEMENT INFORMATION SYSTEMS

Agriculture (inclusive)

VAMIS (Victorian Agricultural Management Information System)
MIS (Management Information System, N.S.W.)
VAMIS Pilot Study (Tas.)
AMIS (Agricultural Management Information System, N.T.)
Department of Primary Industries Management Information System
Project Listing, Division of Marketing and Economic Services, N.S.W.
BSES Research Information System
ARISA (Agricultural Research Information System for Australia)
Research File (Tas.)
SPRAC (System of Planning and Review of Research Activities and their
Communication, N.S.W.)
W.A. Department of Agriculture Research Index
PERSON (Inventory of Research and Extension Professional Staff, N.S.W.)
Organisational Structure (S.A.)
Establishment Central System (S.A.)
CARS (Common Accounting Reporting System, N.S.W.)
Inventory of Allocations from Commonwealth Rural Industry Research Trust
Accounts
STRC (Scientific and Technical Research Centres in Australia)

Education, Extension and Advisory Work

Review of Agricultural Extension (N.S.W.)
Agnote (Victoria)
Farmer Bulletin (N.S.W.)
Journal of Agriculture Distribution List (Tas.)
D.P.P. Mailing List (N.T.)

Economics, Development and Rural Sociology

NAERI (National Agricultural Economic Research Inventory)

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