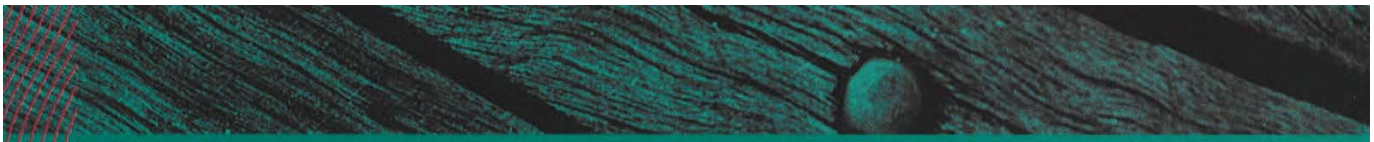

Identifying, Selecting and Implementing Assistive Technology in the Agricultural Workplace

a guide for rehabilitation professionals and other service providers designed to assist them in identifying, selecting and implementing assistive technology, appropriate for the agricultural workplace

AUSTRALIAN CENTRE FOR AGRICULTURAL HEALTH AND SAFETY

Identifying, Selecting and Implementing Assistive Technology in the Agricultural Workplace

A Guide for Rehabilitation Professionals and Other Service Providers, Designed to Assist Them in Identifying, Selecting and Implementing Assistive Technology, Appropriate for the Agricultural Workplace.

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DISCLAIMER

CONTENTS

INTRODUCTION

The purpose of this guide is to provide assistance to rural rehabilitation workers and other service providers in identifying, selecting and implementing assistive technology, appropriate for the agricultural workplace. It is hoped the information presented will improve the quality and efficiency of services currently being provided to individuals with disabilities who are engaged in agricultural production or related occupations.

The information provided in this guide is based primarily on the experience and research activities of the Breaking New Ground Resource Centre and Outreach Program which provides assistive technology services to farmers and farm workers in the United States. The information in the guide has been adapted to Australian Agriculture with the permission of Purdue University.

WHAT IS ASSISTIVE TECHNOLOGY?

Assistive technology extends human abilities and expands opportunities. Technology allows us to manipulate objects to achieve various purposes - to communicate with one another, to feed ourselves, to build shelters, to get around, to work, and to play. Assistive technology extends over a whole range of items from toys; to knives and forks; to communication boards, to wheelchairs; to tractors. This broad range includes the simplest object and the most technologically demanding machinery modification. All are equally as effective in different circumstances.

All people use assistive technology, whether they have a disability or not. Technology allows people to accomplish what they would not otherwise be able to do. We could not fly without aeroplanes; and someone with quadriplegia could not travel down a path without a wheelchair. Telephones allow us to speak to people halfway around the world, while an amplifier enables a person who is hearing-impaired to use the telephone. A tractor and plough enables a farmer to plough 50 hectares in a single day and, if that farmer is a paraplegic, a lift will allow him or her to get onto the tractor.

Assistive technology, in other words, consists of practices, devices, tools, modifications, processes, and a special knowledge of science and engineering which is used to enable a person to perform tasks. In the context of this publication, assistive technology enables a person with a disability to complete essential tasks within an agricultural setting.

The commonly used definition for assistive technology defines it as "any item, piece of equipment or product system, whether acquired commercially off the shelf, modified, or customised, which increases, maintains, or improves functional capabilities of individuals with disabilities".

Assistive technology devices designed for people with disabilities can be categorised according to their intended purposes. In the Australian Occupational Therapy profession, assistive technology devices are commonly categorised according to occupational purposes and activities of daily living, for example personal care, communication, leisure, and home management.

Assistive technology for people with disabilities is also described in terms of the environment in which it will be used most often. Environmental context can determine how a device will be used, as well as the process of acquiring it, and who pays for it.

For example:

1. Technology can be provided in a medical environment, such as a hospital or rehabilitation facility, to enhance the rehabilitation process following an injury or disease. In this context occupational therapists, physiotherapists, doctors, nurses, speech pathologists, and other health professionals help people acquire the assistive technology they need. There may also be an allowance in both public and private health insurance, for the payment of assistive technology.
2. Assistive technology can be used in an educational setting to improve the education and training opportunities of people with disabilities. Teachers and rehabilitation workers are involved to help decide which technology will contribute towards reaching established educational goals. Often the rehabilitation workers visit the school or institution and give ‘hands on’ demonstrations of assistive technology and highlight the importance of assistive technology for disabled people. Funding for the needed technology frequently comes from the rehabilitation workers.
3. People also benefit from the application of assistive technology in the workplace. Enhancing functional abilities of people with disabilities through tools and other

devices qualifies them for many employment opportunities and enables them to pursue vocations after injury or disease. Employers, vocational rehabilitation counsellors, rehabilitation professionals involved with vocational rehabilitation and rehabilitation engineers and technologists help to identify appropriate technology. Employers, vocational rehabilitation agencies and insurance companies may be in a position to offer funding.

Regardless of the setting, the primary responsibility for identifying, acquiring, and funding assistive technology lies with the people who will use it. People with disabilities and their families can best identify problems, needs, and ways to enhance abilities. The uses of assistive technology are limited only by our imagination. We have a long history of finding better ways to extend our reach and to improve our situation. If our ancestors had not dreamt of flying, would we ever have reached the moon?

What is assistive technology? The answer can be found in the answer to the question, "What if …"

Impact of Disability on Rural and Farm Populations

1. Causes of disability within the agricultural community

Since 1993/94 there has been a significant drop in the number of farming enterprises in operation across Australia; falling from approximately 150,389 in 1993/94 to around 130,000 in 2003/04 according the Australian Bureau of Statistics (ABS). While the statistics show a decrease in the number of farms, the size of farms is increasing suggesting that farmers are increasing the size of area to achieve economies of scale. According to ABS, Labour Force 2005/06 statistics the agriculture, forestry and fishing workforce makes up approximately 4% of the total Australian workforce with agricultural and horticulture enterprises contributing more than $30 billion to the Australian economy each year[1]. This workforce includes both owner operators and any number of agricultural workers employed to assist with agricultural activities on a full-time or seasonal basis.

Despite the relatively small number of people working in the agricultural industries, agricultural production remains ranked as one of the most dangerous occupations in Australia. While there is no single source of death and injury data in Australian agriculture, the National Farm Injury Data Centre has examined a number of databases such as the National Coroner's Information System, the Australian Workers Compensation Scheme and Australian Bureau of Statistics to develop an understanding of the Australian agricultural accident and injury rate. The table below shows the number of non-fatal workers compensation claims made in the agricultural industries by salary or wage earners over a 4 year period according to Australian Workers Compensation Scheme data[1].

Table 1. Number of fatal and non-fatal injury workers' compensation claims in agriculture industries by year, Australia 2001-2004[1]

Year	Fatal	Non-fatal*	Total
2001	18	4388	4406
2002	12	4337	4349
2003	16	4096	4112
2004	16	3751	3767
Total	**62**	**16,572**	**16,634**

Source: NOSI Database. www.ascc.gov.au
**Duration of absence: 1 week or more*

Data also show that the majority of agricultural enterprises in Australia are family owned and operated, with only 5% of Australian farms being classified as corporate farms, it can therefore be suggested that a significant number of non-fatal injuries occurring on

[1] Morton C, Fragar LJ, Pollock K. *Traumatic Deaths in Australian Agriculture – The Facts 2007*. Rural Industries Research and Development Corporation and Australian Centre for Agricultural Health and Safety. 2007.

farms are not represented in these statistics and there is a gross underestimate of injuries occurring on Australian farms annually.

A large number of farmers and agricultural workers do continue to farm after an injury however, isolation, limited financial resources, and inadequate access to needed services frequently hinder them.

Farm work injuries encompass a range of injuries from slight bruises to traumatic limb amputations, head and spinal cord injuries, and noise induced hearing loss. In a study undertaken by the Australian Centre for Agricultural Health and Safety in 1997, farmers and farm workers from four regions in New South Wales were asked to report on injuries and illnesses which have stopped them from being able to carry out their usual farm tasks over a period of time. Shown in the table below is the nature of the injury and illness as reported for 110 injury or illness events[2].

Table 2. Nature of the Injury/Illness (n=110 injury/ illness events)[2]

Nature of the Injury or Illness	Number	Percent of Events
Sprain/Strain	46	42
Fracture	18	16
Injury to Internal Organ (eyes, ears)	11	10
Amputation	5	5
Respiratory Difficulty	4	4
Systemic *NEC	3	3
Cut/Laceration	3	3
Soft Tissue *NEC	3	3
Puncture/Penetrating Wound	2	2
Burn	2	2
Dislocation	2	2
Other Injury *NEC	2	2
Oncology	2	2
Coronary Heart Disease	2	2
Q Fever	2	2
Ross River Fever	1	1
Osteoarthritis/Arthritis	1	1
Shingles	1	1
Hypertension	1	1
Paraplegia	1	1

*NEC = Not Elsewhere Classified

Just about any part of the body can be seriously injured in a farm accident. Spine, legs, head, arms, and respiratory tract, are most frequently injured. Table 3 lists various body parts affected by injury and illness as reported in the Rehabilitation Services for Injured and Disabled Farmers and Farm Workers survey.

[2] Boughton K, Fragar L, Davies G. Rehabilitation Services for Injured and Disabled Farmers and Farm Workers, Final report. Australian Agricultural Health Unit. 1997.

Table 3. Body Parts Affected (n=110 injury/illness events)[2]

Body Part Affected	Number	Percent of Events
Trunk (including back)	58	53
Leg	26	24
Head	25	23
Arm	25	23
Respiratory tract	19	17
Systemic	6	5
Digestive Tract	3	3
Nervous System	2	2
No Response	3	3

Farmers and agricultural workers are also disabled as a result of non-farm or non-work related injuries. Motor vehicle and recreational accidents each account for a proportion of disabilities that effect performance of farm related activities. In the Rehabilitation Services for Injured Farmers project up to a quarter of the injuries reported occurred in non-farm related accidents, however these injuries impacted on the ability to work on the farm.

In addition to accidents, farmers and agricultural workers are affected by other disabling conditions such as Ross river fever, Q fever, cancer, multiple sclerosis, stroke, cerebral palsy, heart disease, arthritis, degenerative disc disease and many more[2].

Further results from the study show that from the 227 people working either full time or part time, 51 (22%) indicated they were unable to work at the same pace or with the same ease because of an injury or illness. From the 227 people working either full time or part time on the farm 24 (11%) were only able to carry out different or modified tasks because of the injury or illness. Furthermore, from the 227 people working either full time or part time on the farm 33 (15%) indicted that they were now returning to farm work after having had the injury or because of the illness, which had prevented them from being able to carry out their normal farm tasks[2].

Often in the case of the primary farm workers being injured or ill, there isn't the manpower available to do the necessary work, as a result the farmer is forced to remain on the job in less than ideal physical condition or other unqualified or unskilled family members are required to perform farm tasks. Factors such as increased travel time to health care facilities, greater difficulty in obtaining walk-in treatment, and increased waiting time to schedule medical treatment may result in minor health problems and or injuries developing into permanent disabilities.

2. Physical disabilities among farm children

Extensive research into child safety on farms has been undertaken by the Australian Centre for Agricultural Health and Safety. Results from the 3 study found that on average 30 children under that age of 15 years die on Australian farms each year as

a results of farm injury and on average a further 575 children are admitted to hospital as a results of a farm accident according to the NSW Health, 2002 statistics[3].

The table below shows the number of children admitted to hospital with a farm related injury, by age. Results show that the most common causes associated with hospital admission were: motorcycles, farm vehicles, horses and falls.

Table 4. Children injured on farms who were discharged from hospital between July 1994-June 1998, by selected External Cause code groups and age group, Australia (excluding SA)[3]

Description	0-4 yrs		5-9 yrs		10-14 yrs		Total	
	n	%	n	%	n	%	n	%
Motor vehicle non-traffic accident & other road vehicle accidents								
motorcycles	13	2.7	116	17.3	346	27.5	475	19.7
other vehicles	65	13.5	76	11.3	186	14.8	327	13.6
animal ridden	20	4.2	109	16.3	237	18.9	366	15.2
Poisoning by agricultural chemicals	11	2.3	*	*	*	*	14	0.6
Fire & flames	*	*	8	1.2	21	1.7	32	1.3
Venomous animal/plants	18	3.7	19	2.8	26	2.1	63	2.6
Dog bite	16	3.3	*	*	*	*	21	0.9
Injury by other animal	31	6.4	39	5.8	44	3.5	114	4.7
Agricultural machinery	31	6.4	51	7.6	41	3.3	123	5.1
Other machinery	15	3.1	5	0.7	6	0.5	26	1.1
Cutting & piercing	16	3.3	33	4.9	32	2.5	81	3.4
Subtotal	**246**	**51.1**	**463**	**69.1**	**949**	**75.5**	**1658**	**68.9**
Motor vehicle accidents	20	4.2	36	5.4	110	8.8	166	6.9
Poisoning	14	2.9	0	0.0	4	0.3	18	0.7
Falls	81	16.8	102	15.2	84	6.7	267	11.1
Natural & environmental factors	15	3.1	11	1.6	15	1.2	41	1.7
Drowning	26	5.4	*	*	*	*	27	1.1
Other E Codes	na	na	na	na	na	na	246	10.2
Group Total	**481**	**100**	**670**	**100**	**1257**	**100**	**2408**	**100**

Source: Franklin & Harrison (2002)

* Number of cases less than 4

na Not available

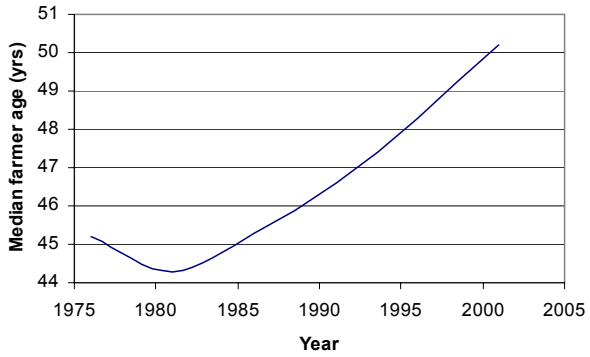
[3] Fragar LJ, Stiller L, Thomas P. *Child Injury on Australian Farms – The Facts 2005*. Rural Industries Research and Development Corporation and Australian Centre for Agricultural Health and Safety. 2005.

Statistics would indicate that there is a substantial population of children with physical disabilities living and working on Australian farms that would benefit from rehabilitation programs and assistive technology.

3. Physical disabilities among older farm residents

The farming population in Australia is ageing. According to ABS 2001 Census data, over a quarter of farmers are over the age of 50, with 37.6% being over the age of 55 years. A significant proportion of farmers are continuing, through choice or economic necessity, to farm well beyond the traditional retirement age of 65 years, in fact 15% of farmers/farm managers are 65 years or older[4]. Figure 1 shows the trend of increasing age over the past 25 years.

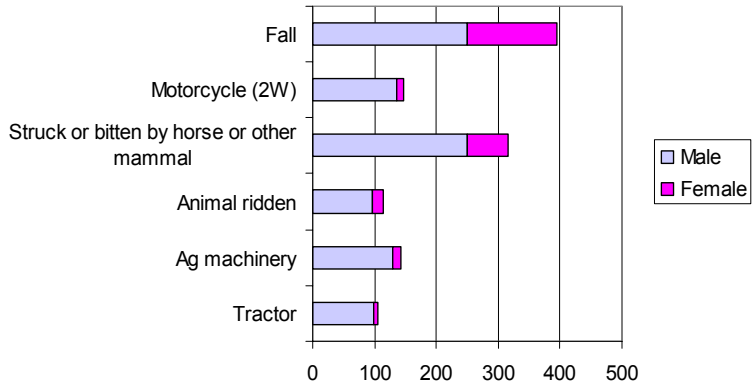
Figure 1: Median age of Australian farmers, 1976-2001[4]



Source: Barr (2004) The Micro-Dynamics of Change in Australian Agriculture 1976-2001.

There is no question that the rural population is rapidly ageing and more is being known about the magnitude and nature of physical disabilities among older farmers. The figure below shows the number and type of hospital admissions occurring in NSW hospitals for both males and females over 55 years of age. While only NSW statistics are shown the majority of the agricultural workforce is employed in NSW and it can be suggested that these results would reflected all states of Australia[4].

Figure 2: Non-intentional, non- fatal hospitalisations of those aged over 55, by major external cause of injury and sex, which occurred on farm, NSW July 2000-June 2005[4]



Source: NSW Inpatients Statistics Collection (HOIST) NSW Health, January 2006.

[4] Morton C, Fragar LJ, Pollock K. *Health and Safety in Older Farmers in Australia – The Facts 2006*. Rural Industries Research & Development Corporation and Australian Centre for Agricultural Health and Safety. 2006.

4. Summary - Need for rural rehabilitation services

The Australian Centre for Agricultural Health and Safety identified key rehabilitation service needs and requirements that should be addressed for the agricultural workforce in Australia[2].

1. The establishment of rehabilitation services for farmers/farm workers is a difficult issue due to the large number of widely distributed and diverse farming operations within Australia.
2. Under-utilisation of the full range of available rehabilitation services may occur due to economic pressures on farmers.
3. Rehabilitation workers will need to be able to recognise the specific physical and environmental demands of the various commodity production systems within Australia.
4. Rehabilitation services will need to take into account unpaid family members, self-employed farmers and farm workers.
5. The proportion of older people in this industry is increasing and rehabilitation services need to take this into consideration as the demands for these services are also likely to increase.
6. There are implications for support services located in traditional clinical care environments which will increasingly need to be able to provide rehabilitation information.
7. Effective rehabilitation services will need to be a team effort involving a wide range of disciplines and a high level of case management skill.
8. There is a need for more accurate information regarding the number and nature of farm injuries occurring as well as the extent to which resulting impairments are constraining active participation of workers in agricultural production.
9. There is often a lack of awareness or understanding of the services available.

There are thousands of farm family members and agricultural workers in the Australia who have physical disabilities which hinder them from completing essential work-related tasks or might eventually force them to prematurely discontinue farming. Furthermore, this population is probably the most isolated from rehabilitation services and resources, such as independent living centres and rehabilitation centres, which have the potential for reducing the impact of their disability.

Experience has shown that for every disabled farmer who seeks rehabilitation assistance by taking the time to make a telephone call or write a letter, there are many more that remain unserved, isolated from the potential benefits of rehabilitation services.

Barriers to Providing Assistive Technology Services in Rural Settings

1. Barriers to services

Following are a number of suggested barriers to the effective delivery of rehabilitation services to rural residents[2].

1. Economic limitations (income levels are lower than for urban residents).
2. High unemployment and underemployment (lack of suitable employment opportunities which will accommodate individuals with disabilities).
3. Health care (shortage of health care professionals and a general absence of preventative and health maintenance activities).
4. Limited educational opportunities (rural educational institutions often lack adequate facilities, qualified staff and specialised educational programming and services).
5. Restricted transportation (isolation, non-existent public transportation and low income greatly restrict travel opportunities).
6. Attitudes (poor image of those with disabilities and agencies which provide services to those individuals).
7. Inadequate data (limitations in knowing the needs prevent the development of effective plans of action).

In the Rehabilitation Services for Injured and Disabled Farmers and Farm Workers project injured and disabled farmers and farm workers were asked why they did not seek professional rehabilitation services following the event[2].

Responses included:

1. Didn't know who to go to.
2. Too expensive.
3. There were no appropriate services available.
4. Didn't think the services could provide the skills required.
5. Not available when I wanted it.
6. Rehabilitation workers generally don't understand the work requirements of farmers and therefore return to work programs are sometimes inappropriate.

2. Need for professional resources

In general, many rural communities have fewer resources to allocate to health care services, education and other human services commonly found in urban settings. Consequently, individuals in need of specialised services often receive lower levels of service or go without. This situation appears to be especially true with respect to all forms of rehabilitation services, including obtaining assistive technology.

Until recently, there have been few resources for the rural rehabilitation professional to turn to for the solution of an assistive technology problem. Few modifications and assistive devices, appropriate for use by farmers and agricultural workers, have been documented, and there has been no central source of this type of information. The result has generally been the frequent "reinventing of the wheel" and the accompanying frustrations by the service provider and consumer.

Several developments have occurred in recent years which have contributed to increasing public awareness in rural areas concerning disability issues and filling the voids that have existed with respect to assistive technology services. These include:

1. Research undertaken by the Australian Centre for Agricultural Health and Safety into rehabilitation services for injured and disabled farmers.
2. Establishment of the AgrAbility Australia Self-Help Network of Injured and Disabled Farmers and Farm Workers.
3. The establishment of a partnership between Purdue University, Indiana and the Australian Centre for Agricultural Health and Safety, allowing co-authorship of documents such as “Conducting Agricultural Worksite Assessments”, “Identifying, Selecting and Implementing Assistive Technology In the Agricultural Workplace” and Volume 2 of "Agricultural Tools, Equipment, Machinery and Buildings for Farmers and Ranchers with Physical Disabilities. "
4. The development of agricultural assistive technology resources by CRS Australia, formerly known as the Commonwealth Rehabilitation Service, including the Farm Safety Solutions Kit and a CD of assistive technology ideas for agriculture.
5. The interest generated among professionals by attendance and presentation of material at conferences on Rural Health and Safety and Farm Safety as well as an increased number of rehabilitation service providers attending Agricultural Field Days.

Unique Characteristics of the Agricultural Workplace

During the past thirty years, agricultural production has changed as dramatically as any part of our society. However, the understanding level of the general public concerning how our food is produced has not kept pace. With a small percentage of the population currently living on farms, many perceptions of how farmers work - not all of which are correct - have developed. For example, a recent Kondinin Group WA, study has shown urban children's perceptions of farmers as being slow, friendly and hardworking, as opposed to the image of farmers as dynamic, innovative and clever members of our society.

Following are characteristics, which may be helpful in describing present day agricultural production to those without the benefit of being raised on a farm:

1. Agricultural workplaces are generally in rural, less populated areas. The time spent travelling for work-related activities can be a substantial part of the day. Vehicles, telephones, and computers, are important business tools.
2. Agricultural workplaces are, in most cases, the living environment for the farm family. In other words, farm families generally live and work in the same location. Bathrooms, eating facilities, and workshops serve both vocational and leisure purposes. Even some of the equipment, such as motorcycles and All Terrain Vehicle's (ATV’s) or quad runners, are used for both work and recreational activities.
3. Work in agriculture takes place in all types of environmental conditions. Workplace temperatures can range from below zero degrees celsius in winter to the mid forties in summer. Regardless of weather, sheep, cattle, pigs and horses need to be fed and cared for. Workers are also exposed to other environmental conditions such as rain, wind and snow and the problems they cause such as mud, dust and ice.
4. Agricultural production today is technology-intensive. Physical strength is no longer a prerequisite for being a successful farmer. The extensive use of technology has removed much of the drudgery of farming, has greatly increased productivity and has increased the demand for good management skills. There are, however, many smaller farms that still are dependent upon a considerable amount of manual labour. Extensive use of manual labour is also still found in horticultural production operations.

5. Agriculture is big business. When a new tractor can cost $50,000-$300,000 and a harvester $300,000-$500,000, the opportunities for starting a farm operation outside of a family setting have been greatly reduced. It takes major investments in capital to begin and maintain a farm operation that can support a family today. There are very few cases of a person with a disability going into farming. Often the individual was involved in some aspect of farming prior to the disability and wanted to remain active.

6. There is a broad range of people involved with agricultural production. A study of work-related disabling injuries reveals that children as young as five are sometimes injured doing farm work and more than one-third of the injuries involve those over the age of 60. It is not uncommon to find individuals over the age of 75 still making significant contributions to the farm operation, and wanting assistive technology.

   Agriculture involves people with a broad diversity of intellectual skills. This can range from no formal education to advanced degrees in agricultural sciences. It can no longer be assumed that when working with farmers you are dealing with a poorly educated group of individuals.

   Those involved in agriculture also have a wide variety of cultural differences. In some areas you can encounter, in the same region, a temporary farm worker from Europe on a working holiday, a migrant family with roots in Southeast Asia, a farm operator with a degree from a university, a hired farm hand with few reading skills, and a hobby farmer who makes his or her living as a lawyer.

7. Agricultural production involves a tremendous diversity of tasks. Task analysis has identified literally thousands of different skills that are needed in the course of a year work on a farm. Some of these tasks are very simple and require little training while other demand considerable technical skills and knowledge. For example: during a two-hour milking, a dairy farmer might perform the following tasks:

   a. Install and remove a milking machine 100 times
   b. Inspect 100 cows for general health problems including mastitis or respiratory infections
   c. Administer an injection of antibiotics
   d. Reprogram an automatic feeding system
   e. Repair a broken gate
   f. Conduct a genetic study of desired blood lines
   g. Detect a cow in need of breeding
   h. Perform an artificial insemination procedure
   i. Disassemble and sanitise milking equipment
   j. Break in a new heifer

8. Agricultural production remains dominated by males. A recent Australian survey of farm families in selected areas in New South Wales found over 90% of cases of farm injuries were reported by males[4]. The overwhelming majority of those served by existing rural rehabilitation programs are male. Males comprise the major portion of the workforce and have the greatest influence over management decisions.

9. Farmers generally work alone. Many of the tasks associated with agricultural production are designed so one person can complete them. It is not uncommon for a farmer to work all day and have contact with only one or two other people.

10. Agricultural production is becoming increasingly regulated. Increasing emphasis is being places on Occupational Health and Safety issues on farms.

DETERMINING THE NEED FOR AGRICULTURAL WORKSITE MODIFICATIONS

Introduction

This is the "who, why and when" in the application of assistive technology services. The "how's" and "what if's" will be addressed later. This section deals with identifying problems and needs. As mentioned earlier, the environmental context determines which device is to be used, how and where it is to be used, and who pays for it. Conducting the assessment promptly will provide the information needed to answer these questions. And, if the primary responsibilities for identifying, acquiring and funding the needed assistive technology lies with the person who will be using it, then rural rehabilitation professionals can be used as a facilitator by asking the right questions or bringing in the appropriate technical personnel to evaluate needs. The rural rehabilitation professional should think of themselves as tools for the end user, putting their service roles in proper perspective and assisting the client to clearly identify their actual needs. The importance of the family or other support people being involved in the assessment process cannot be stressed enough, especially in determining the levels of modification (covered in the following section). **Conducting Agricultural Worksite Assessments** describes one type of agricultural assessment tool, it provides an explanation of the questions that need to be asked and how the answers may be recorded. In this guide, only the processes and results of performing assessments will be discussed.

Conducting an Agricultural Worksite Assessment

1. Objectives of Worksite Assessments

Whatever type of assessment format is used, it is important to identify situational barriers and opportunities in such a manner to facilitate the selecting, financing and/or fabricating of assistive technology. Outcomes of this activity should include:

a. A better understanding of the size and scope of the total operation and the individual's role in it, including the potential for alternative enterprises.

b. Identification of significant workplace barriers and functional limitations that prevent completion of essential tasks.

c. The opportunity to discuss desired worksite modifications, possible task restructuring or the assignment of certain hard-to-perform tasks to other family members or employees.

d. The opportunity to formulate specific goals which will help the farmer to increase independence, productivity and profitability.

e. The opportunity to enhance good rapport between rehabilitation professionals the farmer/farm worker and their family.

Points (a) and (b) are the raw data that builds an overall picture, (c) is the discussion of the data with the individual that helps to determine levels of modification and criteria for selecting assistive technology (d) is the planning stage for financing, obtaining and/or fabricating the needed assistive technology and (e) is the process of developing a professional working relationship with the client and their family.

2. Making the Initial Contact

The initial contact usually comes in one of four ways:

- A referral from the primary rehabilitation provider.
- Direct contact from a consumer seeking assistance.
- Referral from a third-party.
- Contact which you initiate upon hearing or meeting an individual who could benefit from your services.

Your response will differ with each situation and the severity of the problem the individual brings to you. The following are some possible, but not all inclusive, examples:

a. A farmer approaches your stand at a machinery field day, and asks how much does a lift for a John Deer 8760 4WD tractor cost? This should key you to follow up with questions such as accessing other vehicles, what his disability may be (if it is not readily apparent), how often do he needs to use the piece of equipment, does he really need to modify it or could someone else do the task and switch other duties with him, what he is willing (or able) to spend, or will he need something which will work on more than one piece of equipment. Note that you are paying attention to the problem as presented, but leading the conversation into a mini assessment that will help the person to stop and think of other issues he or she may not have considered. This could lead into scheduling a longer visit at the person's farm, discussing mobility issues in general and trying to plan for year round (seasonal weather) problems. Or, if the person feels a need for information about their original question only, you may have to just take their name, address and phone number and forward what you can to them as a "best guess". It is important to respect the person's wish to only talk about the problem they have identified and not push to hard to look at everything that could potentially be of concern.

b. This situation could be a phone call from a social worker at an area rehabilitation hospital, referring a client who is currently in the rehabilitation process and suffering mild depression because he feels that his farming career is over. After getting background from the case manager, you visit the person at the hospital (with their permission) seeking their personal feelings and goals they see as being achievable. This not only begins to build solutions, but also redirects the attention of the person from their disability to their abilities. This situation is also extremely delicate as you must stay in context with known medical facts and the person's present state of rehabilitation so as not to disillusion them into thinking everything will work out quickly or perfectly. Again at this point, establishing a rapport and a problem solving relationship is more important than getting every detail of the farm operation or identifying some possible equipment modification.

c. Another situation can begin after reading a feature article about a farmer who is already back on the farm following an injury. You contact the individual without a request from them. Whether it is via letter or phone, their first impression of you is the most important. You are invading their privacy and therefore, must be as non-threatening as possible. Opening statements of respect for their rights and wishes followed by brief explanations of why you're calling and what services you have to offer must be structured to break the ice and put them at ease. Many times you will have to convince them that you are not a salesperson; or just the opposite, that you do not have unlimited funds at your disposal to finance their rehabilitation plans. Offering an obvious solution to the problem you think you see in the article can sometimes validate your claims of wanting to help, but be careful; the solution you pose without knowing all the facts or the person's own needs can also damage your credibility by making you appear overbearing or pretentious.

3. The On-Site Visit

By now the farmer has been contacted and a time set up for the first visit (make every effort to be punctual). Detailed directions of how to get to the farm are essential, and an idea in mind of what the visit hopes to accomplish would be helpful.

a. Answering the question, "Which questions to ask?"

Not knowing what questions to ask can result in giving the appearance of not knowing what you are doing and can damage credibility. Using the outline of the assessment tool as a guide, you may determine which section covers a particular task by asking the person, "Why do you do that? What does it affect? When and where do you do it?" The tried and true method of asking questions from the general to the specific will begin to break down operations into simplified tasks that can be more easily defined and worked with. The individual is the expert of his or her own farm; rely on their knowledge of just what it is they need to accomplish with each of these tasks and stick with helping them get the results they want. Our job is to adjust the method if need be, not the end product. Learning to go with the flow of the discussion is helpful if you can learn more about a particular operation. Allowing the client to "free associate" or to go off on a tangent momentarily, can often key them to include something they might not otherwise remember.

b. Timeliness

Remember that farms are on-going operations, 24 hours a day, seven days a week. Showing up unannounced or at the wrong time can result in the assessment not running to plan. It may not be possible to see the specific tasks needing to be evaluated or even the client. Do not be surprised if some critical farm operation takes priority over your visit. Likewise, you could gain valuable data by scheduling your visit around a particular job if it has been identified as a priority for assessment (again, the importance of the initial contact).

c. Recording client contacts

Recording contact with clients should be thorough and done at the time of contact or as soon as possible after the contact. Your surroundings can sometimes make it difficult to take notes, but the effort is worthwhile. If the first visit is to be a problem solving session as well, then recording the ideas discussed can provide outlines for follow-up research or sending revised recommendations back to the client.

4. The Need for Follow-up/Repeated Assessments

Follow-up is one of the most important services you can provide. It ensures that ideas and discussions are turned into action and solutions. No matter who's responsible for the task, it is the case manager's job to make sure it is followed up. Timing of follow-up depends upon who is doing the task, what it is, and the priority attached to it. For example:

a. The initial assessment points to further research of commercially available electric wheelchair with higher than normal amount of seat lift, allowing the user to stand and transfer more easily into a car or vehicle, while lowering far enough to slide under tables and remain stable riding over sloping terrain. The follow-up is the responsibility of the case manager to research known contacts at wheelchair manufacturers and determine if something exists that meets these specifications or can be easily adapted by a dealer or manufacturer. The priority is moderately high because it is a mobility issue but not critical because the client happens to have two wheelchairs which perform these functions separately, but inconveniently. If not workable, then the research into modifying the present wheelchair can be done by the client with direction from the case manager. Reason: once the client has names of possible custom fabricators and a strong knowledge of exactly what modification is

needed, he can contact them directly, speeding up the time to identify and OK the vendor, negotiate a price and schedule a time for the adaptation to be performed.

b. If the same wheelchair modification solution is identified, but outside funding sources available, the problem is approached somewhat differently. The ideal situation is the counsellor being present when the solution is first discussed; if not, then recommendations can be presented, most likely in written form, to the counsellor. Upon giving his/her OK, the counsellor may ask you do the research and identify the who, what, when, where and how much, associated with the modification and supply those recommendations in writing, and order the work to be done. Or, by regulation, the counsellor may have no choice but to do it alone, usually a very-time consuming process. The point is, as a case manager for the client's best interests, you must be flexible and facilitate the entire process via a timely follow-up.

c. If the wheelchair modification was not only an issue of convenience but for work functions as well, it could result in the individual being able to participate in harvesting, buying cattle, planting or other seasonal work critical to the farm. If timeliness is an important factor, weekly follow-up by the case manager with the funding source, vendor or other agencies involved is appropriate. Timing cannot always be controlled, but should be taken into account during the planning stages of the assessment with responsibilities clearly identified between the client and the case manager.

d. Once the work is performed, a follow-up assessment of its function is essential. This could be completed over the phone with the client or during another site visit. Again, using the criteria discussed later in this resource, evaluate its appropriateness and plan for potential problems, seasonal adjustments for usage, replacement or obsolescence. As before, scheduling this revolves around the technology and its usage. Once the originally identified needs of the client are satisfied, the case manager may initiate planned follow-up at specific short term intervals (for time periods of less than a year from first assessment). In most situations (and for practical reasons) it should be the client's responsibility to follow up past a year of the last "everything's OK" contact.

Developing a Plan for Completing Agricultural Worksite Modifications

A plan provides the user with a "roadmap" to reach a desired destination, achieve a desired goal or complete a task. As the goal or task becomes more complex, the need for a plan increases. Without a plan, the risk of mistakes or failure will generally increase. A plan can be used to help motivate those involved to complete proposed activities in a timely manner. It can also be helpful in documenting progress and demonstrating to all those involved that success is obtainable if everyone works together.

There are several approaches to developing a plan for completing the necessary worksite modifications. All approaches must involve the client in establishing the priorities and procedures which will be followed.

In some cases, the plan will be part of a more comprehensive rehabilitation plan, which is developed by the vocational rehabilitation provider, a private service provider or other service agency. These plans will address a wide range of issues such as independent living needs, education, medical care, transportation and employment. Your services with respect to the agricultural worksite should be developed in concert with this broader plan and compliment the services provided by other providers.

In most cases, however, a comprehensive rehabilitation plan is not needed or wanted by the client. He or she may have already clarified the needs and prioritised how and when each

should be met. The rural rehabilitation professional's role will be to help facilitate the process, to make things happen in a timely and cost effective manner. In working with the client to develop a more formal plan, insight can be provided that could result in significant changes to the client's original plans.

A formal written plan is not generally a high priority for many clients. They are generally more interested in seeing hardware and things happen than receiving a document of proposed activities and ideas. As the case load increases, the plan, once developed, becomes an important reference tool to keep track of progress and document changes in goals. It should include the specific needs to be met, how the needs will be met and a tentative time line for completing each activity.

Remember, any plan involving people, needs to be flexible to accommodate changing circumstances and goals.

Using A Team Approach

In developing effective and cost efficient solutions for complex worksite modifications, teamwork usually results in a more comprehensive and thorough solution than working alone. Others, such as rehabilitation engineers, a similarly disabled farmer, and individuals with special technical skills can provide rapid feedback on goals, ideas and possible solutions. It would be ideal if each client could be visited by an interdisciplinary team of specialists to complete an assessment and develop a set of solutions. Such a team approach is difficult if not impossible in many cases to carry out because of cost, lack of such personnel in most rural communities and scheduling problems. Because of the restraints to the use of a team approach, it should be generally left to cases which are complex or where numerous modifications are needed.

The following provides some tips on using a team approach.

1. The role of the Case Manager

The primary role of the case manager is to help the client reach his or her goals to the fullest extent possible. This is accomplished through facilitating the assessment, documenting progress, intervention and advocacy when necessary, coordinating all the involved participants, facilitating communication between all participants, being the point of contact for the client, and being a frequent source of encouragement.

2. Who to involve

The initial contact with the person is usually the only data available to identify whom to bring along for the assessment. In a percentage of cases, it will not be possible to involve any other rehabilitation professionals as they may not be available or their specialised services may not be available in the area. In these cases the clients may have to go to them which defeats the purpose of the farm visit.

Other rehabilitation professionals who may be involved include vocational counsellors, occupational therapists, physiotherapists, and rehabilitation engineers. The client will probably wish to include their partner or spouse they may also wish to include the referral source if they have intimate information about the case. This could be friends, hired help, social workers, clergy, or extension agents. Some situations can call for driving evaluators, interpreters, communication aids specialists, fabrication specialists, computer specialists, etc. In many instances, the assessment will be performed by the case

manager working alone with the client, setting goals for rehabilitation and bringing in consultants/specialists as specific needs are identified.

3. When to involve them

Organising the farm visit so it coincides with specific jobs the client has identified as being difficult can prove very beneficial. Many times the objective of the task (whether it is selecting livestock, setting the threshing functions of a header or calibrating seed placement for a planter in different soil conditions) is so subjective it may be difficult for even the client to put into words exactly what outcome is desired. Having team members available for on the spot demonstrations of the desired activities can be a great advantage in determining specific needs. This involves timing visits during critical farm operations: calf marking, cattle husbandry work, harvest time, milking time, etc. Again, difficult, but not impossible and the "hands-on" experience can be very productive.

4. Client's rights and desires

Client's rights and desires are always first and foremost. It's very easy to intimidate someone who is new to the rehabilitation process into feeling they have little knowledge of what it is they need. The case manager's job as a team member is to ensure that the client's rehabilitation needs outweigh the needs of schedules, funding sources, vendors and other service providers. This team approach is valuable only so far as it serves the client's needs. If the individual says no to a certain piece of assistive technology, or insists that their spouse will not have to work on the farm, or that their child is too young to take over certain tasks, then respect their reasoning and look for other options. They probably have access to much more information about their own particular farm tasks and resources than could ever be determined in an assessment.

SELECTING THE APPROPRIATE LEVEL OF MODIFICATION USING A SOLUTION HIERARCHY

Introduction

You have probably heard the saying: "There is more than one way to skin a cat." This idea holds true when attempting to identify modifications for agricultural worksites. Because of the diversity of factors involved, no set of rules can be applied consistently to developing an effective solution in every situation. What works for one farmer might not for another. However, there is a logical, orderly process that can be used in solving assistive technology problems that experience suggests reduces the amount of time, energy and money invested. The purpose of this section is to present a solution hierarchy, which addresses the various levels of modification and limits possible solutions.

Defining the Problem

Before a problem can be solved, it needs to be defined and understood. This allows the nature of the problem to be considered and all possible solutions considered. More is gained from spending time on assessing the problem than working on quick solutions, which often fail or are rejected by the user. For example, a farmer with a leg amputation might consider on a specific day his most significant problem is climbing and entering his grain bin to check grain quality. If the focus is only on the act of climbing the bin, other possible solutions, such as electronic in-bin monitors that practically eliminate the need for bin entry, will probably be overlooked.

When seeking a solution for an agricultural worksite modification problem, take the time to carefully investigate the problem. Consider questions such as:

1. Why does the task need to be done?
2. Who needs to complete the task?
3. What other alternatives exist?
4. Where does the task need to be done?
5. Where does the task fit into the rest of the operation?
6. When does the task need to be done?
7. How often does the task need to be done?
8. How does the task need to be done?

Assessing Abilities and Resources

The abilities and resources available to the client should be assessed in conjunction with the process of defining the problem. These resources can compliment and supersede the resources available to the rehabilitation professional and the use of them can give the client a sense of control over the modification process. Resources may include: other family members or employees who could assist in performing a difficult task; readily available tools and equipment; service contracts to repair equipment and financial resources.

Solution Hierarchy and Levels of Modification

The process of developing a solution to a particular problem can be started once a good understanding of the problem and available resources has been gained. There is no set of rules that result in a solution every time but rather a solution hierarchy that enables you to focus in on potential solutions.

Some refer to the solution process as one consisting of four levels:

1. Solving the problem without purchasing additional equipment or making modifications.
2. Using commercially available items.
3. Modifying commercially available products.
4. Designing or fabricating a device or modification.

In the following overview of a suggested solution hierarchy, six steps are presented in overcoming agricultural workplace barriers. Each is posed as a question, which can result in a possible solution to the problem.

1. Can the task be eliminated?

In some situations, the best solution might be to eliminate the difficult task. When a disability occurs and future plans are being made, consideration should be given to which activities are essential and which can be eliminated. Other personal goals should also be considered, for example, a farmer who develops a severe respiratory problem may use this point in time to decide to concentrate on a breeding program for cattle instead of growing grains, which produce airborne irritants.

2. Should the task be given to someone else to be completed?

In many farm operations, job restructuring is not possible because the bulk of the labour is provided by only one or two individuals. However, in operations where other family members or employees are involved, consideration should be given to reassigning job responsibilities to more effectively accommodate a person's abilities following a disability. In addition there are numerous contract agricultural workers who are able to come onto the property and perform the work during peak periods. For example contract harvesters, fencers and stockmen – these contractors are experienced in their area and often supply their own equipment and any additional labour needed. The use of contractors gives the farmer the opportunity to delegate the work responsibility while still allowing him/her the opportunity to manage the work process.

This approach has special value when it comes to tasks that are too expensive to modify or ones that would pose special hazards to the person if he or she were to continue performing them. Caution should be taken not to push too hard for reassignment of tasks, due to the resistance to any changes in responsibility often felt in a number of family farming operations.

Examples might include a farmer who becomes visually impaired and turns over the fieldwork to another family member and takes on more of the farm management responsibilities.

3. Is there an alternative way to perform the task using existing capabilities and resources?

If the individual decides that he or she wants to (or has to) continue performing a specific task, there might be ways to do so using existing capabilities and resources. These may include:

a. *Using other physical means to complete the task*. For example, a farmer who is a bilateral arm amputee might be able to drive the tractor using his feet. Another farmer with a bad back may be able to split the load and make several trips to carry feed rather than one. With patience and practice many tasks can be performed by alternative methods.

b. *Using existing tools, equipment and facilities to complete desired tasks*. It is not always necessary to purchase or fabricate specialised assistive technology. With a careful assessment of existing resources on many farms, possible solutions could be readily available. A farmer who develops a mobility impairment could use an existing golf cart or ATV to increase access to remote areas of the farm.

4. Is there a commercially available product that will enable the person to complete the desired task?

There are literally thousands of commercially available products that could be used by agricultural producers to complete essential tasks. A description of the more commonly used devices can be found in Volume 2 of "Agricultural Tools, Equipment, Machinery and Buildings for Farmers and Farm Workers with Physical Disabilities." Other sources of information regarding applicable labour saving devices and assistive technology include:

a. Farm Safety Solutions Kit (CRS Australia)

b. AgrAbility Australia network

c. Farm magazines (Farm, Wool Watch, Farming Ahead, NSW Farmers etc)

d. Farm Newspapers (The Land, The Queensland Country Life and Weekly Times)

e. Hardware stores

f. Tool catalogues

g. Specialty catalogues

5. Can a commercially available product be modified so it can be used to complete the desired task?

Experience has shown that commercially available products can often be modified to enable a person with a disability to complete a task. Often these modifications are simple and can be completed with minimal expense. This approach allows, in many cases, a familiar tool or piece of equipment to become the assistive device increasing the likelihood of acceptance. The following are examples of this type of modification.

a. Adding an additional step or safe tractor access platform to the existing approach of a harvester or tractor for an individual with a mobility impairment. Addition of a non-slip surface on the steps of a harvester or tractor is also a simple approach to improving the safety of mounting and dismounting.

b. Adding extensions to the hydraulic control levers on a tractor or header for someone with a reaching or grasping limitation.

c. Installation of foot plates and guards on an All Terrain Vehicle to reduce the potential for contact with the wheels and to support the legs.

d. Installation of extensions to the brake, clutch and accelerator of a tractor or harvester so the machine can be operated by hand in the case of a paraplegic.

e. Padding of handtools and powertools to reduce impact injuries to the hands and improve grip.

f. Modifying a tool with a custom-made grip for an individual with a hand injury.

6. Can a device or modification be designed and fabricated to perform the desired task?

This approach should only be used as a last resort as it is generally the most time consuming and expensive. It requires a process of trial and error to achieve a useable device or modification. One of the primary disadvantages of this approach is the long lead time often required to get a finished product into the hands of the consumer.

There are, however, many examples of devices that have been locally fabricated, at very low cost, and have served the needs of the users quite well. These have usually been the product of a local craftsman who was both a creative designer and skilled fabricator.

Examples of custom made assistive technology include:

a. Tractor or harvester lift for someone with a mobility impairment.

b. Twelve volt electric lift to raise and lower a wheelchair in and out of a truck bed for storage.

c. Piglet cradle for holding baby pigs for administering health care.

d. One-handed wire strainers for individuals with an arm amputation or arthritis needing to fix fences.

SOURCES OF INFORMATION ON ASSISTIVE TECHNOLOGY APPROPRIATE FOR AGRICULTURAL WORKPLACES

Introduction

Once you have determined the need for assistive technology and the appropriate levels of modifications, where can you go? What resource can you investigate? Where do you find potential solutions to assist in the design, fabrication, or procurement of the desired technology?

This chapter will list a variety of resources under the headings of People, Places and Things, but the lists are not exhaustive. The number of resources available are truly only limited by your imagination because assistive technology solutions are found in nearly every occupation. By using creative problem-solving (see Chapter 7), you may discover, for example, that Australian Fruit Grower Magazine advertises assistive technology appropriate for a farmer with a disability who operates a fruit orchard as an alternative enterprise. The point is, make use of the list of resources provided here, but use your imagination to identify further resources that are not listed. Remember appropriate assistive technology can sometimes be found in uncommon places.

People

1. The person who has the need

Having to deal with a problem for a length of time will often provide keen insight into how the problem should or could be solved. Ask the individual if he/she has an idea for a solution. Solutions developed or identified by the potential user are more likely be successful.

2. Farm family

Check with other members of the client's family, including nearby relatives, to see if they have any special skills that could contribute to an appropriate solution. In some cases, they only need to be asked and the response will be overwhelming. Don't assume the family members know what the needs are.

3. Neighbours and friends

Excellent sources of solutions are the client's neighbours and friends, especially those who farm or provide skilled services in the community. In some cases these individuals cannot only provide creative ideas but also are capable of fabricating many types of assistive technology.

4. Consumers using the technology

This category would include consumers who have purchased and are using a commercial product being considered as a solution and other farmers who have built solutions similar to a device being considered for fabrication.

5. Rehabilitation professionals

- Occupational Therapists
- Physiotherapists
- Rehabilitation Engineers
- Prosthetists/Orthotists

Speech pathologists

6. Agricultural engineers

Agricultural engineers have an excellent understanding of agricultural worksites, equipment and processes. Because of the diverse nature of agriculture, these engineers also have experience with designing one-of-a-kind solutions unique to agriculture. In many rural areas the local Technical and Further Education (TAFE) College run courses in metal fabrication and engineering. These are excellent sources of ideas and engineering expertise. In some cases these services can be obtained at no cost. Engineering departments in local schools could also assist through the use of senior student design projects to develop needed solutions for prescribed problems.

In addition, there are many agricultural engineers who provide consulting services for a fee. For further information contact either of the AgrAbility Australia Resource Centres:

Australian Centre for Agricultural Health and Safety

PO Box 256

MOREE NSW 2400

Phone: 02 6752 8210

Fax: 02 6752 6639

7. CRS Australia

CRS Australia, formerly known as the Commonwealth Rehabilitation Service is a government organisation delivering rehabilitation services to people injured at work. CRS offices can be found throughout rural Australia. These professionals can be an excellent resource in developing solutions to agricultural worksite barriers. Most employees don't have any formal training in the field of agriculture rehabilitation but are familiar with agriculture and are experienced with addressing unique problems. Involving them in a team to address specific assistive technology problems could prove very beneficial.

8. Other professionals

- Engineers
- Mechanics
- Electricians
- Machinists
- Welders and Metal Fabricators
- Carpenters
- Cabinet makers

9. Members of service clubs or church groups

Places

1. Dealerships

a. Medical equipment dealers carry products such as outdoor mobility aids and independent living aids.

b. Vehicle or ATV/Motorcycle dealers may have experience installing hand controls or making special modifications.

c. Farm machinery dealers can offer expertise in a variety of areas including modification of equipment and sale of labour-saving devices.

2. Libraries

It is sometimes easy to forget that libraries are full of resources, just waiting to be accessed. Occupation specific magazines and newspapers are also excellent sources of ideas. It seems there is a magazine for every interest, and a significant percentage of them contain at least some advertisements for or reviews of related technology (eg. Successful Farming or Australian Fruit grower as well as the Queensland Country Life Newspaper, The Land Newspaper in New South Wales and the Weekly Times Newspaper in Victoria).

a. Patent abstracts can be searched to locate commercial products of which you are unaware, or to provide direction for creating a new solution.

b. Reference librarians have command of a vast assortment of resources and expertise to help guide you in the correct direction.

3. AgrAbility Australia Resource Centre of Assistive Technology

The AgrAbility Australia Resource Centre is managed by the Australian Centre for Agricultural Health and Safety and is equipped with resources, which can assist with identifying, selecting and implementing appropriate assistive technology. An agricultural engineer is available to take inquiries and offer assistance with technical information.

4. AgrAbility Australia Self-Help Network of Injured and Disabled Farmers.

AgrAbility Australia, self-help network of injured and disabled farmers and farm workers, has been established in Australia and is managed by the Australian Centre for Agricultural Health and Safety. AgrAbility Australia provides support and assistance to injured or disabled farmers and farm workers and their families through contact with similarly disabled farmers working in their industry. The network allows the farmers to talk directly with each other and share ideas and come up with solutions.

5. Non-Profit Agencies

There are many institutions, foundations, and organisations providing assistance to people with particular disability types while others provide assistance to persons with a wider range of disabilities. A list of the agencies serving individuals with disabilities can be found in the local phone book. Three examples of agencies are:

a. The Australian Royal Blind Society is able to assist with information about technical aids and assistive technology for people with visual impairments or blindness. A list of companies, which sell various forms of assistive technology, can be obtained from the nearest office. The Australian Royal Blind Society employs specialists who can answer questions, provide information on financial assistance for purchasing

technology, and provide a comprehensive listing of all manufacturers/distributors of products for blind and visually impaired people.

b. ParaQuad is a national organisation, which provides free information about resources and services available to quadriplegics and paraplegics. There are head offices and regional offices in each state

c. Australian Centre for Agricultural Health and Safety develops material and publishes papers relating to Occupational Health and Safety in the Agricultural workplace.

6. Businesses

a. Hardware and building supply stores carry an assortment of fabrication materials, fasteners, adhesives, lubricants, and just plain neat gizmos that are time savers and labour savers.

b. Agricultural products and equipment supply stores also carry commercially available labour saving devices and equipment.

c. Industrial supply companies can answer questions about fabrication materials and commercial available equipment to meet a certain application or need.

d. Timber mills and factories may have scrap materials, which they may donate or sell at a low cost.

e. Other businesses such as art supply and hobby shops, department stores, electronic stores, and specialty gift stores carry unique devices that can sometimes be used in making worksite adaptations.

f. Australian Automobile Association (AAA) can provide information on where to purchase hand controls and modified vehicles.

7. Agricultural field days

Held all over Australia every year, these shows frequently have new, unique, and innovative devices on exhibit.

Things

1. Written resources

a. Newsletters

b. Catalogues

Farm supply catalogues carry various labour-saving solutions. Modern Farm, which carries such items as a one handed nail starter, a modified shovel and several other labour-saving solutions.

Many industrial supply catalogues carry information on labour-saving tools and fabrication materials.

Recreational catalogues. Farmers and their families can enjoy many recreational activities (at those rare times when they're not working) with help from some recreational assistive technology.

Other resources: Independent Living Centre carry a number of living aids and assistive technology for people with a disability which can easily be adapted to the agricultural work setting.

c. Disability resource manuals

There are several available

d. Professional journals

There are numerous available

e. Other periodicals

Disability related: Paraplegia News, Accent on Living, Sports 'N Spokes.

Farming related: There are several publications that carry articles and information on agricultural worksite adaptations and labour-saving technologies.

f. Technology publications

2. Databases

a. A Breaking New Ground database, being developed, provides an electronic version of the Volume 2 resource manual. In addition, it provides a support system that will guide a professional and a farmer in making decisions about assistive technology issues that may need to be addressed before the latter returns to farming.

b. AgrAbility Australia Self-Help Network directory of participants.

c. The Rural Book – Part of the CountryLink Program, (1995) Department of Primary Industry and Energy.

d. IDEAS Database, CRS Australia, Department of Health and Family Services.

CRITERIA FOR SELECTING ASSISTIVE TECHNOLOGY APPROPRIATE FOR AGRICULTURAL WORKPLACES

Introduction

As new types of assistive technology are developed and reach the marketplace, and as individuals with disabilities become more able to take charge of developing their own solutions to accomplishing desired tasks, rural rehabilitation service providers will be called upon to help select the most appropriate devices or modifications. Furthermore, service providers will be asked to assist in evaluating the various alternatives and making specific recommendations concerning their application in various situations. Since there is a lack of uniformly accepted criteria, the evaluations and choices made are often more subjective in nature and will often be limited by the experiences of the professional and alternatives available.

This section is designed to provide an overview of the primary characteristics of assistive technology used in the agricultural workplace and how these characteristics can be evaluated.

Characteristics of Appropriate Assistive Technology

To be considered appropriate, rural assistive technology should have the following characteristics:

1. The technology should function as expected

The single most important characteristic of any type of assistive technology is its ability to function at the level expected by the user. In other words: Does it work? Does it meet the need? Does it perform under the anticipated conditions? Appropriate assistive technology works.

Most assistive technology is abandoned because it does not work!

Generally, function is the easiest characteristic of assistive technology to confirm. It either works, or it does not. In some cases, function might be dependent upon the perception of the user and the adequacy of the training provided.

A device that works but is placed in the hands of a consumer who is not properly trained can result in rejection of the device or even injury of the user.

Beauty, form, cost or tradition often has little to do with the user's view of how well an assistive device or modification works. A frequent comment concerning a home made device is: "It might not be pretty but it works!" High cost does not automatically mean the selected technology will function as expected or do the job more effectively; in fact just the opposite is often true for farm machinery modifications.

2. The technology needs to be cost effective

Regardless of how great the need might be, in most "real life" situations, economic resources are limited. Unfortunately, the quality of assistive technology services and the quality of the technology itself are often dependent upon how deep a pocket the consumer has to draw from.

Appropriate assistive technology is affordable for the consumer and should result in benefits comparative with the costs. In some cases, the cost of the assistive technology is so great that it would be more "appropriate" to explore alternative ways to accomplish the desired task.

With respect to new technology, which is expensive and has a greater risk of failure, cost effectiveness is not as important during the development stages. As the concept becomes more widely accepted and sales increase, the cost generally decreases.

3. The technology should be safe

Appropriate assistive technology is safe. Devices, practices and modifications that expose the user to increased physical risks are not appropriate and need to be avoided.

Even if a particular consumer is willing to accept the higher risk of a selected technology, the professional rehabilitation engineer, technician, or counsellor exposes him/herself to considerable personal liability by prescribing an unsafe technology. In most cases, such a recommendation may violate his/her professional code of ethics.

Risk is relative. What might be unsafe for one individual could be appropriate for another depending upon physical capabilities, training, and use of safety measures. There are circumstances where specialised training, guarding and supervision can convert an unsafe technology into a safe one for specific applications.

Special attention should be focused on those circumstances where there is little or no room for error, the kind where you can only make the mistake once.

4. The technology should be acceptable to the client

Technology that functions, is cost effective, and is safe but is rejected or eventually abandoned by the consumer is not appropriate technology. Only the user can tell you whether the shoe fits.

Assistive technology which is abandoned or rejected is not necessarily bad or poorly designed but is often not compatible with a specific individual. The same technology which is unacceptable to one individual might be considered indispensable to someone else.

The level of consumer acceptability can also be dependent upon factors such as consumer involvement in the design process, consumer training and follow up maintenance and service. It appears, from experience that the more the consumer is involved with the selection and implementation process, the greater the potential for acceptance of the technology.

5. The technology should be readily available

Assistive technology which is still in the development stage, found only at some research centre, other state or available in only limited quantities is not appropriate. Appropriate assistive technology should be readily available to the consumer.

Promoting technology which is not yet available or tested is cruel, especially if it is presented as a viable solution which would work "if only we could get it."

Many types of assistive technology are readily available which have applications in farm and rural settings but remain unused because consumers and professionals are not aware of its existence. In some cases in Australia farmers are being advised by rehabilitation workers to leave farming because rehabilitation workers are unaware of assistive technology available or the alternative ways of performing farm tasks. Until recently, there has been simply no where to go to get information on what assistance technology is available for the agricultural industry.

6. The technology should be serviceable

In many cases a piece of broken assistive technology is worse than none, especially if the consumer has become dependent upon it.

Appropriate assistive technology should generally be serviceable within the consumer's community. Providing a rural consumer with an assistive device which can only be serviced by two rocket scientists 500 kilometres away, will eventually be frustrating and costly to the consumer.

As the dependency upon the technology increases, the need for being able to service it locally increases.

For rural consumers who are considerable distances from rehabilitation services and facilities, the serviceability of a technology can significantly reduce the "appropriate" options. However, consideration should be given to other sources of service. If a rural farm equipment dealership technician is able to troubleshoot and service sophisticated new farm equipment, they should be able to service many types of new assistive technology. You may also find that this type of service is also less expensive. Also the clients themselves or their family/employees can be taught to service the equipment which significantly reduces the cost of maintenance and the inconvenience of being without the equipment while it is in being serviced.

7. The technology should be durable

The conditions in rural settings, especially agriculture workplaces, can be especially harsh. Appropriate assistive technology should be able to withstand the heat, cold, dirt, rain, dust and manure that will be present.

Devices and modifications used by farmers should be constructed to endure hard use and it should be assumed that this group of consumers will find other applications which will severely test the durability of the device.

8. The technology should be adaptable

Appropriate assistive technology should be flexible enough to accommodate the various circumstances under which it will be used. If both disabled and able-bodied users are expected to utilise the device or modified equipment, it should accommodate the needs of both.

As new technology is developed or changes occur in the equipment or facilities being modified, the assistive technology should be adaptable to avoid the need for a complete change. Changes in the client's condition, both improvements and declines, should also be considered when looking at the adaptability of the technology.

Evaluation of Assistive Technology

At present there are no techniques to objectively evaluate whether a particular type of assistive technology would be appropriate for a specific rural or agricultural worksite application.

CRS Australia has developed a Farm Safety Solutions Kit, which contains pieces of equipment, which have been ergonomically tested by qualified occupational therapists. It is difficult, however, for an evaluation on homemade devices and modifications to determine their value in rural or agricultural worksite environments to be conducted. The numerous

variables involved, many of which are very subjective, will make developing such an evaluation process very difficult.

Based on the eight characteristics previously described, a simple evaluation approach may utilise the following form:

	Score					
Evaluation Criteria	**Low**					**High**
	O	**1**	**2**	**3**	**4**	**5**
1. Function	☐	☐	☐	☐	☐	☐
2. Cost Effectiveness	☐	☐	☐	☐	☐	☐
3. Safety	☐	☐	☐	☐	☐	☐
4. Acceptability	☐	☐	☐	☐	☐	☐
5. Availability	☐	☐	☐	☐	☐	☐
6. Serviceability	☐	☐	☐	☐	☐	☐
7. Durability	☐	☐	☐	☐	☐	☐
8. Adaptability	☐	☐	☐	☐	☐	☐

Using this tool, a score of O to 5 would be given to each of the eight evaluation criteria. A score of O on a given criteria, such as Function would mean that the technology simply does not work. A score of 5 on a criterion, such as Acceptability would indicate that the consumer found the technology very acceptable and useful.

Summary

Evaluation often proves to be an expensive and time-consuming activity. However, prescribing assistive technology to consumers without taking the time to evaluate can result in frustration, failure and wasted resources. Furthermore, it can lead to a succession of problems as new consumers are encouraged to adopt technology or practices that have not worked for previous users.

Investing in the evaluation process can prove to be a good investment with many positive returns.

DEVELOPING CREATIVE SOLUTIONS TO AGRICULTURAL WORKPLACE BARRIERS

Introduction

Rehabilitation workers are routinely called upon to prescribe, provide, design, build and even maintain assistive technology. In your job you have probably been confronted with needs and situations which require technical solutions even though you may have little or no formal technical training or experience in solving these kinds of problems. This chapter explores some strategies which can be used in developing solutions to assistive technology problems and presents a framework for creative and efficient problem solving. Perhaps you can put some of these tools in your personal tool box and use them to better meet the needs of your clients.

Creativity

All people are creative. We are creative in different ways and have different levels of creative energy. Creativity cannot be taught. What can be taught are strategies and methods that can help us exploit our natural creativity and apply our unique talents to solving problems. How many of us have read articles that purport to measure creativity by solving brainteasers? For example: without lifting your pencil, connect all 9 dots in a 3x3 square array with 4 (or 3, or 2, or 1) straight lines. Exercises like this may be fun (for some of us) but they tend to test analytical skills (left-brain function) rather than creative potential. Individual creativity seems to depend on the relative abilities of and communication between the left and right sides of our brain. According to Raudsepp[5] the right part of the brain processes information in a holistic manner, accenting visual spatial skills. People with a right-brain bias are intuitive types who use metaphors and analogies in solving problems. They are apt to visualise solutions in total, then work out the details later. On the other hand, the left part of the brain processes information in a linear manner, favouring verbal/logical skills. People with a left-brain bias (this includes most engineers) are rational types who use analysis as their principal method for solving problems. They tend to "think problems through" as a means for uncovering solutions. The more complete the mix between left and right-brain abilities, the greater the potential for creativity.

Creativity can be defined in a variety of ways: the ability to relate previously unrelated things; the ability to synthesise new combinations of ideas and concepts into useful forms; or an intuitive mixing of previous experiences into patterns and combinations that are new and unique. Creativity goes beyond simply generating ideas. It requires ideas to be implemented and the result be something new. Hence, creativity produces change and both are associated with uncertainty and risk[6]. Because of this, our ability to be creative, innovative or clever may be hindered, thereby preventing us from realising our maximum creative potential.

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[5] Raudsepp E. *Machine Design*, Vol. 58, 1986.

[6] Adams JL. *The Care and Feeding of Ideas.* Addison-Wesley. 1986.

The Process of Design

The definitions of creativity presented above imply the existence of a process that one can follow, either knowingly or unknowingly, when solving problems. Engineers generally adhere to a formal "design process" which begins with recognising a need and deciding to do something about it. The process ends with plans or a device for satisfying the need. Whether we realise it or not, we often use some version of the engineering design process when solving everyday problems. For example, in the supermarket we compare two cuts of meat or two brands of cereal on the basis of personal need, product quality, price, value, etc. and then decide which items best meet our requirements. This process is no different from what an engineer does in solving a problem using analysis (price per kilo), evaluation (nutritional need, convenience), optimisation (minimum waste, value) and decision making (I'll take the Cocoa Pops, thanks).

Steps in the problem solving or design process include:

- Recognising or identifying a need.
- Defining the problem.
- Gathering information.
- Developing specifications.
- Conceptualising, analysing and refining alternatives.
- Evaluating alternatives.
- Testing the device.
- Documenting the design, development and operation of the device.
- Delivering the final product.

This comprehensive problem solving template is quite general and provides a frame work for logically working through problems. It is not unique to engineering and can be modified and applied to a host of technical and non-technical problems. The following example of the design of a seat for a walker illustrates how the steps in the design process are applied.

1. The need

A 9-year-old girl with cerebral palsy wants a portable seat that attaches to her walker. She recognised that from time to time she tires when walking and it would be handy to have a seat in her walker in which to rest. The need statements are generally short and somewhat vague; they simply state the objectives of the design and any necessary limits. Design a seat for a walker. The objective is to design a seat; the limit is to design a seat for a walker. In this case, and for most assistive technology problems, needs are generally obvious and easy to identify.

2. Problem definition

Once the need has been identified, it is expanded into a problem definition. In developing problem definitions, it is often helpful to think in terms of what has to happen in order to meet the stated need. For this problem, the seat should be attached somehow to the walker and should not interfere with normal use of the walker. The seat must be safe and not add much weight to the walker. The resulting problem definition might then be:

> *Design a seat for a walker that is easy to operate for a young girl with cerebral palsy, is lightweight and inexpensive, and folds out of the way when not in use.*

Any additional features desired in the seat or other constraints that would affect the design would also be included in the problem definition.

3. Information gathering

In developing a solution, it is important to learn as much as possible about the problem: what commercial or do-it-yourself designs have already been developed, advantages and disadvantages of previous designs, what new technologies or materials might we want to consider, etc. Information gathering can be time consuming but is an essential part of the process. It may lead to an existing solution or to a solution to a related problem, which can be easily adapted for this need. None of us has time to reinvent wheels! Quantitative descriptions of the user's abilities and resources may also be essential pieces of information for designing or selecting assistive technology.

4. Specifications

Design specifications allow us to judge the quality of and compare solutions we develop. Specifications are closely related to the problem definition but are quantitative rather than vague descriptions. Whereas the problem definition required the seat to be lightweight and inexpensive, the specifications should state maximum weight and maximum cost. For example, we might require the device to weigh less than 1kg and cost less than $20 for materials.

5. Conceptualising

A developing design alternative, or ideation, is the mental process of producing ideas in order to solve a problem. At this stage in the design process we hope to stimulate our imagination to the peak of our creative potential and generate a multitude of concepts and ideas, which will solve the problem at hand[7]. Some techniques to enhance ideation are presented in the section below. The solutions we generate may be practical, clever, silly, expensive, simple, complex, etc. The objective is to initially produce a large number of possible solutions and then, using the problem definition and design specifications, reduce the list to the most promising alternatives, which can satisfy the given constraints.

6. Evaluating and testing

Up to this point, we've relied on our creative energy, detective skills and time to solve the problem. It now becomes necessary to invest material and financial resources to refine, evaluate and test the most viable alternatives and then select the best one for final development or fabrication. Good solutions are effective, simple, easily and quickly completed, require low maintenance, and satisfy the client. Remember off-the-shelf items or simple modifications to existing devices may provide the least expensive and quickest solution to your problem. Generating a unique, custom-made solution from scratch is generally the most costly, time consuming and risky approach to solving an assistive technology problem.

7. Documentation

Documentation for a design project might include notes, sketches, manufacturer's data, memos, reports and operating manuals. Complex problems and lengthy solutions

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[7] Ha`Tisberger L. "*Engineersmanship The Doing of Engineering Design*. Brooks/Cole. 1982.

demand more thorough documentation. A design journal or notebook should be used on a regular basis to document all information relevant to the project. Important decisions should be explained in detail.

The design process is a comprehensive and general template provides a framework for logically working through problems. It is not unique to engineering; and can be modified and applied to a host of technical and non-technical problems. By adhering to the process we increase our chances of understanding the true problem and producing a good solution.

Creative Problem Solving: Overcoming Barriers to Conceptualisation

Very few people like to solve problems. When confronted with a problem, most of us pick the first or easiest solution that comes to mind. Sometimes we turn our back on the problem and pick no solution at all. A better strategy in solving problems, and one that we can all adopt, is to select the most attractive solution from a list of many possible solutions or concepts[8]. This section deals with generating ideas (conceptualisation) and some of the barriers we may encounter in this process.

Creativity in problem solving isn't so much a trait or talent as it is a conscious process. The ability to conceptualise, to generate ideas and concepts, requires an open and energetic mind and a dedicated effort. Learning to conceptualise is no different from learning to play the piano. You can read about how to play, listen to people talk about piano playing or listen to someone play but you can't become a virtuoso until you do it and practice it yourself. It is the same with conceptualising; it must be done consciously and routinely until you are comfortable and proficient. Jim Adams, in his delightfully readable book Conceptual Blockbusting[8], presents some of the barriers which can prevent us from conceptualising and techniques that we can use to overcome these barriers. If we are aware of these blocks, they can be eliminated or compensated for thereby increasing our creativity and productivity in problem solving.

Conceptual blocks prevent problem solvers from either correctly perceiving or conceiving solutions to problems and include perceptual, cultural, environmental, emotional and intellectual blocks. Some examples of these blocks (drawn liberally from Adams[8]) are given below.

- stereotyping - seeing what you expect to see being controlled by preconceptions.
- inability to isolate the problem; too much or too little information; misleading information; information out of context.
- over or under-constraining the problem.
- inability to see the problem from various viewpoints.
    - architect vs. homeowner.
    - rehabilitation specialist vs. consumer.
- cultural taboos.
- tradition preferable to change.
- problem-solving is serious business, limit humour.
- fear of failure.
- fear of taking risks.

[8] Adams JL. *Conceptual Blockbusting*. Addison-Wesley. 1986.

- being criticised.
- making a fool of yourself.
- fondness for order.
- inability to incubate.
- lack of cooperation, trust, support.
- distractions and interruptions.
- using incorrect language.
    - visual vs. verbal vs. mathematical.

Creativity and change are risky and these conceptual blocks are attempts to protect us from the unknown. When heading into the unknown, anything can happen including failure. It is important, when trying to solve problems, to recognise these blocks and the limits they impose on our creativity. It takes courage and confidence to pursue new directions. Although increasing creativity and change lead us into increased risk, they also can lead to rewards such as satisfaction or recognition. These rewards provide the compensation for possible losses connected with leaving an equilibrium state for one with more unknowns[6].

Overpowering conceptual blocks requires a conscious effort to force thoughts that would not otherwise occur. One of the most important capabilities in a creative person is a questioning attitude. If you accept the status quo without question, you will have no need to innovate. You will not be able to see needs and problems, and problem sensitivity is one of the more important qualities of the creative person. Once the problem is sensed, the questioning attitude must be used continually to ensure a creative solution. A creative person should have a healthy scepticism about existing answers, techniques and approaches[8].

Engineers and other professional problem solvers are expected to formulate ideas and seek alternative solutions on demand. Demand ideation is not impulsive or inspirational. It does not wait for the proverbial light bulb to turn on or on being struck by a bolt of lightning to solve problems. Several different demand ideation techniques are available to help limber your mind, increase your flexibility in problem solving and stimulate your imagination to generate a multitude of solutions. Two especially useful techniques rely on making lists: using trigger-words and brainstorming.

1. Using trigger-words

The trigger-word is simply the verb in the problem or needs statement. A list is made of the various actions which can produce the trigger-word. This then creates a new batch of ideas for ways to solve the problem. For example, if the problem is to move an object from point A to point B, we make a list of all the actions corresponding to the verb MOVE. This list may include:

push	glide	float	pull	slide
sling	shove	tumble	throw	roll
lift	swing	fly	drop	whirl
leap	drag	kick	run	slip

Now we rephrase the problem using one of these actions: How can we PUSH the object from A to B? How can we FLOAT it? How can we FLY it? PULL it? Each alternative verb produces different ways to solve the problem. PUSH recalls a bulldozer, a hydraulic ram or a

group of people doing the pushing. PULL recalls a rope, a cable and winch, etc. The trigger-word is a methodical method for increasing the scope of idea stimulation by forcing a variety of ways to conceive the nature of the problem. The purpose is to generate as many solutions as possible without regard to their practicality or feasibility.

2. Brainstorming

Brainstorming is a useful and powerful group technique, which can produce a large quantity of ideas. Brainstorming has four rules:

- No evaluation of any kind is permitted.
- Participants are encouraged to think of the wildest ideas possible.
- Generate as many ideas as possible.
- Participants build upon or modify the ideas of others.

The success of brainstorming depends on the compounding effect of each person in the group responding to the ideas expressed by others[7]. Brainstorming relies on spontaneity and is stimulating and playful provided no one attempts to judge or evaluate the ideas of others. Any single idea which comes forth in a brainstorming session has its faults. The important thing is that it is an idea whether good, bad or ridiculous. Its only value may be that it triggers another possibility that triggers another which eventually leads to a totally unique and valuable solution[7].

As with any skill conceptualisation requires practice and feedback for improvement. There are no sure-fire methods to use or guaranteed results from following a particular process. Each problem is different and each problem-solver will respond differently. The best technique is the one that works best for you. The real issue is:

> How do we relax our ego and become good, creative problem solvers? We go out and do it and we practice it and we learn from that!

REDUCING THE RISKS OF FARMING WITH A PHYSICAL DISABILITY

Introduction

The agricultural workplace is considered by the National Safety Council as Australia's third most dangerous following Transport and Mining. Consistently, agricultural production reports one of the highest work-related fatality and disabling injury rates. Injury prevention can not be ignored when a farmer returns to work with a disability. The purpose of this section is to point out some of the risks associated with farming with a disability and the hazards that should be considered when implementing assistive technology in the agricultural workplace.

Background

1. Agricultural production has been traditionally highly labour intensive, male oriented, and tolerant of high levels of risk.
2. Farm families have traditionally been more tolerant of high injury rates than many other industries.
3. Safety in agricultural production has generally been a low priority and has been, for the most part, unregulated by state or federal safety regulations.
4. Little attention has been given to the role of persons with a disability in agricultural production even though they make up a sizeable percentage of the agricultural workforce.

Risks Associated with Farming with a Physical Disability

There have been no Australian studies published examining the safety record of farmers with physical disabilities and the impact physical disabilities might have on the frequency and severity of injury. Only recently has emphasis begun to be focused on those attempting to farm with physical disabilities; thus, little has been done to identify the potential health and safety risks physically disabled farmers face.

In a study conducted by The Iowa Farmer Seal FaRM Program in American 100 farmers with physical disabilities reported approximately 50 percent of the injuries/illnesses were farm-work related. In 75 percent of the cases the primary disability was believed to be a contributing factor.

Several areas of potential risk have been identified which should be considered to ensure the health and safety of those farming with a physical disability. They are as follows:

1. Potential risks to those providing assistance

Physically impaired farm operators must often rely upon other people such as family members, neighbours, and hired workmen to complete essential farm-related jobs.

Having others to complete certain tasks, especially around machinery, often creates unique hazards to both the disabled operator and the helper. For example, one farmer, who is paralysed from the waist down, relies upon his young son to operate a hoist to lift

him up to the tractor's operator seat. Other problems develop when young or inexperienced family members are expected to hitch implements or make repairs to farm machinery under the direction of the disabled operator.

2. Risks due to visual impairment

Visual impairments, which reduce acuity, colour differentiation, depth perception, or night vision, can all result in unsafe operation of equipment and risks to the operator and bystanders.

In one case, a farmer's sight had completely diminished over a period of several years. During the last few years, before he went blind, his vision was significantly impaired but he continued to operate farm equipment regularly. The risks involved in this particular case are obvious.

In other cases, farm operators who are colour blind may experience problems when attempting to operate machinery where the controls are colour coded or where colour differentiation is required to complete a task. Impaired vision under low light levels can create hazards, both when operating equipment and when inside poorly lit buildings where there is potential to fall.

3. Potential of fires in equipment and buildings

Fire is a major threat to anyone who has a physical impairment, which restricts their mobility. Compound these problems with the difficulty of quickly evacuating a burning machinery cabin, shed or workshop, and serious risks are created.

There are many situations involving physically impaired farmers operating harvesters and other self-propelled equipment where rapid evacuation in the event of a fire would be difficult. In some cases, if the harvester or tractor were to catch on fire, the operator would be virtually helpless to extinguish the fire, call for help, or evacuate the machine. Even if the operator was able to evacuate the machine, the lack of mobility might still expose him to flammable crop residue.

Since the threat of fire is always present in an agricultural workplace, several possible solutions or partial solutions are suggested.

These include:

- Ensuring each self-propelled machine operated by physically disabled individuals be equipped with radio communication to other workers or the home.
- Mounting portable fire extinguishers at strategic locations around each building and on each machine with which a physically disabled person will be working.
- Installing fire detection and extinguishing systems which activate automatically or from the operator's station.
- Investing more time in fire prevention activities to reduce the risk of fire. Keeping the machine clean, inspecting for slipping belts, oil leaks and follow proper refuelling procedures are keys to fire prevention.

4. Exposure to excessive machine vibration and movement

Modern farm tractors and harvesters are designed to substantially reduce operator exposure to high levels of vibration. This is accomplished through the use of larger tyres, operator cabs or platforms that are isolated from the chassis and ergonomically designed seating. Older equipment or equipment which is operated for long periods of time can,

however, result in excessive exposure to machine vibration and motion. This is generally caused by machine characteristics and rough terrain. There is a growing body of literature, which suggests long-term exposure to certain levels of vibration can be harmful.

Even though most of the evidence points to machine vibration as harmful, there has been feedback from some equipment operators, especially those with spinal cord injuries, that there may be some possible benefits to limited machine operations based on a study in America. Several have reported they have felt physically better after getting back on the tractor or combine and the exposure enables them to sleep better. Others have also commented that they have had fewer problems with pressure sores during the summer months when operating equipment.

In addition to the psychologically therapeutic effects the operation of farm equipment might provide, other positive observations include the increased blood flow due to the vibration and the reduction of skin pressure due to the fluid bouncing action of operating large equipment in the paddock. Regardless, many wives have commented that both their husbands' physical and mental condition improved when they were able to get "back on the tractor".

Operators with lower back disorders are especially vulnerable to added injury if exposed to excessive operator station vibration. The additional shock and load to the components of the back can lead to more rapid breakdown of the discs and irreversible damage to the lumbar spine. Other side effects include vision problems, impaired coordination or balance, fatigue, headaches and insomnia.

Another potential hazard is injury caused by repeated contact with operator station fixtures caused by the uncontrolled body motion of individuals with paralysed limbs. This "bumping" leads to bruises and open wounds which in some cases go unnoticed due to the lack of skin sensitivity. Padding is an important protective measure.

5. Respiratory hazards

Agricultural workplaces expose workers to a variety of airborne hazards. These include toxic gases such as those found in silos and manure pits and airborne particulates such as grain dust, dried manure, moulds and soil. Individuals with a hyper-sensitivity to this material can be severely stressed when working and can become extremely ill. With repeated exposures, some individuals exhibit more severe symptoms. In some cases there may be no alternative except to avoid the irritating agent.

Farmers with spinal cord damage may also have reduced respiratory capacity and, thus, may require special filtration systems or air conditioning to work comfortably.

The application of agricultural chemicals may also present a respiratory hazard for farmers who, because of a physical impairment, would be unable to quickly evacuate the application area should a chemical spill occur.

6. Temperature extremes

Farm work goes on regardless of the weather. This means farmers and farm workers are potentially exposed to both extreme cold and heat. Both can present serious safety problems if not attended to.

Farmers with spinal cord injuries and amputations, often require air cooling systems in their tractors and machinery cabs to work in the heat of summer. For amputees the reduced surface area to dissipate heat and their reduced ability to sweat requires a cooler work environment, plenty of fluids and frequent rest breaks.

Paralysed limbs are susceptible to frost bite and require extra protection. This might include thermal underwear or heated tractor cabs. Heated socks and hand warmers are other possibilities.

7. Hazards resulting from impaired hearing

A hearing impairment may make it difficult or even impossible for a farmer to detect machine failure, such as a noisy bearing or loose chain. Likewise, a hearing impaired farmer would experience difficulty determining if the tractor or machine was functioning normally, or at all.

Hearing impaired farmers may also fail to correctly comprehend instructions or commands from fellow farm workers. Failure to completely understand fellow workers, in some circumstances, can result in mishaps. One farmer, who has practically no hearing, was nearly injured when he stepped in front of an oncoming tractor he didn't hear approaching.

8. Length of work day

Farmers traditionally work long hours, and this characteristic does not necessarily change following a disability. Interviews with spinal cord injured farmers indicate even this group tends to put in lots of hours. At this time, it is not known what adverse effects might result from extremely long periods of exposure to certain farm-related job such as machine operation.

Some possible side effects include the increased possibility of pressure sores, bladder infection, bruises and general fatigue. There does not appear to be a common pattern for the onset of any of these problems, but they should not be ignored.

For example, all farmers are susceptible to fatigue and a farmer with a severe disability even more so. Efforts to compensate one set of muscles with another, such as working with only one leg or arm, can wear a person down much quicker. Once tired, the risk of injury or illness increases.

Hazards Associated with Assistive Technology in the Agricultural Workplace

Any technology has potential hazards associated with it. Assistive technology is no exception. The following section provides a brief overview of hazards, which could be present as the result of introducing assistive technology into the agricultural workplace.

1. Modified agricultural equipment

The Australian Centre for Agricultural Health and Safety has had contact with many farmers and farm workers who have made changes to their farm operation to accommodate a physical disability. The most frequent modifications have been to farm equipment including trucks, tractors and harvesters. These changes have, in many cases, been designed and constructed locally with little regard to established engineering standards or safe design principles. Since farm equipment is modified infrequently, compared to vehicles used for high-way or industrial use, there are no applicable standards to follow. Consequently, it is not too rare to find modifications, which expose the user to normally unacceptable levels of risk. This is especially true with respect to manlifts and hand controls. The following are brief summaries of concerns associated with these two areas:

a. Lifts

Manlifts used to raise an individual with restricted mobility up to the operator's station of the tractors or harvesters vary widely in design and operation. Several of the concepts expose the operator to considerable risk. In one case, a tractor mounted boom was used with a chain hoist and body sling to raise the paraplegic operator over the top of the tractor and then down onto the seat. A fall from such a height would have resulted in serious injury. In another case, a lift was constructed of galvanised water pipe which lacked the strength needed to prevent deformity in the structures underloading. Numerous examples of serious pinch points, exposed chains, improperly selected components, and questionable electrical wiring have also been observed.

In some cases, lifting devices were mounted to the tractor by attaching part of the structure to the tractor chassis and part to the cab. In each instance the cab was designed to "float" on the chassis by means of rubber isolation blocks. By joining the cab and chassis together with the rigid frame of the lift assembly, sound was readily transmitted into the cab from the tractor's drive train and stress was placed on the lift as the cab floated on the rubber mounts, when the tractor travelled over rough ground.

b. Hand Controls

Hand controls vary considerably from one modified unit to the next. On some, the hand operated clutch or brake lever is pulled toward the operator to engage or disengage the clutch or brakes, while on others it is pushed away from the operator. In some cases, the brake levers are designed to be moved forward to utilise the forward momentum of the operator, during deceleration, to apply additional force to the brake levers while the clutch lever was moved toward the operator.

Several cases have been encountered where so many controls were hand operated that the operator was forced to allow the tractor to "self-steer" during row end manoeuvres or other complex machine tasks. In flat paddocks this may not present a problem but on steep hillsides or near embankments, unsafe conditions would develop.

Hydraulic or electric actuated controls can present a problem if not designed and installed properly. In some cases small hydraulic or electric actuators were installed on brake or clutch pedals and controlled remotely. These units often lacked a sense of feel or did not allow adequate control. Jumpy starts and the inability to brake quickly presented special problems to other workers.

Injuries have also been reported when contact has been made with controls because of spasticity or vibration. To avoid this possibility, controls should be padded or located to avoid contact. Restraining belts are another possibility but should only be provided in consultation with an occupational therapist or physiotherapist.

2. Modified farm buildings and facilities

Modifications to farm buildings should take into consideration other potential users. For example, ramps constructed where mud can accumulate on them *c*an become a slip hazard for other users. Remote switches on equipment such as augers, and grain unloading equipment should have lock-out capabilities to avoid them being started while someone is working on or near the equipment.

Injury Prevention Tips

1. Upper extremity limitations. There is often the risk of further injury because of: decreased padding or scar tissue around the stump that may not tolerate bumping; prosthetic entanglements; and overuse of opposite extremity.

Injury prevention measures include:

a. For finger and hand injuries with decreased tissue or padding around bony prominence, use a custom-made padded glove to prevent skin damage.

b. Pocket hand-warmers and gloves can be used to prevent frostbite to fingers and hands which have been injured and have reduced circulation. "Easy Gloves" can be purchased; they are insulated muffs, which can be permanently placed over the handlebars of motorbikes and ATV's. They keep the riders hand warm but also allow the operator to slip his hands out to open gates etc.

c. One-handed nail starters might be considered to reduce finger injuries when starting nails.

d. When using an upper-extremity prosthetic device do not rely on a terminal device when grasping an overhead rung on a ladder or for climbing.

e. Be careful when working around livestock so the terminal device does not get caught on chains, collars, ropes, halters, or other materials attached to livestock. Care should also be taken when completing other tasks where the prosthesis could become entangled.

f. When using an upper-extremity prosthetic device with an internal elbow lock, one should be cautious in lifting and carrying objects that exceed the strength of the elbow lock. Consult with a prosthetist on appropriate weights that can be carried. An external elbow lock made out of durable material such as stainless steel might be considered for performing tasks, which require heavier lifting and carrying. Keep in mind heavy-duty external elbow lock will add more weight to the prosthesis.

g. Do not work on electrical equipment with the terminal device of a prosthesis. This is to avoid electrical shock.

h. To prevent frostbite to the stump of a below-elbow amputation, following are some tips which might help: Add additional stump socks to provide more insulation. Obtain stump socks, which absorb perspiration. Tube socks can be added to the outside of the socket to provide more insulation. Frequent breaks should be considered to ensure adequate warmth for the stump. A muff might also be used to keep the stump warm while performing tasks in which the arm is not needed.

i. One-handed tools and other labour-saving devices can help prevent additional injuries to the affected limb as well as potential injuries to the good extremity.

j. For bilateral arm amputations, additional and wider steps, made of non-slip material, could be added to farm machinery to make mounting and dismounting safer to compensate for decreased balance and grasping ability.

2. Lower extremity impairments. Some of the same hazards associated with an upper extremity impairment can be present for someone with a lower extremity impairment such as an amputation. In addition, there appears to be a greater risk of falls. Some important injury prevention measurers are as follows:

a. To prevent potential falls, fatigue and further deteriorations, outdoor mobility aids should be considered when manoeuvring over rough terrain. These aids include: manual, electric/fuel-powered wheelchairs, all terrain vehicles (ATV's), golf carts, and lawn mowers. Foot guards and modifications to controls for ATV and lawn mowers

should be considered for individuals who lack sensation and control in lower extremity.

b. When mounting and dismounting a tractor, one should start with the dominant leg and avoid jumping.

c. Farm machinery could be adapted to accommodate lost abilities in mounting and dismounting through the addition of a manlift, safe tractor access platform, non-slip steps, wider steps, additional steps, and hand-rails.

d. Controls in tractors should be adapted to accommodate for lost strength or function of extremities.

e. Direct contact with livestock should be avoided if possible or approached with extreme caution because of the unpredictable nature of livestock. Worksite modifications, to eliminate direct animal contact, might be considered. These modifications may include fence line feeders, automated feed systems, a lamb or calf cradle, a cattle crush and head bail and raised decks for pigs.

f. Labour-saving devices such as automatic gate openers and automatic hitching devices will help in reducing further degeneration of impaired extremities.

g. For individuals who have experienced hip replacements, tasks that require bending 90 degrees or more from the hip should be avoided. An All Terrain Vehicle that has a bench seat may be more appropriate for hip replacements than an All Terrain Vehicle that requires one to straddle the machine.

h. Walking over rough country or paddocks with high vegetation can cause potential trips, falls or entanglements which can cause twisting of a joint. Follow the wheel tread marks that have been made by farm equipment or create a smoother path for safer physical mobility.

i. Several improvements have been made to lower-extremity prosthetic devices to enhance comfort, reduce skin breakdown, save energy, and improve safety. These improvements include a "NSNA" (Normal Shape, Normal Alignment) socket for above-knee amputees; flex-foot; and hydraulic knee. Consult with a prosthetist to determine if any of these technologies would be appropriate for a specific application.

j. To reduce fatigue and further deterioration of the affected extremity when performing tasks that require standing for long periods of time, a sit-stand chair or stool might be useful to relieve pressure without interfering with the task.

3. Back injuries. Individuals with back injuries often experience limitations in a variety of activities including: lifting, standing, carrying, pulling, climbing, bending, kneeling and walking. The extent of these limitations is generally influenced by the level and severity of the injury. Farmers and farm workers with back injuries should attempt to identify their functional limitations and then determine the tasks, which should be avoided so to reduce the risk of further injury. Because back injuries are not often evident, the individual may attempt to perform a hazardous task or be asked by someone else to complete a task resulting in re-injury or further deterioration of their condition.

The following are safety tips that might reduce the risk for those with back injuries:

a. Avoid unnecessary lifting by using appropriate assistive technology or labour saving devices. For example use a hoist to move tractor tyres or heavy parts rather than manhandling them.

b. When lifting use the basic rules of lifting.

- If the object is too heavy, get help or use a lifting aid.

- Bend at your knees, not your waist. Keep your back straight.
- Keep the object being lifted (eg. bale of hay) close to your body.
- Use your leg muscles, not your back.

c. Wear appropriate footwear when working. Cowboy boots may look nice but some applications can aggravate back injuries.

d. Push on loads rather than pulling. You can push twice the weight you can pull with less strain on your back. For example pushing a feed cart is better than pulling it.

e. Adjust tractor and truck seats so knees are level with hips. Sit straight and adjust the seat so controls can be reached without stretching.

f. Don't stand in one position too long. When working at a work bench, use a box to raise one foot or when milking in a diary change your position frequently. Combination sit/stand stools are available for use when performing tasks that require standing for long periods.

g. In equipment used frequently, use the best seating possible. Features such as cushions, adjustable lumbar supports, adjustable arm rests, swivel bases and proper placement in relationship to controls should be considered. The use of rear vision mirrors can reduce the stress caused by frequent turning to view trailing operations.

h. Devices such as automatic hitching aids, automatic gate openers, and remote controls on equipment can reduce the frequency of mounting and dismounting the tractor.

i. Use extra steps, or a safe access platform on tractors and harvesters to reduce excessive stretching to reach the first step and reduce the temptation to jump down..

j. Direct contact with livestock should be avoided due to their unpredictable behaviour. Job restructuring or modifications to livestock handling facilities should be explored. Possibilities include: fenceline feeding, confined feeding, even employ contract stockmen to perform the major seasonal work such as calf marking, vaccination and basic animal health care, contractors are also available to transport livestock.

k. Watch your weight, get adequate rest on a good mattress, get plenty of exercise and use good posture. Being overweight or not maintaining adequate muscle strength can lead to, or intensify back injuries. Fatigue and stress can also contribute to back problems.

4. Spinal cord injuries. Some of the most serious hazards observed with respect to farming with a disability have been associated with individuals who have spinal cord injuries. The lack of mobility in some circumstances and the techniques used to overcome workplace barriers can present levels of risk that could be considered by many as being unacceptable. The following are suggested injury prevention measures that should be considered.

a. To prevent excessive bruising, scraping, or cuts to lower extremities when mounting or dismounting a tractor, a lift is recommended. In addition, some tractors may require the installation of an overhead grab-bar to assist in transferring from the lift to the tractor seat. Assistance from another person might be required and is generally encouraged.

b. Seat belts or restraining devices should be considered when operating a lift, especially if the individual experiences spasticity in the lower extremities.

c. Hand controls should be installed in farm machinery to accommodate the lost function in the lower extremities.

d. Two-way communication devices should be installed on every vehicle to be operated in cases of emergency and for saving time. These devices could include: two-way radio, cellular phone, and a push-button alarm system.

e. To prevent potential skin breakdown while operating farm machinery, various wheelchair cushions can be used. Modifications can also be made to the tractor seat to provide better upper body stability through the use of ergonomically designed or custom made cushions. A seat belt should also be worn for safety and stability.

f. A fire extinguisher should be available within reach on all equipment to be operated.

g. Approved Roll Over Protective Structure (ROPS) or cabin should be fitted to all tractors and heavy machinery.

h. For tractors without a cab, special care should be taken to prevent sunburn and heat stroke during summer by installing an overhead canopy, drinking lots of fluids, or working during times when there is less exposure to heat (ie early mornings, evenings, or night). Protective clothing, a hat and sun screen should be warn when exposed to the sun to reduce the risk of sun burn and heat stroke.

i. During winter months, warm clothing should be worn to protect against exposure or frostbite due to decreased circulation. Quilted material wrapped around lower extremities, leg-warmers, or other materials can be used to keep legs and feet warm.

j. When welding, a leather welding apron, which covers legs, feet, lap, and wheelchair should be used. A custom made apron might be needed. Caution should be taken when handling hot objects. Leather shoes should also be worn.

k. Outdoor mobility aids such as All Terrain Vehicles and motor bikes should be modified with foot guards to prevent feet from inadvertently slipping off and getting caught under the wheels as well as control modifications. In addition, special caution and care should be taken to avoid contact with the muffler.

l. When working with large livestock, direct contact should be avoided. Restructure these tasks so they can be performed by another person. Also explore the use of labour-saving worksite modifications including; easy open gate latches, automated feed systems, automatic gate openers, raised decks, calf and lamb cradles, cattle crush and head bail and other livestock holding equipment.

m. Dust, mould, dander from livestock and other respiratory irritants should be avoided, especially for spinal cord injuries resulting in decreased function of respiratory systems. There is concern that individuals with higher-level spinal cord injuries and several years of working in livestock handling facilities could be more susceptible to pneumonia.

n. Other labour-saving technologies such as automatic hitching devices and bin level indicators should be considered as well as job restructuring of those tasks which are difficult or hazardous to perform.

Sources of Safety Information

The safety and health of the person being served always needs to be a priority. It is too late to deal with the problem after an injury has occurred. Before any recommendations are made to enable a person to continue completing a farm related task, consideration should be given to the potential risks involved.

There are several sources of information relating to agricultural safety and health hazards. The following are a few examples.

- Farmsafe Australia's, *'Managing Farm Safety'*, 2 day training Course.
- National Occupational Health and Safety Commission.
- State Workcover Office.
- State Farm Safety Training Centres.
- Agricultural Guidance Notes. Available from the Australian Centre for Agricultural Health and Safety.

STRATEGIES FOR FINANCING ASSISTIVE TECHNOLOGY

Introduction

For a number of reasons, financing assistive technology has not been a major concern raised by those who have contacted the existing rural rehabilitation service delivery programs such as the AgrAbility Australia Resource Centre. Of the numerous calls and letters that have been received, only a couple have requested direct financial assistance. Some of the most obvious reasons include:

1. Farm families generally have a strong sense of economic independence. There is usually a hesitancy to accept financial assistance or when there are conditions attached. Even though many farmers and farm workers accept government farm program support, for example “fuel rebates”, such assistance is often viewed as compensation for helping to produce commodities, rather than a handout. In some cases a family may be willing to go without rather than become entangled in some bureaucratic program.
2. Farmers and farm workers have more technical skills than most of the population and frequently do their own repairs, maintenance and fabrication work. Many farms have well equipped workshops which allows for easy fabrication of many needed devices and modifications.

Funding, however, becomes a major barrier when the family's income is low, farm operation marginal, or the needed assistive technology expensive. The following sections provide brief summaries of some of the more typical sources of funds to purchase the needed technology. In some cases, two or more of these will have to be used to obtain the level of funding needed.

Personal Resources

If considered numerically, most of the agricultural workplace modifications which has been documented has been designed, fabricated and financed by the disabled person or a member of his or her family. This approach is often taken without regard for other legitimate sources of support and has generally proven to be the fastest and most cost effective strategy. Though not proven, there is evidence to suggest that the acceptance rate of the technology is also higher than other means. Farms have been visited where literally thousands of dollars of modifications have been made without any input from a rehabilitation engineer or assistive technology specialist. In most cases the costs of the technology is written off as part of the operating expenses of the farm.

Private Insurance

Some farmers carry some personal insurance that will provide for some of the costs associated with a disability, however, many do not. In Australia the premiums for private accident and injury insurance for agricultural workers is high and in the current financial situation few farmers can afford comprehensive private personal insurance. While farm employees are covered by the public workers compensation insurance farm owner/operators are not covered under the public insurance system.

A careful review of all insurance policies should be undertaken to determine the level and scope of the coverage.

Community Resources

It is characteristic of many rural communities to come to the aid of other farmers and their family who experience a catastrophic need. Where cash is in short supply, the assistance is provided as a service such as harvesting a crop, rebuilding a shed or providing transportation. Some examples of providing assistive technology in this fashion are as follows:

a. Donation from a local service organisation of a vehicle which has been modified for a farmer who has experienced a spinal cord injury.
b. Donation of a set of hand controls and wheelchair lift for an individual's work vehicle.
c. A working bee at a farm to install concrete walkways and workshop floor to improve accessibility.
d. Fabrication of a set of hand controls for frequently used machinery.
e. Donation of a two-way communication system to improve the safety of a farmer working in the paddock.
f. Construction of a deck and ramps on an older farm home.

Private Funding Sources

Every state has non-profit organisations, which provide assistance to persons with disabilities. This usually comes in the form of direct payment to the vendor involved or service provider. In most cases, the resources of these groups are considerably less than the demand. Consequently, few cover the entire cost but rather make a partial payment towards the needed service or technology.

All non-profit organisations, which obtain funding through public appeals, are required to be registered. The yellow pages in the local phone book will contain a list of the local Disability Services and Support Organisations, their phone numbers and addresses. It may be necessary to assemble a proposal which breaks down the need into more manageable pieces and approach several of the organisations with each being requested to fund a part of the need.

Public Sources of Funds

A number of state agencies have been established by the legislatures of each state to address the needs of those impacted by disabilities. Some serve a specific population such as the blind, hearing impaired, or those unemployed because of disabilities, while others attempt to act as "safety nets".

Access to public agencies, which serve the disabled, is usually through a local or regional office that attempts to tie many of the services together. None are perfect, they tend to work slowly, often seem insensitive and appear to have a never-ending set of rules and guidelines for compliance. These agencies, however, were established to provide needed services and should be utilised.

Every state is different in the way they address the needs of the disabled, but each generally has agencies such as the following:

1. CRS Australia
2. Royal Blind Society
3. State Worker's Compensation Fund
4. Medicare

In addition, federal agencies such as the Veteran's Affairs, which provides specialised services such as medical and rehabilitation to veterans, should be tapped into if the farmer is eligible.

COMMUNITY BASED RESOURCES FOR FABRICATING ASSISTIVE TECHNOLOGY

Local Fabricating Resources

1. Local TAFE Colleges, (Technical and Further Education) rural engineering departments.
2. Farm machinery and implement dealers
3. Custom fabricators
4. Local craftsmen

Problem Solving Networks

A problem solving network is a group of individuals with various skills, abilities, talents, and creativity which can be utilised to help individuals with disabilities solve unique problem tasks through various levels of accommodation. The types of solutions problem solving networks can develop include: providing alternative ideas for completing a task using existing resources and physical abilities; locating commercially available technologies; modifications to equipment or buildings; and designing and fabricating of new solutions. Almost everyone has some skill or ability, which can be useful in solving a unique problem task.

The development of problem solving networks has become more popular in recent years because of limited financial resources available to solve problems and the push toward consumer responsive, empowerment and community-based approaches which teach people how to solve their own problems. The importance of helping each other during difficult times is not new to people who live in rural areas that have been dependent upon their family, friends, and neighbours during times of crisis.

The benefits of a problem solving network are extensive including the development of better solutions through the input of people with various expertise (remember, three heads are better than one); the cost-effective nature of involving volunteers; and the local grassroots approach to problem-solving.

This paper will discuss and demonstrate ideas for developing a problem solving network which can be utilised when solving difficult problems; methods of identifying, recruiting, and coordinating volunteers; and potential disadvantages when using a problem solving network.

Activities of a Problem Solving Network

Everyone has some type of skill, ability, talent or creativity, which can be used in solving a specific problem. These individuals can be categorised by the nature of their skill, geographic location, and the type(s) of activities they are willing to participate in. There are four primary types of volunteers in a problem solving network.

They include:

1. Idea Generators: Many people enjoy sitting around the table brainstorming possible ideas related to solving a particular problem. People who might be considered as idea

generators include: design engineers, metal fabricators, farmers, consumers who use assistive technology, mechanics, interior decorators, woodworkers, artists, inventors, and people who simply enjoy a brainstorming session over a cup of coffee. Some of the best ideas have been suggested this way.

2. Bargain Hunters: These specialists are often called "bargain hunters" because of their creative and uncanny ability to obtain needed resources. These are people who have expertise in locating materials, people, places, and funding to help solve a problem task. Bargain hunters/procurement specialists/scroungers may be people who are collectors, salesperson, garage sale hunters or go to clearing sales. They often can view what may be considered junk as real treasures, which can be used in various ways. Farmers can be excellent bargain hunters because many have learned that surviving is making the best out of what you have. Antique collectors, scrap iron businesses, and people who run recycling depots are excellent resources for obtaining needed materials, items and parts. Bargain hunters who are able to identify and locate commercially available products are often not afraid to ask for items or materials to be donated. They don't seem to take it personally if someone says no. They may be good at convincing people of the benefits of donating an item or their time for a good cause. Not only are bargain hunters good at finding actual items, they may know of people who can be contacted to assist or places to go to find a unique item. In addition, they may be willing to make the contacts and do the legwork to obtain a needed resource since they're often good at motivating people to become involved or simply opening the door for other people to make the needed contacts.

3. Designers: These people often have the technical skills needed to design an adaptation or an actual product. Designers could include: architects, builders, engineers, and occupational therapists.

4. Fabricators: When an item needs to be built, or a product needs to be modified, skilled fabricators are essential. Examples of fabricators might include: farmers, mechanics, machinery and implement salesmen, electricians, plumbers, concrete workers, artists, tailors, seamstresses, etc. Fabricators may need blueprints, designs, and detailed instructions on how to build a device or make necessary modifications.

Developing a Problem Solving Network

The first step in developing a problem solving network is to identify people who might be interested in helping solve unique problems. The following are methods for identifying people with needed skills, abilities, talents, and creativity.

1. The local media can be contacted and encouraged to carry articles or news stories about the need for volunteers to help out with specific projects.
2. During awareness presentations to community organisations, potential volunteers can be encouraged to participate in a problem solving network.
3. Contact with community organisations, service clubs, churches, associations, and trade organisations. Many of these organisations are interested in doing service projects. Examples of types of organisations include: the Physiotherapy Association or Occupational Therapy Association, National Farmers Federation, Local Apex Club, Lions Club, Rotary Club, Boy Scouts, Girl Guides, and the Mechanics Union, just to name a few.

4. Senior citizens and retirees are another source of volunteers with various expertise. Another option is to consult government funded vocational programs such as the skill share program. These companies and organisations are often interested in providing their early retirees and unemployed with opportunities to keep them active and involved in their communities. Churches, senior citizen groups, and other organisations who serve senior citizens are also excellent resources to contact.
5. Placing posters in hardware shops, service stations, hobby shops, coffee shops, grocery stores, laundry mats, and other places of business can help identify creative people.
6. Word of mouth has always been one of the best methods of learning who in the community has the skills and abilities that might be needed.
7. Consumers of assistive technology are often very useful in a problem solving network. These individuals not only understand the difficulties associated with a particular problem task, but are also interested in helping others to achieve their maximum independence. Furthermore, consumers are often forced to be creative in coming up with solutions to overcome difficult barriers.

Managing a Problem Solving Network

Managing a problem solving network can vary depending upon how the network will be used. An informal problem solving network used on an "as needed basis" is often used by smaller organisations. The names and expertise of the various volunteers are often stored if in the minds of the staff to be recalled when a problem arises. The disadvantage to this approach is that other staff members are not aware of potential resource people who could assist with solving a unique problem. In addition one might not remember a potential volunteer who has not been used for a while.

A more formalised method of managing and coordinating a problem solving network might include the following:

1. Develop a database of individual names, addresses, phone numbers, and the types of activities that they would be willing to participate in.
2. Resources can be categorised by the following activities: idea generating; expert people needed, places, materials; designing, or fabricating solutions.
3. A computerised system or a card catalogue could be used for updating and maintaining an active list of resource people.
4. Although the majority of people listed in a problem solving network may be volunteers, it is important not to rule out resource people who request pay for their services. Specialised and creative people are often invaluable in a problem solving network.
5. Keep track of the types of activities volunteers have participated in. These activities and projects can be documented on the back of an index card or included in a computerised system.
6. Send an information letter to all people in the problem solving network. This letter should include ideas on ways they can assist in helping to solve a problem task and the benefits of participating in a problem solving network.
7. Recognise volunteer participation through organisational newsletters and conducting volunteer appreciation certificates or service recognition events.

Potential Problems

Although problem solving networks can be an excellent resource in solving unique problems in an effective and cost-efficient manner, there can be some difficulties or shortcomings such as:

1. **Time**: For some simple projects, it may take too much time to organise people in the network to become involved. It may be more cost-efficient to simply hire someone with the needed skills. In addition, many individuals in the problem solving network work full-time jobs and are only willing to work on a particular project when they have time. This is fine as long as the problem task does not need to be solved right away. It could be difficult for those problems that need to be solved right away.
2. **Coordination**: Yes, three heads are better than one, but sometimes trying to coordinate three or more people to come together to help with a particular task can be challenging.
3. **Errors**: If the problem task is not clearly defined, then errors are more likely to occur when developing a solution. In addition, many individuals who participate in any problem solving network lack the understanding of the physical limitations associated with a specific disability. As a result, the solution may not be effective. In addition money spent in designing and manufacturing a piece of equipment which can not be fully utilised is wasted as it could have been spent more wisely.
4. **Lack of interest**: If volunteers are not used enough, they may lack interest and choose to find something else to participate in. In addition, service providers may forget the level of expertise available within the problem solving network and therefore under-use this valuable resource.

Coping with Potential Liability

No one is immune from potential liability exposure in anything they do. However, various Good Samaritan laws in individual states have not held volunteers liable for providing services at no cost to their neighbours. It is recommended that one check the laws within one's state related to this matter.

Some volunteers in problem solving networks have their own waiver of liability form. This form is signed by the consumer who receives assistance or services from the volunteer in the network. Some of these volunteers may consult a lawyer in developing the liability waiver form. Organisations that recruits and use volunteers often have liability insurance that covers volunteers associated with their organisation. It is advisable to consult with an insurance company regarding this matter.

An additional consideration is the Occupational Health and Safety Act 1983 in particular the General Duty of Care (Part 3, Division 1 of the ACT). Which states …'employees must ensure the health, safety and welfare at work of their employees'...[9]

When adapting equipment, implements and machinery in the workplace the risk of injury to able bodied workmen may be increased.

For further information about employers obligations under the Occupational Health and Safety Act 1983 visit www.workcover.com or locate the nearest WorkCover Authority office in the yellow pages of the phone book.

[9] *The Occupational Health and Safety Act 1983*. In each state or territory in Australia.

STRATEGIES FOR DELIVERING ASSISTIVE TECHNOLOGY SERVICES IN RURAL SETTINGS

Introduction

The aim of this chapter is to make you aware of, and familiar with, three strategies, which it is hoped will eventually be developed to deliver assistive technology services in rural settings:

1. Central fabrication facility
2. Mobile fabrication vehicle
3. Assistive technology demonstration vehicle

The first two strategies involve direct fabrication of solutions for the persons being served, while the remaining strategy provides services via a van that carries commercially available assistive technology. For each of the three strategies presented, a brief discussion of the strategy is followed by a listing of some of the advantages and disadvantages associated with the strategy. Where possible, programs employing a particular strategy are named to allow readers to contact those programs for further information regarding implementation of that strategy.

All have benefits and drawbacks and no one strategy can be described as "best" for all situations or for all programs. Each strategy has unique advantages and disadvantages, which make it more or less an appropriate choice under given circumstances.

Strategies

1. Central fabrication facility

To fabricate a custom solution then it must almost certainly create or have access to a central fabrication facility where a large proportion of the fabrication will take place.

Any other arrangement could cause both inefficient use of time and/or a reduction in the size and quality of solutions capable of being fabricated. For example, a program choosing to rely solely on machine shops local to a client being served would have no control over what type or size of machine tools are available or whether the machinist is skilled or unskilled.

One major drawback of a central fabrication facility is the cost of purchasing tools and equipment to establish it. According to one source, the cost of tools and equipment could range from $15,000 if buying used equipment, to $25,000 if new equipment was purchased 'carefully', to as much as $60,000 for a well-equipped facility with new equipment. These estimates do not include materials.

Advantage

- Can make use of large, bulky equipment.
- Can make use of specialty machines, because space is less a concern.
- Specialty equipment can make specialty items.
- Higher precision tools can be used.

Disadvantage

- Problem not usually "at hand" for machinist to investigate.
- Rely heavily on design and measurements taken "in the field".
- Can't easily make changes in design as item is being fabricated.
- Relatively slow turn-around time because of travel necessity.
- Specialty equipment requires operators skilled in use of that equipment.
- Inventory costs can be quite large.

2. Mobile fabrication vehicle

The idea of using a mobile fabrication vehicle, or mobile shop, to deliver assistive technology services is gaining popularity among programs serving rural clients. One benefit provided by a mobile shop is the potential to greatly reduce the time spent in assessing, designing, and fabricating a solution when compared with a central fabrication facility. With only a central facility, each step of (1) assessment, (2) initial solution, and (3) modification requires a farm visit. In certain circumstances, this can all be accomplished in one day with a mobile fabrication vehicle. This reduces not only time delay, but also travel costs and staff time.

Similar to those used by machinery dealer mechanics, which travel out to farms to repair broken down machinery. As well as the state road side vehicle maintenance organisations such as NRMA in New South Wales, RACQ in Queensland, RACV Victoria and RAA South Australia.

However, because of the great distances found in the rural areas in which these vehicles operate and the lack of demand, there is concern the operating expenses of the vehicle can make some trips prohibitively expensive. Services provided through a fabrication vehicle may or may not be cost-effective depending upon:

- travel distance.
- numbers of individuals served in a location.
- available services within local communities.
- number and complexity of needed accommodations.

To overcome this problem it may be suggested that a local machinery dealer or mechanic be approached as a possible vendor for the service as an auxiliary service to disabled farmers and farm workers.

For example, it may be cost-effective to design and fabricate worksite adaptations for individuals who reside within a 100 kilometre radius and whose adaptations can be made in two hours or less. It may be too costly, however, to travel 200 kilometres to design and construct a ramp requiring two days to build when, with technical assistance provided, local community volunteers or vendors could construct the ramp themselves. A mobile fabrication vehicle is used most effectively when the design and fabrication of solutions can be accomplished in a day or less.

Ideally the "mobile shop" would be equipped with a COG welder, oxygen-acetylene torch, 220 arc welder, power saws, post hold digger, hand tools, portable work bench, and assorted fabrication material and be located in a commercial van with a raised roof to allow fabrication in a standing position.

Advantage

- Problem is at hand and available for immediate inspection.
- Can easily make changes in design as item is being fabricated.
- Item can be "tried out" by client and reworked immediately if necessary.
- Travel time from farm to central facility is eliminated.
- Necessity of return visits to farm may be eliminated.

Disadvantage

- Solutions limited to fabrication methods and materials carried in the vehicle.
- Requires driver/technologist willing to spend many hours travelling and nights away.
- Inventory costs.
- Not cost-effective for fabricating all types of assistive technology.
- Difficulty in obtaining on-going funding.

3. Assistive technology demonstration vehicle

This strategy for delivering services to people in rural areas does not involve direct fabrication of solutions. An assistive technology demonstration vehicle instead provides contact with solutions that are commercially available. A demonstration vehicle carries actual examples of assistive technology of interest to rural residents with physical disabilities, as well as catalogues of various manufacturers and sales companies. The intent is to let people examine cost-effective solutions, which are commercially available. Farmers may be spared either the time or expense, or both, of developing their own solution when an effective, reasonably-priced solution already exists and is being sold. Demonstrations at local field days and agricultural shows are another effective way of reaching large numbers of the farming population. The only thing lacking, frequently, is the awareness that such an item exists or knowledge of where to go to buy it.

Delivering services via a demonstration vehicle may be appropriate for programs which, because of liability or other issues, are prevented from providing fabrication services.

Initial vehicle costs can range from $40,000 to $60,000 depending upon the types of vehicle modifications requested, such as: custom made cabinets, wheelchair lift, automatic door openers, hand controls, power driver's seat. Inventory costs also can be high if items such as wheelchairs and All Terrain Vehicles are purchased to carry in the vehicle.

Advantage

- Can fill two roles: one as service provider and one as public awareness.
- Service provision:
    1. Convenient - take directly to the home.
    2. Hands-on - people can see before deciding to buy.
    3. Exposure to items that might not have been seen before (eg. drum handling equipment, swing lift, ascender barrow).
    4. If a commercially available product is reasonably priced as compared to the cost to construct a solution, the farmer will save time and/or money.
    5. Can provide design consultation on-site.

- Public Awareness:
    1. Public, both disabled and non-disabled, are made aware of the abilities and needs of farmers with physical disabilities.
    2. New contacts can be generated.
    3. A simple way to transport displays for shows, and items make great displays to attract interest.

Disadvantage

- Individual solution may not be provided by a commercial item.
- Maintenance and fuel costs.
- Still may not have in van an item that a farmer wishes to see.

OTHER RESOURCES

AgrAbility Australia Resource Centre

AgrAbility Australia Resource Centre has many ideas and information on assistive equipment in the agricultural workplace. One of the main resources used is the *Directory of Rural Assistive Technology.* This directory contains information regarding assistive technology. AgrAbility Australia also has current publications, audio-visual resources and newsletters related to rural rehabilitation services and assistive technology for farmers and farm workers with physical disabilities. The operation centre for the AgrAbility Australia Resource Centre is currently the Australian Centre for Agricultural Health and Safety, the contact details are given below.

CRS Australia, agricultural engineers and other interested rehabilitation workers are involved in the program and assist injured and disabled farmers with modifications so they are able to continue farming with the use of assistive equipment and through changes to their farm work practice.

AgrAbility Australia Resource Centre

Australian Centre for Agricultural Health and Safety

PO Box 256

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