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USERS' PERCEPTIONS OF

ATTRIBUTES OF FUNCTIONAL APPAREL

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USERS' PERCEPTIONS

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ATTRIBUTES OF FUNCTIONAL APPAREL

by

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ABSTRACT

USERS' PERCEPTIONS OF
ATTRIBUTES OF FUNCTIONAL APPAREL

By

Maureen Sweeney Henry

The purpose of this study was to contribute to the field of functional apparel design by expanding the design process to include an investigation of the users' perceptions of the attributes of a proposed item of functional apparel. The theory proposed by Rogers and Shoemaker (1971), that the perceived attributes of innovations are significantly related to the rate of adoption, provided the framework for this study.

The perceived attributes of a proposed garment of functional design were incorporated into "attitudinal" and "behavioral" statements for the questionnaire. Responses were a five point scale rating of "Always" to "Never." The sample consisted of 500 certified Michigan pesticide users.

It was found that although responses to the attitudinal and behavioral statements were highly correlated, the attitudinal responses were significantly higher than the behavioral responses in most cases. Significant differences were also found in the respondents' perceptions of the attributes by type of farm, age, acreage, and education as determined by chi-square analyses.

Rogers, Everett M. and F. Floyd Shoemaker, Communication of Innovations (New York: The Free Press, 1971).

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CHAPTER I

INTRODUCTION

An innovation is an idea, practice or object perceived as new by an individual (Rogers and Shoemaker, 1971). Its adoption and acceptance depends upon how the individual perceives its attributes. Innovations from the field of functional apparel are beginning to be generated to meet specific needs of users in industry and athletics. How the intended users of a particular item of functional apparel perceive its characteristics will determine its success or failure in the marketplace.

The unique process of functional apparel design combines the theories of physical and social science with design. It encompasses a systems approach to design rooted in the ergonomics research conducted through organizations of the National Bureau of Standards, the United States Army Research Institute and the National Aeronautics and Space Administration.

The functional design process begins with an analysis of the total situation within which the design is to operate. The critical factors involved are identified and data concerning them are collected. Areas identified as factors may include movement, thermal and impact protection needs and functions of the human body as well as social, psychological and aesthetic needs. The information gained from the data collection is integrated with that of user preferences, the mechanical and chemical properties of textiles, convention, and aesthetic design to develop the specifications for designing prototypes. These prototypes are later evaluated by using the specifications as criteria for success and by user reaction (Orlando, 1979).

The lack of a systematic approach to designing industrial purpose clothing in the past has resulted in garments that are uncomfortable and burdensome to wear and have had a low acceptance by workers. The active sportswear industry suffers similar problems producing apparel that does not allow for a full range of motion and accommodate thermal comfort. However, with the emergence of functional apparel design and the increased application of its methodology to a variety of problem areas in the field of apparel, the resultant innovations should have the potential for greater user acceptance.

In order for the advantages of any innovation to be realized, it must be diffused and utilized (Rogers and Shoemaker, 1971). Presently, the effectiveness of functional apparel design cannot be measured until the innovation has met wide acceptance by the users, or, until many users have purchased the product. Although the design process aims at maximizing user input in developing design specifications, it does not include any steps toward facilitating the adoption of the final output or innovation. For example, a Midwest farmer may positively evaluate a garment prototype to protect him from dangerous pesticide penetration, but positive evaluation and the purchase of the innovation may mean two different things in his mind. A multitude of advantages could be realized if the user investigation were to include a measure of how the users perceive the attributes of the innovation. The incorporation of this measure into the functional design process would enable further refinement of garment prototypes, as well as allow the acceptance and adoption of the final product to be more accurately assessed. Furthermore, these findings would provide manufacturers and marketers with information to facilitate strategies for adoption.

Rogers and Shoemaker (1971) in their study and review of the research in the diffusion of innovations, proposed that if a comprehensive set of attributes of innovations existed which could be as mutually exclusive and as universally relevant as possible, then the rate of adoption could be assessed before the innovation is marketed. Because the perceived attributes of the innovation are positively related to the rate of the adoption, Rogers and Shoemaker proposed the following five categories of attributes as an approach to this classification system:

1. Relative advantage. The degree to which an innovation is perceived as better than the ideas it supercedes.

2. Compatibility. The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receivers.

3. Complexity. The degree to which an innovation is perceived as relatively difficult to understand and use.

4. Observability. The degree to which the results of an innovation are visible to others.

5. Trialability. The degree to which an innovation may be experimented with on a limited basis.

This theory proposed by Rogers and Shoemaker and substantiated by their studies, provided the framework for the present study.

Objectives of the Study

The purpose of this study is to contribute to the field of functional apparel design by expanding the design process to include an investigation of the user's perceptions of the attributes of a proposed item of functional apparel.

The main objective of this study is to devise a method of inquiry to measure the user's perceptions of the attributes of functional apparel using the five general attributes of an innovation. In support of the major objective, the following operational objectives were developed:

1. Determine whether a positive, significant relationship exists between the subjects' responses to the attitudinal and behavioral statements pertaining to the same attribute.

2. Determine whether a significant difference exists between the subjects' responses to the attitudinal and behavioral statements pertaining to the same attribute.

3. Investigate differences in the perceptions of respondents by type of farm, acreage, age, and education.

4. Determine which of the attributes are the best

predictors of favorability toward protective clothing for pesticide users.

Definitions of Terms

Functional Apparel. Clothing that is designed to meet the physical, social, psychological, and aesthetic needs of potential users.

Functional Design Process. A holistic approach to creating apparel that will meet the physical, social, psychological, and aesthetic needs of potential users. The process is based on a strategy control system, whereby each step serves as a built-in check in exploration of problem boundaries followed by the definition of the problem structure and critical factors assessment and analysis. Design specifications are then developed and analyzed for interrelatedness and priority. These specifications become the design criteria used for developing the prototype and eventually evaluating its success (Case and Orlando, 1980).

The following steps, which are not mutually exclusive, outline the functional design process:

1. Request for the design
2. Exploration of the design situation
3. Problem structure perceived
4. Specifications described
5. Design criteria established
6. Prototype developed

7. Design evaluation

Innovation. An idea, practice or object perceived as new by an individual. In this study, protective clothing for pesticide users is the innovation.

Users. Persons for whom the innovation is intended. Michigan agricultural workers who are privately licensed pesticide applicators are the users in this study.

Attributes of Innovations. The characteristics of a new idea, practice or object as sensed by the users that contribute to its rate of adoption. The five general attributes of innovations are:

1. Relative advantage. The degree to which an innovation is perceived as better than the idea it supercedes.

2. Compatibility. The degree to which an innovation is perceived as consistent with the needs of the receivers.

3. Complexity. The degree to which an innovation is perceived as relatively difficult to understand and use.

4. Observability. The degree to which the results of an innovation are visible to others.

5. Trialability. The degree to which an innovation may be experimented with on a limited basis.

Perception. Any act or process of knowing objects, facts, or truths, whether by sense, experience or by thought.

Limitations

1. Perception measurement is an indirect process. Responses

to questionnaire items are easily influenced by uncontrolled circumstances; thus, the data reflect only estimates of the participants' "true" feelings.

2. Because the instrument was not adequately pretested, it is not known whether statements are measuring what they are meant to measure.

3. Because individual scale scores used in this study were added together to create indices, inaccuracies in interpreting some of the respondents' perceptions may have resulted.

CHAPTER II

REVIEW OF LITERATURE

Introduction

A search for literature in the area of clothing for agricultural workers uncovered that this subject had not been dealt with on a research basis. Alternately, literature in the area of industrial clothing and its acceptance or rejection by workers was sought, only again to find that there was none. Ultimately, the author chose to begin the literature review with studies of innovations, mostly within the realm of agriculture, and the attributes of the innovations which led to their eventual adoption. Underlying this approach is the assumption that protective clothing functionally designed for agricultural workers can be treated as an innovation in the same way as other new agricultural practices and technologies. The innovation studies reviewed here have contributed greatly to the formulation of this study.

The history of pesticide legislation in the United States is presented in brief. The rules and regulations have undergone many revisions over the years and continue to do so, impacting the private practices of farmers in ever increasing ways. Amongst those and of great significance to this study are the rules and regulations concerning protective clothing requirements for pesticide users which are reviewed here.

Attributes of Innovations

An innovation is an idea, practice or object perceived as new by an individual (Rogers and Shoemaker, 1971). Innovations and the process by which they spread to members of a social system, have been studied at least since the turn of the century (Tarde, 1903). Contemporary reasons for studying innovations are many and foremost among them are product manufacturers who try to predict the rate of adoption of an innovation before it is marketed on a full-scale basis. With the U.S. Department of Commerce estimating that 90 percent of all new products fail within four years of their release, this becomes a worthy endeavor.

Obviously, all innovations are not equivalent units of analysis. While some innovations reach complete adoption in two or three years, others take decades, and still others are never adopted. It is the characteristics of innovations, as perceived by the individual, which contribute to their different rates of adoption. Perception plays a key role in this process.

Rogers and Shoemaker (1971) proposed a classification system for describing the perceived attributes of innovations. They recognized the need for a comprehensive set of attributes of innovations which would be mutually exclusive and universally relevant. With such a classification system, the rate of adoption could be assessed before the innovation is marketed. Rogers and

Shoemaker's approach to this classification system consists of the following five categories of innovation attributes.

Relative Advantage

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supercedes. The nature of the innovation may determine what specific type of relative advantage is important to adoptors. Subdimensions of relative advantage may be the degree of economic profitability, low initial cost, low perceived risk, a decrease in discomfort, a savings in time and effort and the immediacy of the reward. Rogers and Shoemaker (1971) generalized that "the relative advantage of a new idea, as perceived by members of a social system, is positively related to its rate of adoption."

In analyzing the relationships between attributes of innovations and the rate at which those innovations have been accepted by farm operators, Fliegel and Kivlin (1952) found that a "saving of time" attribute of new farm practices was the most closely related to speed of adoption of all attributes studies. The correlation was moderate in size, r = .41, but statistically significant and indicated that new practices rated high on saving of time tended to adopted rapidly. Practices rated high on "saving of discomfort" also tended to be adopted rapidly, although the relationship was not significant in this case.

An example of the effect of relative advantage on adoption is the case of hybrid seed corn. It was first introduced in 1928, and produced a 20 percent increase in yield (Ryan and Gross, 1943). Between the years of 1933 and 1939, acreage in hybrid corn increased from 40,000 to 24,000,000 acres. Full adoption of the hybrid corn was reached by 1941.

Compatibility

Compatibility is the degree to which an idea is perceived as being consistent with the existing values, past experiences and needs of the receivers. An innovation that is incompatible with the prevalent values and norms of the social system will not be adopted as quickly as an innovation that is compatible. Compatibility ensures greater security, less risk to the receiver, and makes the new idea more meaningful. Rogers and Shoemaker generalized that the compatibility of a new idea as perceived by members of a social system is positively related to its rate of adoption.

McCorkle (1961) discovered that the reason Chiropractic has taken firm root in rural Iowa culture is because it satisfies needs not well covered by Western medicine, and fits well into the idea systems of the rural Iowan. To the rural Iowans, work is a prime value and all family members operate, and sometimes adjust or repair machinery. Getting the job done overrides considerations of inconvenience, so stiff necks, lame backs and strained ligaments are frequent and often go unattended. Farm people do not like to be sick and are more at ease when an ailment can be described as due to physical injury rather than microorganisms. An ideal therapy would be one based on a clean cut diagnosis. Therefore, McCorkle found that the widespread acceptance of Chiropractic is understandable in that it offers a common sense, single cause theory of ailments that can be cured by manual adjustment of the spine. It is simple, inexpensive and offers to get the patient back to work rapidly. Rogers and Shoemaker conclude that the 1000 chiropractors in Iowa are evidence that the compatibility of chiropractic with Iowa culture leads to a high level of adoption.

One indication of the compatibility of an innovation is the degree to which it meets a need felt by clients (Alers-Montelvo, 1957). The introduction of intensified cultivation of vegetables for home consumption was attempted by a change agent in a Costa Rican village. Presumably, the resultant vegetables would aid in correcting vitamin deficiencies in the local diet. The intensive cultivation of home gardens was unsuccessful because villagers felt no need for increasing their vegetable consumption. The incompatibility of daily consumption of a vegetable with the people's norms resulted in the nonadoption of home vegetable gardens.

Southwestern Kansas is a wheat and sorghum growing area unsuited climatically to corn (Brander and Strauss, 1959). When hybrid sorghums were introduced, it would seem that they would fill an economic need, as seeding time, harvesting equipment and other related patterns are the same for hybrid sorghums as for open pollinated varieties. There the new trait could be tried with little risk. However, in northeastern Kansas, the cornbelt of the state, a corn grower would have to change seeding dates and harvest techniques to adapt to hybrid sorghums. Nevertheless, hybrid sorghum spread four times as fast in the northeastern corn area, where the economic and technical adaptability is much less than in the southwestern sorghum area. Brander and Straus concluded that the compatibility of the new practice with the recently accepted practice of planting hybrid corn most likely accounts for the dramatically higher acceptance of hybrid sorghums in the hybrid corn area. They concluded:

> " . . . even in a technologically advanced society which places high value on economic gain, congruity (compatibility) is a basic element in the diffusion process and in the present case even appears to have been of greater relative importance than was economic need."

Complexity

Complexity is the degree to which innovations are perceived as relatively difficult to understand and use. Some innovations will not be understood by some members of a social system and will be adopted more slowly than those that are easily understood. Rogers and Shoemaker generalized that the complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption.

In Kivlin's (1960) study of the characteristics of farm innovations, he found that the complexity of those innovations was more highly related in a negative direction to their rate of adoption than any of the other characteristics studied except relative advantage. Fliegel (1968) found the same to be true in a cross-national comparison of farmer's perceptions of innovations as related to adoption behavior. Innovations based upon specialized knowledge, research and experimentation are difficult to diffuse to illiterate groups (Erasmus, 1952). Attempts to introduce refinements to Haitian farmers, such as composting, prevention of burning, rotation of crops, pruning, seed selection, and soil conservation usually meet with little or no acceptance.

Observability

Observability is the degree to which the results of an innovation are visible to others. The easier it is to see the results of a new idea, object, or practice, the more likely an individual is to adopt. Rogers and Shoemaker generalized that the observability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.

When farmers in the hybrid seed corn study (Ryan and Gross, 1943) were asked to evaluate their various sources of information on hybrid as to their relative influence in leading them to take up the practice, neighbors were cited more frequently than any other medium.

In the Costa Rican village of San Juan Norte (Alers-Montelvo, 1957), there was a direct campaign for the adoption of POJ, a better variety of sugar cane. The villagers simply saw the positive results from other farmers and adopted the variety. One villager commented, "Nobody spoke to me about it. I simply saw that it was much better . . . I became envious and tried it, with good results . . . "

Erasmus (1952) found that a program of curative medicine which stages a spectacular demonstration of its effectiveness is much more successful in replacing folk treatments and beliefs than attempts to diffuse modern practices of preventative medicine and their theoretical justifications.

Trialability

Trialability is the degree to which an innovation may be experimented with on a limited basis. The possibility of trying out something new on a small scale before full adoption has direct economic implications but is also of interest in the sense of minimizing possible consequences, noneconomic as well as economic. Rogers and Shoemaker (1971) generalized that the trialability of a new idea as perceived by members of a social system is positively related to its rate of adoption.

Hybrid seed corn diffused through the midwest at a phenomenal rate (Ryan and Gross, 1943). From 1936 to 1939, two-thirds of the operators in two communities studied changed to the new seed. However, few operators turned their corn acreage completely to hybrid seed in the early years. The size of the first planting increased very little with each successive year until about 1939 when the later acceptors took a shorter time to reach practically complete adoption of the new seed than the earlier acceptors. For example, the operators starting to plant hybrid in

1934, 1936, and 1937 respectively, all reached 100 percent median planting time for the first time in 1939.

Pesticide Regulation

Because the unrestricted uses of pesticides pose a possible threat to man and the environment, federal laws and regulations have controlled their distribution and use for many years. The first effort to regulate pesticides in the United States was the Federal Insecticide Act of 1910. Following closely behind the Pure Food and Drug Act, this act was basically a labeling law for all insecticides and fungicides (Dellavecchia, 1978).

As new classes of pesticides were discovered and subjected to experiment, it was foreseen by lawmakers that the 1910 Act would be inadequate to deal with the potential dangers of the new chemicals (Task Group on Occupational Exposure to Pesticides). Therefore, in 1947, Congress enacted the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947. Repealing the 1910 Act, the main thrust of this act was the registration of all pesticides moving in interstate commerce with the United States Department of Agriculture. It required all pesticide manufacturers to prominently display warning statements and provide adequate directions for use on the label. It further mandated the submission of records on the delivery, movement, and holding of pesticides, upon request, for inspection and copying.

In 1954, the "Miller" amendment to the Federal Food, Drug and Cosmetic Act authorized the administrator of the FDA to set tolerance limits for residues on food and feeds. Further amendments in 1959 brought nematocides, defoliants, and plant regulators under the provisions of the act.

Amendments made to the act in 1964 eliminated the registration of pesticides under protest, sped up the procedures for suspending registration of pesticides determined to be unsafe, and required placing registration numbers on labels. In 1970, the administration of the FIFRA was handed over to the new Environmental Protection Agency (EPA).

In 1972, Congress enacted the Federal Environmental Pesticide Control Act (FEPCA) which once again amended the FIFRA. Following are some of the respects in which it amends the FIFRA:

1. All pesticides are covered, including those which move only in intrastate commerce.

2. All pesticide manufacturers and formulators are to register with the EPA; maintain and periodically submit information on the types and amounts of pesticides produced, sold, or distributed; allow duly designated officers to inspect their establishments; etc.

3. By October, 1976, every registered pesticide shall be classified for "general use," "restricted use," or for some of its uses in one way and for some the other.

4. Restricted use pesticides are to be

applied only by or under the direct supervision of a "certified applicator."

5. States are to develop plans for the examination and certification of applicators of restricted use pesticides, in accordance with standards to be prescribed by EPA.

6. When submitting chemical, statistical, or other data in support of an application for registration, the applicant may "mark any portions thereof which in his opinion are trade secrets."

7. A manufacturer, formulator, wholesaler, retailer, or other person who sustains a loss when a registration is suspended or cancelled in order to prevent an imminent hazard shall be indemnified by the federal government in the full amount of his loss.

(Federal Working Group on Pest Management, 1974)

The concern for protecting agricultural workers from the dangers of pesticides has been an integral part of the FIFRA registration process for several years (Federal Register, July 31, 1973). Requirements and precautions for proper pesticide use including the protection of all workers are mandated by the Environmental Protection Agency and spelled out on the labels of all pesticide products. But not until 1973, with further amendments to the FIFRA, were these label instructions enforceable by law with both civil and criminal penalties for improper use.

Label instructions on pesticide products include both the specification of field reentry intervals and the specification of protective clothing requirements. Field reentry refers to the period of time in days, one day being 24 hours, that must lapse after a field has been treated with a pesticide before anyone not wearing protective clothing may be permitted to enter the field to harvest (Federal Register, March 11, 1974). Minimum protective clothing requirements for those involved in loading or applying pesticides, or for those who must enter the field before the reentry interval expiration, were proposed in July of 1973 as the following:

> HIGHLY TOXIC pesticides - for reentry within 24 hours after application, wear protective clothing to include a garment or garments of impermeable material to cover the entire body, hat, natural rubber gloves, impermeable shoe coverings, and goggles or face shields, wear also a respirator of the type approved by the U.S. Department of the Interior (Bureau of Mines).
>
> For later entry to perform work involving prolonged and substantial contact with foliage but before the end of the reentry period, wear a coverall type of garment of close-woven washable fabric, hat, shoes, and possibly gloves. To perform work involving little or no contact with foliage, no special protective equipment is considered necessary after 24 hours.
>
> LOW, SLIGHTLY and MODERATELY TOXIC pesticides - for reentry within 24 hours after application, wear protective clothing to include a coverall type of garment of closely-woven fabric, normal footwear to cover the entire foot, and an approved respirator where inhalation or ingestion is a hazard.
>
> For later reentry involving prolonged and substantial contact with the foliage, the coverall type of garment and footwear described above should be worn. To perform work involving little or no

> contact with foliage, no special protective equipment is considered necessary.
>
> (Federal Register, July 31, 1973)

Hearings by state regulatory agencies, research and extension agencies, growers and their organizations, pesticide manufacturers as well as public interest groups, were held across the United States concerning the above proposed standards and others. Of the protective clothing standards, testimonies revealed that the requirements for impermeable garments would be impractical under normal working conditions. The build up of heat could lead to heat prostration, constituting a greater risk than wearing no protective clothing at all (Federal Register, July 31, 1973). As a result, protective clothing was redefined as, "at least a clean hat with a brim, a clean long sleeved shirt and long legged trousers or a coverall type garment, all of closely-woven fabric covering the body, including arms and legs, shoes to entirely cover both feet, clean socks, and clean fingerless gloves covering the back and front of hands and wrists." (Federal Register, March 11, 1974)

Still further hearings and testimonies revealed that growers, manufacturers and labor groups were dissatisfied with the altered definition of protective clothing. They purported that gloves may increase the hazard by increasing absorption of pesticide residues confined in the gloves. Furthermore, a hat with a brim could prove hazardous as it would be difficult to keep on the head during many of the tasks (Federal Register, May 10, 1974).

Finally, the worker protection standards adopted on May 10, 1974, redefined protective clothing and its definition holds today as "at least a hat or other suitable head covering, a long sleeved shirt and long legged trousers or a coverall type garment (all of closely woven fabric covering the body, including arms and legs), shoes and socks." (Federal Register, May 10, 1974)

Conclusion

Rogers and Shoemaker (1971) confirmed through their studies, some of which were reviewed here, that the characteristics of an innovation as perceived by the users contribute to its rate of adoption. It follows then, that if the designers of an agricultural innovation to protect pesticide users from dangerous exposure had a measure of the users' perceptions of the innovation, they would be able to predict its acceptance or nonacceptance.

The issue of pesticide legislation is thought to be bound to enter into the users' perceptions of the innovation. The protection of workers from the dangers of pesticides has been a part of the legislation for many years. Not until recently, though, did users have to pass certification tests to buy and use certain pesticides. Nor were there re-entry restrictions or protective clothing requirements. As these rules and regulations continue to impact upon the private practices of farmers, it is highly likely that users will perceive the clothing innovation as a future requirement and thus another infringement upon their private lives. This probability was given the utmost consideration throughout the entire study.

CHAPTER III

METHODOLOGY

Introduction

This study is part of a larger Michigan State University Agricultural Experiment Station project entitled, "Design and Evaluation of Functional Clothing for Agricultural Workers," in which the author was a graduate research assistant. The purpose of the larger project was to develop functionally designed apparel for the Michigan farmer involved in applying pesticides. There were many component parts to the total project, from an investigation of farm accidents to a thermal analysis of garment prototypes. The present study contributed to the collection of user information and preferences.

Overview of Procedure

Because of the sensitivity of Michigan farmers concerning the issue of pesticides since its regulation there in 1973, careful consideration was given to the method of collecting information. Some initial observation and interviewing was done with local farmers to give the researcher a base from which to later make a more formal inquiry. Experts in the field of agriculture were consulted on the processes of pesticide application and the problem areas of when and where exposure is most likely to occur. Pesticide applications were observed on local vegetable, field crop, and fruit farms, with special attention paid to the tasks involved and the clothing worn. Users were questioned about their use of clothing to protect themselves and their general concern for safety and protection while dealing with pesticides.

The importance of anonymity in the formal inquiry was evidenced here by the users' apprehension in being observed and questioned. Therefore, a questionnaire to be mailed and anonymously returned by the respondents through the mail was selected as the method that would be most effective in obtaining their unguarded responses.

Development of the Instrument

In addition to the observation and interviewing of local vegetable, field, and fruit crop farmers, the study of innovations was undertaken by the researcher. Studying the attributes of innovations provided a format in determining the characteristics of a garment functionally designed to protect pesticide users from dangerous exposure. The relative advantage, compatibility, complexity, observability, and trialability attributes of a proposed garment of functional design were determined by the researcher on the basis of:

1. An examination of an up-to-date file of

protective clothing.

2. Opinions and concerns of local users gained through unstructured, informal interviews on protective clothing and safety.

3. Knowledge of the exposure that occurs in the processes of pesticide application.

4. General climatic conditions in which pesticides are applied (in Michigan).

The "relative advantage" attribute is the degree to which the innovation is perceived as better than the idea it supercedes. The relative advantage attribute of the proposed innovation was determined to be that the protective garment would provide more comfort than the protective clothing available to pesticide users at present. This attribute was incorporated into the following statements with the intent of eliciting the respondents' perceptions of the relative advantage attribute. These statements will be referred to as "attitudinal" statements.

1. Workers involved in the application of pesticides demand clothing that is comfortable.

2. Pesticide users demand clothing that protects the body from pesticide exposure.

3. Protective clothing and equipment currently available for pesticide users are hot and bothersome.

As a further measure of the user's perceptions of the relative advantage attributes, three more statements were formulated. This time the attributes were incorporated into "behavioral" statements -

referring to behaviors that, if acted out, would reinforce the respondent's perception of the attributes. These statements were included for purposes of comparison to the attitudinal statements.

RELATIVE ADVANTAGE

ATTITUDINAL	BEHAVIORAL
Workers involved in the application of pesticides demand clothing that is comfortable.	When applying pesticides in hot weather, I select clothing for comfort.
Pesticide users demand clothing that protects the body from pesticide exposure.	I select clothing for protection when applying pesticides.
Protective clothing and equipment currently available for pesticide users are hot and bothersome.	I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.

The "compatibility" attribute of the proposed innovation, or the degree to which the innovation is perceived as consistent with the needs of the users, was determined to be that of meeting the need of the pesticide users to be covered and protected from the potential dangers of the chemicals with which they deal. The following statements were formulated to later assess how the users perceive the need to be protected by clothing.

COMPATIBILITY

ATTITUDINAL	BEHAVIORAL
The exposure that occurs when handling pesticides could be harmful to the body.	I wear clothing that covers my arms and legs when applying pesticides.

Clothing worn when working around pesticides should not allow seepage should spills occur.

My clothing provides me with protection from pesticide penetration due to spills or heavy exposure.

Pesticide users should be more concerned about the dangers of pesticides to themselves.

In extremely hot weather, I wear as little clothing as possible when applying pesticides.

The "complexity" attribute of the proposed garment, or the degree to which the innovation is perceived as relatively difficult to understand, was determined to be the understanding that clothing can be contaminated by toxic substances and the understanding that protective clothing can be comfortable.

COMPLEXITY

ATTITUDINAL

Clothing worn while applying pesticides becomes contaminated by the pesticide.

Clothing that would be protective yet comfortable in both warm and cool temperatures would be highly suitable for pesticide users.

A worker should have separate clothing for working with poisonous substances.

BEHAVIORAL

I change my clothes after working with pesticides and before going on to other work.

I would wear protective clothing while applying pesticides if I knew that I would be comfortable in hot weather.

I purchase some clothing to wear working with pesticides.

The general attribute of "observability" is the degree to which the results of the innovation are visible to others. It was determined that the observability of the proposed garment to users would most likely be through word-of-mouth and exhibition at extension meetings, sales shows, and through agricultural friends and neighbors. To assess how the users perceive the observability attribute, the following statements were formulated.

OBSERVABILITY

ATTITUDINAL	BEHAVIORAL
Agricultural workers should participate in the various local meetings held by growers and extension services to keep abreast of the latest predictions and practices.	I would attend a local meeting that included in its agenda a presentation and demonstration of protective clothing for pesticide users.
Attending farm equipment sales shows helps to keep farmers aware of recent inventions and their availability.	If protective garments for pesticide users were displayed at a farm equipment sales show which I attended, I would examine the garments.
Agricultural friends and neighbors are often good sources for finding out about new products or methods.	If my neighbor or good friend told me how satisfied he was with a new garment for pesticide protection, I would consider purchasing the garment.

The last of the general attributes of innovations is "trialability," or, the degree to which an innovation may be experimented with on a limited basis. The last six statements were formulated to assess whether respondents would try protective garments if they were easily available to them.

TRIALABILITY

ATTITUDINAL	BEHAVIORAL
In the sale of poisonous products, pesticide manufacturers should include protective coverings for users.	I would try protective clothing for pesticide users if I didn't have to pay for them.
Agricultural publications aid the farmer in providing detailed descriptions of new products.	If the agricultural publication that I read most often had an article on protective clothing, and highly praised and recommended a certain new line, I would purchase the clothing.
It is important that special, protective clothing be available to all pesticide users.	I would purchase protective clothing made specially for pesticide users if it were available in stores where I buy my work clothes.

In attempting to avoid pressured responses, the scale was originally proposed to be a nine point Likert type scale of "Always to Never." However, upon consultation with agricultural professionals, they suggested fewer points because of farmers' reluctance to refine their answers. Although they suggested a three point scale, the investigator originally compromised on a six point scale rating of: Always True, True Most of the Time, Sometimes True, Sometimes False, False Most of the Time, Always False.

The first draft of the questionnaire was submitted to seven informed sources within the university for assistance in its refinement (Appendix A). From this input it was suggested that a fog index be conducted on the questionnaire to assure that not more than twelve years of schooling be necessary to complete it. This resulted in the re-wording of one statement. It was also suggested that one last statement, "In general, I am in favor of protective clothing for pesticide users," be included on the questionnaire for purposes of analysis to be used later.

Pre-Test

The questionnaire used in the pre-test is shown in Appendix B. The purpose of the pre-test was to assure the questionnaire's clarity in its statements and its ease in readability.

County Extension Directors in Ingham, Eaton and Clinton counties were contacted by telephone to assist in obtaining a sample for the pre-test. The directors were asked to contact local farm owner-operators for their cooperation in filling out the questionnaire. Although the directors did not anticipate any noncooperation, they encountered much difficulty due to the respondents' reluctance to answer questions dealing with their personal practices with pesticides. This proved to be a very time-consuming effort and was soon abandoned due to time restraints of the entire project.

A sample of five respondents for the pre-test was ultimately obtained when a source within the university, who was an owner-operator himself, distributed the questionnaire to his neighboring pesticide users. Although none of the respondents indicated that they had difficulty in filling out the questionnaire, some commented that many of the statements sounded similar. It was also brought to the attention of the investigator that two of the ratings on the scale were the same: "Sometimes True" and "Sometimes False." Therefore, the ratings were changed and the scale as it appeared on the final questionnaire (Appendix C) was a five point scale rating of: Always, Almost Always, Sometimes, Almost Never and Never.

Description of Sample

A randomized list from a computer printout of all Michigan licensed pesticide applicators and their addresses was obtained from the State of Michigan Department of Agriculture. Each of the names had been assigned a number and were then printed out in a random order. The list contained over 17,000 names of both privately and commercially licensed applicators.

Those who were commercial applicators were excluded from the sample. The first 1,200 private applicators on the randomized list were chosen as the sample in this study to represent the diversity in types of farms and geographical locations in Michigan.

Administering the Instrument

The subjects' names were each assigned a different two character code on the computer printout. The stamped, self-addressed return envelopes were coded with the same characters that appeared next to the subjects' names. Names and addresses were typed up on mailing labels which were placed on the outside mailing envelope. As the questionnaire and coded return envelope were placed inside, the label and code were checked against the printout for consistency. The purpose of the coding was to keep track of which subjects responded, so that if a second mailing were needed, they would be excluded.

The questionnaires were mailed on October 12, 1979. By November 16, only 23.8 percent of the respondents had returned their questionnaires, so it was decided that a second mailing was necessary. A letter accompanied the questionnaire (Appendix D). By mid-January, over a 41.1 percent return rate was received.

CHAPTER IV

FINDINGS

Sample

Of the 500 privately licensed Michigan pesticide users returning their questionnaires, only 367 completed it in its entirety. Nevertheless, to make optimum use of all of the information obtained, the various analyses included cases which had the required information and reported those that were missing. Consequently, there is a different number of cases for each analysis.

Distribution of Respondents

Those respondents not answering questions pertaining to the type of farm they operated, acreage they cultivated, age or education completed, were eliminated from this part of the analysis. This left a sample size of 467.

Type of Farm

Approximately one half of the respondents were involved in more than one type of farm production (Table 1). Therefore, it was

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Table 1. Distribution of Respondents by Type of Farm

	Type of Farm	N of Cases	Relative N Percent	Adjusted N Percent
1.	Fruit	75	15.0	16.0
2.	Field	92	18.4	19.6
3.	Vegetable	32	6.4	6.8
4.	Livestock	9	1.8	.9
5.	Dairy	27	5.4	5.7
6.	Fruit and Field	14	2.8	3.0
7.	Fruit and Vegetable	19	3.8	4.0
8.	Fruit and Livestock	4	.8	.9
9.	Fruit and Dairy	3	.6	.6
10.	Field and Vegetable	11	2.2	2.3
11.	Field and Livestock	96	19.2	20.4
12.	Field and Dairy	26	5.2	5.5
13.	Vegetable and Livestock	2	.4	.4
14.	Vegetable and Dairy	1	.2	.2
15.	Livestock and Dairy	6	1.2	1.3
16.	Fruit, Field and Vegetable	9	1.8	1.9
17.	Fruit, Field and Livestock	7	1.4	1.5
18.	Fruit, Field and Dairy	1	.2	.2
19.	Fruit, Vegetable and Livestock	1	.2	.2
20.	Fruit, Vegetable and Dairy	0	0	0
21.	Fruit, Livestock and Dairy	0	0	0
22.	Field, Vegetable and Livestock	4	.8	.9
23.	Field, Vegetable and Dairy	0	0	0
24.	Field, Livestock and Dairy	17	3.4	3.6
25.	Vegetable, Livestock and Dairy	0	0	0
26.	All But Dairy	10	2.0	2.1
27.	All But Livestock	0	0	0
28.	All But Vegetable	1	.2	.2
29.	All But Fruit	0	0	0
30.	All Five Types	0	0	0
	Missing	33	6.6	
	TOTAL	500	100	100

Table 2. Combined Into Mutually Exclusive Categories

Category	Type of Farm		N of Cases
Farm 1	Field		92
	Vegetable		32
	Field & Vegetable		11
		TOTAL	135
Farm 2	Livestock		9
	Dairy		27
	Field & Livestock		96
	Field & Dairy		26
	Vegetable & Dairy		2
	Livestock & Dairy		1
	Field, Livestock		6
	& Dairy		17
	Field, Vegetable & Livestock		4
		TOTAL	188
Farm 3	Fruit		75
	Fruit & Vegetable		19
	Fruit & Field		14
	Fruit & Livestock		4
	Fruit & Dairy		3
	Fruit, Field & Vegetable		9
	Fruit, Field & Livestock		7
	Fruit, Field & Dairy		1
	Fruit, Vegetable & Livestock		1
	All But Dairy		10
	All But Vegetable		1
		TOTAL	144
		TOTAL	467

necessary to condense the 30 possible categories of types of farm into fewer categories. Because of the differences in pesticide use, subjects were divided into three mutually exclusive categories. The first group consisted of those growing only field and/or vegetable crops (N = 135). The second group was made up of those raising livestock and/or dairy cattle with or without field and/or vegetable crops (N = 188). And thirdly were those growing fruit with or without other crops, livestock or dairy cattle (N = 144) (Table 2).

Acreage

The distribution of types of farm by acreage is shown in Table 3. It can be seen that for the sample as a whole, the majority of respondents operated farms of 180 acres or more. However, 62.5 percent of the Farm 3 respondents operated 99 acres or less. The largest amount of acreage under operation was that of the Farm 2 respondents, the majority of which operated upwards of 260 acres. Like the total sample, most of the Farm 1 respondents had 180 acres or more under operation.

Age of Respondents

The distribution of types of farm by age of respondents is shown in Table 4. The majority of the respondents for the whole sample were in the 25 to 44 age brackets, with 56.5 percent under 45 years of age. Of Farm 1 and Farm 2 respondents, the majority

Table 3. Distribution of Respondents By Type of Farm and Acreage

Acreage	Under 50		50-99		100-179		180-259		260-499		500-999		1000-1999		2000 +		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
TYPE FARM																		
Farm 1	26	30.6	14	23.0	19	27.6	11	23.9	29	25.9	20	29.0	12	63.2	4	66.7	135	28.9
Farm 2	3	3.5	13	21.3	25	36.2	24	52.2	73	65.2	45	65.2	4	21	1	16.7	188	40.3
Farm 3	56	65.9	34	55.7	25	36.2	11	23.9	10	8.9	4	5.8	3	15.8	1	16.7	144	30.8
TOTAL	85	100	61	100	69	100	46	100	112	100	69	100	19	100	6	100	467	100

Farm 1 = Field and/or Vegetable Crops

Farm 2 = Livestock and/or Dairy Cattle with or without Field and/or Vegetable Crops

Farm 3 = Fruit with or without other crops, Livestock or Dairy Cattle

Table 4. Distribution of Respondents by Type of Farm and Age

Age	Under 25		25 - 34		35 - 44		45 - 54		55 - 65		Over 65		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Type of Farm														
Farm 1	13	28.9	38	34.2	35	32.4	27	29.0	15	18.5	7	24.1	135	28.9
Farm 2	25	55.6	54	48.6	49	45.4	33	35.5	25	30.9	2	6.9	188	40.3
Farm 3	7	15.5	19	17.2	24	22.2	33	35.5	41	50.6	20	69.0	144	30.8
TOTAL	45	100	111	100	108	100	93	100	81	100	29	100	467	100

Farm 1 = Field and/or Vegetable Crops

Farm 2 = Livestock and/or Dairy Cattle with or without Field and/or Vegetable

Farm 3 = Fruit with or without other crops, Livestock or Dairy Cattle

were also in the 25 to 44 age brackets, with 63.5 percent and 68.1 percent respectively, of those respondents under 45 years of age. However, for Farm 3, the majority of the respondents were in the 45 to 65 year age brackets, with 65.3 percent of the respondents 45 years of age or older. Observation of the 25 to 65 year age categories reveals that there are decreasing numbers of operators of Farm Types 1 and 2 as age increases. In contrast, for type 3 Farms, as age increases there are increasing numbers of operators.

Education of Respondents

Approximately 48 percent of the respondents of the total sample attained at least a high school education, with about 52 percent having furthered their education beyond high school. Of the total sample, 19.5 percent had received a four year college or advanced degree. Of those with an advanced degree, 50 percent were Farm Type 3 respondents, 34.6 percent were Farm Type 2 respondents and 15.4 percent were Farm Type 1 respondents. The distribution of type of farm by education is shown in Table 5.

Correlational Analysis of Attitudinal and Behavioral Statements

The first research question under analysis sought to determine whether a relationship existed between the attitudinal and behavioral responses of the same attribute. The responses to the attribute questions were scale ratings of "Always," "Almost Always," "Sometimes," "Almost Never," and "Never." They received

Table 5. Distribution of Respondents by Type of Farm and Education

Education	Eighth Grade		High School		Some Coll or Bus Sch		Associate or 2 yr deg		4 yr Coll Deg		Advanced Degree		TOTAL	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Type of Farm														
Farm 1	10	26.3	55	29.6	34	32.4	11	23.4	21	32.3	4	15.4	135	28.9
Farm 2	8	21.1	78	41.9	43	41.0	25	53.2	25	38.5	9	34.6	188	40.3
Farm 3	20	52.6	53	28.5	28	26.6	11	23.4	19	29.2	13	50.0	144	30.8
TOTAL	38	100	186	100	105	100	47	100	65	100	26	100	467	100

Farm 1 = Field and/or Vegetable Crops

Farm 2 = Livestock and/or Dairy Cattle with or without Field and/or Vegetable Crops

Farm 3 = Fruit with or without other crops, Livestock or Dairy Cattle

scores of "1", "2", "3", "4", and "5", respectively. A correlational analysis was undertaken using the Kendall tau rank-order correlation coefficients. Coefficients which reached the .95 or higher level of confidence were accepted as indicating the existence of a relationship between the variables.

All of the attitudinal-behavioral sets of statements under the Relative Advantage, Complexity, Observability, and Trialability attributes were found to be related at a highly significant level, .001, although the coefficients were low to moderate in strength (Table 6).

The first set of attitudinal-behavioral statements under the Compatibility attribute were found to be negatively correlated at the .001 level of significance. A closer look at these questions revealed that the behavioral statement 1, "In extremely hot weather, I wear as little clothing as possible," was stated in a manner inconsistent with not only the parallel attitudinal statement but all of the statements as well. Due to this inconsistency, the statement was dropped from further analysis. However, the two remaining sets of statements under the Compatibility attribute were correlated at significant levels.

Construction of Attribute Indices

Indices of the attribute statements were created for further analysis. The Likert format of the "Always" to "Never" scale lends itself to the construction of indices where an overall score

Table 6. Correlational Analysis of **Attitudinal** With Behavioral Statements

Attribute	Attitudinal Statement	with	Behavioral Statement	Kendall tau Coefficient	Significance
Relative Advantage					
	1		1	+ .22	.001
	2		2	+ .33	.001
	3		3	+ .26	.001
Compatability					
	1		1	- .12	.001
	2		2	+ .05	.048
	3		3	+ .26	.001
Complexity					
	1		1	+ .36	.001
	2		2	+ .23	.001
	3		3	+ .21	.001
Observability					
	1		1	+ .35	.001
	2		2	+ .25	.001
	3		3	+ .24	.001
Trialability					
	1		1	+ .32	.001
	2		2	+ .14	.001
	3		3	+ .13	.001

represents the summation of the scores of each item in the index. The Likert method is based on the assumption that the total score to the many items seeming to reflect the variable under construction provides a reasonably good measure of the variable (Babbie, 1973).

Each of the three sets of attitudinal and behavioral statements under the various attributes were designed to, in total, measure that attribute. Therefore, index construction by summation across scores was considered necessary in order to get a total measure of the attributes. A separate behavioral and attitudinal index for each attribute was created to permit separate analyses of the attributes. Each of the attributes, Relative, Advantage, Compatibility, Complexity, Observability and Trialability, now had an attitudinal index, a behavioral index and a combined attitudinal and behavioral index. The components of these indices which were used for all further analyses are shown in Figure 1.

Index Scoring

As a result of combining the statements into indices, the range of possible scores changed considerably. The scores of the attitudinal and behavioral indices had a possible range of 3 to 15. The range of the combined indices was 6 to 30. Because Compatibility had one less variable in its behavioral index, its range of scores was 2 to 10 for that index and 5 to 25 for the combined index. The "Almost Always," "Sometimes" and "Almost Never" ratings were designated by those points on the scales where respondents would

Figure 1. Components of Attitudinal, Behavioral and Combined Attribute Indices

RELATIVE ADVANTAGE COMBINED INDEX

Relative Advantage Attitudinal Index

Workers involved in the application of pesticides demand clothing that is comfortable.

Pesticide users demand clothing that protects the body from pesticide exposure.

Protective clothing and equipment currently available for pesticide users are hot and bothersome.

Relative Advantage Behavioral Index

When applying pesticides in hot weather, I select clothing for comfort.

I select clothing for protection when applying pesticides.

I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.

COMPATIBILITY COMBINED INDEX

Compatibility Attitudinal Index

The exposure that occurs when handling pesticides could be harmful to the body.

Clothing worn when working around pesticides should not allow seepage should spills occur.

Pesticide users should be more concerned about the dangers of pesticides to themselves.

Compatibility Behavioral Index

I wear clothing that covers my arms and legs when applying pesticides.

My clothing provides me with protection from pesticide penetration (due to spills or heavy exposure).

COMPLEXITY COMBINED INDEX

Complexity Attitudinal Index

Clothing worn while applying pesticides becomes contaminated by the pesticide.

Clothing that would be protective yet comfortable in both warm and cool temperatures would be highly suitable for pesticide users.

A worker should have separate clothing for working with poisonous substances.

Complexity Behavioral Index

I change my clothes after working with pesticides and before going on to other work.

I would wear protective clothing while applying pesticides if I knew I would be comfortable in hot weather.

I purchase some clothing to wear only when working with pesticides.

OBSERVABILITY COMBINED INDEX

Observability Attitudinal Index

Agricultural workers should participate in the various local meetings held by growers and extension services to keep abreast of the latest predictions and practices.

Attending farm equipment sales shows helps to keep farmers aware of recent inventions and their availability.

Agricultural friends and neighbors are often good sources for finding out about new products or methods.

Observability Behavioral Index

I would attend a local meeting that included in its agenda a presentation and demonstration of protective clothing for agricultural workers.

If protective garments for pesticide users were displayed at a farm equipment sales show which I attended, I would examine the garments.

If my neighbor or good friend told me how satisfied he was with a new garment for pesticide protection, I would consider purchasing the same garment.

TRIALABILITY COMBINED INDEX

Trialability Attitudinal Index

In the sale of poisonous products, pesticide manufacturers should include protective coverings for users.

Agricultural publications aid the farmer in providing detailed descriptions of new products.

It is important that special, protective clothing be available to all pesticide users.

Trialability Behavioral Index

I would try protective clothing for pesticide users if I didn't have to pay for it.

If the agricultural publication that I read most often had an article on protective clothing, and highly praised and recommended a certain new line, I would purchase the clothing.

I would purchase protective clothing made especially for pesticide users if it were available in stores where I buy my work clothes.

have had to answer all of the statements in that particular index as "Almost Always" or all "Sometimes" or all "Almost Never." (Tables 7, 8)

<u>Reliability of Indices</u>

The reliability of the scales was computed to obtain a measure of their internal consistency. The alpha model of reliability was used to derive the coefficients. Alpha is thought to be the most widely used reliability coefficient and is computed as follows: If s_i^2 is the variance of the instrument, T, and i and s_T^2 are the variance of the sum over the k items, then coefficient alpha is calculated by the formula:

$$\text{alpha} = \frac{k}{k-1}\left(1 - \frac{\bar{s}^2}{s_T^2}\right)$$

where $\bar{s}^2$ is the average item variance (SPSS Supplement, 1978). The alpha coefficients of the attribute indices are shown in Table 9. None are extremely high indicating that the ratio of variation within an item to the variation between items is large. The negative alpha shown in the behavioral index of the Relative Advantage attribute shows that there is more variation within an item than between the items in the scale. A correlation matrix of the items in the combined Relative Advantage index was undertaken as shown in Table 10 and it was revealed that there were several negative correlations between the items.

Table 7. Attitudinal and Behavioral Indices

INDEX	2	Always 3	4	5	Almost Always 6	7	8	Sometimes 9	10	11	Almost Never 12	13	14	Never 15	Median	Mean	STD DEV	N of Cases
RELATIVE ADVANTAGE																		
Attitudinal		24	37	89	71	99	45	45	16	8	3	2	0	0	6.48	6.51	1.96	439
Behavioral		7	16	45	61	115	103	75	25	16	5	5	1	0	7.44	7.48	1.85	474
COMPATABILITY																		
Attitudinal		123	86	102	63	41	27	17	5	1	2	0	0	0	4.74	5.02	1.84	467
Behavioral	41	73	110	99	84	40	17	6	1						4.62	4.71	1.63	471
COMPLEXITY																		
Attitudinal		91	74	103	64	64	35	25	5	5	12	0	0	0	5.17	5.44	1.93	467
Behavioral		33	19	49	49	69	76	56	37	34	17	16	6	3	7.67	7.75	2.69	464
OBSERVABILITY																		
Attitudinal		34	40	89	97	108	60	32	8	6	0	0	0	0	6.26	6.24	1.75	474
Behavioral		25	47	68	91	88	64	36	20	13	8	1	0	0	6.50	6.62	2.06	461
TRIALABILITY																		
Attitudinal		29	21	44	56	82	86	80	35	21	8	0	0	0	7.49	7.33	2.13	462
Behavioral		29	23	58	49	93	64	78	21	30	9	2	2	2	7.27	7.32	2.34	461

Table 8. Combined Attitudinal and Behavioral Indices

INDEX	5	Always 6	7	8	9	10	11	Almost Always 12	13	14	15	16	17	Sometimes 18	19	20	21	22	Almost Never 23	24	25	26	27	28	29	Never 30	Median	Mean	STD DEV	N of Cases
RELATIVE ADVANTAGE		1	4	14	12	24	33	57	45	66	40	62	24	23	13	7	3	3	1	1	0	1	0	0	0	0	13.91	13.95	3.09	434
COMPAT-IBILITY	19	27	50	63	73	55	54	46	27	20	8	7	4	1	1	0	0	0	0	0	0	0	0	0	0	0	9.44	9.74	2.67	455
COMPLEXITY		19	7	36	24	33	44	47	38	41	33	33	29	15	14	12	9	7	6	1	0	0	0	0	0	0	12.89	13.21	2.69	448
OBSERV-ABILITY		5	12	29	29	38	38	62	54	45	50	35	21	16	9	2	1	0	0	0	0	0	0	0	0	0	12.71	12.86	3.21	446
TRIAL-ABILITY		11	2	9	14	21	30	33	44	44	44	53	51	37	9	13	9	10	4	2	1	2	0	0	0	0	14.81	14.67	3.90	443

Table 9. Reliability of Indices

INDEX	ALPHA[a]	INDEX	ALPHA[a]
RELATIVE ADVANTAGE			
Attitudinal	.375		
Behavioral	-.336		
Combined	.321	OBSERVABILITY	
COMPATIBILITY		Attitudinal	.361
		Behavioral	.527
Attitudinal	.438	Combined	.624
Behavioral	.499		
Combined	.462		
COMPLEXITY		TRIALABILITY	
Attitudinal	.496	Attitudinal	.228
Behavioral	.557	Behavioral	.549
Combined	.680	Combined	.547

[a]Significant at the .0001 level of confidence

Table 10. Relative Advantage Correlation Matrix

	A1	A2	A3	B1	B2	B3
A1	1					
A2	.28	1				
A3	.16	-.02	1			
B1	.22	-.06	.09	1		
B2	.12	.32	-.06	.09	1	
B3	.04	.01	.35	-.00	.04	1

A1 = Workers involved in the application of pesticides demand clothing that is comfortable.

A2 = Pesticide users demand clothing that protects the body from pesticide exposure.

A3 = Protective clothing and equipment currently available for pesticide users are hot and bothersome.

B1 = When applying pesticides in hot weather, I select clothing for comfort.

B2 = I select clothing for protection when applying pesticides.

B3 = I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.

Correlational Analysis of Attitudinal and Behavioral Indices

The first research question was again considered for analysis, this time using the attitudinal and behavioral indices of each attribute. The correlational analysis using the Kendall tau coefficients showed the attitudinal and behavioral indices for each attribute to be correlated at highly significant levels, thus consistent with the previous correlational analysis. (Table 11)

Table 11. Correlational Analysis of Attitudinal with Behavioral Indices

INDEX	KENDALL TAU COEFFICIENT[a]
Relative Advantage	.25
Compatibility	.15
Complexity	.40
Observability	.36
Trialability	.26

[a]Significant at the .001 level of confidence

Ranked-Signs Test of Attitudinal and Behavioral Indices

The next research question sought to determine if there was a significant difference in the way respondents answered the attitudinal as opposed to the behavioral statements of the same attribute. Ranked-signs tests were used to determine if there was a significant difference between the attitudinal and behavioral indices of the five attributes (Table 12). The results showed that for the Relative Advantage, Compatibility, Complexity, and Observability attributes, the differences between the indices were significant at the .02 or greater level of probability. The significance of the Z score of the Trialability attitudinal and behavioral indices was .935 indicating no difference between the indices.

Table 12. Ranked-Signs Test of Attitudinal and Behavioral Indices

INDEX	TIES	-RANKS MEAN	+RANKS MEAN	Z SCORE	SIGNIFICANCE
Relative Advantage	80	151.49	188.03	- 8.286	.000
Compatibility	94	185.51	175.33	- 2.327	.020
Complexity	64	117.12	201.02	-14.883	.000
Observability	107	168.80	178.15	- 3.848	.000
Trialability	92	178.41	173.64	- .081	.935

Analysis of Indices by Demographic Data

The next objective was to investigate the difference in the perceptions of respondents by type of farm, acreage, age and education. Only those respondents who completed all of the demographic data on the questionnaire were included in the analysis. The original sample size was 500 but was further reduced by those not answering the particular statements under analysis. To determine whether differences in perceptions were due to factors such as type of farm, education, and age, a chi-square analysis was undertaken. For this analysis, it was necessary to recode the responses since so few respondents answered in the negative categories and this would result in unequal cell sizes. Therefore, the "Always" and "Almost Always" categories were recoded into a "Positive" category and the remaining categories were recoded into a "Neutral" category. The chi square analysis would reveal whether significant differences existed between the independent and dependent variables but it was also important to identify precisely where those differences existed, i.e., between which groups of respondents. The Bonferroni method of post hoc contrasts was used to determine the specific differences in the positive perceptions of the respondents.

Type of Farm

The first factor analyzed was the type of farm and its effect on the various attribute indices. Type of farm was shown to have a highly significant effect on several of the indices, as shown in Table 13. Post hoc contrasts revealed that most of the significance could be attributed to differences between the respondents of farm types 3 and 2. For purposes of discussions, the farm types will be referred to as: Type 1, field and/or vegetable; Type 2, livestock and/or dairy; Type 3, fruit. Table 13 provides the exact description of the formation of these mutually exclusive categories. The fruit farm respondents were consistently the most positive in their perceptions than were the other types of farm respondents, and livestock and/or dairy farmers were consistently the least positive.

A significant difference between fruit farmers and dairy and/ or livestock farmers was found in all three of the Relative Advantage indices. Field and/or vegetable respondents in the Relative Advantage attitudinal index were also found to differ significantly from dairy and/or livestock respondents, the former being more positive in their responses.

Differences in the behavioral and combined indices of the Compatibility attribute showed fruit farmers as being significantly more positive in their responses than either dairy and/or livestock farmers. However, in the combined index, significant differences were also found between field and/or vegetable farmers and dairy and/or livestock respondents. Again, the former were more positive in

Table 13. Summary of Chi-Square Analysis: Indices by Type of Farm

INDEX		DF	CHI SQUARE	SIGNIFICANCE	CONTRASTS*
Relative Advantage	Attitudinal	2	10.988	.004	1 > 2 3 > 2
	Behavioral	2	6.375	.041	3 > 2
	Combined	2	8.047	.017	3 > 2
Compatibility	Behavioral	2	16.767	.000	3 > 2
	Combined	2	6.293	.043	1 > 2 3 > 2
Complexity	Attitudinal	2	7.928	.019	3 > 2
	Behavioral	2	36.745	.000	3 > 1 3 > 2
	Combined	2	27.324	.000	3 > 1 3 > 2
Trialability	Behavioral	2	6.0861	.047	3 > 2

*Farm Type 1 = Field and/or Vegetable Crops

2 = Livestock and/or Dairy Cattle with or without Field and/or Vegetable

3 = Fruit with or without Other Crops, Livestock or Dairy Cattle

their responses than the dairy and/or livestock farmers.

Type of farm was shown to have significant effects on all three indices of the Complexity attribute. Fruit farmers were consistently shown to have significantly more positive responses than dairy and/or livestock farmers. For the behavioral and combined indices, fruit farmers were also shown to differ significantly from field and/or vegetable farmers, who were less positive in their responses.

Lastly, a significant difference in effects of type of farm on the Trialability behavioral index was found between fruit farm respondents and dairy and/or livestock respondents.

Acreage

The second factor analyzed was that of acreage and its effect on the various attribute indices. The number of acres of farm operation in use was found to have a significant effect on several of the indices as shown in Table 14. Post hoc contrasts showed that most of the significance could be attributed to differences between the farms with 50 acres or less and those with 260 acres or more. The smaller farm respondents were consistently more positive in their responses than those of the larger farms.

For the Relative Advantage attitudinal index, a significant difference was found between those respondents with 50 acres or less and the respondents of farms with 180 to 2000 and over acres.

In the attitudinal index of the Compatibility attribute, there was a significant difference between the under 50 acre

Table 14. Summary of Chi-Square Analysis: Indices by Acreage

INDEX		DF	CHI SQUARE	SIGNIFICANCE	CONTRASTS*
Relative Advantage	Attitudinal	7	16.491	.021	1 > 4 1 > 5
Compatibility	Attitudinal	7	18.223	.011	1 > 5
	Behavioral	7	24.210	.001	1 > 5 1 > 6 1 > 7
	Combined	7	13.982	.051	3 > 6 4 > 8 3 > 7 5 > 8 3 > 8
Complexity	Attitudinal	7	19.985	.005	1 > 5
	Behavioral	7	42.340	.000	1 > 5 3 > 6 1 > 6 3 > 7 1 > 7 4 > 7 2 > 6 5 > 7 2 > 7 5 > 8 2 > 8
	Combined	7	27.636	.000	1 > 5 2 > 6 1 > 6 3 > 6 2 > 5

*Acreage 1 = under 50
2 = 50 - 99
3 = 100 - 179
4 = 180 - 259
5 = 260 - 499
6 = 500 - 999
7 = 1000 -1999
8 = 2000 +

respondents and the 260 to 499 acre respondents. The same difference was found in the behavioral index of this attribute along with significant differences between under 50 acre respondents and the respondents of the 500 to 1999 acre farms. The Compatibility combined index had significant differences between 100 to 179 acre respondents and 500 to 2000 and over acre respondents. Significance was also found between the 260 to 499 acre respondents and those of the 2000 and over acre farms for the Compatibility combined index.

Like the attitudinal index of the Compatibility and Relative Advantage attributes, a significant difference was found between the under 50 acre respondents and the 260 to 499 acre respondents for the Complexity attitudinal index. For the behavioral index of the Complexity attribute, ten significant differences between respondents emerged. Again, all were between the smaller farm respondents who were most positive in their perceptions and the larger farm respondents, as listed in Table 14. The combined index also had several significant differences between the respondents. Respondents of those farms of under 50 acres and those of 50 to 99 acres were significantly more positive in their perceptions than those with 260 to 999 acres. A significant difference was also found between the 100 to 179 acre respondents and the 500 to 999 acre respondents.

Age

The third factor analyzed was that of age and its effect on the responses to the various attribute indices. The age of the

Table 15. Summary of Chi-Square Analysis: Indices by Age

INDEX		DF	CHI SQUARE	SIGNIFICANCE	CONTRASTS*
Compatibility	Behavioral	5	19.400	.001	6 > 1 6 > 2 6 > 3 6 > 4 6 > 5
Trialability	Attitudinal	5	21.937	.000	3 > 1 4 > 1 4 > 2 6 > 3

*Age 1 = under 25
2 = 25-34
3 = 35-44
4 = 45-54
5 = 55-65
6 = over 65

respondents was found to have an effect on two of the attribute indices as determined by the chi square analysis and shown in Table 15. Post hoc contrasts revealed that most of the significance of the effects could be attributed to the difference in respondents over 65 and the younger respondents. The older respondents were consistently more positive in their perceptions than were the younger respondents.

Age of respondent was shown to have significant effects on the Compatibility behavioral index. Post hoc contrasts revealed significant differences between the age 65 and over respondents and all of the other age categories. For the Trialability attitudinal index, the 35 to 44 age respondents and the 45 to 54 age were significantly more positive in their responses than were the under 25 age respondents. The 45 to 54 age respondents and the over 65 age respondents were found to be significantly more positive in their responses than were the 25 to 34 and the 35 to 44 age respondents, respectively.

Education

The last factor analyzed was that of education and its effect on the responses to the various attribute indices. It was shown to have a significant effect only upon the attitudinal index of the Relative Advantage attribute. With 5 degrees of freedom and a chi square of 12.096, education was shown to have an effect on the index at the .033 level of significance. The post hoc contrasts revealed a significant difference between those with an advanced degree and those with an eighth grade education. Those with the degree were more positive in their responses than were the eighth grade educated respondents. However, those respondents with a high school education were significantly more positive in their responses than were those with a four year college degree.

Multiple Regression Analysis

The last statement on the questionnaire, "In general, I am in favor of protective clothing for pesticide users," did not belong to any of the attribute indices. It was included solely for the purpose of using it as the dependent variable in a multiple regression equation. The combined attribute indices served as the predictor variables.

Because only interval data can be inserted into a regression equation, dummy variables were created for each of the combined attributes in the following manner. The median point of each of the attribute scales was located and all scores less than or equal to the median were set equal to "1". All other scores were set equal to "0". "1" represents the "Always" half of the "Always to Never" scale and "0" represents the "Never" half of it.

Dummy variables were also created for the general statement, which had a scale rating of 1 to 5, "Always to Never" scale as in the original attribute statements. The frequencies of the general statement were skewed towards "Always" so scores of 1 or 2 were set equal to "1" and scores of 3, 4, or 5 were set equal to "0".

The first objective was to evaluate the contribution of each of the attribute variables to the variation in the general statement. Table 16 provides the summary table of the multiple regression procedure with all of the variables in the equation.

Table 16. Multiple Regression Summary Table

	Attribute	F to Enter or Remove	Sig of F	R^2	R change
1.	Trialability	68.61	0	.13	.13
2.	Complexity	23.05	.00	.17	.04
3.	Observability	15.99	.00	.19	.02
4.	Compatibility	5.48	.02	.20	.01
5.	Relative Advantage	.46	.49	.20	.00

As can be seen in the table above, Trialability accounts for 13 percent of the variation in the general statement. Relative Advantage adds virtually nothing to explanation of the variation, while Complexity, Observability, and Compatibility contributes little.

The next objective was to find the best linear prediction equation and evaluate the prediction accuracy. Any attribute that did not produce an increment of at least .01 in the R^2 value was dropped from the equation. Table 17 gives the best linear prediction of the general statement based on the attribute indices.

Table 17. Prediction Equation

Variable	B	Standard Error B
Trialability	.135	.35
Complexity	.115	.35
Observability	.120	.33
Compatibility	.077	.33
(Constant)	.591	

R^2 = .20
Standard Deviation = .32
General Favorability = .5911 + .1348 (Trialability score) + .1153 (Complexity score) + .1198 (Observability score) + .0767 (Compatibility score)

The overall accuracy of the prediction equation is reflected by R^2, which represents the proportion of variation explained by the variables in the equation. The standard error of estimate is .32. Thus, on the average, predicted general scores will deviate from actual scores by .32 units of the general scale.

Discussion

For the most part, respondents were reluctant to answer toward the negative end of the 1 to 5 scale of the individual questions. This could be due to the wording of the statements which was very positive, straightforward and, on afterthought, seemed to almost "expect" a positive answer. Or the reluctance could be due to the respondents' anticipation of increasing regulation through legislation. One may have felt that if one did not answer positively, they would look as though they were not taking measures to protect themselves and, therefore, more legislation on protective measures would be necessary for the future.

Nevertheless, it was necessary to recode the responses for the chi square analysis in order to obtain somewhat equal cell sizes. Since the respondents did not for the most part answer negatively, it was appropriate that the responses be divided into those that were "positive" and those that were "neutral."

Because this was an exploratory study using an instrument that has not been adequately pre-tested, the internal consistency of the items in each index was not expected to be great. The alpha model of reliability produced coefficients of a moderate size at a highly significant level of probability. However, the negative alpha coefficient of the Relative Advantage behavioral index prompted further exploration of the items in the index. The Relative Advantage attribute of the proposed innovation was determined to be that the protective garment would provide more comfort than the protective clothing available presently. In answering the statements dealing with protection and comfort, respondents chose either one or the other and were consistent in this choice throughout. Negative correlations between comfort and protection resulted. Pesticide users have not been exposed to the idea of comfort and protection in one garment and therefore felt that they could not demand both. The Relative Advantage indices are not good measures of the attribute of the availability of a more comfortable, protective garment for pesticide users.

It is not known to the investigator whether the behavioral, attitudinal or combined index scores are the "truer" indication of a respondent's perception of an attribute. Each behavioral statement incorporated the same idea as in its attitudinal counterpart as a reinforcement of the respondent's perception of that attribute. While the behavioral statements included personal pronouns and referred directly to the respondents' personal practices, the attitudinal statements were of a third person nature, referring to pesticide users in general. Although the responses to each of the attitudinal behavioral indices of the same attribute were found to be significantly related, they were found to have significant differences as well. Except for the Trialability attribute the mean scores of the attitudinal indices were lower than those of the behavioral indices for the same attribute, thus they were closer to the "Always" end of the "Always to Never" scale. It is possible that when respondents encountered the attitudinal statements, they removed themselves from the situation and as a result answered in a more prescriptive manner. However, upon answering its behavioral counterpart, respondents were forced to put themselves back into the situation and as a result answered, perhaps, more realistically.

The Trialability attribute was the only attribute in which there were no differences in the way users responded to the attitudinal and behavioral indices. The mean of the attitudinal index for this attribute was higher than the mean of any of the other attitudinal indices. Upon closer study, it was seen that this could be explained by the following item which had the highest frequency of "Never" than any other item on the questionnaire:

> "In the sale of poisonous products, pesticide manufacturers should include protective coverings for users."

Forty-five percent of the respondents answered in the "Always Never to Never" range. Their negative response could be due to their feeling that if protective coverings were included with the pesticide products, this would mean a considerable increase in the price of the products. Furthermore, they may have felt that the only reason manufacturers would include these coverings would be because of increased regulations and they were firmly against this. Both "attitudinally" and "behaviorally" users were more negative in their responses to this attribute than they were to any other attribute.

In analyzing differences in the perceptions of the attributes by types of farms, it was not surprising to find that most of the differences lie between the respondents of Farm 3, those raising fruit with or without livestock, dairy cattle or other crops, and the respondents of Farm 2, those raising livestock and/or dairy with or without field and/or vegetable crops. Fruit farmers are potentially subjected to much more danger from pesticides than are either field and/or vegetable respondents or dairy and/or livestock respondents. The frequency of pesticide application for fruit crops is many times that necessary for field or vegetable crops. And the type of application which fruit farmers must use to protect their trees, exposes the person doing the application to a much greater extent than the types of applications that field or vegetable crop farmers use. Fruit farmers use a type of air blast sprayer which in effect shoots the spray up into the fruit trees, immersing an applicator driving an "open cab" tractor in a mist of falling pesticide particulates. While field and vegetable farmers most often use open cabs as well, they use applicators which spray the pesticide within inches from the ground. These farmers are also exposed to pesticide particulate but not to the degree of farmers using air blast sprayers.

Both respondents from fruit farms and those from field and/ or vegetable farms are likely to be exposed to pesticides much more often than those farmers having dairy and/or livestock with or without vegetable and/or field crops. Having dairy and/or livestock, Farm 2 respondents must be very careful about the use of pesticides and the contamination of their animals. Although these respondents have the largest amount of acreage under operation, it is assumed that most of the land is for grazing and therefore application is most likely to involve less of the large scale ground application that is necessary for Farm 1 respondents.

Overall, the exposure to pesticides is greatest for fruit farmers and least for livestock and/or dairy respondents. It follows, then, that fruit farm respondents have a greater need for protection than do field and/or vegetable respondents and dairy and/or livestock respondents. This was evidenced in the chi square analysis of the type of farm by the Compatibility attributes. Fruit farmers perceived the need to be protected from the dangers of pesticides in a significantly more positive way than did dairy and/or livestock farmers. This was true for the behavioral and combined Compatibility indices but not for the attitudinal index. Perhaps this is because, in an idealistic sense, all farmers, regardless of the type of farm, desire to be protected, but on the behavioral level, fruit farmers are willing to carry out the necessary behaviors to a greater extent.

Fruit farmers and field and/or vegetable farmers perceived the attribute of comfort, protection, and the availability of a more comfortable protective garment, in a significantly more positive way than did livestock and/or dairy farmers. They also indicated a greater understanding of the complexity of the problem - that clothing can be contaminated by pesticides, and that protective yet comfortable clothing would be highly suitable for pesticide users. Because of their greater need of protective clothing, field and/or vegetable farmers and especially fruit farmers are more likely to have experienced the discomfort of the protective clothing available today than the dairy and/or livestock respondents. Therefore, they can appreciate the Relative Advantage and Complexity attributes to a greater degree. Furthermore, fruit farmers indicated that they are willing to try the innovative apparel more readily than dairy and/or livestock farmers.

The respondents operating smaller farms perceived the attributes of the protective apparel much more positively than the larger farm respondents. Many of the significant differences were found between the under 50 acre respondents and the 260 to 999 acre respondents. It is possible that the real difference coming through in this part of the analysis is the difference between fruit farmers and the other types of farm respondents since most of the under 50 acre respondents are fruit farmers.

All three of the Compatibility and Complexity indices contained most of the significant differences in respondents of different size farms. It would seem that the larger size farm respondents would perceive the need for protective apparel, and understand the complexities involved in apparel for pesticide users, to a greater degree than the smaller farm respondents. But the majority of the larger farm respondents are dairy and/or livestock farmers and therefore deal with pesticides much less than do the smaller farm respondents who are most likely fruit or field and/or vegetable farmers.

The interaction effect of type of farm is thought to have come through on the analysis by age also. Older farmers were shown to be more positive in their perceptions of the attributes of protective apparel for pesticide users. Farmers aged 65 or over were more positive in their perceptions than any of the other age groups in the Compatibility behavioral index. These older farmers, half of whom are fruit farmers, perceive the need for protective apparel greater than those under 65. Again, this is probably an interaction effect of type of farm but it is also possible that older farmers take more precautionary steps in their work than do the younger farmers who do not feel as great a need to be protected. Older farmers generally had a more positive attitude towards trying protective apparel than did the younger farmers. Those aged 35 to 54 were more positive than those under 25, perhaps due to the older farmers having more experience in pesticide application than the younger respondents.

The results of the effect of education on the Relative Advantage attitudinal index is not clear. Advanced degree respondents were more positive in their perceptions than were those with only an eighth grade education, but those with a high school education were more positive in their perceptions than were those with a four year college degree. It would seem that respondents with a four year college degree would be more positive than the high school educated respondents.

The type of farm, acreage, age and education factors produced no significant differences amongst respondents on any of the observability attribute indices. It is probably that the visibility of the innovation and its attributes would be the same for all respondents, regardless of their differences in the before mentioned factors. The observability statements in the questionnaire dealt with the visibility of the innovation and its results through word-of-mouth and exhibition at extension meetings, sales shows, and through agricultural friends and neighbors. The observability attribute was perceived more positively by all respondents than all of the other attributes excepting Compatibility. The lack of any significant differences between respondents by type of farm, acreage, age and education reveals that all respondents perceived the observability attribute in a similarly positive way.

While the information discussed thus far describes the characteristics of the agricultural worker and his perceptions of the innovation, the ultimate use of the information was to contribute to the design of protective apparel. The steps of the functional design process set forth by Orlando (1979) and discussed in the introduction of this paper, are outlined and discussed below with some suggested changes in the first three steps of the process that incorporate the implications of the findings of this study.

The functional design process is initiated by defining the problem and stating the objectives. For example, the objective of the larger project of which this study is a part is to design a garment that will protect pesticide users from dermal exposure during pesticide application and accommodate thermal comfort. The problem is bounded by the stipulation that the design is for Michigan pesticide users and it must rely on available, conventional technology.

In addition, consideration of the source of the request for the design should be included in this initial step. If the request came from the intended users themselves, it could be assumed that they have perceived the need for the design. However, if the request came from an outside agency, it might not be known to the designers at this point whether the intended users perceive the need for the innovation. As was indicated in the Alers-Montelvo (1957) study cited in the review of literature, if the innovation is incompatible with the users' perceived needs, it will result in nonadoption.

The source of the request for the design is also of importance to future marketers of the innovation. If the innovation was not requested by the intended users, then advertising and promotional efforts would have to identify and emphasize the needs of the innovation for the users as well as its advantages, which will be explored in the next step. Therefore, "who" requests the design may have important implications in the overall acceptance of the innovation.

In the second step of the process, the design situation is thoroughly explored with no interference from boundaries of any type. A combination of strategies such as brainstorming, interviewing users, literature searching, and observation, are used to broaden the designer's perception of the problem and to identify as many different directions for further consideration as possible. This stage is sometimes termed one of "divergence" as all aspects of the constructed, behavioral and natural environments are included in the scope of the problem.

In the larger project of which this study is a part, among the considerations brought forth were those of the equipment involved in pesticide application, weather conditions in which pesticides are applied, the users' preferences of work apparel, penetration of pesticides through fabric, and the deposition of pesticides on the worker during low and regular volume spraying.

It is in this stage that the functional research designer could consider some of the user's perceived attributes of functional apparel in their exploration of the design problem. The designer should consider the following questions in the search of the problem.

1. In what ways can the existing design be improved upon? (Relative Advantage)
2. How do the intended users perceive the need for the design? (Compatibility)
3. How difficult is the understanding of the design problem to the users? (Complexity)

The Observability and Trialability attributes are not considered because they deal with the actual innovation itself and, at this point in the process, the solutions to the problem can not be limited.

In the third step of the process, the problem structure is defined, assessed and analyzed. The problem situation has been given complete consideration and must be narrowed down and the critical factors isolated. As the previous stage was one of "divergence" this stage is termed one of "transformation" from all of the areas considered to those critical areas that focus in on the design problem.

After those areas are identified, they must be assessed in order to come up with specifications for the actual design. Five areas of assessment are identified in the design process, as major critical factors, the emphasis on each varying with the design. These areas are: activity assessment, specific body movement assessment, impact assessment, thermal assessment, and values and preferences assessment.

It is in the values and preferences assessment that the method of inquiry similar to the one used in the present study could be utilized. This method would incorporate the attributes of innovations into a survey to assess the users' perceptions of the characteristics of the eventual functional apparel. In the present study the following specifications were derived from such a survey. The attributes, or general specifications, are listed in order of their rating by the users.

1. The garment must be perceived by the users as protective from the dangers of pesticide penetration. (Compatibility)
2. The traits or characteristics of the garment must be perceived as being observable to the users either through agricultural friends or neighbors, or other agricultural contacts. (Observability)

3. The garment must be perceived by the users as comfortable, as well as protective. (Complexity)
4. The garment must be perceived by the users as easily available to them (perhaps in stores where they buy their work clothes). (Trialability)
5. The garment must be perceived by the users as more comfortable than what is available to pesticide users now. (Relative Advantage)

This step will also serve to isolate the target market for the marketers of the innovation by defining the potential users' ages, occupations, educations, and the combinations of these and other factors. For example, in this study, fruit farmers evolved as the group of users that perceived the greatest need for the functional apparel, as well as had the greatest understanding of the design problems. All of the attributes were perceived favorably, with little or no differences emerging in the perception of the Trialability and Observability attributes between all groups.

This information and all of the output received from the critical factors assessments become the input for the next stage of the design process in which the design criteria is established. In this step, the specifications derived previously are charted, ranked and weighted in order to finalize the set of design criteria which will become the guide for designing the prototype.

There are no suggested changes for this step or the prototype development and its evaluation. However, since the perceived attributes of the innovation are related to the acceptance of it, they could influence the priority of the design criteria and are therefore a valuable contribution to the functional design process.

Conclusions

The conclusions regarding the objectives of this study are as follows:

1. A positive significant relationship exists between the attitudinal and behavioral responses of the same attribute.

2. A significant difference exists between the attitudinal and behavioral responses of all attributes except the Trialability attribute in which there is no difference.

3. Type of Farm. Fruit farmers were consistently the most positive in their perceptions of all the attributes, while the dairy and/or livestock farmers were consistently the least positive. Fruit farmers and field and/or vegetable farmers perceived the comfort and protection attribute (Relative Advantage) of a functionally designed garment for pesticide users in a significantly more positive way than did dairy and/or livestock farmers. Fruit and field and/or vegetable farmers also percieved a greater need (Compatibility) of protective apparel than did the dairy and/or livestock farmers. However, fruit farmers understood that clothing can be contaminated and that protective clothing can be comfortable (Complexity) in a significantly more positive way than both the field and/or vegetable farmers and the dairy and/or livestock farmers. Fruit farmers indicated more positively that they would be willing to try the innovation than did the dairy and/or livestock farmers (Trialability).

3. (cont.) Acreage. Those pesticide users who operated smaller farms were more positive in their perceptions of the attributes than were those users operating the larger farms. The respondents of smaller acreage farms perceived the comfort and protection attributes of functional apparel for pesticide users more positively than did the larger acreage farmers. The larger acreage respondents were also less positive in their perceived needs of protective apparel during pesticide use. The smaller farm respondents understood the complexity of the functional apparel to a greater degree than the respondents operating larger farms.

Age. Older farmers tended to be more positive in their perceptions of the attributes than were the younger farmers. Those aged 65 or over perceived a greater need to be covered and protected from pesticides than did all of the other age groups under 65 years of age. The older farmers also had a more positive attitude towards trying the protective apparel if it was easily available to them, than did the younger farmers.

4. The following attributes of innovations are the best predictors of the general favorability of functionally designed protective clothing for pesticide users. They are listed in their order of contribution to the results of the general favorability statement: Trialability, Complexity, Observability, Compatibility. Together they account for only twenty percent of the variation in the general favorability toward protective clothing.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Summary

This investigation was part of a larger Michigan State University Agricultural Experiment Station project in which protective clothing for agricultural workers was being designed and evaluated using the functional design process. Presently, the effectiveness of functional apparel design can not be measured until the innovation has met wide acceptance by the users. Therefore, this study was undertaken to expand the design process by including an investigation of the users' perceptions of the attributes of a proposed item of functional apparel. The theory proposed by Rogers and Shoemaker (1971), that the perceived attributes of innovations are significantly related to their rates of adoptions, provided the framework for the present study. Following are the five categories of perceived attributes as defined by Rogers and Shoemaker:

1. Relative Advantage. The degree to which an innovation is perceived as better than the ideas it supersedes.

2. Compatibility. The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receivers.

3. Complexity. The degree to which an innovation is perceived as relatively difficult to understand and use.

4. Observability. The degree to which the results of an innovation are visible to others.

5. Trialability. The degree to which an innovation may be experimented with on a limited basis.

The Relative Advantage, Compatibility, Complexity, Observability, and Trialability attributes of a proposed garment of functional design were determined by the researcher mostly on the basis of: 1) an examination of protective clothing available on the market, 2) opinions of local users gained through unstructured, informal interviews on protective clothing and safety, and 3) knowledge of the exposure that occurs in the processes of pesticide application.

The Relative Advantage attribute of the proposed garment was determined to be that it would be more comfortable than the protective clothing available presently.

The Compatibility attribute of the proposed innovation was determined to be that of meeting the need of the pesticide users to be covered and protected from the potential dangers of the chemicals with which they deal.

The Complexity attribute of the proposed garment was determined to be the understanding that clothing can be contaminated by toxic substances and the understanding that protective clothing can be comfortable.

The Observability attribute of the innovation was determined to be that it would most likely be exposed to users through word-of-mouth and exhibition at extension meetings, sales shows, and through agricultural friends and neighbors.

The Triability attribute of the proposed garment was determined to be the ease with which users could try the garment if it was easily available to them.

Each of these attributes were incorporated into two types of statements with the intent of eliciting the respondents' perceptions of the attributes. The first type of statement was termed "attitudinal" and the second, "behavioral." The attitudinal statements were of a third person nature, referring to pesticide users in general, while the behavioral statements included personal pronouns and referred directly to the respondents personal practices. The responses to the statements were a scale rating of: Always, Almost Always, Sometimes, Almost Never, and Never.

The sample consisted of 500 certified Michigan pesticide users who responded to the mailed questionnaire. Since more than half of them were involved in more than one type of farming, respondents were divided into three mutually exclusive groups: 1) those growing only field and/or vegetable crops, 2) those raising livestock and/or dairy cattle with or without field and/or vegetable crops, and 3) those growing fruit with or without other crops, livestock or dairy cattle.

The largest amount of acreage under operation was that of the livestock and/or dairy farm respondents (Farm 2) and the smallest amount of acreage was operated by fruit farmers (Farm 3). Most of the respondents of livestock and/or dairy farms and the field and/or vegetable farms (Farm 1) were in the 25 to 44 year age bracket while most of the fruit farm respondents were in the 45 to 65 year age brackets. 52 percent of the sample had furthered their education beyond high school. Of those with an advanced degree, 50 percent were fruit farmers, 35 percent were dairy and/or livestock farmers, and the remaining 15 percent were field and/or vegetable farmers.

The first objective of the study sought to determine whether a significant relationship existed bwtween the attitudinal and behavioral responses of the same attribute. A correlational analysis revealed a positive significant relationship between all pairs of statements excepting one in the Compatibility attribute, which resulted in dropping it from analysis. For all further analyses, indices of all attributes, attitudinal, behavioral, and combined were constructed by summation across the scores of those items to be included in the index. Correlational analysis of the attitudinal and behavioral indices of the same attribues again revealed highly significant relationships existing among them.

The indices were then subjected to ranked-signs tests and a significant difference was found in all attitudinal and behavioral pairs of statements except Trialability in which the negative and positive ranks were nearly the same. Respondents answered the attitudinal statements more positively than they did the behavioral statements, perhaps indicating that how they perceive the attributes "ideally" is different than how their behaviors "realistically" carry out these perceptions in their personal practices.

There were significant differences in the responsents' perceptions of the attributes by type of farm, age, acreage, and education as determined by chi-square analyses. Fruit farmers and field and/or vegetable farmers perceived the comfort and protection attribute of a functionally designed garment for pesticide users in a significantly more positive way than did dairy and/or livestock farmers. Fruit and field and/or vegetable farmers also perceived a greater need of protective apparel than did the dairy and/or livestock farmers. However, fruit farmers understood that clothing can be contaminated and that protective clothing can be comfortable in a significantly more positive way than both the field and/or vegetable farmers and the dairy and/or livestock farmers. Fruit farmers indicated more positively that they would be willing to try the innovation than did the dairy and/or livestock farmers.

The respondents of smaller acreage farms perceived the comfort and protection attributes of functional apparel for pesticide users more positively than did the larger acreage farmers. The larger acreage respondents were also less positive in their perceived needs of protective apparel during pesticide use. The smaller farm respondents understood the complexity of the functional apparel to a greater degree than the respondents operating larger farms.

Surprisingly, farmers ages 65 and over responded more positively to the Compatibility behavioral index, indicating that they carried out the perceived need to be covered and protected from pesticides, than did all of the other age groups under 65 years of age. The older farmers also had a more positive attitude towards trying the protective apparel if it was easily available to them, than did the younger farmers, mainly those under 35 years of age.

Lastly, education was found to have an affect on the way that some of the respondents percieved the availability of comfortable and protective functional apparel for pesticide users. Those with an advanced college degree were more positive in their perception of this attribute than were those respondents with only an eighth grade education. However, those with a high school education were significantly more positive in their responses than were those with a four year college degree.

Upon closer study of the results of the chi-square analysis, it was thought that the interaction effect of type of farm, mainly fruit farmers, was responsible for many of the differences in the respondents. Those who were fruit farmers, or had under 50 acres of land that they operated, or were in the 65 and over age category, showed up on the post hoc contrasts as those groups that were most positive in their perceptions of the attributes. The perceived need for the innovation, as well as the greatest understanding of the problem involved, is significantly greater for fruit farmers than for the other respondents.

The last objective was to determine which attribute is the best predictor of favorability of protective clothing for pesticide users. The responses to the following statement, "In general, I am in favor of protective clothing for pesticide users," were used as the dependent variable in a multiple regression analysis with the responses to the combined indices as the predictor variables. The best to the worst predictors were as follows: Trialability, Complexity, Observability, and Compatibility. Together, they account for only 20 percent of the variation in the general statement, indicating that other factors are involved in the favorability of protective clothing for pesticide users.

While the information gained from the study describes the characteristics of the agricultural worker and his perceptions of the innovation, the ultimate use of the information was to contribute to the design of protective apparel. The following specifications were derived for this purpose and will be utilized in the process of functionally designing a garment to protect pesticide users from dangerous exposure.

1. The garment must be perceived by the users as more comfortable than the protective clothing available to them presently. (Relative Advantage)

2. The garment must be perceived by the users as meeting their need to be covered and protected from the dangers of pesticides. (Compatibility)

3. The garment must be perceived by the users as being comfortable as well as protective. (Complexity)

4. The features and characteristics of the garment must be easily observable by the users. (Observability)

5. The garment must be perceived by the users as easily available to them. (Trialability)

Recommendations

The present investigation built upon the theories of functional design and the perceived attributes of innovations. This study was exploratory in nature, and therefore the researcher feels that future studies, incorporating the following suggestions, would yield more significant results.

1. Items to be used in the inquiry should be generated and pretested on an adequate sample of the population to be studied.

2. A factor analysis of the items should be done to see if the items intended to be measuring the same attribute group together. Those items grouping together should then be selected to be included in the questionnaire.

3. Different scaling, perhaps a continuous scale, should be experimented with, as this investigator ran into problems in the analysis with the ordinal scale used in this study.

4. This type of inquiry should be included in all functional design studies, as the assessment of the users' perceived attributes of innovations should influence the design criteria, and thus the outcome of the process and its final adoption.

APPENDIX A

FIRST DRAFT OF QUESTIONNAIRE

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EAST LANSING · MICHIGAN · 48824

July 27, 1979

We have just completed the first draft of the questionnaire to be sent to pesticide users throughout the state for the "Design and Evaluation of Functional Clothing for Agricultural Workers" project. Because our experience and expertise in the agricultural area is limited, we are requesting your assistance in refining our questionnaire, and would appreciate any input or suggestions you may have regarding its content, logic, etc.

We hope to do our pretesting the first two weeks in August. If at all possible, we would greatly appreciate your comments by August 3.

Jacky Orlando

Jacquelyn Orlando
Associate Professor

Maureen Sweeney

Maureen Sweeney
Graduate Assistant

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Enclosure

I. What type of farm do you operate?
Check as many as apply:

____ fruit
____ field crops
____ vegetable
____ livestock
____ dairy

What is the total acreage of your farm operation?

____ under 50
____ 50-99
____ 100-179
____ 180-259
____ 260-499
____ 500-999
____ 1,000-1,9
____ 2,000+

What is your age?

____ 20's ____ 30's ____ 40's ____ 50's ____ 60's+

What is your educational background?

____ High school or less
____ Some college
____ Associate or 2-year degree
____ 4-year college degree
____ Advanced degree

Who is involved in pesticide application on your farm?
Check as many as apply:

____ myself
____ part time employee
____ full time employee
____ my spouse
____ my children
____ commercial applicator

II. The following statements were developed to represent each of the five perceived attributes of innovations (in our case protective clothing) on both the objective and subjective levels. They will appear randomly ordered on the actual questionnaire and the answers will be a scale rating of: Always True, True Most of the Time, Sometimes True, Sometimes False, False Most of the Time, Always False. We are interested in comparing objective and subjective statements and in attempting to avoid pressured responses.

<u>OBJECTIVE STATEMENTS</u>	<u>SUBJECTIVE STATEMENTS</u>
RELATIVE ADVANTAGE	
A demand exists among pesticide users for clothing that is comfortable.	When applying pesticides in hot weather, I select clothing for comfort.
A demand exists among pesticide users for clothing that protects the body from pesticide exposure.	I select clothing for protection when applying pesticides.
Protective clothing and equipment currently available for pesticide users are hot and bothersome.	I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.

OBJECTIVE STATEMENTS	SUBJECTIVE STATEMENTS
COMPTABILITY	
The exposure that occurs when handling pesticides could be harmful to the body.	I wear clothing that covers my arms and legs when applying pesticides.
Clothing worn when working around pesticides should not allow seepage should spills occur.	My clothing provides me with protection from pesticide penetration (due to spills or heavy exposure).
Pesticide users should be more concerned about the dangers of pesticides to themselves.	In extremely hot weather, I wear as little clothing as possible when applying pesticides.
COMPLEXITY	
Clothing worn while applying pesticides becomes contaminated by the pesticide.	I change my clothes after working with pesticides and before going on to other work.
Clothing that would be protective yet comfortable in both warm and cool temperatures would be highly suitable for pesticide users.	I would wear protective clothing while applying pesticides if I knew I would be comfortable even in hot weather.
A worker should have separate clothing for working with poisonous substances.	I purchase some clothing to wear only when working with pesticides.
OBSERVABILITY	
Agricultural workers should participate in the various local meetings held by growers, extension services, and equipment sales-people to keep abreast of the latest predictions, practices, and innovations.	I would attend a local meeting that included in its agenda a presentation and demonstration of protective clothing for pesticide users.
Agricultural friends and neighbors are often good sources for finding out about new products or methods.	If my neighbor or good friend told me how satisfied he was with a new protective garment he bought to protect himself from pesticide exposure, I would consider purchasing the same garment.
TRIALABILITY	
In the sale of poisonous products, pesticide manufacturers should include protective coverings for the users.	I would try protective clothing for pesticide users if I didn't have to have to pay for them.
Agriculatural publications aid the farm in providing detailed descriptions of new products.	If the agricultural publication that I read most often had an article on protective clothing, and highly praised and recommended a certain new line, I would purchase the clothing.

OBJECTIVE STATEMENT	SUBJECTIVE STATEMENT
TRIALABILITY, continued	
It is important that special, protective clothing be available to all pesticide users.	I would purchase protective clothing made specially for pesticide users if it were available in stores where I buy my work clothes.

APPENDIX B

QUESTIONNAIRE USED IN PRE-TEST

MICHIGAN STATE UNIVERSITY

COLLEGE OF HUMAN ECOLOGY — EAST LANSING, MICHIGAN 48824
DEPARTMENT OF HUMAN ENVIRONMENT AND DESIGN

We are involved in the design of clothing to meet the needs of agricultural workers today. Your answers to the following questions will aid us in our designing.

Please read each question carefully and answer as accurately as possible. It is important that you ANSWER ALL OF THE QUESTIONS. Your prompt return of the questionnaire in the postage paid envelope provided will be appreciated.

Sincerely,

Jacquelyn Orlando	Maureen Sweeney
Associate Professor	Graduate Assistant

1. What type of farm do you operate? Check as many as apply:
   1. ___ fruit
   2. ___ field crops
   3. ___ vegetable
   4. ___ livestock
   5. ___ dairy

   What is the total acreage of your farm operation in use?
   1. ___ under 50
   2. ___ 50-99
   3. ___ 100-179
   4. ___ 180-259
   5. ___ 260-499
   6. ___ 500-999
   7. ___ 1,000-1,999
   8. ___ 2,000 and over

   What is your age?
   1. ___ under 25
   2. ___ 25-34
   3. ___ 35-44
   4. ___ 45-54
   5. ___ 55-64
   6. ___ 65 and over

   Check the highest level of education completed.
   1. ___ eighth grade
   2. ___ high school
   3. ___ some college or business school
   4. ___ Associate or 2-year degree
   5. ___ 4-year college degree
   6. ___ advanced degree

   Who is involved in pesticide application on your farm? Check as many as apply:
   1. ___ myself
   2. ___ part time employee
   3. ___ full time employee
   4. ___ my spouse
   5. ___ my children
   6. ___ other relative
   7. ___ commercial applicator
   8. ___ other ____________________

II. Please indicate your response by placing a check in the appropriate column.

	Always	Almost Always	Sometimes	Almost Never	Never
1. I select clothing for protection when applying pesticides.					
2. I would attend a local meeting that included in its agenda a presentation and demonstration of protective clothing for pesticide users.					
3. I would wear protective clothing while applying pesticides if I knew I would be comfortable in hot weather.					
4. Agricultural friends and neighbors are often good sources for finding out about new products or methods.					
5. Clothing worn while applying pesticides becomes contaminated by the pesticide.					
6. It is important that special, protective clothing be available to all pesticide users.					
7. When applying pesticides in hot weather, I select clothing for comfort.					
8. In the sale of poisonous products, pesticide manufacturers should include protective coverings for users.					
9. I change my clothes after working with pesticides and before going on to other work.					
10. Clothing that would be protective yet comfortable in both warm and cool temperatures would be highly suitable for pesticide users.					
11. A worker should have separate clothing for working with poisonous substances.					
12. If my neighbor or good friend told me how satisfied he was with a new garment for pesticide protection, I would consider purchasing the same garment.					
13. In extremely hot weather, I wear as little clothing as possible when applying pesticides.					
14. I purchase some clothing to wear only when working with pesticides.					
15. I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.					
16. Workers involved in the application of pesticides demand clothing that is comfortable.					

	Always	Almost Always	Sometimes	Almost Never	Never
17. I would try protective clothing for pesticide users if I didn't have to pay for it.					
18. Clothing worn when working around pesticides should not allow seepage should spills occur.					
19. Pesticide users demand clothing that protects the body from pesticide exposure.					
20. Protective clothing and equipment currently available for pesticide users are hot and bothersome.					
21. My clothing provides me with protection from pesticide penetration (due to spills or heavy exposure).					
22. Agricultural publications aid the farmer is providing detailed description of new products.					
23. Pesticide users should be more concerned about the dangers of pesticides to themselves.					
24. If protective garments for pesticide users were displayed at a farm equipment sales show which I was at, I would examine the garments.					
25. Agricultural workers should participate in the various local meetings held by growers and extension services to keep abreast of the latest predictions and practices.					
26. I would purchase protective clothing made specially for pesticide users if it were available in stores where I buy my work clothes.					
27. If the agricultural publication that I read most often had an article on protective clothing, and highly praised and recommended a certain new line, I would purchase the clothing.					
28. The exposure that occurs when handling pesticides could be harmful to the body.					
29. I wear clothing that covers my arms and legs when applying pesticides.					
30. Attending farm equipment sales shows helps to keep farmers aware of recent inventions and their availability.					
31. In general, I am in favor of protective clothing for pesticide users.					

APPENDIX C

FINAL QUESTIONNAIRE USED IN STUDY

MICHIGAN STATE UNIVERSITY

COLLEGE OF HUMAN ECOLOGY — EAST LANSING • MICHIGAN • 48824

DEPARTMENT OF HUMAN ENVIRONMENT AND DESIGN

We are involved in the design of clothing to meet the needs of agricultural workers today. Your answers to the following questions will aid us in our designing.

Please read each question carefully and answer as accurately as possible. It is important that you **answer ALL of the questions.** Your prompt return of the questionnaire in the postage paid envelope provided will be appreciated.

Sincerely,

Jacquelyn Orlando

Jacquelyn Orlando
Associate Professor

Maureen Sweeney

Maureen Sweeney
Graduate Assistant

I. What type of farm do you operate? Check as many as apply:

1._____ fruit
2._____ field crops
3._____ vegetable
4._____ livestock
5._____ dairy

What is the total acreage of your farm operation in use?

1._____ under 50
2._____ 50-99
3._____ 100-179
4._____ 180-259
5._____ 260-499
6._____ 500-999
7._____ 1,000-1,999
8._____ 2,000 and over

What is your age?

1._____ under 25
2._____ 25-34
3._____ 35-44
4._____ 45-54
5._____ 55-64
6._____ 65 and over

Check the highest level of education completed.

1._____ eighth grade
2._____ high school
3._____ some college or business school
4._____ Associate or 2-year degree
5._____ 4-year college degree
6._____ advanced degree

Who is involved in pesticide application on your farm? Check as many as apply:

1._____ myself
2._____ part time employee
3._____ full time employee
4._____ my spouse
5._____ my children
6._____ other relative
7._____ commercial applicator
8._____ other _______________

II. **Please indicate your response by placing a check in the appropriate column.**

	Always	Almost Always	Sometimes	Almost Never	Never
1. I select clothing for protection when applying pesticides.					
2. I would attend a local meeting that included in its agenda a presentation and demonstration of protective clothing for pesticide users.					
3. I would wear protective clothing while applying pesticides if I knew I would be comfortable in hot weather.					
4. Agricultural friends and neighbors are often good sources for finding out about new products or methods.					
5. Clothing worn while applying pesticides becomes contaminated by the pesticide.					
6. It is important that special, protective clothing be available to all pesticide users.					
7. When applying pesticides in hot weather, I select clothing for comfort.					
8. In the sale of poisonous products, pesticide manufacturers should include protective coverings for users.					
9. I change my clothes after working with pesticides and before going on to other work.					
10. Clothing that would be protective yet comfortable in both warm and cool temperatures would be highly suitable for pesticide users.					
11. A worker should have separate clothing for working with poisonous substances.					
12. If my neighbor or good friend told me how satisfied he was with a new garment for pesticide protection, I would consider purchasing the same garment.					
13. In extremely hot weather, I wear as little clothing as possible when applying pesticides.					
14. I purchase some clothing to wear only when working with pesticides.					
15. I anticipate discomfort when I consider wearing special clothing or gear for protection while mixing or applying pesticides.					
16. Workers involved in the application of pesticides demand clothing that is comfortable.					

	Always	Almost Always	Sometimes	Almost Never	Never
17. I would try protective clothing for pesticide users if I didn't have to pay for it.					
18. Clothing worn when working around pesticides should not allow seepage should spills occur.					
19. Pesticide users demand clothing that protects the body from pesticide exposure.					
20. Protective clothing and equipment currently available for pesticide users are hot and bothersome.					
21. My clothing provides me with protection from pesticide penetration (due to spills or heavy exposure).					
22. Agricultural publications aid the farmer in providing detailed descriptions of new products.					
23. Pesticide users should be more concerned about the dangers of pesticides to themselves.					
24. If protective garments for pesticide users were displayed at a farm equipment sales show which I attended, I would examine the garments.					
25. Agricultural workers should participate in the various local meetings held by growers and extension services to keep abreast of the latest predictions and practices.					
26. I would purchase protective clothing made specially for pesticide users if it were available in stores where I buy my work clothes.					
27. If the agricultural publication that I read most often had an article on protective clothing, and highly praised and recommended a certain new line, I would purchase the clothing.					
28. The exposure that occurs when handling pesticides could be harmful to the body.					
29. I wear clothing that covers my arms and legs when applying pesticides.					
30. Attending farm equipment sales shows helps to keep farmers aware of recent inventions and their availability.					
31. In general, I am in favor of protective clothing for pesticide users.					

APPENDIX D

LETTER ACCOMPANYING SECOND MAILING

MICHIGAN STATE UNIVERSITY

COLLEGE OF HUMAN ECOLOGY
DEPARTMENT OF HUMAN ENVIRONMENT AND DESIGN

EAST LANSING • MICHIGAN • 48824

Your needs as an agricultural worker in Michigan are the main concern of our research at Michigan State University. We are urgently requesting your response to the enclosed questionnaire so that we can include your needs and preferences in clothing we are designing with the pesticide applicator in mind. We need your input so that we may come up with a design that is not only comfortable and protective, but accepted by the agricultural worker as well.

We are encouraged by the responses we have received so far, but it is vital to this project that we get your response. Please take a couple of minutes right now to fill out the questionnaire, seal it in the enclosed envelope and drop it in the mail box.

Sincerely,

Jacquelyn Orlando

Jacquelyn Orlando
Associate Professor

Maureen Sweeney

Maureen Sweeney
Graduate Assistant

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