A TEAM APPROACH TO FOREST WEED CONTROL

C.H. WELLS[1] and M.J. LEWTY[2]

[1]Forest Development Branch
Department of Forestry
G.P.O. Box 944
BRISBANE 4001

[2]Forest Research Centre
M.S. 483
GYMPIE 4570

Summary. High weed control costs and an uncertain future for the phenoxy herbicides, prompted the Queensland Department of Forestry to appoint a Project Team to review Hoop Pine Weed Control and develop solutions to the problems. The Team concluded that the best approach was to develop an integrated weed control system.

The elements of a system were developed by management and research, and various systems were tested in broadacre field trials. Full use and involvement of field staff was made. A new system of weed control emerged and is being implemented into field practice. The new system provides a means of achieving a stated weed control objective with the flexibility of being able to change as new knowledge is gained.

The Project Team approach has been successful in both improving the practice and reducing the cost of weed control.

INTRODUCTION

Hoop pine (*Araucaria cunninghamii*) is grown as a plantation tree in south-east Queensland. Since the 1920's the Queensland Department of Forestry has established some 43 000 ha of plantation.

Hoop pine plantations are expensive to grow, mainly because of the need for repeated weed control operations. Until age 4 years, intensive weed control is needed to successfully establish the species. From age 5 to 12 years, operations are needed to contain vines and tall woody weeds. After age 12 years, repeated lantana (*Lantana camara*) control operations are needed to maintain access until clear fall at age 45 to 50 years. Nett annual weed control costs may exceed $1.2 million for a plantation area of about 40 000 ha.

Until the mid 1970's weed control made extensive use of the phenoxy herbicides 2,4-D and 2,4,5-T. At this time the Department recognized that a less costly means of weed control was needed and that the future use of phenoxy herbicides was doubtful. As a result, the Department appointed a Weed Control Project Team. This team was to review the situation and develop solutions to the problems.

THE PROJECT TEAM

The team comprised a research and management forester. The pair were to work closely together and intimately involve local field staff with their activities. Their role was to define, co-ordinate and implement development of forest weed control. The team defined three goals.

- Immediate optimisation of the current weed control prescription to increase cost effectiveness.
- Develop a short term non-phenoxy herbicide prescription.
- Develop a future prescription on the basis of a study of the dynamics of hoop pine - weed competition.

The objective in every case was to develop an integrated weed control system. Rather than solve individual weed problems, the object was to design an integrated sequence of field operations that would continuously achieve a stated weed control objective.

SETTING A DIRECTION

The team began by summarising all available data on hoop pine weed control. These data summaries were issued as a series of written reports. This data base permitted some immediate changes to the field prescription and identified needs for future research.

The data showed that little was known about the dynamics of competition between weeds and hoop pine. Investigation on this aspect was given first priority for research.

Four broad means of weed control were considered. Biological and physical methods of weed control were judged to be unsuitable. Biological control had limited relevance to certain exotic weeds whilst physical methods were severely limited in application by the steep and rugged terrain of hoop pine plantations. Chemical methods were seen as the best direct control option. However, little was known about non-phenoxy herbicides and work on screening a number of herbicides began. The application of appropriate management practices was the last usable option. By paying attention to silvicultural management such as the season of planting, stock quality, espacement and site preparation, early pine growth was enhanced, thus giving the trees a competitive advantage over weeds. In addition, the concept of using a ground cover crop was considered worthy of research. A period of intensive research and field trials began.

THE DEVELOPING SYSTEM

Improvements were made to the existing weed control prescription. These involved the introduction of new application equipment, a code of practice, refined application techniques and a reduction in herbicide mixture concentrations. These factors reduced herbicide use and field costs.

The initial results of weed competition studies began to challenge traditional weed control practice. Instead of broadacre control of over-topping weeds, research pointed to the need for control in a specific growth zone around each tree. Provided a high level of weed control was maintained in this ring, the tree grew well. In addition, weed control was apparently only needed for the first 18 months after planting. Further research began to examine the optimum ring size and time of cessation of weed control.

Results from herbicide screening trials suggested a range of suitable knockdown and residual herbicides. Subsequently, use of these chemicals achieved the level of weed control required for maximum pine growth. These new and usually expensive herbicides demanded a complete review of application methods. The knapsack sprayer began to be replaced by a range of equipment; forest guns, splatter guns, CDA sprayers, rope wicks and sprinkler sprayers. Considerable effort was directed to developing simple and accurate equipment which could withstand the rigors of forest use. Close attention to small details was needed if equipment was to be practical and cost effective.

Ground cover crop trials suggested that sown grass could stabilize the site and substantially inhibit general weed growth. There were problems with the cover crop competing with the pine, but with appropriate tending methods these could be overcome. Research began to examine non-grass cover crops whilst management examined sowing rates, methods and timing. The elements of a new system were developing.

TESTING THE SYSTEM

Various systems were tested in broadacre field trials using local field staff. Costs and practical difficulties were derived from broadacre work whilst growth and weed control data were obtained from controlled experiments.

These trials went through three phases. Phase 1 simply tried to apply the system regardless of cost. Phase 2 refined the system and began to examine cost. Phase 3 incorporated all available improvements and was a test of cost effectiveness. Each phase was repeated in several locations to encompass a range of staff and field situations. Problems were considered and further specific research carried out where needed.

The approach of full use and involvement of local field staff had advantages and disadvantages. Field staff made a valuable contribution to the definition of problems and often produced a solution. Because they were involved, they believed the results and had no reluctance to convert to the new methods. On the negative side, some field staff who were used to a traditional practice had difficulty when confronted with different objectives, herbicides and application methods. A great deal of effort had to be spent on staff education and training.

By the early 1980's a new system had emerged in a basic form. Instead of repeated broadacre applications of phenoxy herbicides, a ring of residual herbicide was applied around each tree and couch grass cover crop was sown in a line down each interrow. Ring treatments were periodically applied to maintain a high level of weed control around each tree. General weeds were contained with a more specific application of herbicide. Under the new system pine growth was substantially greater. Although initial costs were higher, long term costs promised to be lower. Research began to refine the components with an emphasis on cost effectiveness.

IMPLEMENTATION OF A NEW SYSTEM

By late 1983 the new system was ready for initial implementation. Many of the developments had already been informally incorporated in field practices. A major workshop was held for senior staff to present the data and define a formal field prescription. This new prescription will be applied in late 1984.

Implementation involves a major training effort and production of new manuals. During the development of the system, training was recognized as an essential element and a training officer was added to the Team.

The new system is by no means a final answer. It is a major change which still needs further work. While the basic philosophy will not change, the means of achieving the objective will. Research is providing superior chemicals, application methods and cover crops. As more knowledge is gained on the hoop pine - weed dynamics, the system will be revised.

ANALYSIS

The new system is a result of a concerted and continual effort by research, management and local field staff. Each party has had the opportunity for input in the development and has shared in the result. This interplay of different groups has maintained both a momentum for the programme and a sense of direction.

The new system is based on a factual knowledge of weed competition dynamics. This base is valid but is open to change as more knowledge becomes available.

The new system employs all available means of weed control. Management methods are emphasised. Herbicides are applied accurately, specifically and in a way that results in negligible movement from the area of application. Departmental use of herbicides has reduced from 50 000 l in 1976/77 to under 23 000 l in 1982/83. This has resulted in a dramatic reduction in costs. In 1976/77 the Department spent $1.3 million on hoop pine weed control. Costs have progressively reduced to $0.85 million in 1981/82. In that time, while annual plantings have decreased, the hoop pine plantation estate has been expanded from 37 771 ha to 42 292 ha. While many factors have played a part in the cost reduction, the changes in weed control approach and methods have been significant elements.

The cost of supporting the Project Team was about $85 000-00 per year for salaries and experimental work. The Department is now spending some $400 000-00 a year less on weed control than when the Team began. Added to this, there will be a monetary gain from the improved tree growth obtained.

The Project Team will continue to operate to review and revise forest weed control in hoop pine and also in exotic pine plantations.

CONCLUSION

The Project Team approach has been successful in both improving the practice and reducing the cost of weed control in Queensland hoop pine plantations. This success is attributed to the enforced integration of the previously differing views, priorities and needs of research, management and local field staff. By combining the effort and forming a common sense of direction, the separate parties could concentrate on specified areas to create an integrated weed control system.