

## ปัจจัยที่มีผลในการยอมรับวิธีการปฏิบัติในการผลิตยางพาราของเกษตรกรสวนยางขนาดเล็ก อำเภอหาดใหญ่ จังหวัดสงขลา

อภิญญา รัตนไชย<sup>1</sup> และจำนงรักษ์ อุดมเศรษฐ์<sup>2</sup>

<sup>1</sup>วท.ม. (ส่งเสริมการเกษตร), ผู้ช่วยศาสตราจารย์,

ภาควิชาพัฒนาการเกษตร คณะทรัพยากรธรรมชาติ, มหาวิทยาลัยสงขลานครินทร์

E-mail: apinya.r@psu.ac.th

<sup>2</sup>วท.ด. (การสื่อสารเพื่อการพัฒนา), รองศาสตราจารย์,

ภาควิชาส่งเสริมและนิเทศศาสตร์เกษตร คณะเกษตร มหาวิทยาลัยเกษตรศาสตร์

### บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์สำคัญเพื่อศึกษา 1) ลักษณะทั่วไปของเกษตรกรสวนยางขนาดเล็กในอำเภอหาดใหญ่ 2) ปัจจัยที่มีผลในการยอมรับวิธีการปฏิบัติในการผลิตยางพาราของเกษตรกร 3) ปัญหาและข้อเสนอแนะของเกษตรกรในการยอมรับวิธีการปฏิบัติในการผลิตยางพารา โดยมีกลุ่มตัวอย่างจำนวน 128 ครัวเรือนจาก 7 ตำบล เครื่องมือในการเก็บข้อมูลคือ แบบสัมภาษณ์ สถิติที่ใช้วิเคราะห์ข้อมูลคือ ค่าความถี่ ค่าร้อยละ ค่าเฉลี่ย และโคสแควร์ ผลการวิจัยพบว่า ปัจจัยที่มีผลต่อการยอมรับวิธีการปฏิบัติในการผลิตยางพาราของเกษตรกรสวนยางขนาดเล็ก ได้แก่ ขนาดของพื้นที่ปลูกยางพาราและการเป็นสมาชิกกลุ่มมีผลต่อการยอมรับการทำยางแผ่นของเกษตรกร อย่างมีนัยสำคัญทางสถิติที่ระดับความเชื่อมั่น 0.05 ส่วนรายได้มีความสัมพันธ์กับการยอมรับในเรื่องการกรีดยางที่ระดับความเชื่อมั่น 0.05 และมีความสัมพันธ์กับการยอมรับการทำยางแผ่นอย่างมีนัยสำคัญที่ระดับความเชื่อมั่น 0.01 เกษตรกรมีข้อเสนอแนะที่สำคัญคือ ให้มีการถ่ายทอดข้อมูลข่าวสารเกี่ยวกับยางพาราผ่านสื่อต่าง ๆ ให้มากขึ้น

คำสำคัญ: การยอมรับ, การผลิตยางพารา, สวนยางขนาดเล็ก

**RESEARCH ARTICLE**

## **Factors Affecting Adoption of Rubber Production Practices by Rubber Smallholders in Amphoe Hat Yai, Changwat Songkhla**

**Apinya Ratanachai<sup>1</sup> and Jumnongruk Udomsade<sup>2</sup>**

<sup>1</sup>M.S. (Agricultural Extension), Assistant Professor,  
Department of Agricultural Development, Faculty of Natural Resources,  
Prince of Songkla University, Hat Yai Campus  
E-mail: apinya.r@psu.ac.th

<sup>2</sup>Ph.D. (Development Communication), Associate Professor,  
Department of Agricultural Extension and Communication,  
Faculty of Agriculture, Kasetsart University, Bangkaen Campus

### **Abstract**

The main objectives of the study were to 1) identify the characteristic factors of rubber smallholders in Amphoe Hat Yai, 2) determine the relationship between characteristic factors and rubber production practices, and 3) identify the problems confronted by the rubber smallholders and the suggestions for improving adoption of rubber practices in rubber production. The respondents in 128 households were selected from 7 Tambons. Data were collected through an interview schedule, analyzed and presented for frequency, percentage, and arithmetic means. Chi-square test at 0.05 of significant level was used in data analysis. It was found that there existed relationship between land size and member in organization with the adoption of sheet-making practices by smallholders at 0.05 significant level. There were significantly relationship between income and the adoption of tapping at 0.05 significant level and with the adoption of sheet-making practices at 0.01 level of significant. Suggestions from all rubber smallholders were concerned with the need for more information transmitted via various media regarding rubber production.

**Keywords:** adoption, rubber production, rubber smallholder

### Introduction

Rubber is one of major economic crops in Thailand. Total rubber plantation area is estimated at 12.62 million rai and is the world's second largest producer in term of plantation area after Indonesia. However, Thailand has been a world largest producers un term of quantity of rubber natural. Rubber is one of the ten major exported commodities of Thailand, contributing around US\$ 5,207 million to the country's economy in 2006 (Thai Chamber of Commerce & Board of Trade of Thailand, 2006). At present, rubber is the economic crop which is important for 6 million or 10 percent of the total population (Department of Agriculture, 2007). About 97 percent of rubber planters in Thailand or more than 1 million plantations are small scale, and average holding size is between 13- 25 rai (Petcharat, 2004) and 87 percent of total rubber smallholders live in the south of country (Bangao, 2005). Around 36.07 percent of total product is the block rubber, 30.70 percent smoked rubber sheet and 28.75 percent rubber concentrated latex (Office of Agricultural Economic, 2007). Thus a large number of smallholders are either directly or indirectly dependent on rubber production for livelihood. Accordingly, rubber production generates a lot of revenue for the country and hence there is a need for rubber producers to take good care of their rubber trees.

### Problem Statement

In Songkhla, there are 3.08 million rai or 66.58 percent of agricultural area are compound of area of province. The rubber plantations cover about 2.07 million rai or 67.13 percent of the agricultural area (Office of Songkhla Agriculture, 2007). Rubber is

the major among the economic crops in the province.

The rubber plantation areas increase with population of the province (Songkhla Agricultural and Cooperatives Office, 2007). The rubber smallholders in Thailand have faced many problems as follows: low efficiency of rubber production, increasing cost of small-scale rubber production, low quality of raw rubber products, leading to low price and consequently low family income, and lack of the appropriate technology for rubber holders (Weerana, 2003). They need to adapt for suitable production practices such as good variety, correct planting distance, weed and disease control, fertilization and tapping practices that damage the trees (Sangrugsawong, 1996). One alternative for increasing farm production of rubber is to adopt the rubber practices. The study aimed to investigate the socioeconomic factors of rubber smallholders, their adoption of rubber practices, problems and factors associated with rubber smallholders' adoption of rubber practices.

### Objectives of the Study

1. To identify characteristic factors of rubber smallholders.
2. To determine the relationship between characteristic factors and adoption of practices in rubber production.
3. To identify problems faced by the rubber smallholders and to provide suggestions to the adoption of practices in rubber production.

### Scope and Limitations

This study focused on some characteristic factors, i.e., age, education, family labors, income,

credit, land size of rubber plantation, experience, and membership in organization. The study area does not represent all the rubber plantation area in Thailand. The result of study may not be applicable to other areas due to difference in economic conditions and situational factor.

### Definition of terms

**Characteristics of rubber smallholder** refer to the socio-economic characteristics of rubber smallholders such as age, education, family labors, income, credit, land size, experience, and membership in organization.

**Adoption of rubber practices** refers to the utilization and application of practices in rubber production.

**Rubber production practices** refer to rubber smallholder's practices from rubber planting to post-harvesting. Production process includes clone, planting, pruning or cultural practices, weed and disease control, fertilization, tapping, and sheet-making.

**Rubber smallholder** refers to the person who has rubber plantation area between 2-50 rai based on the Rubber Research Institute of Thailand's classification.

**Family labors** refers to the number of family members who work full-time in rubber production.

**Income** refers to the total income from sale of all rubber products.

**Experience** refers to number of years smallholders are involved in rubber production

**Land size** refers to area of rubber plantation owned in rai by rubber smallholders.

### Review of Related Literature

The adoption process is the mental process through which an individual passes from first hearing about an innovation to final adoption.

Rogers (1983) mentioned that the adoption process may be arbitrarily broken down into stages for conceptual purposes. This breakdown is 1) consistent with the nature of the phenomena, 2) congruent with previous research findings, and 3) potentially useful for practical applications. It should be pointed out that there are not necessarily only five stages in the adoption process. It is simply that at the present time there seem to be five main functions involved in the adoption process, and each of these is assigned to a stage. The number of stages in the process is selected primarily on the basis of ease of conceptualization. Either more or fewer stages might be postulated in the adoption process, but further subdivision needs to be pursued only if the fruitfulness of the analysis is enhanced.

Negatu and Parikh (1999) cited Feder et al. (1985) and Feder and Umali (1993) reported that farmers' decisions to adopt a new agricultural technology in preference to other alternative (old) technologies depend on complex factors. One of the factors was the farmers' perception of the characteristics of the new technology. Other factors which influence farmers' adoption were the conventional (traditional) ones: resource endowments, socio-economic status, demographic characteristics, and access to institutional services (extension, input supply, markets, etc.).

Somin (1993) studied agricultural information exposures of farmers from village broadcasting towers

in Changwat Nakhon Nayok. Result revealed that age, education level, membership of farmer groups were not significantly related to the agricultural information utilization. However significant differences were found in the relationship between incomes and the agricultural information utilization of the farmers.

Tekanate (1996) studied some factors affecting the farmer's adoption of the asparagus production technology in Amphoe Tamaka, Changwat Kanchanaburi. The results showed that there were significant relationship between ages, incomes, farm labors, cultivated area and the farmer's exposures with the farmer's adoption of the asparagus production technology at 0.05 level.

Geetha et.al. (2001) studied socioeconomic determinants of farmer oriented technology packages for sericulture. The study reported that factors like land size and mulberry under irrigation were independent and education was also insignificant. In addition, other socioeconomic variables like family form, family size, occupation status, experience in sericulture, extension support, yield, and income had positive significant correlation with the level of adoption.

Elwell (2002) reported that the obstacles to adoption of soil and water conservation practices in Central Africa are focused on the reasons for low adoption of conservation technologies by the smallholder sector. The smallholder farming is characterized by subsistent farmers living predominantly in the semiarid regions of Central Africa. Although the reasons for poor uptake of serve technologies are many and varied, the following shortcomings are considered to be major obstacles to the success of conservation programmes: lack of

government support, incorrect mode of technology development and transfer, farmer perceptions and socioeconomic constraints, and inappropriate aid.

### Hypotheses

A study needs to be conducted to answer the following questions: What are the characteristic factors affecting the adoption of production practices of rubber smallholders? Then the hypothesis of study is the characteristic factors of rubber smallholder is related to adoption of rubber production practices.

### Methodology

A total of 1,279 rubber smallholders from 7 Tambons are selected through simple random technique. Sample size was calculated to be ten percent and hence 128 samples were selected (Department of Agricultural Extension, 1985). Samples from each village were identified by proportional sampling and structured interview schedule was used for data collection. A pilot study was conducted with 30 rubber smallholders in Amphoe Namom not included in the sample before the study and minor changes were made in the interview schedule.

Data were collected during April and June 2005. Data were analyzed and presented for frequency, percentage, and arithmetic means. Chi-square test was employed to test hypotheses at 0.05 and 0.01 significance level.

### Results and Discussion

#### Characteristics of rubber smallholders

The preliminary information of the sample is summarized in Table 1. Almost half of the respondents at 47.66 percent were between 41 and 55 years old

while 34.38 percent of the smallholders were above 55 and only 17.97 percent were between 25 and 40. The majority of smallholders at 64.84 percent were educated at primary school level. Approximately 27.34 percent of the respondents obtained the secondary education, the remaining, 3.11 percent, were degree holders. Around 4.69 percent received no formal education.

Around half of the smallholders at 48.44 percent had 1 to 25 years of experience while 45.31 percent had 26 to 50 years of experience. Only 0.78 percent of the smallholders had more than 50 years. The majority of respondents at 67.19 percent cultivated rubber plantations of 1 to 15 rai. Approximately 22.66 percent of the respondents cultivated owned 16 to 30 rai, while 8.59 percent cultivated 31 to 45 rai. Only 1.56 percent cultivated lands measuring more than 45 rai. Owners around 98.40 percent cultivated on their own land. The smallholders at 60.16 percent had two members actively supported the rubber production while 17.97 percent of respondents had only one active supporters in the rubber plantation. The rubber smallholders around 11.72 percent did not have any member to support the rubber production. The smallholders 25.78 percent employed outside labor for rubber production.

The results also revealed that almost half of rubber smallholders at 44.53 percent earned the income from rubber production lower than 100,000 baht per year. About 25.00 percent of respondents had the income between 100,000 and 200,000 baht, while 14.06 percent received the income between 200,001 and 300,000 baht annually. Only 4.69 percent of smallholders obtained the annual income more than 500,000 baht. More than half of smallholders at

40.63 percent obtained credit from different sources while the rest at 59.37 percent did not obtain credit for the rubber production. In the study majority of smallholders about 71.88 percent had membership in organization and the rest at 28.13 percent had no membership. Most of rubber smallholders at 70.31 percent sold their rubber product as latex, 18.75 percent as rubber sheet and 10.94 percent sold both (Table 1).

#### **Adoption of rubber production practices**

Table 2 illustrates the adoption of rubber production practices by the rubber smallholders.

Study reveals that all of rubber smallholders cultivated the recommended rubber tree clone. The main reason for adoption of recommendation clone was the better resistance of disease, the thin bark which is easy for tapping, better growth, and high yields.

All of the rubber smallholders adopted rubber planting practice as it resulted in high yields, less weeds and disease damage, easy for working in the plantation, and ability to compete with weeds were the main reasons for use of the recommended planting method.

Resulted in this study, all of smallholders adopted the pruning of rubber tree. Responses from the smallholders reinforced that it increase yield, easy for tapping and other work in the plantation, and less disease.

This study revealed that all of rubber smallholders adopted preventive weed and disease control practices that found in less weeds and disease, better growth, and increased yields.

All of respondents adopted the recommended fertilizer about chemical fertilizer and formula of

**Table 1 Preliminary information on rubber smallholders**

(N=128)

Characteristics	Number	Percentage
<b>Age (year)</b>		
25-40	23	17.97
41-55	61	47.66
Above 55	44	34.37
<b>Education level</b>		
No education	6	4.69
Primary school	83	64.84
Secondary school	35	27.34
Higher education (degree)	4	3.11
<b>Experience in rubber production (year)</b>		
1-25	62	48.44
26-50	58	45.31
Above 50	1	0.78
Unspecified	7	5.46
<b>Size of rubber plantation (rai)</b>		
1-15	86	67.19
16-30	29	22.66
31-45	11	8.59
Above 45	2	1.56
<b>Family labor</b>		
No supporter	15	11.72
1 supporter	23	17.97
2 supporters	77	60.16
3 supporters	10	7.81
More than 3 supporters	3	2.34
<b>Income (baht / year)</b>		
Lower than 100,000	57	44.53
100,001-200,000	32	25.00
200,001-300,000	18	14.06
300,001-400,000	4	3.13
400,001-500,000	4	3.13
Above 500,000	6	4.69
Unspecified	7	5.46
<b>Credit</b>		
Obtained	52	40.63
Not obtained	76	59.37
<b>Membership in organization</b>		
Member	92	71.88
Non-member	36	28.12

**Table 2 Adoption of rubber production practices by smallholders**

Rubber production practices	Adoption of rubber production practices			
	Adopted		Not adopted	
	No.	Percentage	No.	Percentage
Use of the recommended variety	128	100.00	-	-
Planting practice	128	100.00	-	-
Pruning practice	128	100.00	-	-
Weed and disease control practice	128	100.00	-	-
Fertilizer practice	128	100.00	-	-
Tapping recommendations (N = 102)	34	33.33	68	66.67
Sheet-making for rubber product	24	18.75	104	81.25

**Table 3 Relationship between characteristic factors and adoption of rubber practices**

Characteristic factors	Adoption of rubber practices ( $\chi^2$ )						
	Variety	Planting	Pruning	Weed and disease control	Fertilization	Tapping	Sheet-making
Age	n/a	n/a	0.098	0.140	n/a	0.083	0.208
Education	n/a	n/a	0.156	0.200	n/a	0.141	0.136
Experience	n/a	n/a	0.086	0.091	n/a	0.080	0.189
Land size	n/a	n/a	0.155	0.127	n/a	0.157	0.286*
Family labor	n/a	n/a	0.077	0.243	n/a	0.234	0.175
Income	n/a	n/a	0.210	0.223	n/a	0.335*	0.389**
Credit	n/a	n/a	0.620	0.009	n/a	0.505	0.671
Member in organization	n/a	n/a	1.708	0.100	n/a	0.230	6.197**

n/a Not available

\* At significance level 0.05

\*\* At significance level 0.01

fertilizer. Response from the rubber smallholders revealed that increase yields and profit were the main reasons for adoption of fertilizer.

On the other hand, study revealed that 33.33 percent of respondents, who tapped the rubber trees, adopted the tapping practices about tapping system, they tapped the tree at 1 day or 2 days and stopped 1 day. While 66.67 percent of rubber smallholders

did not adopted the practices because they need quick cash for daily life and then they tapped 3 days and at 1 day interval. The main reasons for adopting recommendation were long-term benefits and they were a lot of rubber plantation which alternated tapping practice. Vice versa, main reason for not adopting of recommendation was due to lack of investment. There were some respondents who did

not tap their rubber trees because they were not suitable for tapping due to small tree, too young for tapping.

The rubber smallholders at 18.75 percent adopted sheet-making for the rubber product while 81.25 percent did not adopted the practices. The smallholders preferred rubber sheet to latex due to price and longer storage time as reasons for adoption. Main reasons for non-adoption of sheet-making were due to time-consuming for sheet-making, not enough labor, and need the quick cash for daily expense.

#### **Relationship between characteristic factors and adoption of rubber practices**

The chi-square test indicated that there were no significant relationships between age, education, experience, family labor, and credit with adoption of rubber production practices. Table 3 illustrates the chi-square test results of relationship between the characteristic factors of rubber smallholders and production practices.

Land size was related to the adoption of sheet-making process at 0.05 significance level. The respondents who had many land size made rubber unsmoked sheet. However, they sold rubber latex too.

Income was significantly related to the adoption of tapping practice at 0.05 significance level and related to the adoption of sheet-making process at 0.01 significant level. The respondent who had many incomes for daily life adopted the recommended tapping system and sheet-making process from the government staff more than the poor respondent. Because of they had enough money for daily life and then they could tapped the trees at 1 day or 2 days and stopped 1 day before they tapped again and

stored rubber product (rubber unsmoked sheet) in long time for sale.

Membership in organization was related to the adoption of sheet-making for rubber product at 0.05 significance level. The respondent who was member in organization could communicate with many people and got rubber information about rubber production which helps their decision. In the same time, they had a lot of money for daily life

#### **Problems and suggestions from rubber smallholders pertaining to rubber production practices.**

The study found some important problems; i.e., lack of rubber information from media at 100 percent, high cost of fertilizer 79.13 percent, shortage of labor 31.25 percent and lack of interest of younger generation 23.44 percent. The suggestion from smallholders were transferring information through diverse media such as personal media, group and mass media, training for preparing the fertilizer domestically, regular local training for rubber production, and introduce the method of making farming profitable to the younger generations (Table 4).

### **Conclusions and Recommendations**

#### **Conclusions**

Following study, it has concluded that all rubber smallholders adopted some rubber practices especially the rubber variety, planting, pruning, weed and disease control, and fertilizer. About one-third adopted the recommended tapping method and one-fourth adopted the sheet-making process for their product. The main reasons for non-adoption were the smallholders' need of quick cash for their daily

**Table 4 Problems in rubber production and smallholders' suggestions**

(n=128)

Problems	Frequency of responses	Percentage	Suggestions
Lack of rubber information from media	128	100.00	- Disseminate information through diversified media such as personal media, group and mass media
High cost of fertilizer	100	78.13	- Train smallholders for preparing fertilizer locally
Shortage of labor	40	31.25	- Training labor from outside area: north and northeast of Thailand or northeast of Thailand or foreign labor for smallholders
Lack of interest from younger generation	30	23.44	- Introduce the method of more profitable farming

**Note:** More than one problem can be expressed by a smallholder.

life. Regarding to the relationship between land size and membership in organization, there was significant relationship with the adoption of sheet-making of smallholders at significance level 0.05 and income related to sheet-making at 0.01 significance level. There were significant relationship between income and the adoption of tapping regimes at 0.05 significance level. The important response from rubber smallholders were the need for more information about rubber production and transmission through more diversified media.

### Recommendations

Based on the study, the following recommendations are proposed;

1. Cost of production, i.e. expense on chemical fertilizer are increased each year. As a result, smallholders are available to cope with recommended practice. The government officials should educate the smallholders for domestically prepared fertilizers.

2. The rubber smallholders should join together in group organization in their community rather than attempting alone in the rubber production. In addition, the group organizations should be strengthened and motivated to better serve them in providing information on improved rubber practices.

3. The government should transfer rubber information or knowledge through various media. The important media is personal because these media are close to the smallholders. Mass media and group media can be used together with personal media for transferring information.

4. Printed matter should be evaluated and redesigned in a manner to suit smallholders and broadcasting time has also to be adjusted to suit smallholders' convenience.

5. The government staffs have to work jointly in extension work and solve smallholders' field problems as early as possible.

**References**

- Bangauo, S. (2005). "The Superb Plan of Thai Rubber Industry." **Journal of Community Research**, Special Report, 27-33.
- Department of Agriculture. (2007). **Baseline information on horticulture** (Online). Available: [www.doa.go.th/pl\\_data/RUBBER/1STAT/st01.html](http://www.doa.go.th/pl_data/RUBBER/1STAT/st01.html). Accessed: [June 8, 2007].
- Department of Agricultural Extension. (1985). **Principle and Agricultural Extension Method**. (2<sup>nd</sup> ed). Bangkok: Ministry of Agriculture and Cooperatives.
- Elwell, H. (2002). Obstacles to adoption of soil and water conservation practices in Central Africa. **Tropical Agriculture Association Newsletter**, 22(1), 20-23.
- Geetha, G. S., G. Srinivasa, H. Jayaram, M. N. S. Iyengar, and N. B. Vijayaprakash. (2001). Socio-economic determinants of farmer oriented technology packages for sericulture. **Indian Journal of Sericulture**, 40(1), 6-99.
- Negatu, W. and A. Parikh. (1999). The impact of perception and other factors on the adoption of agricultural technology in the Moret and Jiru Woreda (district) of Ethiopia. **Agricultural Economic**, 21, 205-216.
- Office of Agricultural Economic. (2007). **Quantity and Value of Agricultural Export, 2005-2006** (Online). Accessed: [www.oae.go.th/statistic/export/QVExp.xls](http://www.oae.go.th/statistic/export/QVExp.xls). Available: [July 18, 2007].
- Office of Songkhla Agriculture. (2007). **Agriculture** (Online). Available: [www.songkhla.go.th/index\\_thai.htm](http://www.songkhla.go.th/index_thai.htm), Accessed: [July 6, 2007].
- Petcharat, J. (2004). An Analysis of Rubber Unsmoked Sheet Cost of Production for Small Holders, Southern Thailand. **Songklanakarin Journal of Social Sciences and Humanities**, 10(2), 189-202.
- Panna, S. (1999). **Adoption of Farmers to Use Neem Extract for Insect Pest Control in Changwat Suphan Buri**. M.S. Thesis, Kasetsart University.
- Rogers, E. M. (1983). **Diffusion of Innovations**. (3<sup>rd</sup> ed.). New York: The Free Press.
- Sangrugsawong, C. (1996). "Production Development and Rubber Marketing of Thailand." **Journal of Rubber**. 16(3), [n.p].
- Somin, J. (1993). **A Study on Agricultural Information Exposures of Farmers from Village Broadcasting Towers in Changwat Nakhon Nayok**. M.S. Thesis, Kasetsart University.
- Songkhla Agricultural and Cooperative Office. (2007). **Economic Crop** (Online). Available: [www.doae.go.th/stat/stats12.htm](http://www.doae.go.th/stat/stats12.htm). Accessed: [June 7, 2007].
- Tekanate, P. (1996). **Some Factors Affecting the Farmer's Adoption of the Asparagus Production Technology in Amphoe Tamaka, Changwat Kanchanaburi**. M.S. Thesis, Kasetsart University.
- The Thai Chamber of Commerce & Board of Trade of Thailand. (2006). **The Situation of Export – Import of Thailand in 3/2006** (Online). Available: <http://www.thaiechamber.com/cms/content.jsp>, Accessed: [July 06, 2007].
- Weerana, W. (2003). "Thailand rubber production and marketing in 2002/2003". **Journal of Technical Review**, 11(3), 10-13.

