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CONSUMER RESEARCH AND PRODUCT OPTIMIZATION
FOR GLUE STICK DEVELOPMENT IN THAILAND

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HATHAIRAT UAPHITHAK

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ABSTRACT

This study, on the development of a new glue stick product based on tapioca starch for Thai consumers, had a major emphasis on the use of consumer input in the product optimization. At the beginning of the development process consumers identified the problems of existing products and generated the important attributes of glue stick products. Then product prototypes were made using mixture experimental designs and quantitative relationships between the ingredients and the product attributes were determined. For evaluating the sensory attributes of prototypes, a trained panel was employed during the development of the first prototypes and then a consumer panel in the second prototype development. Consumers not only evaluated the product attributes of the prototype products using line scales but also indicated their ideal product attribute levels. Physical attributes of the products were also measured. Multiple regression was used to generate the empirical equations showing the relationships between the ingredients and the product attributes.

These linear relationships were then used to develop the constraints for a linear programming model. The consumer ideal product profile as well as the sensory profiles of the commercial products were employed to create upper and lower acceptable limits of the attributes' constraints. The raw materials and the physical properties were also included in the linear programming model. Acceptability maximization and cost minimization were used to generate the optimum formulations. The prototype products from these formulations were tested by a small consumer panel to select the one with highest acceptability. A pilot scale plant was designed and built and then a small quantity of the final formulation was produced.

The final product, from the successful pilot scale production, was tested in a home-use test by 108 students and 64 office workers in Bangkok. The consumers evaluated the performance of the developed product in comparison with their 'usual brand'. The results from the consumer testing showed that the developed glue stick was generally accepted by the target consumers. However, some improvements of the product in terms of colour, aroma and packaging are still necessary.

The product could be made commercially in Thailand in a simple plant using a closed stainless steel vessel with steam jacket, condenser and central anchor type mixer. Suitable packaging equipment is needed in order to maintain the high temperature of the mix while discharging the glue mixture into moulds. The product should be able to compete with the glue sticks already in the Thai market since it has the distinctive feature of adjustability and could be sold at a lower price.

PREFACE

Tapioca (cassava) has been regarded as one of the world's most important crops that can be used for human consumption, for animal feed and in various industries. Thailand is the largest exporter of tapioca products with the total export about 86 percent of the world's exports in 1989 (TTTA, 1990). The exports are made in two main forms, tapioca chips and pellets for use as animal feed and tapioca flour for human and industry consumption. The European Community is the dominant tapioca importer taking about 59 percent of the total export. Tapioca chips and pellets have been used extensively as one of the most important feed ingredients in the animal feed industry in Europe for over 20 years. Starch another important product from tapioca is used in both food and non-food industries. Tapioca flour is employed as a raw material by industries making such products as soup, candy, pudding, sausages, bread, ice-cream, noodles and vermicelli. It is used as a binder by the pharmaceutical industry in making pills. Moreover due to its saccharification property, tapioca flour is used for manufacturing food seasonings, glucose, fructose, soft drinks and canned food. Tapioca flour is also used in the production of adhesives, paper, textiles, plywood and alcohol.

In the adhesive industries, tapioca flour can also be used in the form of dextrin or modified starch. Adhesives from tapioca are mainly used in the corrugated board industry which manufactures vast amounts of board to be used for cartons, boxes and containers. Tapioca adhesive have also been used in laminated paper board, remoistening gums, wall paper and home use. Although tapioca starch has permanent use in some starch using industries, there is still the need to expand its use in various ways to be able to compete with other starches. Most research has been done on improving formulation and techniques in processing of adhesives used in paper and board industries. Nevertheless there is the demand for the development of an adhesive product for consumers' use particularly in Thailand.

Glue stick was considered to be a suitable product to be developed for Thai consumers. Glue stick is a consumer product which has become popular recently owing to its ease of use, convenience and good performance compared with other glue products. It was found that all the glue sticks commercially available in the Thai market are imported

from other countries: Germany, Japan, Korea and China. These glue sticks are based on synthetic polymers, mainly polyvinyl pyrrolidone which is one of the factors that contribute to the high cost of the product. It was decided that if tapioca starch could be used to replace polyvinyl pyrrolidone in glue stick formulation the cost of product could be reduced. This would also increase the use of tapioca starch in the non-food product area.

This project was done partly in New Zealand where the product was developed in the laboratory scale and partly in Thailand where the product prototypes were tested with Thai consumers, a pilot plant built and an optimum product was developed and tested with Thai consumers.

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TABLE OF CONTENTS

ABSTRACT	ii
PREFACE	iv
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xiv
LIST OF FIGURES	xviii
LIST OF APPENDICES	xix
CHAPTERS	
1	1
1.1	2
1.1.1	2
1.1.2	2
1.2	3
1.2.1	3
1.2.2	4
1.2.3	5
1.2.4	5
1.3	6
1.3.1	7
1.3.2	7
1.4	9
2	11
2.1	11
2.1.1	12
2.1.2	12
2.2	13
2.2.1	13
2.2.2	15
2.2.3	16
2.2.4	18
2.2.5	20
2.3	20
2.3.1	22
2.3.2	22
2.3.3	23
2.4	24
2.5	25
2.6	26
2.6.1	27
2.6.2	28
2.6.3	29

	2.6.4	Solvent	29
	2.6.5	Plasticizers and Emulsifiers	30
	2.6.6	Fillers, Antifoaming Agents, Colours, Perfumes	30
	2.6.7	Formulation, Processing and Packaging	31
2.7		USE OF STARCHES IN GLUE STICK	32
	2.7.1	Uses of Starch and its Derivatives in Adhesive	32
	2.7.2	Use of Tapioca Starch in Thailand	34
	2.7.3	Use of Starches in Glue Stick Formulation	35
2.8		TESTING OF GLUE STICK PROPERTIES	35
	2.8.1	Stick characteristics	36
	2.8.2	Amount of glue applied on paper	36
	2.8.3	Initial adhesion	37
	2.8.4	Adhesion after drying	39
2.9		CONCLUSIONS	40
3		PROJECT METHODS	41
3.1		CONSUMER STUDY	42
	3.1.1	Consumer Survey	42
	3.1.2	Consumer Testing	42
3.2		SENSORY TESTING OF GLUE STICKS BY TRAINED SENSORY PANEL	42
	3.2.1	Panel Selection	43
	3.2.2	Development of Descriptive Terms	44
	3.2.3	Training of the Panel	44
	3.2.4	Use of Trained Panel	47
3.3		PHYSICAL TESTING	49
	3.3.1	Choosing the Physical Testing Methods for the Product	49
	3.3.2	Hardness	50
	3.3.3	Melting Point	51
	3.3.5	Water activity	51
	3.3.6	Amount of Glue Applied per Area	52
	3.3.7	Open time	53
	3.3.8	Peel Strength of the Adhesive Bond	54
3.4		INGREDIENTS AND THEIR PROPERTIES	56
	3.4.1	Starches	56
	3.4.2	Polyvinyl Pyrrolidone	56
	3.4.3	Glycerol	57
	3.4.4	Stearic Acid	57
	3.4.5	Sodium Hydroxide	57
	3.4.6	Glyceryl Monostearate	57
	3.4.7	Brij 35	57
	3.4.8	Dextrin	58
	3.4.9	Casein	58
3.5		PROCESSING OF GLUE STICK	58
	3.5.1	Equipment	58
	3.5.2	Method	60
3.6		EXPERIMENTAL PLANS	61
3.7		DATA PROCESSING METHOD	63

4	CONSUMER STUDY	64
4.1	AIM AND OBJECTIVES	64
4.2	METHOD OF CONSUMER STUDY	65
	4.2.1 Products of Interest	65
	4.2.2 Stages of Survey in New Zealand and Thailand	65
	4.2.3 Method Used in Generation of Important Attributes	66
	4.2.4 Method of Measuring Importance of Attributes	66
	4.2.5 Questionnaires for Consumer Survey in New Zealand and Thailand	67
	4.2.6 Survey Method	68
4.3	DATA PROCESSING	68
4.4	PATTERN OF GLUE USAGE	68
4.5	ATTRIBUTES OF GLUE STICKS WHICH SHOULD BE IMPROVED	71
4.6	IMPORTANT ATTRIBUTES OF GLUE STICK AND SELF-ADHERING NOTE PAD	73
4.7	IMPORTANCE MEASURE OF GLUE PRODUCT ATTRIBUTES	75
	4.7.1 Importance of Attributes Measured by Open-ended Elicitation Method with Panel in New Zealand	76
	4.7.2 Importance of Attributes Measured by Direct-rating Method with Panels in New Zealand and Thailand	77
	4.7.3 Importance of Attributes of Glue Products with Panel	79
4.8	ACCEPTABILITY OF ATTRIBUTES OF GLUE PRODUCTS	80
4.9	BUYING INTENTION, SIZE AND PRICE FROM PANEL IN THAILAND	81
4.10	DISCUSSION	83
	4.10.1 Pattern of Glue Usage	83
	4.10.2 Importance of Attributes	84
	4.10.3 Differences between Cultures in Glue Usage	85
	4.10.4 Comparison between Glue Products	85
	4.10.5 Consumers Intention of Buying between the Two Products - Permanent and Temporary Bonding Glue Sticks	86
	4.10.6 Development of Product Concept	86
	4.10.7 Using the Consumer Study for Development of Glue Stick Products	87
4.11	CONCLUSIONS	88

5	INITIAL DEVELOPMENT STUDY ON GLUE STICK FORMULATION	89
5.1	AIM AND OBJECTIVES	89
5.2	SELECTION OF PRELIMINARY FORMULATION	89
	5.2.1 Criteria for Selection of Preliminary Formulation	90
	5.2.2 Preliminary Experimentation	91
	5.2.3 Dextrin Experimentation	92
	5.2.4 Casein Experimentation	94
5.3	ATTRIBUTES OF COMMERCIAL GLUE STICKS	99
5.4	DEVELOPMENT OF GLUE STICK PROTOTYPES	100
5.5	PROPERTIES OF GLUE STICK PROTOTYPES	102
5.6	COMPARISON BETWEEN PROTOTYPE PRODUCTS AND COMMERCIAL PRODUCTS	103
5.7	RELATIONSHIPS BETWEEN GLUE STICK ATTRIBUTES	107
	5.7.1 Correlations between Glue Stick Physical Attributes	107
	5.7.2 Correlations between Glue Stick Sensory Attributes	108
	5.7.3 Relationships between Physical Attributes and Sensory Attributes	110
5.8	RELATIONSHIPS BETWEEN INGREDIENTS AND GLUE STICK ATTRIBUTES	111
5.9	DISCUSSION	115
	5.9.1 Effect of Ingredients on Attributes of Glue Sticks	115
	5.9.2 The Suitable Levels of Basic Ingredients for Starch Based Glue Stick	115
	5.9.3 Selection of Physical Attribute Measures	116
	5.9.4 Selection of Sensory Attributes for Consumers Testing	116
5.10	CONCLUSIONS	117
6	PRODUCT FORMULATION DEVELOPMENT WITH CONSUMER	117
6.1	AIM AND OBJECTIVES	117
6.2	EXPERIMENTAL METHODS	118
	6.2.1 Basic formulation	118
	6.2.2 Experimental Design	119
6.3	PHYSICAL TESTING	120
6.4	SENSORY EVALUATION BY CONSUMER PANEL IN THAILAND	120
	6.4.1 Consumer Panel in Thailand	121
	6.4.2 Sample Preparation	121
	6.4.3 Questionnaire	122
	6.4.4 Preparation for the Consumer Panel Test	122
	6.4.5 Consumer Testing Procedure	123
6.5	DATA PROCESSING AND ANALYSIS OF RESULTS	125
6.6	PHYSICAL ATTRIBUTES OF THE PROTOTYPES	125
6.7	SENSORY ATTRIBUTES OF THE PROTOTYPES EVALUATED BY CONSUMER	127
	6.7.1 Affective Attributes	127
	6.7.2 Sensory Attributes	130
6.8	RESPONSE OF CONSUMERS IN DIFFERENT MARKET SEGMENTS	131
6.9	IDEAL RATIO SCORES AND LOG OF IDEAL RATIO SCORES OF THE SENSORY ATTRIBUTES OF THE PROTOTYPES	133
	6.9.1 Ideal Ratio Scores of the Sensory Attributes of the Prototypes	133

	6.9.2	Log of Ideal Ratio Scores of the Attributes of the Prototypes	133
6.10		RELATIONSHIPS BETWEEN ATTRIBUTES OF THE PROTOTYPES	134
	6.10.1	Physical Attributes	134
	6.10.2	Sensory Attributes	135
	6.10.3	Acceptability and Sensory Attributes	136
	6.10.4	Sensory Attributes and Physical Attributes	136
6.11		RELATIONSHIPS BETWEEN THE COMPONENTS AND ATTRIBUTES OF THE PROTOTYPES	137
6.12		DISCUSSION	140
6.13		CONCLUSIONS	143
7		PRODUCT OPTIMIZATION	145
	7.1	AIM AND OBJECTIVES	145
	7.2	OPTIMIZATION PLANNING	146
	7.3	DEVELOPMENT OF LINEAR PROGRAMMING MODEL	147
	7.3.1	Objective Functions	147
	7.3.2	Decision Variables	148
	7.3.3	Constraints	149
	7.4	DEVELOPMENT OF OPTIMUM FORMULATIONS FROM LINEAR PROGRAMMING	151
	7.4.1	Cost Minimization	152
	7.4.2	Acceptability Maximization	154
	7.5	SELECTION OF FORMULATIONS OBTAINED FROM LINEAR PROGRAMMING	156
	7.6	PHYSICAL ATTRIBUTES OF GLUE STICKS DEVELOPED FROM LINEAR PROGRAMMING MODELS	158
	7.7	SENSORY TESTING	159
	7.7.1	Selection of Samples for Sensory Testing	159
	7.7.2	Sample Preparation	159
	7.7.3	Method of Sensory Testing	159
	7.7.4	Sensory Attributes	160
	7.7.5	Optimum Formulation	161
	7.8	DISCUSSION	163
	7.8.1	Comparison of Optimum Formulation with Commercial Products and Consumers' Ideal Product	163
	7.8.2	Comparison between Cost minimization and Acceptability Maximization	164
	7.8.3	Use of Linear Programming in Glue Stick Optimization	165
	7.9	CONCLUSIONS	166
8		PRODUCTION TRIAL	168
	8.1	AIM AND OBJECTIVES	168
	8.2	PILOT SCALE PRODUCTION	170
	8.2.1	Equipment	170
	8.2.2	Formulation	170
	8.2.3	Processing	171
	8.2.4	Testing of the Finished Product	172
	8.3	YIELD AND COSTS IN GLUE STICK PRODUCTION	172
	8.4	CHANGES OF PRODUCT ATTRIBUTES DURING 30 DAY	

	STORAGE	174
8.5	PRODUCT VARIABILITY BETWEEN BATCHES	176
8.6	PRODUCT VARIABILITY BETWEEN STICKS FROM DIFFERENT LOCATIONS	177
8.7	PRODUCT VARIABILITY BETWEEN LABORATORY SCALE AND PILOT SCALE SAMPLES	178
8.8	COMPARISON OF NEW GLUE STICK WITH A COMMERCIAL GLUE STICK	179
8.9	DISCUSSION	180
8.10	CONCLUSIONS	181
9	FINAL CONSUMER TESTING OF PRODUCT	182
9.1	AIM AND OBJECTIVES	182
9.2	METHOD OF CONSUMER TESTING	183
	9.2.1 Selection of Consumers	183
	9.2.2 Sample Preparation	183
	9.2.3 Questionnaire	183
	9.2.4 Testing of the Product	184
9.3	DATA PROCESSING AND ANALYSIS OF RESULTS	184
9.4	PATTERN OF GLUE STICK USAGE OF THE CONSUMERS	184
	9.4.1 Frequency of Glue Stick Usage	184
	9.4.2 Source of the Glue Stick Consumers Used	185
	9.4.3 Brand Name of Glue Stick Consumers Used	186
	9.4.4 Size of Glue Stick Consumers Used	186
9.5	CONSUMER ACCEPTABILITY OF THE NEW PRODUCT	187
9.6	CONSUMER BUYING INTENTION	188
9.7	PRICE OF THE NEW GLUE STICK	189
9.8	THE CHARACTERISTICS OF THE DEVELOPED GLUE STICK WHICH ATTRACTED CONSUMERS	190
9.9	DISCUSSION	191
	9.9.1 Reaction of the Target Consumers towards the Developed Glue Stick	191
	9.9.2 Selection of Market Segment	192
	9.9.3 Improvement of the Developed Product	192
	9.9.4 Future Research	193
	9.9.5 Position of the Developed Product in the Market	193
9.10	CONCLUSIONS	193
10	DISCUSSION AND CONCLUSIONS	195
10.1	INTRODUCTION	195
10.2	OPTIMIZATION PROCESS	195
10.3	THE USE OF CONSUMER INPUT IN THE OPTIMIZATION PROCESS	198
	10.3.1 Benefits of Using Consumers throughout the Optimization Process	198
	10.3.2 Differences between Thai and New Zealand Consumers	200
	10.3.3 Selection of the Important Attributes	201
	10.3.4 Relationship of Acceptability to Purchase Intention and Price to Buy	201
	10.3.5 Comparison between Consumer Panel and Trained Panel	202

10.4	USE OF EXPERIMENTAL DESIGNS IN PRODUCT OPTIMIZATION	203
10.4.1	Selection of the Preliminary Formulation	203
10.4.2	Use of Ingredient/Product Attribute Relationship Models in Final Product Optimization	204
10.5	GLUE STICK FORMULATION AND ATTRIBUTES	205
10.5.1	Use of Tapioca Starch in Glue Stick	205
10.5.2	Sensory Properties of Glue Stick	206
10.5.3	Relationships of Sensory Properties and Physical Tests	206
10.5.4	Properties of Developed Glue Stick Compared with Commercial Products	206
10.6	RELATIONSHIP BETWEEN MARKET POSITIONING AND PRODUCT ATTRIBUTES	207
10.7	RECOMMENDATIONS FOR FUTURE WORK	208
10.8	CONCLUSIONS	209
	REFERENCES	211
	APPENDICES	220

LIST OF TABLES

3.1	Six components extreme vertices	62
4.1	Users of each glue product	69
4.2	Frequency of glue product usage	70
4.3	Purposes of glue product usage	71
4.4	Attributes of glue stick product needing improvement	72
4.5	Attributes of self-adhering note pad needing improvement	73
4.6	The attributes of a glue stick product	74
4.7	Important attributes of self-adhering note pads given by the consumers	75
4.8	Importance of glue stick attributes from open-ended elicitation method	76
4.9	Importance of self-adhering note pad attributes	77
4.10	Importance of glue stick product attributes from panel in New Zealand	78
4.11	Importance of self-adhering note pads attributes from panel in New Zealand	78
4.12	Importance of glue product attributes from Thailand panel	79
4.13	Importance of permanent bonding glue stick attributes	80
4.14	Importance of temporary bonding glue stick attributes	80
4.15	Acceptability of glue products by panel in Thailand	81
4.16	Buying intention of consumers towards the new product	82
4.17	Usage time for one stick of glue	82
4.18	Price of glue stick consumer prepared to pay	83
5.1	Formulations used in preliminary experimentation	91
5.2	Properties of glue stick samples from preliminary experimentation	92
5.3	Experimentation plan for dextrin experiment	93
5.4	Physical attributes of dextrin glue sticks	93

5.5	Empirical equations showing relationships between ingredients and attributes of glue sticks from dextrin experiment	94
5.6	Experimentation plan for casein experiment	95
5.7	Empirical equations showing relationships between ingredients and physical attributes from casein experiment	97
5.8	Empirical equations showing relationships between ingredients and sensory attributes of glue stick from casein experiment	98
5.9	Physical attributes of the commercial glue sticks	99
5.10	Sensory attributes of the commercial glue sticks	100
5.11	Experimental plan for prototype development	101
5.12	Physical attributes of the glue stick samples from constrained mixture design experiment	102
5.13	Sensory attributes of the glue stick samples from mixture design experiment	103
5.14	Comparison between physical attributes of prototype products and commercial products	104
5.15	Comparison of sensory attributes of prototype products and commercial products	105
5.16	Correlations between physical attributes of glue stick samples from mixture design experiment	107
5.17	Correlations between sensory attributes of glue stick samples from mixture design experiment	108
5.18	Correlations between physical and sensory attributes of glue stick samples from mixture design experiment	111
5.19	Correlations between ingredients and output variables	112
5.20	Empirical equations showing relationship between ingredients and physical attributes	113
5.21	Empirical equations showing relationship between ingredients and sensory attributes	114
6.1	Experimental plan for mixture design with three components	120
6.2	Physical attributes of the prototypes	126
6.3	Comparison between physical attributes of the prototypes and commercial products	126

6.4	Acceptability, purchase intention and price to buy of the prototypes	128
6.5	Sensory attributes of the prototypes	130
6.6	Ideal scores of the sensory attributes of the prototypes	131
6.7	Correlations between sensory scores obtained from three groups of consumers	132
6.8	Ideal ratio scores of the sensory attributes of the prototypes (Original data)	133
6.9	Ideal ratio scores of the sensory attributes of the prototypes (Transformed data)	134
6.10	Correlations between physical attributes of glue stick samples	135
6.11	Correlations between sensory attributes of glue stick samples	135
6.12	Correlation between acceptability and sensory attributes	136
6.13	Correlations between sensory attributes and physical attributes	137
6.14	Correlations between the components and the attributes	138
6.15	Empirical equations showing relationships between glue stick attributes and glue stick components	139
7.1	Costs of the ingredients used in glue stick formulation	147
7.2	Costs of the components used in glue stick formulation	148
7.3	Decision variables in glue stick formulation	149
7.4	Glue stick optimum formulations and their expected attribute levels obtained from cost minimization	154
7.5	Glue stick optimum formulations and their expected attribute levels obtained from acceptability maximization	156
7.6	Selected formulations obtained from linear programming	157
7.7	Physical attributes of the glue sticks developed from linear programming models	158
7.8	Sensory attributes of the glue sticks developed from linear programming model	160
7.9	Sensory attribute ideal ratio scores of the glue sticks developed from linear programming	161

7.10	Attributes of optimum glue stick compared with commercial products and ideal product	163
7.11	Comparison between using cost minimization and acceptability maximization	164
8.1	Levels of glue stick ingredients used in the pilot scale production	171
8.2	Costs incurred in producing an 8 g glue stick	174
8.3	Physical attributes of glue stick at different storage times	175
8.4	Sensory attributes of glue sticks at different storage time	175
8.5	Physical attributes of glue sticks from different batches	176
8.6	Sensory attributes of glue sticks from different batches	176
8.7	Physical attributes of glue sticks from different locations on the tray	177
8.8	Sensory attributes of glue sticks from different locations on the tray	177
8.9	Physical attributes of pilot scale and laboratory scale samples	178
8.10	Sensory attributes of pilot scale and laboratory scale samples	179
8.11	Sensory attributes of new glue stick and a commercial glue stick	180
9.1	Frequency of Glue Stick Usage	185
9.2	Source of Glue Stick Consumers Used	185
9.3	Brand Name of Glue Stick Consumer Normally Used	186
9.4	Size of Glue Stick Consumers Used	186
9.5	Comparison between the New Product and the Product Consumer Currently Used	187
9.6	Comparison between the developed glue stick and the glue stick consumers normally used	189
9.7	Price that consumers who said they would buy the product recommended for the developed glue stick compared with their glue stick	189
9.8	Characteristics which could attract consumers to buy or try the developed glue stick product	190
9.9	Environmental friendly ranking by consumers	191

LIST OF FIGURES

3.1	Stages of glue stick optimization	41
3.2	Descriptive terms and their definitions used by the trained panel	48
3.3	Hardness testing diagram	50
3.4	Peel strength testing diagram	55
3.5	Laboratory scale equipment	59
5.1	Product profiles of glue stick prototypes compared with commercial product attributes	106
5.2	Diagram Showing Relationships between Physical Attributes	107
5.3	Diagram Showing Relationships between Sensory Attributes	109
6.1	Complete mixture space showing feasible area for experimentation	119
6.2	Acceptability of the prototypes	129
6.3	Product profiles of the prototypes compared with ideal product profile	141
7.1	Constraints for glue stick linear programming model	150
7.2	Model (1) for cost minimization	152
7.3	Model (2) for acceptability maximization	155
7.4	Positions of the optimum formulations on the mixture space	158
7.5	Product profile of optimum formulation compared with the ideal profile	162
8.1	Pilot scale equipment	169
10.1	Steps in Glue Stick Optimization	196
10.2	Comparison of prototypes from different steps during product optimization	197

LIST OF APPENDICES

3.1	Prescreening Questionnaire for a Glue Stick Panel	220
3.2	Descriptive Terms Developed by the Trained Panel	221
3.3	Questionnaire for Glue Stick Testing by Trained Panel	222
4.1	Questionnaire for Consumer Survey in New Zealand	224
4.2	Questionnaire for Consumer Survey in Thailand	226
5.1	Correlations between Ingredients and Physical Attributes of Glue Stick from Dextrin Experiment	236
5.2	Physical Attributes of Glue Sticks from Casein Experiment	236
5.3	Correlations between Ingredients and Physical and Sensory Attributes of Glue Stick from Casein Experiment	236
5.4	Commercial Glue Sticks	237
6.1	Questionnaire for Glue Stick Testing by Consumer Panel	238
6.2	Sensory Attributes Scores of the Prototypes Obtained from Consumer Testing	241
6.3	Ideal Ratio Scores of the Prototypes' Sensory Attributes (Original Data)	248
6.4	Log of Ideal Ratio Scores of the Prototypes' Sensory Attributes (Transformed data)	253
9.1	Questionnaire for Final Product Testing	258
9.2	Summary of Results from Final Product Testing	262
9.3	Cross-tabulation of 'Reason Consumers Thought that the Developed Glue Stick was Better or Worse than their Glue Stick' by Acceptability	267
9.4	Cross-tabulation of 'Comparison of Developed Glue Stick with Glue Stick Consumers Normally Used' by 'Purchase Intention'	267