

Evaluating Feasibility and Effectiveness of The Self-Learning CD-ROM Developed as A Tool to Promote The Kitchen Garden Concept among The Rural Households in Sri Lanka

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Abstract— Home gardening has been identified as a successful mean to improve household food security in resource poor communities. “Kitchen gardening” is a concept of home gardening with less inputs and minimal production factors. This research project was conducted with the main objective of evaluating the instructional CD-ROM which was developed as a self-directed learning material to promote and disseminate the “kitchen garden” concept to address the household level food insecurity in rural communities in Sri Lanka. Lack of knowledge of the rural communities on home gardening is a major constraint to enhance household level food security. The CD-ROM technology can be applied as a cost effective and potential mean to raise the awareness of the rural households on home gardening. Prior to the production of the CD-ROM, a preliminary survey with a sample of 60 randomly selected households from three purposively selected GN divisions in the Central Province of Sri Lanka was conducted to investigate the feasibility of using the CD-ROM multimedia technology as a tool to disseminate agricultural information among the rural households, and to identify the content and the desired presentation style of the CD-ROM to make it more attractive to the target group. Thirty five randomly selected households from the same GN divisions were selected to evaluate the CD-ROM by comparing the knowledge and perceptions of the sample respondents on home gardening before and after the exposure to the CD-ROM. The majority (80%) of the rural households in Sri Lanka owns a CD/DVD player. Nearly 43% of the respondents suggested that the self learning CD-ROM is an excellent method to disseminate agricultural information. The findings of the research disclose that the level of knowledge of the respondents on all aspects of the “kitchen garden” concept has significantly changed as per the “Wilcoxon signed rank” test. The pre-test further reveals that the interest towards home gardening of the rural households has increased from 41% to 72% after the exposure to the contents of the CD-ROM. The study reveals that the CD-ROM is capable of disseminating information and motivating people towards home gardening. Recommendations can be made to improve the production by incorporating interactive features and more information on other methods of home gardening under different contexts. Tamil version of the CD-ROM would be needed to expand its potential user base.

Keywords— CD-ROM; Self learning; Kitchen garden

I. INTRODUCTION

Food insecurity is one of the major problems faced by the under developed and developing countries in the third world. Food security is affected by interrelated social issues such as poverty, inferior health conditions, low production, short supply and unfair distribution of food, political instability, poor infrastructure, low access to markets and natural hazards etc. Although addressing all these issues simultaneously to eliminate food insecurity sounds impractical, measures could be brought forward to address the most prominently existing issues to suppress the

detrimental impacts of food insecurity and to initiate the eradication process with a sustainable start.

Households in rural communities could be introduced with low input technologies of food production to help them combat the adverse effects of food insecurity. The idea here is to make them fully or partially self-sufficient in their food requirements. “Kitchen gardening” is such an economically feasible concept of home gardening that can be practiced by the rural communities struck by poverty.

A. Problem Statement and Justification

Agricultural field staff is limited in Government, Non-Government and private sectors to satisfy the demand for

agricultural information requirement, developed within the rural level. Lack of knowledge and low income of rural households are directly connected with the inability of access to balanced and nutritional meals by the rural communities intensified by the increase of living cost in Sri Lanka. Land fragmentation can also be identified as a problem that can have an impact on food security which limits the capacity of the rural households in producing their own food within their lands. Demographic and Health Survey and other major national household surveys conducted in 2010 in Sri Lanka, indicate 17% of infants with low birth weight and 21 % of under-fives suffering from underweight. World Bank report released in 2011 shows, there are at least 15 houses within one acre of land as a result of land fragmentation in Sri Lanka. The requirement of educating rural households on self-food production techniques within limited resources such as land, inputs and credit is highly felt in the efforts of ensuring food security. At the same time, cost effective and viable IT based solutions and alternatives are needed to be sought out as channels of information dissemination to overcome the constraints resulted due to limited field level extension staff.

To improve the knowledge of households on kitchen gardening, several types of feasible technological methods can be applied to disseminate information. Self-learning CD-ROM is one of such methods that can be used to disseminate information among the rural communities and to improve their knowledge and change their attitudes on home gardening. Households can self-learn through the CD-ROM and apply kitchen garden concept in their back yards.

B. "Kitchen Garden" Concept

Households can produce their own vegetable requirements in backyards using available fresh water as well as kitchen and bathroom wastewater. "Kitchen gardening" is a concept of home gardening that demands for less inputs and minimal production factors. Kitchen garden concept applies the traditional methods of controlling pests and diseases with non-use of agro chemicals. This concept is based on maximum space utilization as the whole kitchen garden could be limited to a small land area of 15 feet² which can however fulfil many food requirements of the family of four members. "Kitchen garden" concept can also be identified as an initial step of developing a home garden. Thus the two words are interchangeably used in this paper.

C. Self-Learning CD-ROM Technology to Promote Kitchen Garden Concept

The CD-ROM technology can be applied as a cost effective and potential mean to raise the awareness of the rural households on home gardening practices. This method is cost effective compared to other extension methods such as information dissemination through extension officers, however this method alone will not be effective as this method demands for technological requirements such as equipment's to play the CD-ROM and certain knowledge to operate the equipment's. Thus this method can be complementarily used with other extension methods of information dissemination to raise the effectiveness of the local extension service available for rural communities.

This study entails two phases; research and product development. Under the product development component, a

self-learning CD-ROM on "Kitchen gardening" was methodologically produced. The research component was directed towards the identification of the pre-requisites and the format to design the product and to evaluate the level of suitability of the product as a tool to disseminate information on kitchen gardening as well as a tool to motivate the rural households toward home gardening. This paper attempts to discuss the findings revealed through the research component which align with the following specific objectives.

- 1) Assessing the status of knowledge and perception among the members of rural households on "kitchen/home gardening".
- 2) Assessing the viability of the self-learning CD-ROM as a self-directed learning/training material.
- 3) Identifying the content and presentation style of the self-learning CD-ROM.
- 4) Evaluating the effectiveness of the CD-ROM by comparing the knowledge and perceptions of the rural households on home gardening before and after the exposure to the CD-ROM.

II. METHODOLOGY

The Research phase consists with three major steps namely; situation analysis, need identification through preliminary survey and pre test. Pre- test involves both pre and post evaluations.

A. Situation Analysis

Situation analysis was conducted to identify the problems and issues that have an impact on household food security and agricultural information dissemination in Sri Lanka. A comprehensive literature survey backed by key informant interviews was conducted in this analysis.

B. Need Identification; Preliminary Survey

Need identification was done through a cross-sectional survey backed by key informant interviews, researchers own observations and other secondary data sources such as reports of the Department of Census and Statistics, research publications etc. The preliminary survey attempted to assess the accessibility and the viability of the CD-ROM as a tool of information dissemination among the rural households in Sri Lanka, and to identify the content and presentation style of the CD-ROM. The key informant interviews were conducted with the audio-visual material production experts at the Audio Visual Center attached to the Department of Agriculture, officers at Agrarian Service Centers attached to the Department of Agrarian Development and *Grama Niladari* officers (local administrative officers) of the study area. Major variables of the study tested through the survey were formulated on adult learning, self-directed learning and multimedia principles in addition to other general variables. The sample of 60 respondents of the preliminary survey was randomly selected from three GN (*Grama Niladari*) divisions in Central Province of Sri Lanka. Those GN divisions were Ambakote, Gonawala and Hunnasingiriya. GN divisions were purposively selected considering the prevalence of poverty, density of agricultural households and exposure to innovations by the households.

C. Pre-test

Pre test involved with both pre and post evaluations. Pre-test sought to identify the level of knowledge and perception of the respondents on home gardening prior to the exposure to the CD-ROM and after the exposure to the CD-ROM. Pre evaluation was conducted with the respondents before they got exposed to the self learning CD-ROM whereas the post evaluation was conducted with the same group of respondents after they got exposed to the self learning CD-ROM. Pre test was also conducted in the three GN divisions that were selected for the preliminary survey. Total number of 35 households were randomly selected for the cross sectional survey. Two semi structured questionnaires were prepared for the pre-test. The questions of the two questionnaires coincide with each other to facilitate comparison in analysis. Observations made by the researchers were also used as a primary data collection source. Various secondary data sources were made use to collect secondary data in aid of the study objectives. Statistics of the World Bank reports, reports of the Department of Census and Statistics, reports of the FAO and research journals were the main sources of secondary data.

D. Data Analysis

Before analyzing the data, they were cross-checked for accuracy and reliability. Data were analyzed with the assistance of a computer software package; Statistical Package for Social sciences (SPSS). Descriptive statistics; mean, “Wilcoxon signed rank” test, frequency tables were used to conclude the data with inferential statistics.

III. RESULTS AND DISCUSSION

The content of the CD-ROM was identified by analyzing the variables such as level of knowledge, time duration of the CD-ROM and literacy of households. Presentation style was identified through the preliminary survey by analyzing the variables such as respondents' preference on style of narration, type of narrator, language and background music. The feasibility of the CD-ROM technology in dissemination of information among the rural households were measured by analyzing the variables such as possession of a CD/DVD player, ability to self operate the CD/DVD player and social behavior in watching TV.

A. Demographic Characteristics of the Sample

According to the results obtained from the preliminary survey, 51% of the sample consisted of female respondents. As shown in Table I, most of the respondents (44%) were 51-60 years old and more than half of the sample respondents belonged to the middle age category.

TABLE I
AGE DISTRIBUTION OF RESPONDENTS.

Age category	Percentage %
21-30	18
31-40	8
41-50	16
51-60	44
61-70	14

As per the Fig. 1, majority of the respondents (31.4%) had only received primary level education and more than half of the sample had undergone at least 11 years of schooling up to G.C.E. O/L indicating a high level of literacy among the respondents of the sample.

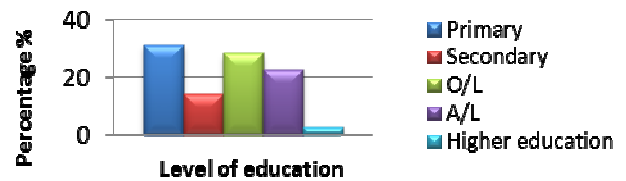


Fig. 1 Education Level of Respondents.

B. Accessibility and Viability of the CD-ROM Technology in Information Dissemination

Nearly 71% of the rural households in Sri Lanka had the access to technical equipments to take the information via digital media. (Department of Census and Statistics, 2006) According to a report published by the Department of Census and Statistics in 2009/2010, 79.3% of the Sri Lankan households had their own televisions, 33.5% had their own CD/DVD players, 11.2% had multimedia computers and 70.1% had mobile phones to access information. Thus, applications of Information Technology can be effective in disseminating information to fill the information gap exists in rural areas in Sri Lanka.

As stated in the Fig. 2, majority of the rural households (47%) preferred to find agricultural information regarding home gardening via television. This proves the enormous possibility of using mass media such as TV in information dissemination which has not been yet fully utilized in Sri Lanka as a channel of distributing agricultural information.



Fig. 2 Information sources preferred by the rural households to receive information on home gardening/kitchen gardening.

However as per the Fig. 3, the interest of the rural households on agricultural programs telecasted in TV is low compared to other programs such as news and teledramas. This could be due to the low frequency of agricultural program telecasted and the low level of entertainment and target orientation of such programs.

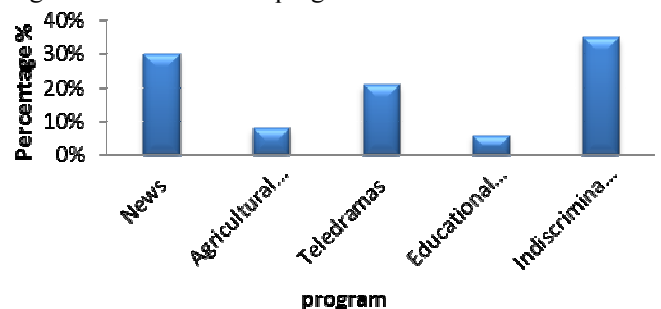


Fig. 3 Level of interest on television programs among rural households.

According to the preliminary survey results, 80% of the households had their own CD or DVD players in contrast to

the report of the Department of Census and Statistics which had given the same figure as 33.5%. This indicates the level of accessibility to CD-ROM technology by the Sri Lankan rural population. Majority of the respondents (62.8%) had ability to self operate the CD or DVD players. This further indicates the high possibility to apply CD-ROM technology in information dissemination. Self learning CD-ROM can increase the interest among rural households on agricultural programs as it has many advantages over other conventional TV learning programs. The choice of watching time, ability to watch the same program repeatedly, ability to navigate the program and skip watching the unwanted parts are the major advantages of the CD-ROM over other conventional TV programs.

C. Selecting the Content of the CD-ROM

As per the Fig. 4, majority of the households (84%) were interested in learning and being motivated by true stories. According to this interest of the respondents, the CD-ROM content was developed based on a true story happened in Deegawapiya in Digamadulla district which has been given as a success story of a lady who brought success to her family by engaging in home gardening. The reason as to why many households preferred true stories would be the fact that adults are result oriented and seek to avert risk by investigating into others experience to calculate the outcomes.

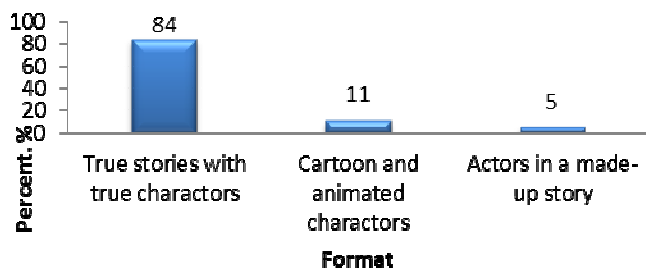


Fig. 4 Preferred presentation formats of the respondents.

Majority of the respondents preferred the program to run for thirty (30) minutes, thus the CD-ROM content was compressed to 25-30 minutes.

The technical content of the CD-ROM was selected by interviewing rural households, home gardening trainers and technical experts in AV material production.

D. Selecting the Presentation Style of the CD-ROM

In order to identify the narration style, a simple method was used based on the different styles of news delivery telecasted by different TV channels in Sri Lanka. Respondents were asked to select the most interesting style of news presentation that they have experienced during the past year. As per the Fig. 5, majority of the rural households (39%) were interested in the presentation of news by “Swarnawahini” which is a local TV channel. The presentation of news by this particular channel is simple and dramatic. They also use much colloquial terms in delivering news. As per the responses by the sample respondents, the narration in the self learning CD-ROM was done using simple-colloquial terms.

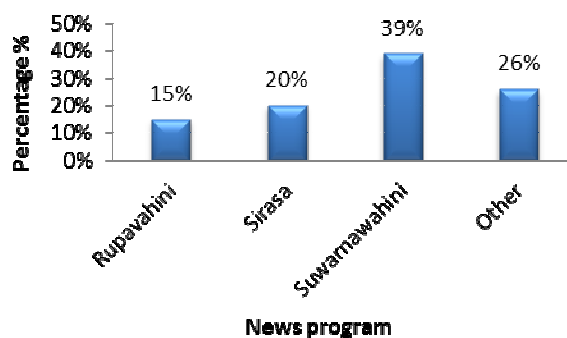


Fig. 5 Preference on news programs telecasted by local television channels in terms of style of presentation.

Majority of the households (87%) were interested in both male and female combined narration style (Fig. 6). As per the finding, the CD-ROM was narrated by both male and female narrators.

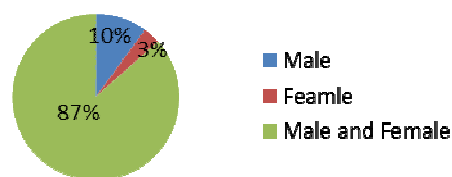


Fig. 6 Type of narrator that preferred by the rural households.

As per the Fig. 7, majority of the respondents (47%) were interested in having a classical type of music in the background. This interest was verified by the AV material production experts. Based on this result, a classic and light music was included in the background to treat the message with entertainment without distracting the educational message.

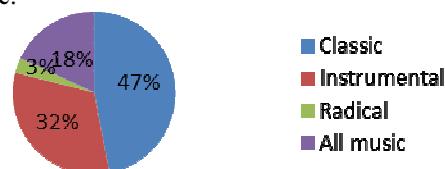
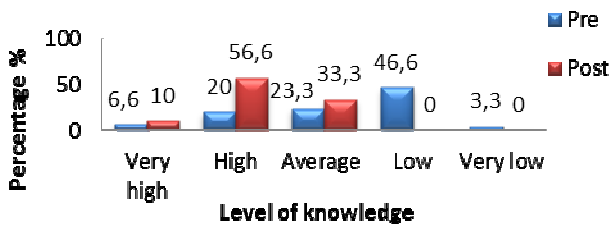


Fig. 7 Interested music categories of the households.

E. Effectiveness of the Developed CD-ROM

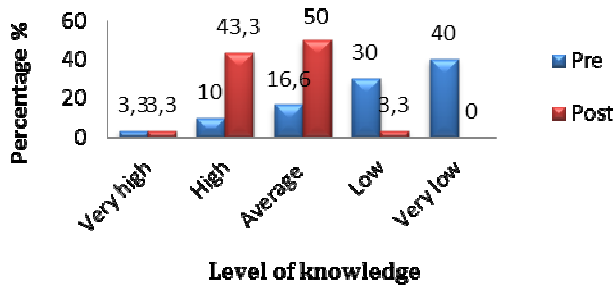
As mentioned earlier, pre test was conducted to identify the effectiveness and the households’ perception on developed self learning CD-ROM. It was conducted in two steps, such as pre and post evaluations. Majority of the rural households (60%) had not been interested in home gardening activities prior to the exposure to the self learning CD-ROM, but after the exposure, majority of them (71.6%) had developed an interest towards home gardening. As per the Fig. 8, majority of the respondents’ knowledge about the compost preparation (46.6%) was in “low” level before the exposure to the self learning CD-ROM, but after the exposure, Majority of the households (56.6%) stated that their knowledge rose to high level about the compost preparation.



Z	-5.201 (a)
Asymp. Sig. (2Tailed)	.002

Fig. 8 Change in knowledge of the respondents on compost preparation.

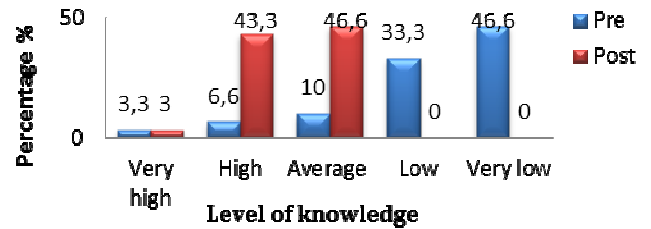
Wilcoxon signed rank test indicates that the two medians of the pre and post conditions of the sample are significantly different at $P = 0.01$. Thus, it is safe to conclude that the CD-ROM helped them to increase their knowledge on compost making. As per the Fig. 9, 10% of the respondents indicated to have a high level of knowledge about the fence method in compost preparation prior to the exposure to the CD-ROM, but after the exposure to the CD-ROM the same figure escalated to 43.3% indicating a significant change of the respondents' knowledge on home gardening after watching the CD-ROM. The significance of the change is verified by the Wilcoxon signed rank test as the two medians of the pre and post conditions of the sample are significantly different at $P = 0.01$.



Z	-5.184 (a)
Asymp. Sig. (2Tailed)	.003

Fig. 9 Change in knowledge of the respondents on the fence method in compost preparation.

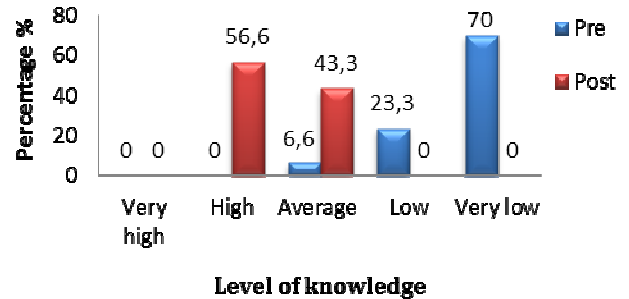
Majority of the respondents stated to have a very low knowledge on liquid fertilizer preparation prior to the exposure to the CD-ROM, however the figures drastically changed after respondents being exposed to the CD-ROM (Fig. 10). Majority of the respondents stated that their knowledge increased to "high" and "average" levels from "very low" and "low" levels.



Z	-4.841 (a)
Asymp. Sig. (2Tailed)	.002

Fig. 10 Change in knowledge of the respondents on liquid fertilizer preparation.

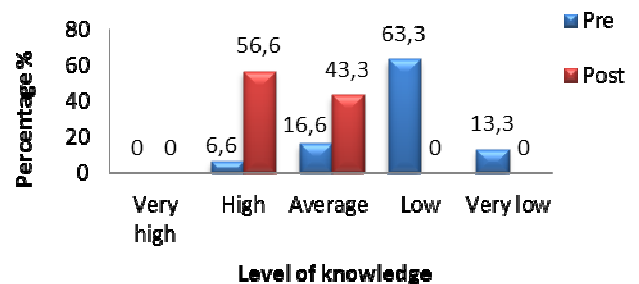
As per the Fig. 11, before the exposure to the self learning CD-ROM majority of the households (70%) indicated to have a low level of knowledge about the wormy wash preparation, but after the exposure to the CD-ROM, majority (56.6%) of the households mentioned that their knowledge was at high level.



Z	-5.140 (a)
Asymp. Sig. (2Tailed)	.003

Fig. 11 Change in knowledge of the respondents on wormy wash preparation.

As per the Fig. 12, before the exposure to the self learning CD-ROM, 63.3% of the respondents claimed to have low level of knowledge about traditional pest control methods, but after the exposure to the self learning CD-ROM, 56.6% of the respondents stated that their level of knowledge was at higher level on traditional pest controlling methods. These figures indicate that the CD-ROM is effective in filling the information gap of the rural households on combating household level food insecurity.



Z	-5.140 (a)
Asymp. Sig. (2Tailed)	.003

Fig. 12 Change in knowledge of the respondents on traditional pest control methods.

The research attempted to assess the perceptual changes of the respondents on various applications on home gardening as a result of the exposure to the CD-ROM. Mere change of knowledge and skills alone cannot promote the adoption of desired technologies by the rural communities unless changing the negative and undesirable attitudes that prevent people from practicing and continuing certain technologies new to them.

As per the Fig. 13, households' perception about the applicability of traditional pest control methods was majorly at "poor" perception levels (71.3%) as indicated by "not practical" (28.5%) and "doubtful" (42.8) before the exposure to the self learning CD-ROM, but after the exposure to the self learning CD-ROM, majority of the households stated that the application of traditional pest control methods which are very instrumental in home gardening as "very practical" (25.7%) and "practical" (54.2%). This indicates the CD-ROM's strength in addressing the perceptions of the rural households.

Wilcoxon signed rank test indicates that the two medians of the pre and post conditions of the sample are significantly different at $P = 0.01$. It is safe to conclude that the CD-ROM helped to change their perception of the respondents on the application of traditional pest control methods.

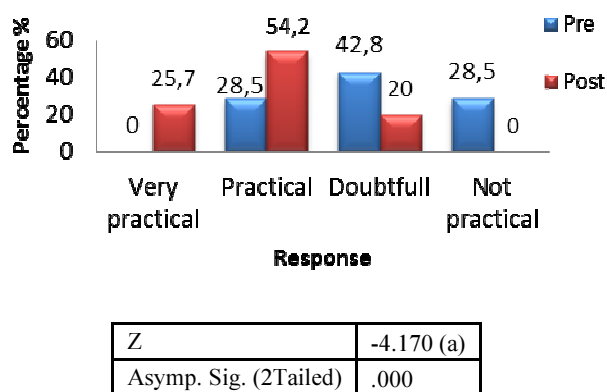
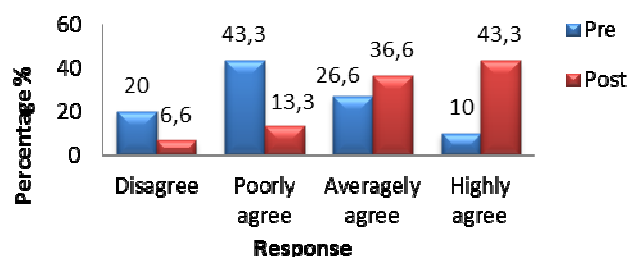


Fig. 13 Change in perception of the respondents on the application of traditional pest control methods in kitchen gardening.

The researcher again attempted to investigate the change of perceptions of the rural households on another aspect of home gardening. That is availability of land which is generally considered as a limiting factor, although it could be challenged through properly managed home gardening on the principles of maximum space utilization. The CD-ROM attempts to instruct the users on techniques to utilize the space at maximum in kitchen gardening.

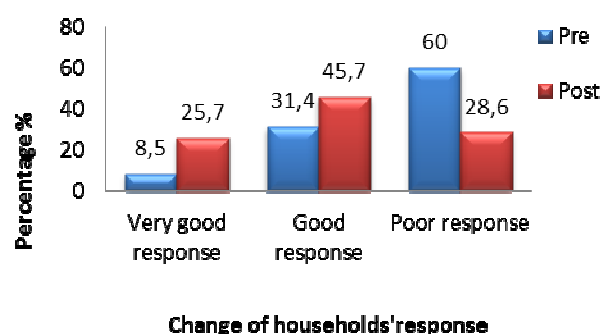
As show in Fig. 14, before the exposure to the self learning CD-ROM, majority of the households (43.3%) had a poor perception on the faith on possibility to initiate a kitchen garden in an area of 15 feet², but after the exposure to the self learning CD-ROM, 36.6 % of the respondents agreed and 43.3% highly agreed that a home garden could be established within a limited land space of 15 feet² area. The significant change of the faith of the respondents is verified by the Wilcoxon signed rank test as the two medians of the pre and post conditions of the sample are significantly different at $P = 0.01$.



Z	-4.468 (a)
Asymp. Sig. (2Tailed)	.000

Fig. 14 Change in perception of the respondents on the ability to initiate a kitchen garden in an area of 15 feet²

The respondents were inquired about the uses of a well prepared home garden before and after the exposure to the self learning CD-ROM. As shown in Fig. 15, before the exposure to the self learning CD-ROM, 60% of the respondents indicated to have a poor knowledge on the uses of a well prepared home garden, but after the exposure to the self learning CD-ROM, majority (71.4%) of the respondents indicated to have good and very good levels of knowledge on the uses of a well prepared home garden. The significant change of the knowledge on the uses of a home garden of the respondents is verified by the Wilcoxon signed rank test as the two medians of the pre and post conditions of the sample are significantly different at $P = 0.01$. These figures indicate that the CD-ROM is effective in improving the knowledge as well as changing the attitudes of the households.



Z	-4.031 (a)
Asymp. Sig. (2Tailed)	.000

Fig. 15 Response of the households about the uses of well prepared home garden.

Majority (60%) of the households indicated to have low level interest to involve in home gardening before the exposure to the CD-ROM, but a considerable number of households among this majority (31.6%) stated that they got an interest to involve in kitchen gardening after the exposure to the self learning CD-ROM. This indicates the strength of the self learning CD-ROM in changing the attitudes of the households to involve in home gardening.

The pre-test results further proved that 20% of the households had watched the CD-ROM for more than two times within 24 hours. This indicates that that the delivery of the technical message has been effective and the households generally find it interesting to watch.

As per the Fig. 16, majority of the respondents (74.2%) had watched the CD-ROM with their children and/or other family members while 8.5% of the respondents had watched it with neighbors. This indicates the possibility of using the CD-ROM technology to disseminate information targeting families and community groups. Home gardening is an activity that requires the efforts of all family members, thus this social behavior in watching the CD-ROM is a good indication of its effectiveness in meeting the objectives.

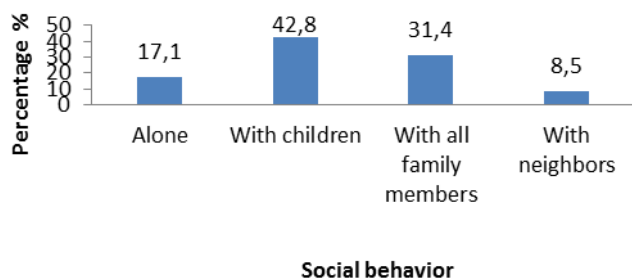


Fig.16 Social behavior of watching the CD-ROM.

As per the Fig. 17, more than half of the sample (54%) respondents had discussed about the contents of the CD-ROM with their neighbors within 24 hours of being exposed to the CD-ROM. This indicates that the CD-ROM technology could be a possible alternative to overcome the limitation of lack of field staff to disseminate agricultural information to rural communities where as rural households seem to share information among each other on the knowledge gained through the CD-ROM.

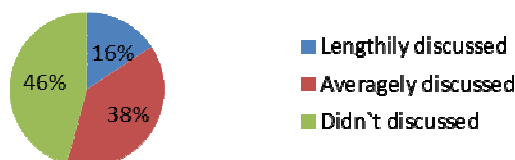


Fig. 17 Percentage of respondents who talked about the CD-ROM content with their neighbors.

As per the Fig. 18, 43% of the respondents claimed that their neighbors watched the self learning CD-ROM after hearing from them. This indicates the strength of the CD-ROM technology in disseminating information to a wider audience as it can be easily shared.



Fig. 18 Percentage of respondents whose neighbors watched the self learning CD-ROM after hearing from them.

As per the Fig. 19, majority of the respondents (43.33%) indicated self-learning CD-ROM as an excellent method to

disseminate agricultural information to rural households. This further proves the preference of the rural communities in using CD-ROMs to obtain information.

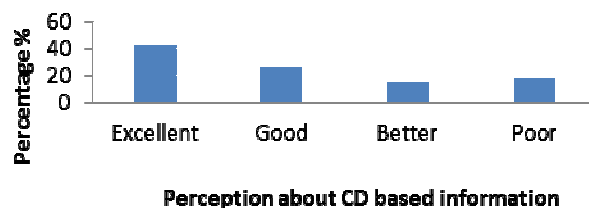


Fig. 19 Households' response about dissemination of Agricultural Information via CD-ROM technology.

IV. CONCLUSIONS AND RECOMENDATIONS

The self learning CD-ROM is a feasible and viable tool to disseminate information about the kitchen garden concept and other agricultural information to the rural households, given the fact that the infrastructure requirements for IT based dissemination channels have rapidly developed in rural settings during the last decade

Wilcoxon signed rank test indicates that the level of knowledge of the respondents on the areas such as land preparation, soil testing, compost making, liquid fertilizer preparation, production of plant growth hormones and traditional pest control methods have significantly increased after the exposure to the self learning CD-ROM. The research also reveals that the CD-ROM could change not only the level of knowledge, but also the attitudes of the respondents to a satisfactory level on different aspects of home gardening.

After the exposure to the CD-ROM, 72% of the rural households had developed an interest to initiate a kitchen garden. Thus this study concludes that the CD-ROM has a good effect in motivating people towards home gardening.

This study concludes that the presentation style and the content of the CD-ROM have to follow certain standards to make its acceptance by the rural households effective. Narration must be simple and should be presented using a colloquial vocabulary and personalized way of addressing the target group.

The study also revealed that presentation of facts using a true story had been very effective as the rural people prefer to learn by observing the behavior and experience of their colleagues. This helps them to avert risk and implement a certain practice with high level of self confidence.

This interactive self learning CD-ROMs also can be used as a teaching material in training groups of community members. The CD-ROM can bring more results if it could be combined with other methods of teaching adults in groups.

It is recommended to Produce a Tamil version of the self learning CD-ROM (dubbed or with Tamil subtitles) to reach Tamil community in order to expand the user base of this product.

It is also recommended to disseminate the digital content of the CD-ROM, not only via compact disks, but also through television to reach rural households who do not have

the access to a CD/DVD player. Since mobile phones are used even by the rural young crowd abundantly, opportunities could be sought out to disseminate the content of this CD-ROM via mobile applications.

Improving the production by incorporating interactive features and more information on other methods of home gardening under different contexts will be highly effective.

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