



Evaluating the National Mango Board's Programs Impact on U.S. Demand for Mangos

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Preface

This paper measures the economic impact of the National Mango Board's (NMB) programs on mango demand based on household panel data. The analyses show the gains in demand without presenting the thousands of media copy and messages that are behind the scene. Almost all evaluation research activities are a joint effort working closely with those staff professionals who are responsible for the creative process. Similarly, a system for planning and implementing research projects requires countless hours of dedication by staff in order to support the scientific research. The overall performance of a commodity program such as the NMB does not just happen but evolves with professional leadership. This evaluation research could not have been completed without the close cooperation of Dr. Leonardo Ortega, Research Director. While this paper is a summary of the evaluation research, it is also a reflection of the professional staff within the NMB and a special acknowledgment is given to William Watson, Executive Director; Leo Ortega, Research Director; Wendy McManus, Marketing Director; Megan McKenna, Marketing Manager; Amy Mercado, Operations Manager; Marilda Peele, Industry Relations Specialist. Appreciation is extended to Vera Sodek for her editorial assistance and to the staff of MarketTools, the company contracted to provide household panel data.

Most of the results presented in the following text are based on statistical models that are very technical in nature. Sometimes those technical details need to be explained but for the most part one can discuss the results without going into every aspect of the models. The more technical details are left to the appendices but are included so the reader interested in the details can see the supporting evidence. While the staff provided considerable assistance, the models and evaluation conclusions were completed independent of the NMB and staff.

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Introduction

Food shopping entails some of the most essential decisions made by households and is something that every household is involved with. There are nearly 120 million households in the U.S. with the average household having slightly more than 2.5 persons. Diversity among these consumers obviously leads to a wide range of buying behavior. Yet there are groups of foods that are basic to most households and the patterns of buying are generally well established. Foods such as cereals, milk, meats, drinks, and fresh produce make up much of the food market basket. Within that basket the choices are almost limitless depending on varieties, packaging, product forms, perishability, qualities, brands, presentations, and availability. Many consumption decisions are driven by habits where the buying behaviors are closely tied to the underlying characteristics of the household demographics. Even then, decisions depend on prices and the ability to afford certain foods. That is, household incomes set limits on what can be purchased. Many food purchases are tied to traditions and special calendar occasions. All of these decisions lead to a demand for each specific food type.

Demand is the consumer's reflection of a preference for a particular food good at a point in time. That preference may change and often depends on the information a potential buyer has acquired or been exposed to before making a decision. A shopper often has a lot of discretion about whether to buy or not, depending on the food being considered. For example, in the produce section tomatoes or bananas are usually on the shopping list so there may be less spontaneity in the buying decision. Whereas, shoppers have more discretion when considering less staple foods such as fresh mangos. Even then, the alternative fruits within the category may be considerable. While choices depend on the moment, they may be influenced through efforts to better inform potential buyers about the specific attributes of a given food such as the mango example. One cannot underestimate the role of information, but must recognize that the impact of information depends on the product, the state of existing knowledge among potential buyers, the importance of the product in the overall household diet, and the message.

Purchasing choices entail a two-step process depending on the product

attributes, the characteristics of the decision makers, the state of knowledge, and the costs to the shopper. These combined decisions translate into a demand for the good such as mangos where the first decision is to make the purchase and then secondly how many or how much depending on the units of the product. The person considering mangos must decide to make the purchase then the units are most often one, two, three or more whole mangos since the units are the whole mango. Many fresh produce are similar in the whole units instead of weights. Either way, first the household has to make the decision to purchase and that becomes *market penetration*. That is, something has convinced the shopper to become a buyer. Then and only then is the decision about how much to purchase is made and that becomes the *market intensity*.

In total across all households, market penetration is measured through determining the percent of households who buy the particular food within a defined period of time. Market intensity is measured by the volume or units purchased among those buyers. Total demand is the shopper base (number of households) times the market penetration (percentage buying) times the market intensity (volume). The shopper base or number of households is easily predicted and cannot be readily changed. Whereas, market penetration and market intensity can potentially be influenced through changes in the product attributes, through how the product is presented to the potential buyer, and through various means of influencing the shopper's knowledge and perceptions about the food. The latter of these are frequently achieved through various advertising, promotions and, more broadly, marketing programs.

Many commodity groups have developed and funded industry-wide programs to better inform potential buyers of their specific foods. These programs differ from brands or private labels in that they are industry wide and are intended to provide the shopper with a base knowledge about the attributes of their specific food, again such as mangos. Through a transfer of information, the ultimate goal is to enhance the demand for that food product. These types of programs are generally referred to as *generic advertising* since they are intended to influence total industry demand without impacting individual shares of the market. That is, they are designed to grow total

demand but remain share neutral. Such generic information programs may have little impact on demand or may lead to greater market penetration and/or intensity. While an expectation of impact and benefits from industry-funded programs may be high, they must ultimately be measured through appropriate statistical techniques.

Above, mangos have been purposely mentioned since demand for mangos is the focus of this research report. In 2005, the National Mango Board (NMB) started their programs to enhance the U.S. demand for mangos using the same types of organizational and legal structures found for other commodities (AMS-USDA, 2010; Ward, 2010). The legal structure for the NMB is well documented and will not be included in this report. Instead, the report will concentrate on the impact of the mango programs while documenting the efforts to reach U.S. households through many media avenues, with the print medium being particularly important. Measuring demand through both market penetration and intensity requires analytical tools and a database for monitoring household buyer behavior. This process is technical and much of the analytical details will be put in an appendix while trying to keep the text focused on the impact and conclusions.

In the following sections, a brief insight into the mango industry and flow of mangos into the U.S. is documented. Import data are used since almost all mangos entering U.S. markets are imported. Then the report turns to quantifying household demand for mangos using a major household database designed and funded by the NMB. Next the activities by the NMB to influence mango demand are presented. Using the household data, import data, and the NMB's programs, the demand for mangos is estimated and used to analytically and scientifically determine if the programs have had a measurable impact on both market penetration and market intensity. Within that analysis, a rate-of-return from the NMB's investment (ROI) will be shown. Using the demand models, other demand drivers will also be shown and discussed relative to the impacts of the generic demand enhancement efforts.

Throughout the discussion the term *generic marketing* will be used to denote the efforts by the National Mango Board. Generic advertising is the most common term used by most commodity boards, but advertising is only one part of an overall marketing program. Generic advertising is getting the message out within the broader

industry strategy of growing demand. Sometimes marketing includes pricing, bringing buyers and sellers together, packaging design and labeling, and influencing the exchange process. Also, marketing plays a major role in quality assurance and distribution issues. Technically, the term generic advertising is not directly a part of changing the underlying attributes of the product moving through the commercial channels. Within the legal definition, commodity boards operating under the authority of the National Research and Promotion Act cannot have any role in pricing and/or the exchange of goods. All of the programs under the Act have generic advertising and promotions, but some like the NMB may have functions more common to the broader term of marketing with the exclusion of pricing and selling. In the subsequent discussions, *generic marketing and marketing* are used to capture the full meaning of demand-enhancing efforts while recognizing the limited definition of marketing as applied to all of the industry-wide commodity promotion boards. As a final note, the report does not deal with production and distribution issues and is limited to the ability to understand and measure the U.S. demand for mangos.

Mango Imports into the U.S.

Worldwide, mangos have been consumed for thousands of years with much of the earliest productions originating in Southeastern Asia. Over the centuries climatic conditions in Central and South America have led to thriving production regions with much of the harvested crop flowing into the U.S. New technologies for packaging, transportation, and quality controls have all contributed to the potential for growth in mango imports into the U.S. Even with the feasibility for imports, there has to be a demand for the fruit.

Figure 1 shows the annual imports of mangos into the U.S. with the bars and left axis depicting the FOB value and the line and right axis showing the quantity expressed in metric tons. These data are reported by the USDA Foreign Agricultural Service (FAS) and are the most current source of import information. Since these are annual numbers, statistics for 2010 are not shown even though the data are available monthly, usually with a two-month reporting lag for recording and tabulation purposes. As seen through 2009, mango imports at the FOB level exceeded \$200

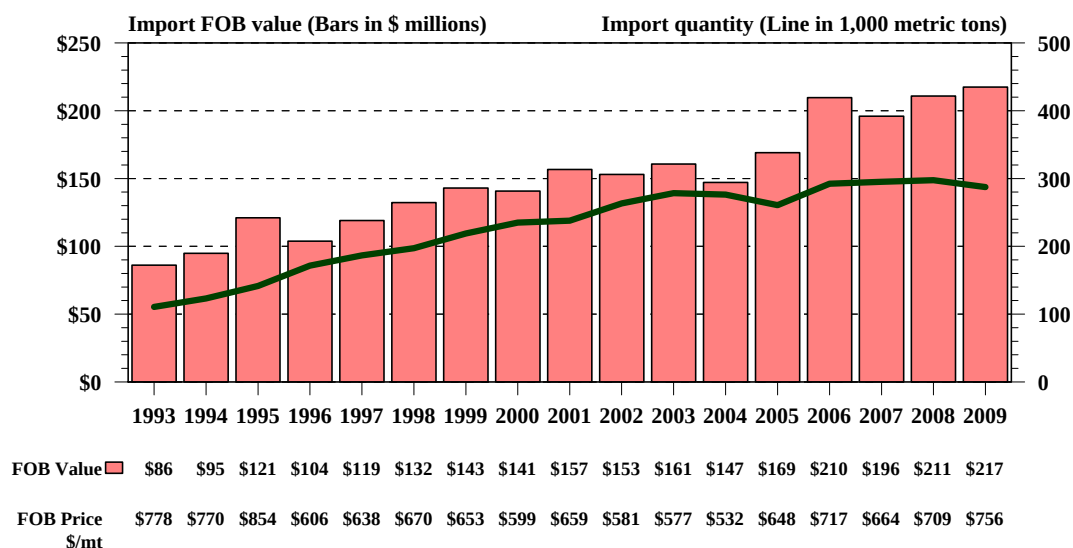


Figure 1. Annual mango imports into the U.S. market based on the FOB values.

million in annual value and have more than doubled since 1993, the first full year of complete import data. Import volumes are approaching .30 million metric tons as seen with the highest value of .29 million metric tons in 2008. Over the same years, U.S. population increased from 260 million people to 307 million in 2009. Expressing the imports on pounds per capita basis shows that the per capita consumption increased from .93 pounds to slightly more than 2 pounds annually by 2009. To put this number into some perspective, in 2009 the average person consumed nearly 26 pounds of bananas annually based on the same import data but for bananas (Foreign Agricultural Service, 2010).

Below the bottom axis in Figure 1, actual FOB values and import prices per metric ton are reported. For the 17-year time span, the FOB price has averaged \$671 per metric ton. Interestingly, prices have been about ½ as volatile as the tonnage of imports (i.e., $CV_{Prices}=.12$ and $CV_{Imports}=.27$ where $CV=Stdev/mean$).

Over the periods in Figure 1, less than 1% of the imports come from countries outside the Americas. Within the western hemisphere, Mexico has historically accounted for nearly 66% of the value and 69% of the mango export volume. Brazil, Peru, Ecuador, and Guatemala accounted for nearly 26% of the remaining imports. Production and harvest seasons differ considerably across these export regions and

the shares will differ when compared on a month-to-month bases. Nevertheless, Mexico is clearly the dominant mango exporter to the U.S. Also, the average export prices differ by region with the imports from Mexico averaging \$631 per metric ton while Brazil and some of the other South American mangos average over \$800 per metric ton. A large part of those price differences can be attributed to seasonality in supplying the U.S. market. Part may be due to varietal and quality differences, but that cannot be determined from the FOB data since the data only report volume, value, sources and periods.

Once imports enter the U.S. market, it is nearly impossible to trace the flow-to-market beyond that entry point using the trade data. An expected large portion of the mango imports go directly to retail outlets and foodservices in the form of whole mangos. A portion is diverted to processing and an unknown expected small share is loss through spoilage and shipment damage. Since the product is perishable and subject to bruising, some loss in the flow-to-market must exist even though it is not recorded in the databases. More on this will be discussed later in the modeling and linkage between the retail and FOB analyses.

Early in the formation of the National Mango Board, the staff and NMB members recognized the limitations of using imports for analytical demand analyses. Imports give an aggregate measure of the base volumes but do little in providing insight into the behavior of households when making purchasing decisions. To address this major research problem, a plan for building a database of household purchasing decisions was put in place. The results of that plan follow in the next section.

Household Purchasing Database

In late 2007 the NMB staff started the exploratory process for acquiring household consumption patterns for mangos. Quickly it became apparent that historical mango purchasing data did not exist and that data collection plans were not being funded by other private companies or agencies. Immediately, staff and this consultant started searching for companies who specialize in retail consumption data collection. At the outset, the essential elements of a new database were defined

including sample size and coverage, reporting frequency, household demographics and status, product inclusion, product forms, units of measurement, value and prices of purchases, decision factors, household traceability, and tabulation procedures. After considerable screening, the NMB contracted with a San Francisco based company that specializes in maintaining a very large panel of households who report their purchasing of products specifically identified for the contracting organization, here the National Mango Board. A detailed questionnaire was designed by the NMB staff and then a contract was completed. The questionnaire is in Appendix A.

While the questionnaire is very detailed, the essence of the content is that within a two-week shopping window over 1,000 households report if they purchased mangos and, if they did, how much and at what price. Initially, these biweekly data were sent to the staff and consultant, and then tabulated for internal use. An ongoing database management system was put in place and as of December 2010 the data included 48,755 observations with biweekly purchasing records across thousands of households starting in March 2008. After considerable analysis of the sampling properties, the reporting frequency was reduced to once a month instead of the biweekly reports. This change proved adequate as well as cost saving for the NMB.

Table 1 shows the more important aspects of the database. For each household, demographics include location, age, ethnicity, education, marital status, and income. All of these are measured with standard groupings according to the distributions within each demographic. Secondly, shopping behavior is captured with several variables such as shopping frequency, preference for organic foods, importance of eating fruits and vegetables, and preference for new foods. Households were asked about the health situation of the family members. For each respondent who purchased mangos, he or she was asked to rank the 1st, 2nd, and 3rd most important reason for selecting mangos. Finally, each household reported if mangos were purchased and, if so, indicate both the volume and price paid. These latter two questions were essential to measuring market penetration and market intensity as discussed earlier.

These data are maintained in a computer format that can be readily accessed for creating monthly industry reports, special request reports, and for demand

analysis. Specifically, one can measure the impact of demographics, attitudes and behavior, health status, prices, and marketing efforts on both market penetration and market intensity. It is this database that is used to estimate the demand for mangos. Recognize that the NMB started from a zero household database and now has a rich data source for exploring many dimensions to what drives the demand for mangos.

Table 1. Variables included in the mango panel questionnaire.

Variable	Unit of Measurement	Variable	Unit of Measurement
Race	Binary	Health - Sight/Hear	Yes/No
Age	Ranges	Blood Pressure	“
Ethnicity		Health - Cholesterol	“
Income		Health - Obesity	“
Education		Health - Allergies	“
Marital status		Health - Diabetes	“
		Health - Mobility	“
Frequency of Shopping Seasons	5-point Likert Scale	Reasons for buying - Country of Origin	Ranking reasons 1 st , 2 nd , or 3 rd
Organic preference	“	Quality	“
Try new foods	“	Aroma	“
Healthier than most	“	Color	“
Count calories	“	Size	“
Eat fruits and vegetables	“	Appearance	“
Exercise Regularly	“	Package	“
Prices paid	\$ per mango	Ripe	“
NMB expenditures	\$ per month	Fresh	“
Did/did not buy mangos	yes/no	Advertising	“
Amount purchased	whole/pounds		

Major Trends in Household Purchases of Mangos

As indicated in the introduction, demand is a product of market penetration and market intensity or volume purchased. The need to understand demand requires the type of data outlined above. While many trends can be found within the data set, levels of market penetration and actual volume purchased are the two most direct indicators of the overall performance of the industry. Using the large sample of households, market penetration is defined as the number of households indicating at least one purchase of mangos within the two-week shopping window divided by the

total number of households reporting for that same shopping period. Through October 2010, there are 45 reporting periods with the earlier periods including reports twice a month and the latter, with the sampling changes noted above, only once a month. For discussion periods, market penetration is shown for each month instead of the biweekly periods. Figure 2 shows the average market penetration starting with March 2008.

The left vertical axis is the level of market penetration with each bar representing a month. Over the nearly three-year (31 months) time span, 4.86% of the sampled population purchased mangos at least once during a two-week shopping period. It is worth emphasizing again that without the NMB's investment in collecting and maintaining the household database, it would have been impossible to know this basic statistic. There are considerable month-to-month changes in the levels as seen with the low penetration levels around November and the peaks usually in June and July. Much of the seasonality in these percentages relates to the normal seasonal nature of mango production. Later in the report the importance of other factors influencing these levels of market penetration will be shown, including the impacts of the NMB's overall programs to enhance demand.

Note in Figure 2 the highest level of market penetration occurred in June 2010

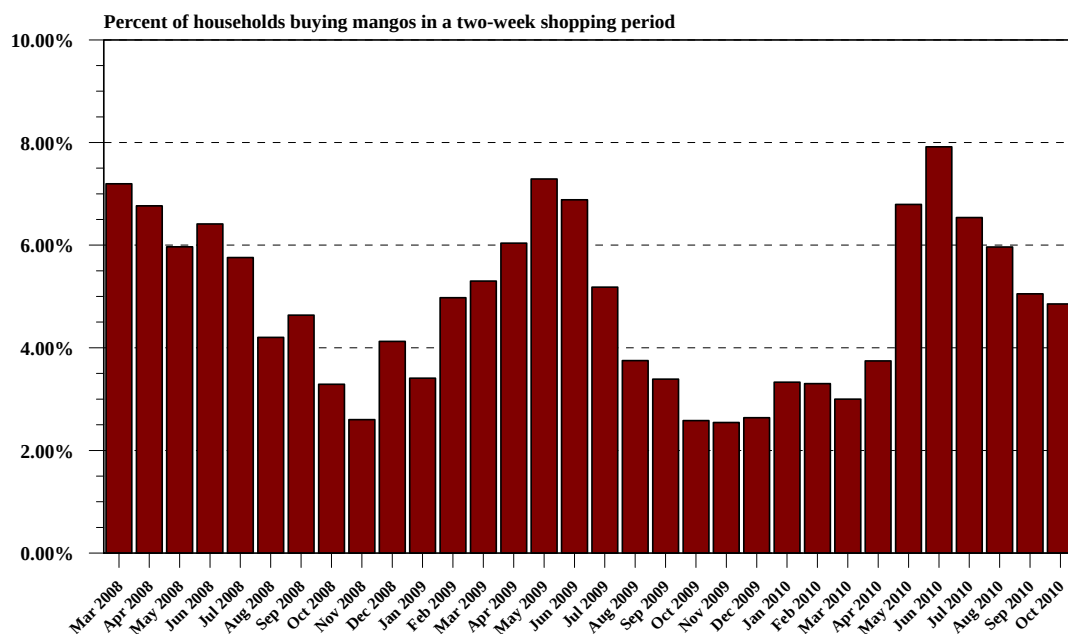


Figure 2. Monthly percent of households buying mangos (Average=4.86%).

and generally the 2010 normal decline is less than seen in the two prior years. While this pattern looks favorable for the industry, one must determine empirically how much of any improvement is due to actions by the industry versus changes in the values of other demand drivers.

All percentages in Figure 2 are based on aggregations over households reporting their buying mangos. At the respondent level, the household would report a “yes” if they purchased or “no” otherwise. Also, the response for one period is totally independent of another where a respondent could purchase one period and not another. In demand research these types of data (with a yes/no) responses are coded as a “0” or “1” with “1” being a yes. In analytical demand analyses the goal is to determine the probability of buying mangos (i.e., the probability of a ‘yes’) and statistically measure the impacts of major factors expected to influence that probability. These types of empirical methods, known as Probit analyses, will be used later to scientifically show the impact of the National Mango Board’s programs on market penetration.

Market intensity measures the amount once a household becomes a buyer within the shopping period. For those households reporting some purchase, they may have purchased mangos in some form other than whole mangos or they may have purchased one, two, three or more whole mangos in the shopping occasion. Figure 3 shows the average number of mangos bought in a two-week shopping period where the overall average is 2.67 whole mangos per two-week shopping occasion. Just like market penetration, there is considerable seasonal variation in the number of whole mangos purchased where the range varies from under two to over four mangos per household. Approximately 50% of those households buying mangos purchased three or fewer mangos and 19% of the buyers indicated they purchased just one mango in the average shopping period. June 2010 is particularly noteworthy given the substantial number in that month relative to earlier years. Overall, there is a very slight positive upward trend across the reporting periods.

During the same months in Figure 3, the average retail price paid per mango was very near \$1.00 per mango. The low was \$0.75 and the high was \$1.28 in November 2009 as shown with the black line in this figure. A simple correlation

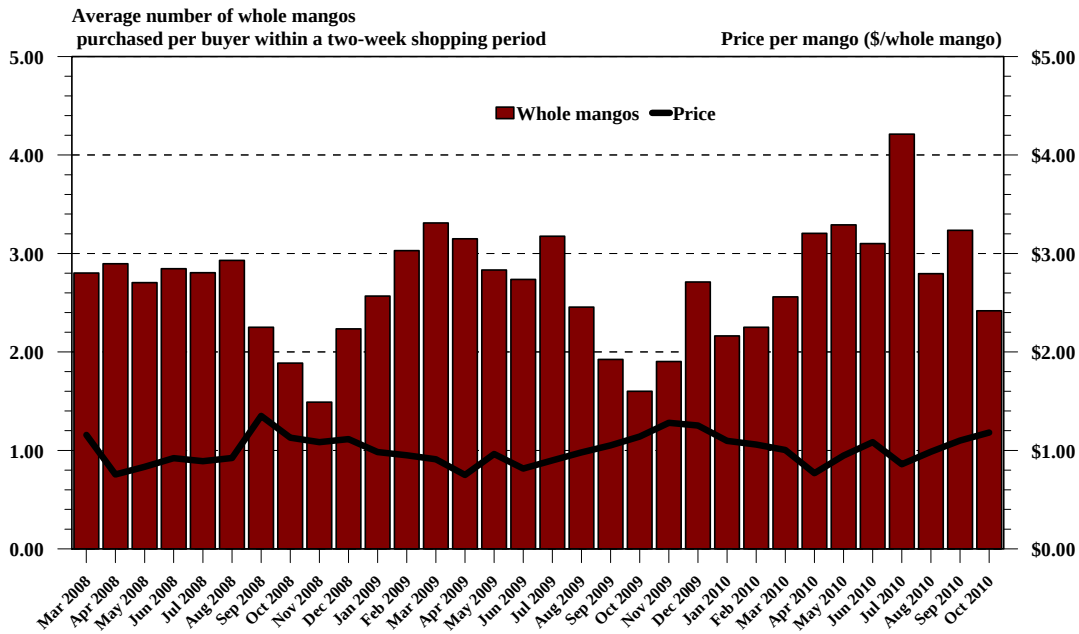


Figure 3. Average number of mangos purchased per buyer in a two-week period.

between the volume of mangos per household and the price paid is $-.57$. As should be the case, there is a strong negative correlation between prices and the amount purchased. The fact that the correlation is considerably different from -1.0 indicates that there are factors other than price in play influencing demand. These other factors will be captured in the demand model presented later including the National Mango Board marketing programs.

Combining market penetration (Figure 2) and the market intensity (Figure 3) along with the number of U.S. households, one can quickly calculate the total number of mangos purchased in a month and the expenditures. This gives the total demand for mangos at each point in time and corresponding expenditures on those mangos. Figure 4 shows these monthly data points with the left axis giving the volume and the right axis giving the expenditures. On average for the months since March 2008, approximately 35.3 million mangos were bought each month with an average expenditure of \$34.3 million per month. Month-to-month variations in demand are readily seen with the seasonal demand patterns being particularly evident. For the 32 months plotted in Figure 4, total household expenditures equaled \$1.097 billion in fresh whole mangos. On a twelve-month basis, this translates into \$411 million in

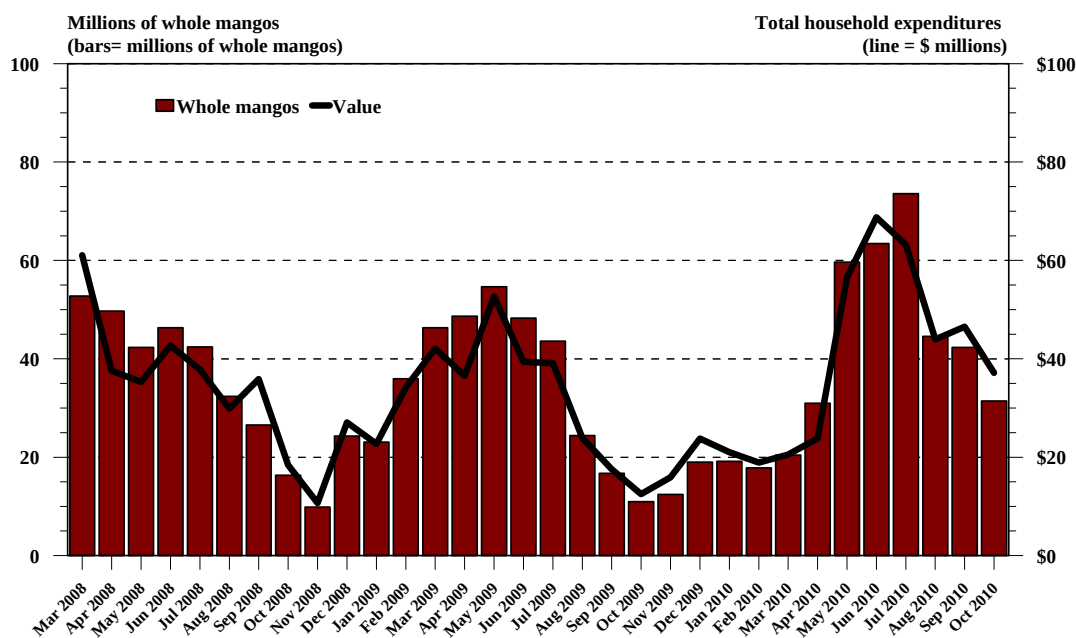


Figure 4. Total household expenditures and number of whole mangos purchased.

expenditures on whole mangos. Through the investment by the NMB, they now have a database to track market penetration, volume per buyer, prices, and the total industry value at the retail household level.

Before turning to the specific objective of measuring mango demand and its drivers, it is imperative to know that the volumes and values from the household panel are consistent with the information coming from the import data. Mangos are perishable so imports should move quickly through the market channels and be purchased at the end point. Given the storage limitations, there should be a reasonable mapping between the reported household purchases and the reported imports. Some portion of the mangos moves through non-retail channels and, to that extend, the import numbers should differ from the household sample numbers. Yet the patterns of movement should be close if the household panel is truly representing the household-level purchases of mangos. Household consumption is reported in total whole mangos while imports are in terms of metric tons. Without knowing the exact weight of the household purchases, there could be some measurement error converting the household to a pound equivalent. Consistency in the patterns of household volume relative to imports is of primary interest. Hence, one can take both

the household volumes and the import values and index each series to its mean value. Indexing removes the measurement problem and allows for a quick comparison of the two series. The better household data capture true retail demand, then the two mango volume indices should be highly associated.

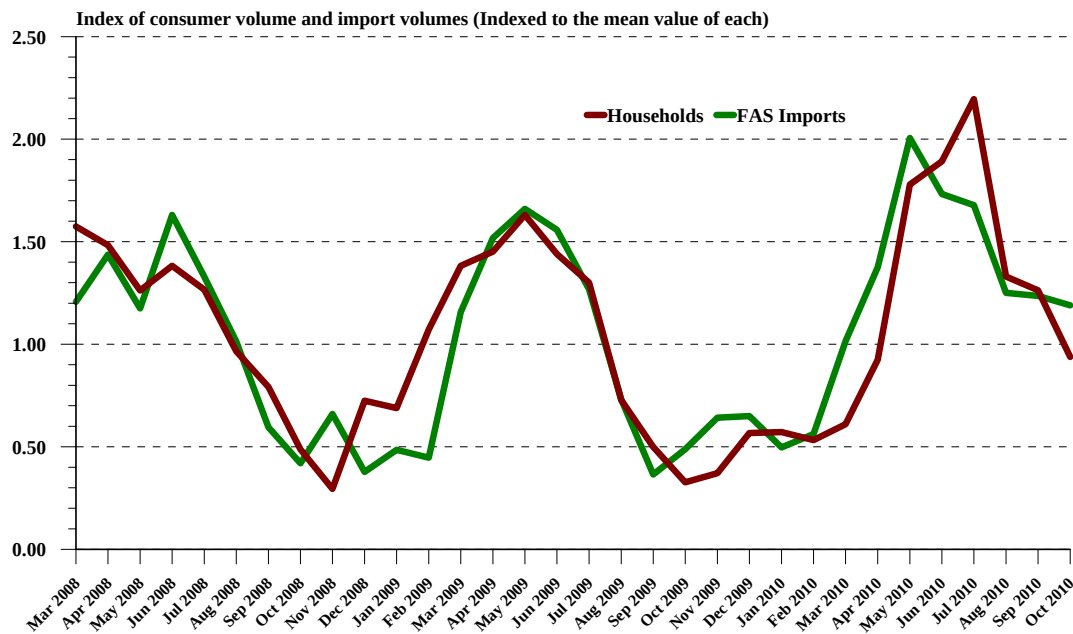


Figure 5. Index of mango volume through imports and through household indicated purchases.

Figure 5 includes these two indices with the red measuring the household level and the green, the import level. As most apparent in this figure, the panel data almost mirrors the import patterns with occasionally a slight lag between the two series. The large swings are fully reflected in both and most turning points are close. As shown in the figure, the simple correlation between the two series is .854, pointing to a statistically strong association between the two series. The take-out from Figure 5 is that the household data truly represent the real world of mango trade. One can have strong confidence in using the household data as a representative sample of U.S. household mango purchasing history.

National Mango Board Programs

With the approval of the National Mango Board in 2005, a system very similar to other commodity boards was established using an assessment of ½ cent per pound to fund the programs. Assessments are on those producers and importers with annual volumes of 500,000 pounds or more. Collection of assessments started in 2005 along with implementing the necessary strategies for building a staff and programs. There is always considerable lead time required to bring all the elements together for a fully-functioning commodity promotion board. Strategies and goals have to be defined, positions staffed, and messages and media systems identified. Also, by law these programs have to put in place a scientific approach for evaluating the economic impact on mango demand. Participation is mandatory but subject to government oversight and scheduled or special called referendums (USDA-AMS, 2010). The NMB meets in person three times a year as a full NMB to set plans, approve budgets, and redirect if needed. Conference calls are also scheduled throughout the year for the different committees. Technical and legal aspects of the NMB can be found within

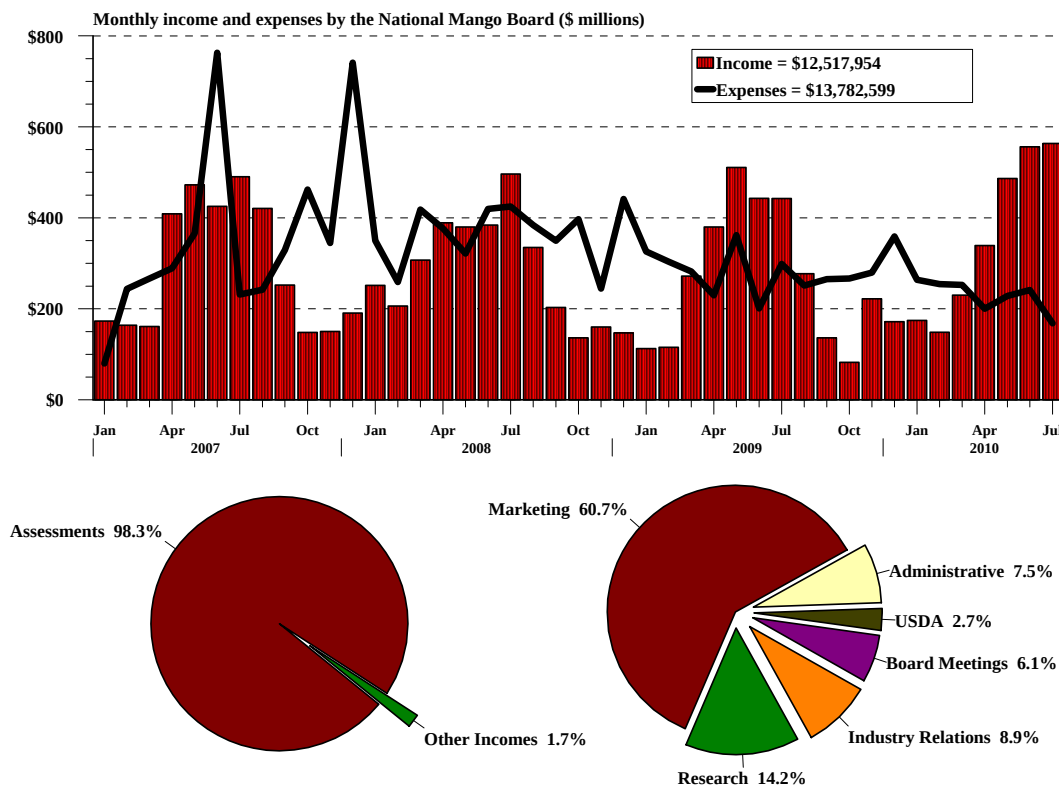


Figure 6. Income and expenses by the National Mango Board for 2007:1- 2010:7.

the USDA Agricultural Marketing Service as well as on the National Mango Board website (shown later).

Starting with January 2007, Figure 6 shows the total monthly incomes and expenditures up through July 2010. Over these 43 months, total incomes equaled \$12.5 million and expenditures totaled \$13.8 million. For those periods, expenses exceeded incomes by about \$1.0 million with much of those expenditures covered through early assessments in 2005 and 2006 near the startup of the program. This negative net income is one of the reasons for the current NMB considering increases in the assessment rates (Watson, 2010).

Since assessments are on a volume basis, one would expect the pattern seen in Figure 6 where the assessments are highly seasonal. In comparison, program expenditures are much less seasonal with a lot of activities in the off months of each season. Also, part of the less-seasonal nature of expenditures is due to the staffing and overhead that continue throughout the year.

The lower portion of Figure 6 shows that over 98% of the NMB's income comes from mandatory assessments. On the expenditures side for the full three-plus years, the NMB's marketing programs account for nearly 61% of the total expenditures and research accounts for 14.5%. Cost for funding the household data for this analysis is included in the research budget. The remaining 25% covers administrative, government oversight, NMB meetings, and interfacing with industry groups. Industry relations are particularly challenging since most of the NMB members are from Central and South American and there are considerable costs for having NMB and committee member meetings.

Marketing entails all media and supporting programs for getting the mango message directly to potential consumers and the trade who eventually service consumers through away-from-home outlets. For the months since January 2007, marketing in its broadest definition totaled \$8.36 million with funds used to support the following programs: consumer public relations (38.14%), retail promotions (36.75%), trade media (5.01%), website (4.73%), foodservice (3.40%), trade shows (1.86%), and marketing overhead (10.07%) (National Mango Board Accounting Records, 2010). While not included in this report, the NMB's accounting system does

provide much greater depth showing the expenses within financial categories and subcategories. Allocation of marketing funds differs across time and according to evolving program focus. Nonetheless, these percentages give a general insight into the range of marketing efforts to influence both market penetration and volumes purchased.

As seen in Figure 6 marketing is the primary instrument for reaching potential mango buyers. With the NMB's consumer media efforts, U.S. consumers have seen mango messages in newspapers, magazines, online and on TV over 1.4 billion times (i.e., 1.4 billion consumer impressions) since 2006. These messages focus on creating day-to-day awareness of mangos while illustrating how to select, cut, store and use mangos. Since 2006, approximately 75,000 retail stores have been reached using over 450 retail promotions programs. In 2009 alone, over 4,000 mango demo events took place. Dozens of additional free retail promotions were generated through these retail relationships. With the use of eleven large-scale foodservice promotions, several food-service operators added mango items after receiving training on how maximize their yield and labor efficiency when cutting mangos.

The NMB's website is another good example of measurable progress and impact on various audiences. Websites have become essential to commodity boards as a direct line to consumers, but they also provide an additional opportunity to communicate with retailers, foodservice operators and industry members. They have evolved with more creative graphics and interactive alternatives depending on the degree of dedication to site development. The National Mango Board has made a substantial investment in the development of their website as illustrated in Figure 7 below. Once in the website, the user can choose between English and Spanish and then explore the world of mangos from recipes to industry statistics. The NMB logo is on the left top portion and then immediately under the logo the visitor can move to Recipes, About Mangos, Nutrition, ManGO Kids, and Celebs & Events. Clicking on each brings a rich set of information about the attributes and use of mangos. To the right of these five tabs, detailed information about the Media, Industry, Retailers, and Foodservice sections can be accessed. Within these sections, the visitor can even go to monthly updated charts similar to those shown in Figures 2 and 3 of this report.



Figure 7. National Mango Board website (www.mango.org).

Since many potential buyers have limited knowledge of how to cut and use mangos, there is a full section with a video on “How to Cut a Mango.” Sections for Kids and Seasonal eating are to the right of the how-to-cut section. Moving around the site, one can tap into the latest internet communication tools such as Facebook, Twitter, You-Tube, and more.

Websites are only as good as the number of visitors accessing them and using the information. Likewise, visits do not necessarily translate into increased market penetration or number of mangos purchased. Yet, visits give some indication of interest with the expectation that increased interest eventually leads to purchases. At a minimum, if a website has no activity that is a sure indication of lack of interest and, in contrast, growing visits point to interest or at least curiosity.

In Figure 8 below, monthly visits to the NMB’s website are shown starting with June 2007, the first period with visit data. Visits are seasonal as would be expected given the seasonal nature of mangos entering the U.S. market. As seen in the figure, visits range from around 5,000 to nearly 15,000 over the months shown. More important, there is a positive growth trend in the visits after accounting for the

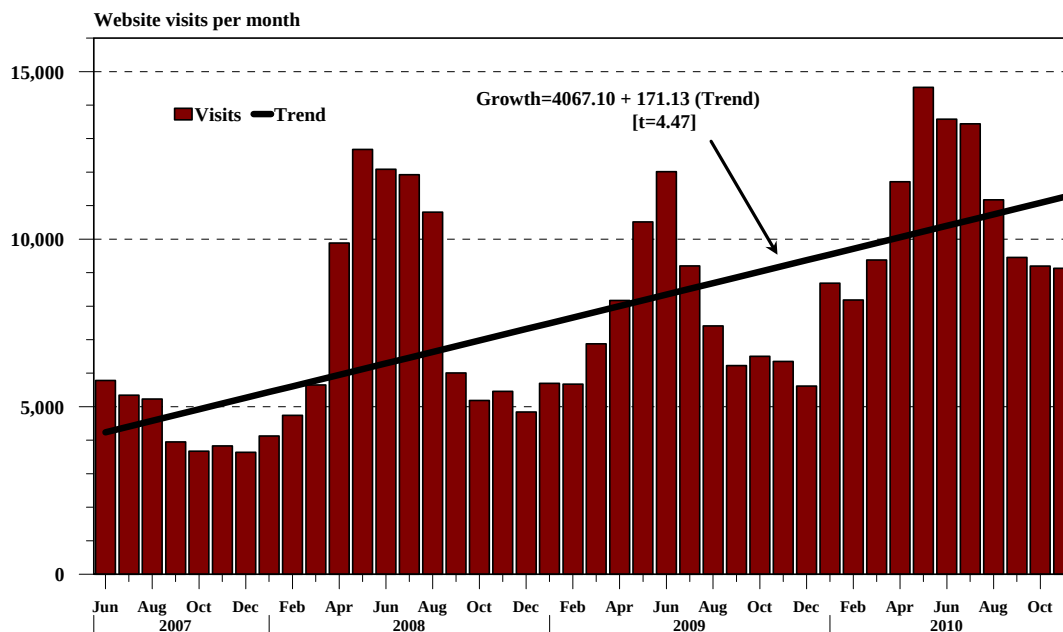


Figure 8. Visits to the National Mango Board website.

seasonal nature of the visits. The black line in Figure 8 is the predicted visits without the seasonality and the trend shows that each month the number of visits is expected to increase by 171. This trend is statistically significant with more than a 95% confidence level. Recognizing that visits are not equivalent to demand, this trend in visits is an initial measure that the National Mango Board has at least stimulated interest in learning about mangos. The average visit also includes reading around three pages of the website. A visit with reading just one page would suggest possible curiosity, but reading three pages should be pointing to a more in-depth interest in the website content.

Before turning to actually measuring the demand for mangos in the next section, it is again emphasized that consumer impressions and website visits are the most basic of measures of the impact of the NMB. The positive growth signals that households have been reached in providing information and improving knowledge about mangos. We must turn to the next section to determine scientifically if the U.S. demand for mangos has been impacted with the National Mango Boards programs.

The Concept of Mango Demand

Demand is a commonly used term often just referring to how much of a product is being purchased. Technically it is complicated since one must determine how much is being purchased under a very specific set of conditions. For example, a household may buy mangos but only at a certain price. Then at that price, the decision depends on the demographics of the household; the state of knowledge about foods in general and mangos specifically; the attributes and display of mangos at the time considering the purchase; and possibly just random decisions that cannot be associated with something specific. The key element in demand analysis is to identify and measure the impact of those major factors influencing the decisions while recognizing that one does not have to identify everything entering the decision process. Something left out of a demand model does not invalidate the model, it simply means that part of the demand has not been explained. With the current objective to measure the impact of the NMB's programs, it is obvious that a measure of the NMB's efforts must be included in the model. That can be done without the inclusion of every detail about the household. As long as there are no demand drivers highly correlated with the marketing programs, the impact of the NMB's programs can be measured even when more minor demand drivers are not included in the model. A model that captures the major factors influencing demand is preferred. For most commodities at the consumer level those factors include price, demographics, attitudes, information, and seasons that are usually associated with calendar occasions.

Using Figure 9 to illustrate, demand for mangos shows the relationship between price and quantity at a point in time and for a set of conditions (i.e., values for the demand drivers). The left axis is the price of a whole mango at the grocery store and the bottom axis is the number of whole mangos purchased. The solid black line labeled D_0 shows how the number of mangos purchased changes for different prices. Note that D_0 is drawn as a straight line for convenience only. For most goods, the demand is more likely curved when shown over a wide range of prices.

Movement along D_0 maps out the number of whole mangos purchased at each price level. Point (a) shows the number of mangos (M_0) purchased for the price P_0 .

The area under (a) denoted with (I) represents household expenditures on mangos for those conditions that lead to the demand D_0 . For discussion purposes, suppose this demand is for the average household under normal conditions but in the total absence of the National Mango Board's marketing programs. Clearly, there is a demand for mangos without the NMB's programs. Now start the programs and given enough time and effort, those marketing programs could potentially enhance the demand for mangos. The impact must be measured, but for now suppose those marketing programs did enhance demand. Demand shifts from D_0 to D_1 while still working with the average household and other conditions. Households faced with the price P_0 would increase their demand for mangos from M_0 to M_1 . This increase could be from more mangos per buyer or from entry of additional buyers (i.e., market penetration). For the same price P_0 , household expenditures attributed to the rightward shift in demand would increase by the area labeled (II), the green area in the figure. These new expenditures were theoretically achieved at a cost to the NMB's marketing programs for this example. Eventually, one has to calculate these costs relative to the gains and that cannot be done until the actual shifts in demand are measured. It could be that no shifts were seen or the shifts were positive but not enough to cover the cost. On a more positive perspective for the industry, it could be

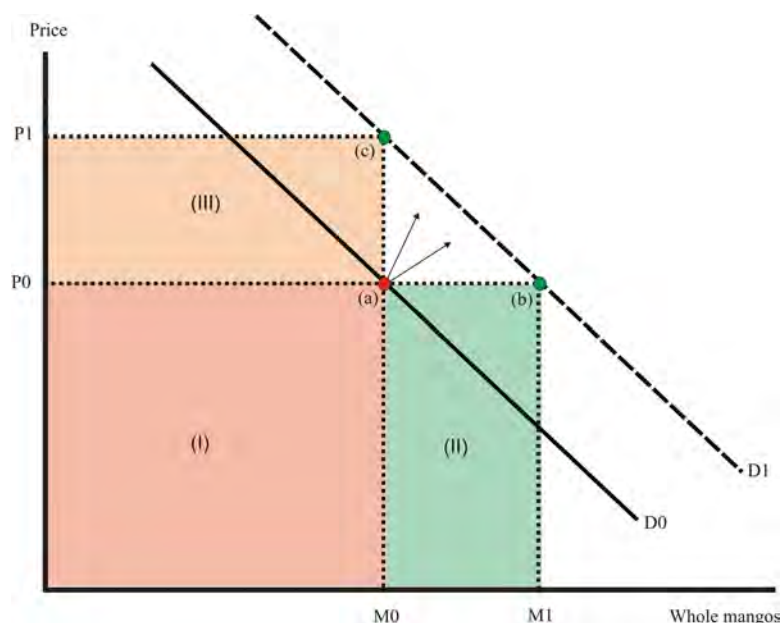


Figure 9. Graphic concept of mango demand.

that the programs shifted demand substantially with resulting gains far exceeding the costs. To know precisely, one has to turn to the statistical modeling in order to scientifically measure the impacts.

In Figure 9 it could be that households purchased the same amount but at a higher price. The same demand shift applies but now the price has increased to P1 and purchases remain at M0, the initial pre-marketing level. Under this example, household expenditures increase by the orange area labeled (III). The same argument in the previous paragraph still applies in terms of the gains relative to the cost of achieving the demand shift.

Finally, in this figure other conditions have been fixed in order to illustrate the positive shift in demand. In the real world nothing remains fixed, both D0 and D1 are constantly moving as other demand drivers take new values. For example, suppose we were looking at the mango demand for the U.S. Asian population versus the U.S. Caucasian population, we will see later that both D0 and D1 would be much further to the right for the Asian population when the demand is on a per household basis. This is true because Asians consume more mangos on a household basis. Similar illustrations could be made for any of the non-marketing demand drivers with some shifting everything to the right and others moving both D0 and D1 to the left. In the next several sections we will see the empirical differences in demand across a range of demand drivers. As a final note at this point, Figure 9 is drawn at the household level. Eventually that same demand must be expressed at points down the distribution system closer to the levels where the mango assessments are placed.

Empirical Models of the U.S. Demand for Mangos

Estimating demand models requires mathematics, statistics and data, and is a highly technical process. However, one can explore the impacts of mango demand drivers without going into all of the empirical details. In the following sections, the essential aspects of the models are laid out in general terms and then the more technical parts of the models are included in Appendices (B) and (C). As just illustrated in Figure 9, the goal is to quantify the demand for mangos and determine how that demand changes with the NMB's programs along with other important

factors influencing the demand for mangos. Mango demand occurs when households decide to buy and then the question of how many is made. Factors influencing the first decision may or may not be the same as those guiding how many mangos to purchase. Essential to the overall evaluation is determining if the NMB's programs influenced just market penetration, just intensity or both. As noted earlier in the report, demand is a product of the *(number of households) × (percentage buying) × (volume)*. Table 1 identified the major variables expected to have an impact on market penetration and volume. In this section of the report we concentrate on the NMB's impact and then later discuss the role of demographics and other demand drivers.

Market Penetration and the National Mango Board

The National Mango Board's program expenditures were incorporated into the market penetration model (Appendix (B)) and the resulting coefficient was positive and statistically different from zero with a 99% confidence level. That is, we are 99% confident that the NMB's impact on market penetration is statistically different from zero. Using the characteristics of the average household and average season, the penetration model was used to predict the probability of buying mangos over a range of NMB expenditures. These probabilities are for the months from February 2008

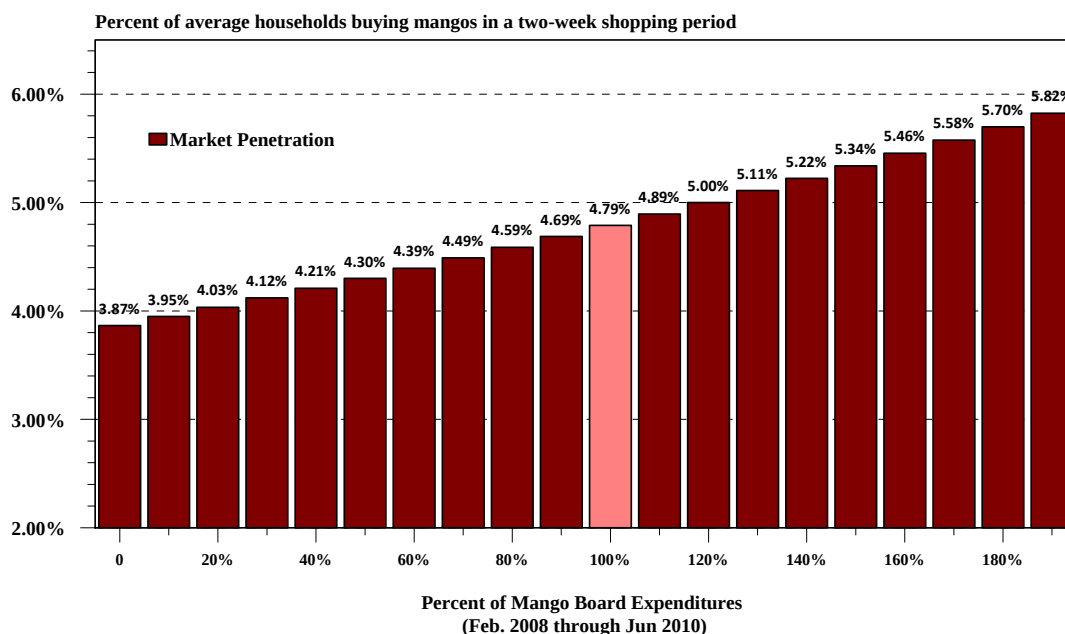


Figure 10. Estimated impact of the National Mango Board on market penetration.

through June 2010 and, hence, differ a little from those in Figure 2 because Figure 2 extends through October 2010. The models were estimated using data through June, the latest period available when the models were completed. During those months, total NMB expenditures equaled approximately \$8.90 million. For that level, the model shows the estimated probability of buying mangos to be 4.79%, again for the average household, prices, and period.

Next with increases or decreases, the corresponding change in market penetration is revealed. As a general rule, for each 20% adjustment to the NMB's expenditures, market penetration will change by .20 percentage points. For example, going from actual NMB expenditures to a 20% increase, market penetration increases from 4.79% to 5.00%. Similarly, with a reduction of .20 percentage points, market penetration declines to 4.59%. Within the range shown, the entry or exist responses are nearly linear. Note that with a complete elimination of the NMB, the model points to a decline in market penetration to 3.87% or almost a full percentage point decline in the level of household buyers. In a market where the average penetration is already low, a one percentage point change can be quite an impact.

The responses in this figure provide half of the equation for showing the full impact of the NMB's efforts to enhance mango demand. To emphasize again, the levels of penetration are for the average household and would differ when considering specific household demographics or other factors. The responses to the programs would remain the same but just at higher or lower levels of the percent buying mangos.

Market Intensity and the National Mango Board

Referring back to Figure 3, the average number of mangos per household was shown. Now using the demand model (see Appendix (C)), one can quickly show how market intensity changes with changes in the NMB's programs paralleling the immediate discussion for market penetration. At 100% of the NMB's expenditure level, Figure 11 shows a predicted 2.69 mangos per average household in the shopping period. Again, the number is slightly different from Figure 3 since the periods included differ. The impact of the NMB's program is statistically different from zero with a 97% confidence level and the impact is positive. Numerically,

however, the NMB's impact on the number of mangos is relatively small compared with market penetration. In Figure 11 comparing at 100% to 150% of NMB expenditures, the number of mangos increases slightly from 2.69 to 2.73 or .04 mangos. Equally, a complete elimination of the programs would decrease the number of whole mangos to 2.61 or .08 mangos. Obviously households cannot purchase part of a mango but the fractions exist because of averages over those reported purchases. The real takeout from this part of the model is that while the marketing and supporting programs do have a measurement impact on market intensity, it is relatively small compared with changing market penetration. Even with this relatively small change in the number of mangos, one still needs to remember that a small change in a single household can translate into large volumes when dealing with millions of households.

The combined results from Figures 10 and 11 are particularly useful in that they first establish a strong statistical linkage between the NMB's programs and U.S. demand for mangos. They provide a quick means for seeing where the gains (or losses) would occur with changes in the programs, i.e., attracting new consumers or increasing consumption levels among existing consumers. Finally for this report, they provide the means for measuring the full impact of the NMB's programs on total mango demand.

Total Demand and the National Mango Board

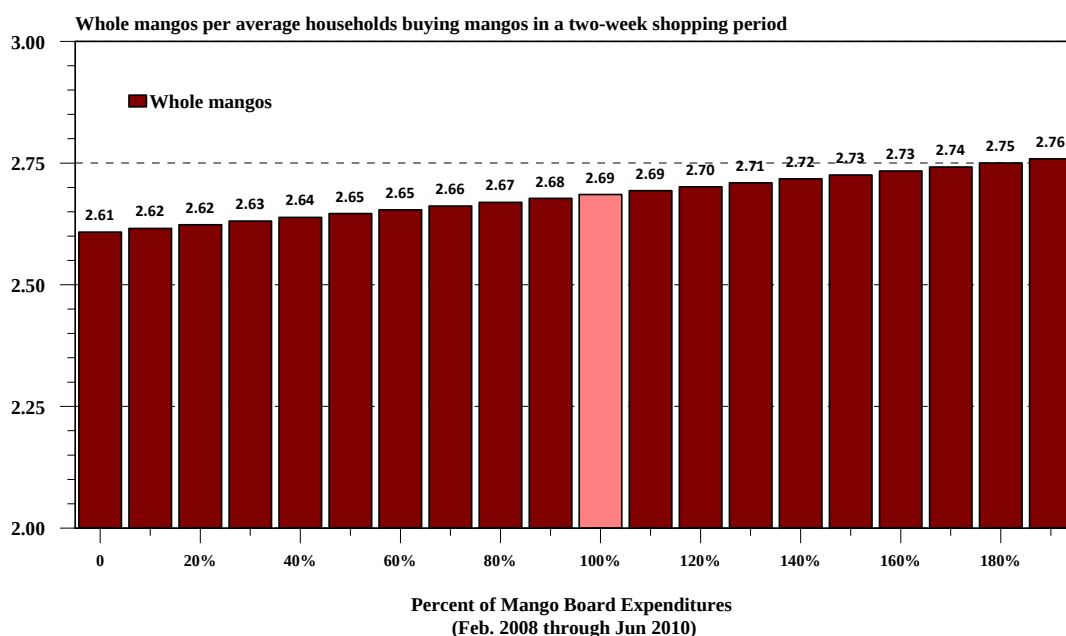


Figure 11. Number of whole mangos per buyer with changes in Board programs.

Using both the market penetration and whole mango models, it is now possible to predict total household demand with actual NMB program expenditures and then estimate the same demand but assume the programs were set to zero. That is, mango demand is estimated with and without the program expenditures for the periods included in the household panel data. Unlike the levels shown in Figures 10 and 11, these estimates are for all actual conditions except for controlling the expenditure level. The total household population is known and the models yield estimated levels for market penetration and volume. These month-to-month estimates are shown in Figure 12 where the upper line gives the total number of mangos with the NMB programs and the bars are the estimates without the programs. Month-to-month changes are attributed to all factors that changed with each period but the difference is due to the generic program efforts. Also, variations in the difference are a direct result of monthly changes in the NMB's program expenditures. The actual numbers from Figure 12 will be used in the next major section to derive the return-on-investment from the National Mango Board's programs. Note that for each monthly volume the prices paid are also known, thus the resulting expenditures with and

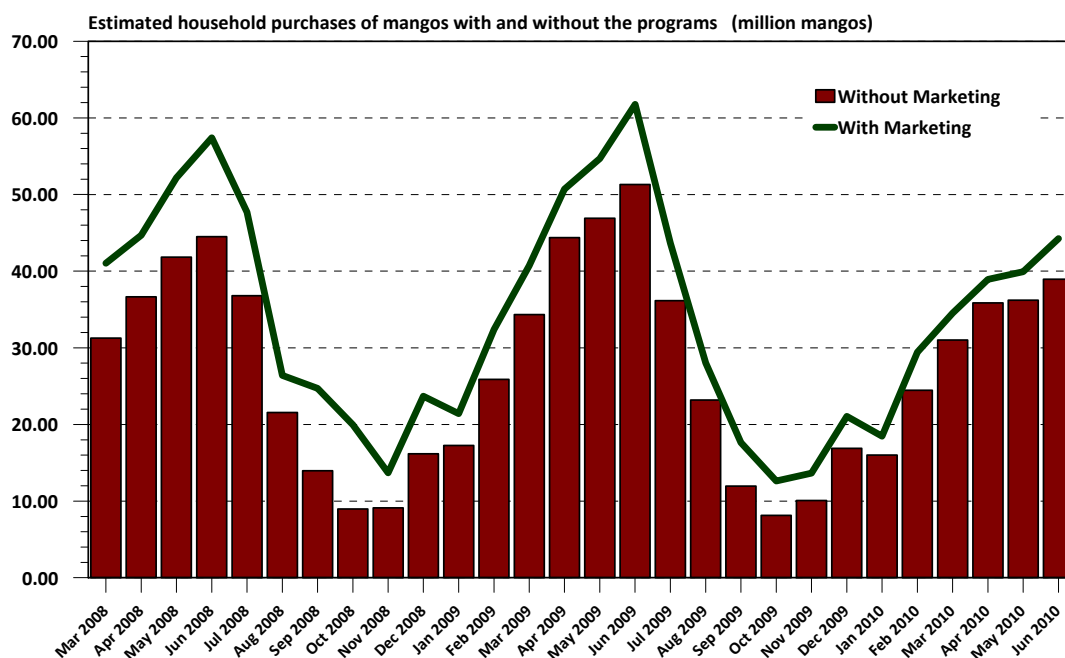


Figure 12. Estimated impact of the National Mango Board programs on household demand for whole mangos.

without the NMB's programs can be estimated.

Return-on -Investment (ROI) and the National Mango Board

In Table 2 the accumulated differences between the estimated mango demand with and without the NMB's programs (see Figure 12) are presented. It is important to always remember that these demand estimates are based on models and are subject to normal statistical interpretation. Also recall that both the penetration and volume responses were statistically significant. The first row in this table shows the estimated household expenditures on mangos over the period from March 2008 through June 2010. Table 2. Estimated return-on-investment for the National Mango Board.

National Mango Board Programs			
Mar 2008-Jun 2010	With Programs	Without Programs	Difference
Household Expenditures	\$ 881,100,124.00	\$ 693,965,034.00	\$ 187,135,089.00
Percent of Expenditures		78.8%	21.2%
FOB Equivalent (Factor=34.07%)	\$ 300,228,938.00	\$236,463,915.00	\$63,765,022.00
NMB Expenditures (Feb 2008 - Jun 2010)	\$8,904,426.00		
Return on Investment (FOB Level)			7.16
Attributed to Market Penetration			\$165,309,454.00 (88%)
Attributed to Market Intensity			\$21,825,634.00 (12%)

2010. With the marketing and supporting mango programs, total household expenditures on whole mangos were approximately \$881 million for the 28 months. Without the generic programs, household expenditures would have been an estimated \$694 million, giving a difference of around \$187 million at the household level. At the retail that represents a 21% increased in demand attributed to shifts in demand as a direct result of the generic marketing and supporting programs.

Since the mango assessments (see Figure 6) are at the import level, it is useful to express the demand gains at an equivalent FOB level. Over the data set, FOB prices have generally averaged approximately 34% of the retail price. Using that percentage factor, household expenditures are expressed on an equivalent FOB value. Hence, in Table 2 those gains attributed to the NMB are equivalent to \$63.8 million at the FOB level. The models presented in Appendices (B) and (C) included a lagged marketing effect to capture an expectation that there would be some carryover effect between months. Some of the program's efforts in February 2008 were expected to have some impact in March 2008. Hence, while the demand changes are for March 2008 through June 2010 months, the total NMB expenditures are shown starting with February 2008 giving a total of \$8.9 million for those months. Dividing the FOB equivalent gains by \$8.9 million gives an estimated ROI of 7.16. At the FOB level, the NMB's generic efforts have produced around \$7 million in additional FOB level revenues for each million dollars of investment in their demand enhancement activities. This ROI is in the range seen for many other commodity programs (Ward, 2010).

Interpretation of the ROI needs to be done with care. It shows that the programs have successfully generated substantial additional expenditures on mangos by shifting the demand for mangos. As shown in the table, nearly 88% of the demand gains are attributed to attracting buyers rather than changing the number of whole mangos per buyer. The NMB's programs are enticing households to try mangos and the resulting demand gains are relatively large. While somewhat subjective, it is not surprising that most of the gains result from market penetration since the level is already quite low compared to many other commodities with similar generic programs.

The return-on-investment (ROI) in Table 2 was limited to March 2008 through June 2010 because of the data range from the household panel data. During those same months, total mango imports were 183.8 million boxes, assuming 8.8 pound boxes. Reported FOB value was \$544.38 million based on FAS online data sources for the 28 months. Rows 1 and 2 in Table 3 show these import numbers and that value should include any impact attributed to changes in demand attributed to the National

Table 3. Imports and the ROI from the National Mango Board (NMB).

	(Mar 2008 - Jun 2010)	Imports
Row 1	FOB reported imports (8.8 lbs. boxes in mil.)	183.80
Row 2	Import value as reported for the period (\$ mil.)	\$544.38
Row 3	Estimated gains attributed to the NMB	\$ 63.77
Row 4	Estimated value without the NMB (Row 2 - Row 3)	\$480.61
Row 5	FOB price with the NMB (\$ per box) (Row 2 ÷ Row 1)	\$2.962
Row 6	FOB price without the NMB (\$ per box) (Row 4 ÷ Row 1)	\$2.615
Row 7	Estimated gain in price per box	\$0.347
Row 8	Assessment per 8.8 lbs box (.05 ¢ × 8.8 lbs.)	\$0.044
Row 9	ROI based on a per FOB box basis (Row 7 ÷ Row 8)	7.88
Row 10	Percentage gain in price attributed to the NMB (Row 7 ÷ Row 6)	13.3%

Mango Board. From Table 3, the total mango value at the FOB level was estimated to be \$63.77 million greater as a direct result of the generic marketing and supporting programs. Thus, Row 4 shows what the estimated FOB would have been in the absence of those programs. Dividing total imports (Row 1) into both values gives the price per box with and without the NMB's efforts. The difference between these two prices (Row 5 and Row 6) is the gain in FOB price that can be attributed to the programs or 34.7 cents per box (see Row 7). Mangos are assessed at ½ cent per pound or 4.4 cents per 8.8 pound box. Dividing that per-box assessment into the price gain gives another way to estimate a ROI to the NMB. Row 9 shows this ROI to be 7.88 compared to the slightly lower ROI from Table 2. Part of the difference results from the conversions between whole mangos in the first case and box units in the latter. More importantly is that fact that the two methods for deriving the ROI are

very close especially when recognizing that one ROI is derived from the total expenditures and the other on a price basis.

Results from Table 3 can be useful when considering the potential benefits further down the distribution system closer to producers. We do not know with statistical confidence the linkage between the FOB and producer prices as well as if all of the assessments are passed down to producers. Once those numbers are known with confidence, then it is possible to use Table 3 to express the gains at levels beyond the FOB or Row 9 in Table 3.

The estimated gains are based on detailed econometric models included in the appendices. It is worth noting here, however, that the models included both the immediate and one month lag effects of the programs. That is, the full response to a media effort is not realized during the same month. In fact, the models show that 65% of the impact is realized immediately in the same month of exposure to the public and 35% in the subsequent month. Within two months the full impact is realized or, stated another way, there is a rapid decay to the response. Programs with this type of quick response and decay points to the need to continually be in the marketplace contrasted with intermediate large media blimps.

Demographic Impact on Mango Demand

The market penetration and market intensity models included the demographic differences among the thousands of households included in the household panel data. Most of the demographics had statistically significant impacts on entry and level of purchases. Table 4 shows the average probability of buying mangos with a two-week shopping window and the number of mangos purchased among those households buying. The demographics include income, age, education, race, household size, region location, and seasonality. While the reader can easily follow the patterns for each demographic, a few responses are particularly important. Responses to income differences and education are mixed except that there is a major increase in the probability of buying mangos among the households in the higher education bracket. Likewise, market penetration tends to decline with higher income levels while the changes in number of mangos are mixed across incomes. Among the demographics,

Table 4. Demographic effects on mango demand.

Demographics	Levels	Market Penetration	Mangos per Hwd
Average	Average	<u>0.0478</u>	<u>2.6852</u>
Income	Under \$50,000	0.0466	2.4924
	\$50/\$75,000	0.0515	2.9519
	\$75/\$100,000	0.0472	2.7204
	Over \$100,000	<u>0.0446</u>	<u>2.8523</u>
Age	18/24 yrs	0.0605	2.5439
	25/44 yrs	0.0466	2.5641
	45/55 yrs	0.0467	2.7141
	55+ yrs	<u>0.0433</u>	<u>3.0311</u>
Education	High School or less	0.0461	2.5165
	College	0.0431	2.6788
	Graduate	0.0730	2.7694
	Other	<u>0.0502</u>	<u>3.3197</u>
Race	White Non-Hispanic	0.0345	2.2103
	White Hispanic	0.0553	2.9497
	Black	0.0596	2.9647
	Asian	0.1077	2.9979
	Others	<u>0.0736</u>	<u>3.1875</u>
House size	1 person	0.0453	2.1871
	2 people	0.0526	2.4481
	3 “	0.0609	2.6240
	4 “	0.0701	2.7566
	5 “	0.0805	2.8617
	6 or more	<u>0.0919</u>	<u>2.9475</u>
Regions	New England	0.0597	2.7427
	Middle Atlantic	0.0521	2.8259
	East North Central	0.0367	2.7155
	West North Central	0.0402	2.8752
	South Atlantic	0.0480	2.5363
	East South Central	0.0312	2.5207
	West South Central	0.0468	2.5737
	Mountain	0.0636	2.5766
	Pacific	<u>0.0550</u>	<u>2.7993</u>
Seasons	Jan	0.0373	2.4278
	Feb	0.0456	2.7374
	Mar	0.0587	2.5362
	Apr	0.0617	2.7478
	May	0.0725	2.9978
	Jun	0.0725	2.8521
	Jul	0.0555	2.7730
	Aug	0.0414	2.7280
	Sep	0.0341	2.3475
	Oct	0.0217	2.1853
	Nov	0.0256	2.2108
	Dec	0.0362	2.7321

race has a major influence on mango demand. The Asian population shows a market penetration more than twice any other ethnicity group and the white non-Hispanic

population shows the lower level of market penetration. The race patterns for number of mangos are similar with the white non-Hispanic again showing the least number of mangos per household. This cross section of the population is the largest group but the least likely to consume mangos. This pattern points to the possible need to further target this group.

Also, there is an almost linear relationship between household size and the probability of buying mangos. Increase in the number of mangos with family size would be expected but the higher probability was not necessarily expected. Finally, one can see the regional differences with the East South Central region showing the lowest probability and lowest number of mangos. Again, the regional patterns provide trends that may suggest regional types of marketing efforts especially in those weaker market places. The seasonal patterns are known so we will not comment further on them.

Household Attitudes and Mango Demand

Following the same format as Table 4, several household attitudinal variables included in the demand models are in Table 5. Each variable is based on a statement that the household scores a response in terms of the degree of agreement or disagreement to the statement. For example, the first statement is that “*I count calories*” with the obvious goal to determine mango purchase habits among households with weight concerns. The other questions in Table 5 are self explanatory using the same 5 point scale of agreement (i.e., a Likert Scale). The level of agreement with counting calories strongly points to households concerned about the consumption of mangos when weight concerns exist. The probability of buying mangos drops from a high of 5.86 to a low of 3.57 as a household expresses more agreement to counting calories. Similar declines are seen with the number of mangos purchased. An opposite preference is seen when seeking out new foods where the ranges are pronounced and positive as a household is more inclined to seek out new food. In contrast, there is very little impact among those households who like to exercise.

Table 5. Household attitudes and behavior effects on mango demand.

Attitudes	Levels	Market Penetration	Mangos per Hwd
Average		0.0478	2.6852
<i>"I count calories"</i>	Completely disagree	0.0456	2.9905
	Somewhat disagree	0.0585	2.7811
	Neither	0.0506	2.5720
	Somewhat agree	0.0460	2.5554
	Completely agree	0.0356	2.4813
<i>"I seek out new foods"</i>	Completely disagree	0.0261	2.0823
	Somewhat disagree	0.0362	2.4102
	Neither	0.0483	2.6675
	Somewhat agree	0.0435	2.5451
	Completely agree	0.0714	2.9699
<i>"I like to exercise"</i>	Completely disagree	0.0483	2.4553
	Somewhat disagree	0.0480	2.4484
	Neither	0.0507	2.7462
	Somewhat agree	0.0429	2.4023
	Completely agree	0.0486	2.9742
<i>"I am healthier than most"</i>	Completely disagree	0.0592	3.2451
	Somewhat disagree	0.0358	3.2753
	Neither	0.0441	2.5482
	Somewhat agree	0.0482	2.6601
	Completely agree	0.0577	2.5639
<i>"I like to eat fruits and vegetables"</i>	Completely disagree	0.0378	1.9340
	Somewhat disagree	0.0403	2.0192
	Neither	0.0387	2.6055
	Somewhat agree	0.0606	2.7038
	Completely agree	0.0543	3.0497
<i>"I seek out organic foods"</i>	Completely disagree	0.03624	2.8469
	Somewhat disagree	0.03222	2.8994
	Neither	0.05006	2.7018
	Somewhat agree	0.06576	2.5785
	Completely agree	0.08163	2.4802

Households viewing themselves as healthier than most are more likely to purchase mangos in moderation since the number of mangos drops with the same question. Clearly, the healthier issue is somewhat mixed. A similar mixed pattern is seen among those households seeking out organic foods. The probability of buying mangos increases, but the number per buyer actually decreases among the same preference for organics.

Table 5 is important in that the responses provide insight into the potential focus for messages and the potential gains. For example, messages associated with exercising would probably do little to stimulate demand. Whereas, positioning mangos within the new food category has more potential for impacting overall demand for mangos. While Table 5 is not a measure of the impact of the National Mango Board, investments in the effort to gain insight into the behavior of potential consumers give an indication of the proactive efforts by the NMB to gain a greater understanding of the consumer base who are the ultimate decision makers about consuming mangos.

Health Status and Mango Demand

Each household was asked to indicate if anyone in the household had any of

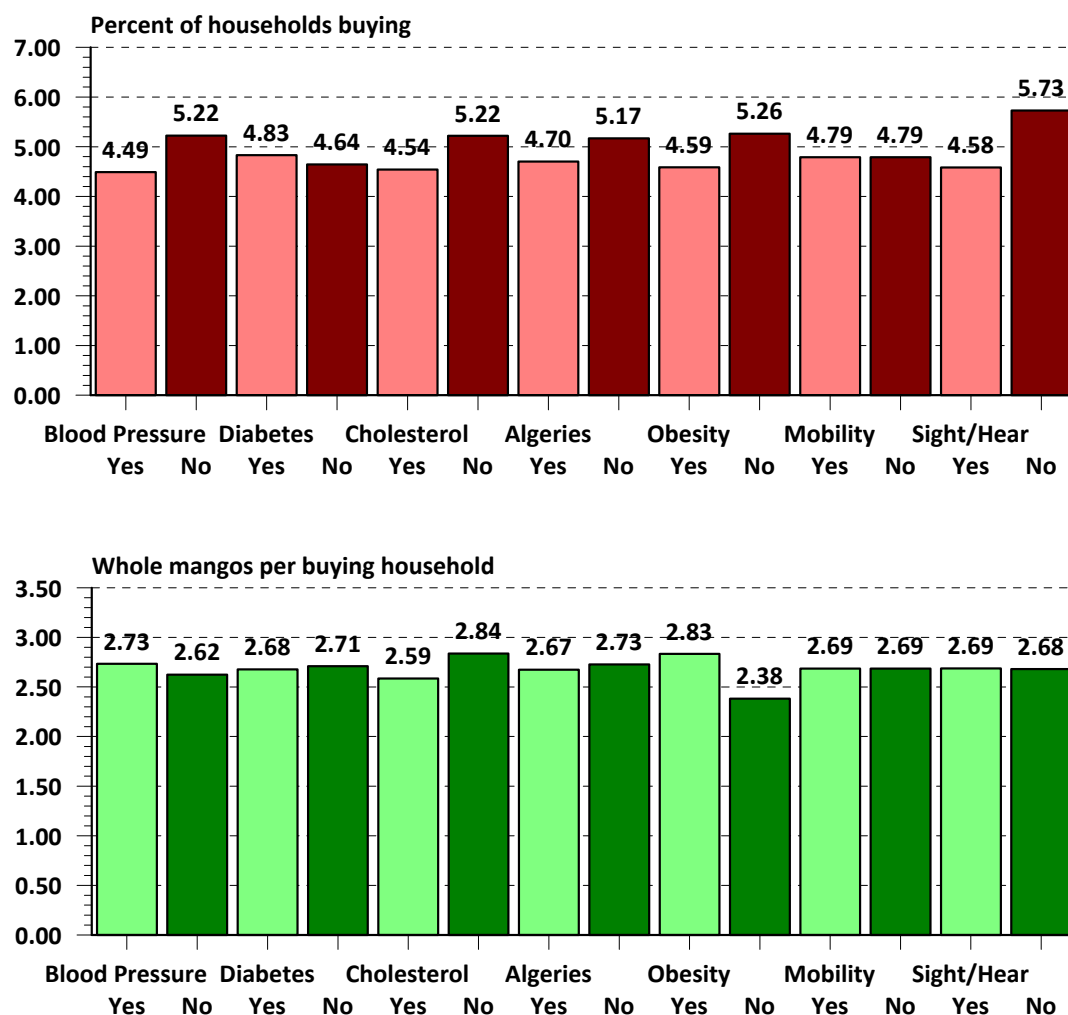


Figure 13. Household health status and mango demand.

the health problems defined in Figure 13. A simple “yes” or “no” response was given and those variables were included in both the market penetration and market intensity models. One can look at each health issue but, in general, there was less chance of buying mangos when a health issue existed. For example, the first two bars are for blood pressure where the probability is 4.49 when “yes” and 5.22 when “no.” Diabetes problems are notable exceptions where the probability goes up slightly with this health issue. While mangos have been shown to have many positive health attributes, the results in Figure 13 suggest that consumers may not yet be fully aware of those attributes since the probabilities of buying are more likely larger when specific health problems do not exist. In Figure 13, the results between health issues and number of mangos are mixed.

Reasons for Buying Mangos

Finally, within the household panel questionnaire, mango buyers were asked to rank their first, second, and third reasons for buying mangos, selecting from a list of 13 reasons. In Figure 14 we have ranked the reasons from the one more frequently ranked as first to the least. The left axis is the percentage ranking each reason in first

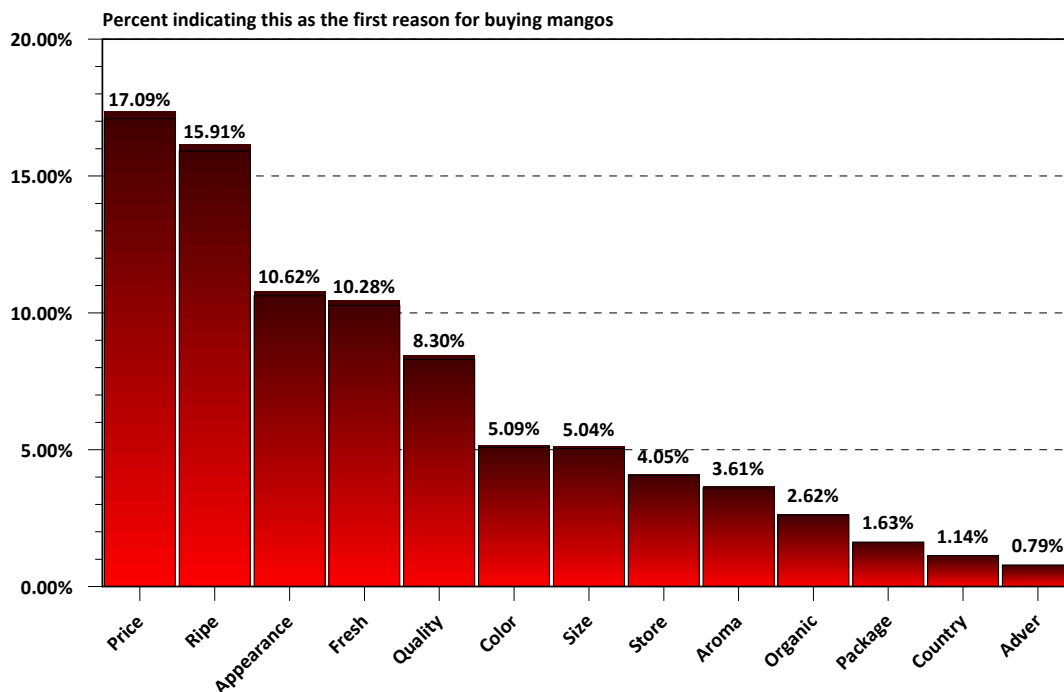


Figure 14. Ranking reasons for buying mangos.

place. As most apparent, price and ripeness were by far the two most important reasons for buying mangos where around 17% of the buyers indicated price as the first reasons. Appearance, freshness, and quality are in the second tier of reasons then the percentages drop off quickly. The low level for packaging is not surprising since most whole mangos are often displayed in bulk form in the supermarket. Mangos are imported from many countries, yet the country-of-origin plays a very minor role in the reasoning for buying mangos.

Evaluations and Conclusions

In this report the primary purpose was to provide insight into the impact of the National Mango Board's programs to enhance the demand for mangos. That impact can be viewed directly and indirectly through measuring demand and seeing general interest in mangos. Visits to the NMB's website show the general interest while the analytical models provide definitive evidence of how demand has changed with the NMB's programs. Detailed econometric models based on Probit and Order Probit techniques were used to measure many demand drivers and then show each driver impact on market penetration and market intensity. The technical aspects of the models were left for the appendices.

What constitutes the evidence of the impact of the National Mango Board? One can look at the level of activities and drawn inferences and then look at the statistics using well-established scientific methods. In this report we have looked at the big picture recognizing there is considerable detail about specific programs that have not been discussed or analyzed. Within the big picture, the following observations can be fully documented:

- The NMB has made a substantial investment in building a database for monitoring potential and actual mango consumers. That database is operational and fully utilized for reporting and economic research.
- An interactive website is fully operational and updated frequently. The number of visits points to a positive growth trend in visits to the website.

- The accounting system for tracing the NMB's activities is exceptional including the details needed for modeling purposes. Monthly expenditures by program activities are fully documented.
- An economic research plan was put in place several years before the analysis had to be completed. The staff worked continuously with the economic consultant as the evaluation process evolved.
- Ongoing monthly reports on market penetration and market intensity were posted on the internet and distribution by the staff.
- Using the household panel data, econometric models of mango market penetration and volume were developed and estimated. Also, simulation programs were written to use the models to explore the impact of each variable in the demand models.
- The models established that the National Mango Board has had a positive economic impact on the demand for mangos. Most of the impact is realized through attracting more buyers and less so in increasing the number of mangos per buyer. However, the responses to both were positive and statistically significant.
- Results show that over the period since the panel data collection was started, the return-of-investment (ROI) is slightly above 7 (i.e., 1:7). When estimating the ROI based on expenditures at the FOB level, the ROI=7.16. Using part of the same model but expressing the gains in terms of FOB prices per box with and without the NMB programs, the ROI=7.88. These two measures are close and similar to that seen for many other commodity programs (Ward, 2006; Ward, 2009; Ward and Boynton, 2010). The latter method is convenient for expressing returns per box which is easier for the industry to understand.
- The same models included many other demand drivers and their relative impacts on mango demand are known but not fully discussed in this report. However, the effects of demographics, attitudes, and health issues were shown along with some insight into the usefulness for the NMB when designing programs.
- Many factors influence demand and changes in many of these have a relatively large effect on demand. For example, differences in ethnicity or seasonality. The analysis shows that while the NMB's programs are positive and significant, there are other factors not controlled by the NMB that may have an even larger impact on demand.

References

- Foreign Agricultural Service. 2010. "Global Agricultural Trade System Online (GATS)." U.S. Department of Agriculture. USDA-FAS. Washington D.C., www.fas.usda.gov.
- MarketTools. 2010. "National Mango Board Study Main Questionnaire." www.markettools.com. Florham Park, NJ 07932.
- National Mango Board. 2010. "Mangos: The Taste Takes You There." NMB Website: www.mango.org. Orlando, Florida, 2010.
- USDA-AMS. 2010. "Mango Promotion, Research and Information Order ". Agricultural Marketing Service. U.S. Department of Agriculture. www.ams.usda@gov. Washington D.C., Dec. 22, 2010.
- Watson, William. 2010. "National Mango Board One-quarter Cent Assessment Rate Increase Proposal Approved by 69% of the Board at the NMB Budget Planning Meeting." National Mango Board. Orlando, FL, September, 2009.
- Ward, Ronald W. 2006. "Commodity Checkoff Programs and Generic Advertising." Choices. 2nd Quarter 2006, 21(2):55
- Ward, Ronald W. 2009. "The Beef Checkoff Programs and Their Impact on U.S. Beef Demand." Cattlemen Beef Board. Centennial, CO. www.beefboard.org. 63 pages.
- Ward, Ronald W. and Bruce Boynton. 2010. "U.S. Honey Supply Chain: Structural Change, Promotions and the China Connection." International Journal on Food System Dynamics. 1(2010):13-25.
- Ward, Ronald W. 2010. "Understanding the U.S. Generic Advertising System and Its Role in Information Management Among Commodities and Food Systems." International Journal on Food System Dynamics. 3 (2010):204-211.

Appendix (A): Household Panel Questionnaire

The National Mango Board contracted with MarketTools, Inc. to start collecting household panel data based on a survey questionnaire designed by the National Mango Board. Using MarketTools proprietary ZoomPanel, panelists opt in to take monthly surveys. MarketTools uses a point based incentive program (ZoomPoints) to motivate panelists to complete the surveys. The targeted sample is approximately 1,000 households per month. Each survey is deployed on the first of the month and the resulting data are provided to the National Mango Board in the form of an SPSS file after each field period is completed.

Respondents are screened to meet the following requirements according to US residency, adults 18 or older, and personally shopped for food in the past 30 days or personally ate at a restaurant in the past 30 days. MarketTools manages the panel recruitment so that there is a nationally representative sample on key demographic variables. MarketTools utilizes TrueSample™, which is a market research sample quality technology to ensure data quality. All ZoomPanelists are TrueSample™ certified to verify that each survey respondent is real, unique and engaged. You can find more information about MarketTools at: www.markettools.com/ and learn more about ZoomPanel and TrueSample at: www.markettools.com/products/truesample (MarketTools).



National Mango Board Study MAIN (ongoing) QUESTIONNAIRE

Programmed Version 2-15-08

P1 Welcome

Welcome to our semi-monthly fruit and vegetable consumption survey! We are interested in your opinions. In appreciation of your time, you will receive 50 ZoomPoints. Please answer each question on your screen prior to proceeding to the next screen. If you experience any difficulty while taking this survey, please click on the [Report Problems Here](#) link. Let's get started! Just click on the "CONTINUE" button to begin.

Create a weekly punch, to record which week the data is from

Q0 respondent verification

/M

This survey is intended for the person in the household who agreed to join a special panel about fruit and vegetable consumption. Are you the person in the household agreed to join this panel and complete a survey every other week?

- ☐ Yes [\[Skip to Q1a Grocery Shopping\]](#)
☐ No

This survey is intended for the person in the household who agreed to join a special panel about fruit and vegetable consumption.

If the person who completed that survey is available, please ask them to complete this survey.

If the person is not available, you can close your current browser window and ask them to complete it when they are available. To re-access the survey, simply click on the link in the invitation email again, and they will be brought back to this point in the survey. This survey will be available for the next couple of days.

Q1a Grocery Shopping Past 2 Weeks

Which of the following have you, personally purchased in a store, farmer's market, from a street vendor or at a restaurant between Feb 1st 2008 and Feb 15th 2008? Select all that apply.

Randomize all but none

- ☐ Whole or sliced fresh fruits
- ☐ Whole or sliced fresh vegetables
- ☐ Breads/Cereals/Grains/Pasta
- ☐ Beef or Pork
- ☐ Dairy
- ☐ Poultry or Fish
- ☐ Candy
- ☐ Salty snacks
- ☐ Beverages
- ☐ None of the above [\[EXCLUSIVE\]](#)

If none of the above is selected in Q1a, auto-punch I did not buy this fresh fruit/vegetable for all rows in Q2.

If neither fruits nor vegetables is selected in Q1a, auto-punch I did not buy this fresh fruit/vegetable for all rows in Q2.

Q2 Fruit Purchased Past 2 Weeks

Thinking just about the last two weeks (between Feb 1st 2008 and Feb 15th 2008), please indicate if you bought any of the following fresh fruits or vegetables by checking the appropriate columns for each – select all that apply in each row.

	I bought this fruit/vegetable whole, selecting each one individually	I bought this fruit/vegetable whole, but packaged in a multipack	I bought this fruit/vegetable cut/sliced/peeled, by itself	I bought this fruit/vegetable sliced/peeled as part of a fruit or vegetable platter	I ordered a dish at a restaurant that contained this fresh fruit/vegetable	I did not buy this fresh fruit/vegetable (EXCLUSIVE)
Apples	☐	☐	☐	☐	☐	☐
Artichokes	☐	☐	☐	☐	☐	☐
Avocados	☐	☐	☐	☐	☐	☐
Bananas	☐	☐	☐	☐	☐	☐
Cantaloupes	☐	☐	☐	☐	☐	☐
Cucumbers	☐	☐	☐	☐	☐	☐
Grapefruits	☐	☐	☐	☐	☐	☐
Honeydews	☐	☐	☐	☐	☐	☐
Kiwis	☐	☐	☐	☐	☐	☐
Mangos	☐	☐	☐	☐	☐	☐
Oranges	☐	☐	☐	☐	☐	☐
Papayas	☐	☐	☐	☐	☐	☐
Pears	☐	☐	☐	☐	☐	☐
Peppers (green/red/orange/yellow)	☐	☐	☐	☐	☐	☐
Pineapples	☐	☐	☐	☐	☐	☐
Pomegranates	☐	☐	☐	☐	☐	☐
Watermelons	☐	☐	☐	☐	☐	☐

SELECT UP TO FOUR FRUITS/VEGETABLES THAT WERE PURCHASED WHOLE, PREPACKAGED, SLICED/PEELED ALONE (FIRST THREE COLUMNS). ALWAYS INCLUDE MANGOS, AND LOW BUCKET FOR OTHER 3 FRUITS/VEGGIES.

IF NONE ARE SELECTED IN FIRST THREE COLUMNS SKIP TO LANDING PAGE 1

CREATE ONE SECTION FOR EACH PROMPT IN Q2 CONTAINING Q3 TO Q10. (17 sections in total)

IF NONE ARE SELECTED IN THE FIRST THREE COLUMNS SKIP TO LANDING PAGE 1.

NOTE, WE ARE SETTING THIS UP SO THAT THE PROGRAM RANDOMLY CHOOSES THE ROW, AND ASKS ADDITIONAL QUESTIONS ONLY FOR WHOLE FRUITS/VEGGIES, WHOLE FRUITS/VEGGIES PREPACKAGED, AND THOSE SLICED/PEELED, BUT NOT PART OF A PLATTER).

START OF SECTION

Q3 Where Purchase Fruit/Vegetable

Where did you purchase the whole and/or cut/sliced/peeled [pick in fruit/vegetable name] you bought between February 1st and February 15th? (Select all that apply.)

Randomize first 8

- ☐ Grocery store
- ☐ Warehouse club store (Costco, Wal-Mart, etc.)
- ☐ Farmers' Market/ Produce Stand (including free-standing carts)

- ☐ [PIPE IN IF MANGOS] Haden
- ☐ [PIPE IN IF MANGOS] Kent
- ☐ [PIPE IN IF MANGOS] Tommy Atkins
- ☐ [PIPE IN IF MANGOS] Kiett
- ☐ [PIPE IN IF MANGOS] Francine
- ☐ [PIPE IN IF MANGOS] Ataulfo
- ☐ [PIPE IN IF PINEAPPLES] Smooth Cayenne
- ☐ [PIPE IN IF PINEAPPLES] Cayenne
- ☐ [PIPE IN IF PINEAPPLES] Queen
- ☐ [PIPE IN IF PINEAPPLES] Golden
- ☐ [PIPE IN IF PINEAPPLES] Red Spanish
- ☐ [PIPE IN IF PAPAYAS] Pink Formosa
- ☐ [PIPE IN IF PAPAYAS] Red Formosa
- ☐ [PIPE IN IF PAPAYAS] Red Sunshine
- ☐ [PIPE IN IF PAPAYAS] Solo
- ☐ [PIPE IN IF ORANGES] Pera
- ☐ [PIPE IN IF ORANGES] Valencia
- ☐ [PIPE IN IF ORANGES] Navel
- ☐ [PIPE IN IF AVOCADOS] Hass
- ☐ [PIPE IN IF AVOCADOS] Fuerte
- ☐ [PIPE IN IF AVOCADOS] Gwen
- ☐ [PIPE IN IF AVOCADOS] Pinkerton
- ☐ [PIPE IN IF AVOCADOS] Reed
- ☐ [PIPE IN IF AVOCADOS] Zutano
- ☐ Other
- ☐ I'm not sure [Exclusive]

Q8 Country of Origin

What was the country of origin of the whole and/or cut/sliced/peeled [pipe in fruit/vegetable name] you purchased in the past two weeks? (Select all that apply)

Randomize all but other and not sure.

- ☐ [PIPE IN IF MANGOS, PAPAYA, ORANGES, PINEAPPLES] Brazil
- ☐ [PIPE IN IF MANGOS] Ecuador
- ☐ [PIPE IN IF MANGOS] Peru
- ☐ [PIPE IN IF MANGOS, PAPAYA, ORANGES, AVOCADOS] Mexico
- ☐ [PIPE IN IF MANGOS] Guatemala
- ☐ [PIPE IN IF MANGOS] Haiti
- ☐ [PIPE IN IF PINEAPPLES, PAPAYA] Hawaii
- ☐ [PIPE IN IF PINEAPPLES] Thailand
- ☐ [PIPE IN IF PINEAPPLES] The Philippines
- ☐ [PIPE IN IF PINEAPPLES] Paraguay
- ☐ [PIPE IN IF PAPAYAS] Vietnam
- ☐ [PIPE IN IF PAPAYAS, AVOCADOS] Indonesia
- ☐ [PIPE IN IF ORANGES, AVOCADOS] USA
- ☐ [PIPE IN IF, AVOCADOS] Chile
- ☐ [PIPE IN IF, AVOCADOS] Dominican Republic
- ☐ [PIPE IN IF ORANGES] Israel
- ☐ Other
- ☐ I'm not sure [Exclusive]

Q9 Factors in Selection

When choosing whole and/or cut/sliced/peeled [pipe in fruit/vegetable name] in the past two weeks, what factors went into your decision?

Please select the three most important factors.

Please check the box under "first choice" to indicate the factor that most influenced your choice; the box under "second choice" to indicate the factor that was second most important in your choice and the box under "third choice" to indicate the factor that was third most important to your choice.

Randomize all but other	First Choice	Second Choice	Third Choice
Price	☐	☐	☐
Color	☐	☐	☐
Size	☐	☐	☐
Organic	☐	☐	☐
Where it was grown	☐	☐	☐
Store specials	☐	☐	☐
TV/Radio/newspaper advertising	☐	☐	☐
Freshness	☐	☐	☐
Packaging	☐	☐	☐
Quality	☐	☐	☐
Ripeness (firmness)	☐	☐	☐
Aroma	☐	☐	☐
Appearance	☐	☐	☐
Other	☐	☐	☐

Q10 How Used

How have you used the whole and/or cut/sliced/peeled [pipe in fruit/vegetable name] you bought in the past two weeks? (Select all that apply)

Randomize all but other and have not used them yet

- ☐ Ate as a snack
- ☐ Ate plain
- ☐ Pureed/added to a smoothie
- ☐ Used in a recipe
- ☐ Used in a salad
- ☐ Ate with cereal
- ☐ Squeezed into a juice
- ☐ Used it as a dessert
- ☐ Other
- ☐ Have not used them yet [Exclusive]

END OF SECTION

Landing Page 1

ASK Q15 ONLY FOR ORANGES AND MANGOS, IF NOT PURCHASED WHOLE, PREPACKAGED, SLICED/PEELED ALONE (FIRST THREE COLUMNS) IN Q2. ONLY ASK OF EVERY 5th PERSON WHO QUALIFIES. ELSE SKIP TO INSTRUCTION BEFORE THANK YOU PAGE.

Create two sections containing Q15 and Q16, one for Mangos and one for Oranges

Q15 Why Not Purchase Fruit All

Why didn't you purchase fresh [pipe in fruit/vegetable name], either sliced or whole, in the past two weeks? (Select all that apply)

Randomize all but other

- ☐ Too expensive
- ☐ Not on sale
- ☐ Not the right color
- ☐ Not the right size
- ☐ Did not like where it was grown
- ☐ Did not like the packaging
- ☐ No one in my household likes the taste
- ☐ Just didn't think of it
- ☐ Not available
- ☐ Not in season
- ☐ Not familiar with this fruit/vegetable
- ☐ Hard to select /pick ripe ones
- ☐ Already have some at home
- ☐ Didn't feel like eating them recently
- ☐ Not good for my diet
- ☐ Other

IF Q15 only one is selected, Autopunch and skip Landing Page 2.

Q16 Why Not Purchase Fruit Main

What is the main reason you did not purchase fresh [pipe in fruit/vegetable name], either sliced or whole, in the past two weeks? (Select one.)

Randomize all but other

- ☐ [PIPE IN ALL RESPONSES FROM PRIOR QUESTION]

Landing Page – 2

ASK Q17/Q18 FOR EVERY 5th PERSON since will be doing this 2 x per month

Q17 Usetime

Because consumers like you are such a valued part of what we do, we'd like you to think about the survey you just participated in.

On a scale of 1 to 10, where 1 means "It was not a good use of my time", and 10 means, "It was a good use of my time", which number between 1 and 10 best describes how you feel about your experiences today?

1-It was not a
good use of
my time

10-It was a
good use of
my time

Survey experience

Q18 Feedback

OPTIONAL: We would like your feedback. Do you have any comments, either positive or negative, about the survey you just participated in? Did you find anything about the survey confusing or unclear? Please be specific.

Thank You Page

Thank you very much for taking part in this survey. Your responses have been successfully recorded. We appreciate your feedback. Look for our NEXT food consumption panel survey in two weeks!

Survey Closed Page

Thank you for your willingness to participate, however this study has been completed and is closed. We hope you will visit us in the future for other surveys.

Appendix (B): Market Penetration Model

The Market Penetration model was estimated using a Probit specification with the dependent variable being within a two-week shopping window did a household purchase any forms of mangos with Yes=1 and No=0. Thus it is a standard binary model. The probability of a Yes depends on the values of each variable in the model including the National Mango Board's efforts. In Table B.1 all variables are defined and B.2 provides the estimated Probit results where the first column identifies the specific variable ranges such as income or age. Most of these variables were binary so dummy variable techniques were used. For each variable the coefficients are reported along with the t-values. As a guideline, t-values exceeding 2.0 indicate that coefficient to be statistically different from zero. That is, it has a significant impact on market penetration. The codes in Table B.1 can be easily associated with the variables in Tables 1, 5 and 6. The NMB's impact on market penetration was the primary evaluation goal and in Table B.1. the variable CCKTOT0 captures that effect. This variable is defined as:

$$\text{CCKTOT0} = .65 * \text{CCKTOT} + (1-.65) * \text{CCKTOT1}$$

with CCKTOT being the deseasonalized NMB expenditures during a specific month and CCKTOT the same but from the previous month. Preliminary analysis showed that 65% of the effect was in the same month and 35% in the next month. Thus CCKTOT0 has lagged effects and seasonal adjustments. At the bottom of this table the coefficient for CCKTOT is shown and is statistically significant at the 98% confidence level (see the t-value of 2.2279). All other test in Table B.1 are relative to the average household. For example, none of the income effects were statistically different from the average household. In stark contrast, differences in market penetration across ethnicity is most evident. Price (PRWHOLE1) is negative as would be expected by statistically weak. We know the prices of those that purchased mangos but not the price when they did not buy. Hence, the average mango price was used as the exposed price to households. This is a proxy variable and may help explain the weak price response. Further details will be presented in a technical journal paper.

Table B.1. Variables codes in the mango demand models.

Variable	Description	Level	Model Variables
INC1	Income	Under \$50,000	ZINC1=INC1 - INC1
INC2	"	\$50/\$75,000	ZINC2=INC2 - INC1
INC3	"	\$75/\$100,000	ZINC3=INC3 - INC1
INC4	"	Over \$100,000	ZINC4=INC4 - INC1
INC5	"	No reported	ZINC5=INC5 - INC1
EDU1	Education	High School or less	ZEDU1 = EDU1 -EDU1
EDU2	"	College	ZEDU2 = EDU2 -EDU1
EDU3	"	Graduate	ZEDU3 = EDU3 -EDU1
EDU4	"	Other	ZEDU4 = EDU4 -EDU1
RACE1	Race	White/Caucasian	ZRACE1= RACE1 - RACE5
RACE2	"	Black/African American	ZRACE2= RACE2 - RACE5
RACE3	"	Asian	ZRACE3= RACE3 - RACE5
RACE4	"	Pacific Islander	ZRACE4= RACE4 - RACE5
RACE5	"	Others	ZRACE5= RACE5 - RACE5
AGE1	Age	18-24 years old	ZAGE1 = AGE1 - AGE1
AGE2	"	25-44	ZAGE2 = AGE2 - AGE1
AGE3	"	45-54	ZAGE3 = AGE3 - AGE1
AGE4	"	over 55	ZAGE4 = AGE4 - AGE1
CAL1	Count Calories	Completely disagree	ZCAL1 = CAL1 -CAL3
CAL2	"	Somewhat disagree	ZCAL2 = CAL2 -CAL3
CAL3	"	Neither	ZCAL3 = CAL3 -CAL3
CAL4	"	Somewhat agree	ZCAL4 = CAL4 -CAL3
CAL5	"	Completely agree	ZCAL5 = CAL5 -CAL3
MTH1	Months	Jan	ZMTH1 = MTH1 - MTH3
MTH2	"	Feb	ZMTH2 = MTH2 - MTH3
MTH3	"	Mar	ZMTH3 = MTH3 - MTH3
MTH4	"	Apr	ZMTH4 = MTH4 - MTH3
MTH5	"	May	ZMTH5 = MTH5 - MTH3
MTH6	"	Jun	ZMTH6 = MTH6 - MTH3
MTH7	"	Jul	ZMTH7 = MTH7 - MTH3
MTH8	"	Aug	ZMTH8 = MTH8 - MTH3
MTH9	"	Sep	ZMTH9 = MTH9 - MTH3
MTH10	"	Oct	ZMTH10= MTH10 - MTH3
MTH11	"	Nov	ZMTH11= MTH11 - MTH3
MTH12	"	Dec	ZMTH12= MTH12 - MTH3
HWD	Household Size	People in Household	HWD

EXPR1	I like to Experiment with	Completely disagree	ZEXPR1= EXPR1 - EXPR3
EXPR2	New Foods	Somewhat disagree	ZEXPR2= EXPR2 - EXPR3
EXPR3	"	Neither	ZEXPR3= EXPR3 - EXPR3
EXPR4	"	Somewhat agree	ZEXPR4= EXPR4 - EXPR3
EXPR5	"	Completely agree	ZEXPR5= EXPR5 - EXPR3
EXER1	I like to Exercise	Completely disagree	ZEXER1= EXER1 - EXER3
EXER2	"	Somewhat disagree	ZEXER2= EXER2 - EXER3
EXER2	"	Neither	ZEXER3= EXER3 - EXER3
EXER4	"	Somewhat agree	ZEXER4= EXER4 - EXER3
EXER5	"	Completely agree	ZEXER5= EXER5 - EXER3
HLTH1	Healthier than most	Completely disagree	ZHLTH1= HLTH1 - HLTH3
HLTH2	"	Somewhat disagree	ZHLTH2= HLTH2 - HLTH3
HLTH3	"	Neither	ZHLTH3= HLTH3 - HLTH3
HLTH4	"	Somewhat agree	ZHLTH4= HLTH4 - HLTH3
HLTH5	"	Completely agree	ZHLTH5= HLTH5 - HLTH3
FRVG1	Eat Fruits/Vegetables	Completely disagree	ZFRVG1= FRVG1 - FRVG5
FRVG2	"	Somewhat disagree	ZFRVG2= FRVG2 - FRVG5
FRVG3	"	Neither	ZFRVG3= FRVG3 - FRVG5
FRVG4	"	Somewhat agree	ZFRVG4= FRVG4 - FRVG5
FRVG5	"	Completely agree	ZFRVG5= FRVG5 - FRVG5
FREQ1	Frequency of	Once a week or more	ZFREQ1= FREQ1 - FREQ6
FREQ2	Shopping in Grocery	Once every few weeks	ZFREQ2= FREQ2 - FREQ6
	Store		
FREQ3		Once a month	ZFREQ3= FREQ3 - FREQ6
FREQ4		Once every few months	ZFREQ4= FREQ4 - FREQ6
FREQ5		Less often than once a year	ZFREQ5= FREQ5 - FREQ6
FREQ6		Never	ZFREQ6= FREQ6 - FREQ6
ORG1	I seek out Organic Foods	Completely disagree	ZORG1 = ORG1 - ORG3
ORG2	"	Somewhat disagree	ZORG2 = ORG2 - ORG3
ORG3	"	Neither	ZORG3 = ORG3 - ORG3
ORG4	"	Somewhat agree	ZORG4 = ORG4 - ORG3
ORG5	"	Completely agree	ZORG5 = ORG5 - ORG3
HLTH_BP	High Blood Pressure	Yes/No	ZHLTH_BP= (HLTH_BP=YES) - (HLTH_BP=NO)
HLTH_DB	Diabetes	Yes/No	ZHLTH_DB= (HLTH_DB=YES) - (HLTH_DB=NO)
HLTH_CL	Cholesterol	Yes/No	ZHLTH_CL= (HLTH_CL=YES) - (HLTH_CL=NO)
HLTH_AG	Allergies	Yes/No	ZHLTH_AG= (HLTH_AG=YES) - (HLTH_AG=NO)
HLTH_OB	Obesity	Yes/No	ZHLTH_OB= (HLTH_OB=YES) - (HLTH_OB=NO)
HLTH_MB	Mobility	Yes/No	ZHLTH_MB= (HLTH_MB=YES) - (HLTH_MB=NO)

HLTH_SI	Sight	Yes/No	ZHLTH_SI= (HLTH_SI=YES) - (HLTH_SI=NO)
DIV1	U.S. Divisions	NEW ENGLAND	ZDIV1= DIV1 - DIV1
DIV2	"	MIDDLE ATLANTIC	ZDIV2= DIV2 - DIV1
DIV3	"	EAST NORTH CENTRAL	ZDIV3= DIV3 - DIV1
DIV4	"	WEST NORTH CENTRAL	ZDIV4= DIV4 - DIV1
DIV5	"	SOUTH ATLANTIC	ZDIV5= DIV5 - DIV1
DIV6	"	EAST SOUTH CENTRAL	ZDIV6= DIV6 - DIV1
DIV7	"	WEST SOUTH CENTRAL	ZDIV7= DIV7 - DIV1
DIV8	"	MOUNTAIN	ZDIV8= DIV8 - DIV1
DIV9	"	PACIFIC	ZDIV9= DIV9 - DIV1
PRWHOLE1	Price	Whole Mango price	PRWHOLE1
CCKTOT0	Mango Board Programs	Expenditures	CCKTOT0

Table B.2. Probit model for mango market penetration.

Dependent variable: WHOLEBUY				
Number of observations = 42275		Sum of squared residuals = 1445.37		
(zero slopes) = 1588.85 [.000]				
Number of positive obs. = 1584		R-squared = .052023		
Schwarz B.I.C. = 6350.56				
Mean of dep. var. = .037469		Scaled R-squared = .039195		
Log likelihood = -5961.76				
Fraction of Correct Predictions =		0.962507		
Parameter	Estimate	Standard Error	t-statistic	P-value
C	-1.62084	.148386	-10.9231	[.000]
ZINC2	-.031504	.035471	-.888163	[.374]
ZINC3	-.070136	.043757	-1.60286	[.109]
ZINC4	-.033375	.043590	-.765655	[.444]
ZINC5	.041481	.042685	.971786	[.331]
ZEDU2	-.010040	.033788	-.297132	[.766]
ZEDU3	.224151	.045653	4.90984	[.000]
ZEDU4	.062283	.088242	.705822	[.480]
ZRACE1	-.428731	.037565	-11.4129	[.000]
ZRACE2	-.184984	.047949	-3.85792	[.000]
ZRACE3	-.197456	.047013	-4.20000	[.000]
ZRACE4	.148199	.056716	2.61300	[.009]
ZAGE2	-.070348	.037443	-1.87881	[.060]
ZAGE3	-.036384	.044488	-.817842	[.413]
ZAGE4	-.062558	.044503	-1.40570	[.160]
ZCAL1	-.021388	.038261	-.559020	[.576]
ZCAL2	.126788	.036889	3.43698	[.001]
ZCAL4	-.085491	.042224	-2.02469	[.043]
ZCAL5	-.139500	.048891	-2.85331	[.004]
ZMTH1	-.275725	.061942	-4.45134	[.000]
ZMTH2	-.097285	.060708	-1.60253	[.109]
ZMTH4	.039804	.051964	.765979	[.444]
ZMTH5	.126655	.049254	2.57143	[.010]
ZMTH6	.160041	.048806	3.27913	[.001]
ZMTH7	.011348	.055605	.204077	[.838]
ZMTH8	-.189083	.060667	-3.11673	[.002]
ZMTH9	-.293969	.084304	-3.48699	[.000]
ZMTH10	-.535317	.097030	-5.51704	[.000]
ZMTH11	-.445325	.070608	-6.30705	[.000]
ZMTH12	-.257982	.062855	-4.10441	[.000]

HWD	.206406	.054956	3.75586	[.000]
ZEXPR1	-.342970	.064752	-5.29668	[.000]
ZEXPR2	-.133136	.042846	-3.10735	[.002]
ZEXPR4	-.027257	.033476	-.814218	[.416]
ZEXPR5	.235169	.038644	6.08545	[.000]
ZEXER1	.015029	.046937	.320201	[.749]
ZEXER2	-.036786	.042215	-.871403	[.384]
ZEXER4	-.109937	.041931	-2.62186	[.009]
ZEXER5	-.033901	.038085	-.890139	[.373]
ZHLTH1	.217202	.055304	3.92741	[.000]
ZHLTH2	-.053996	.046360	-1.16471	[.244]
ZHLTH4	.071442	.034913	2.04629	[.041]
ZHLTH5	.107328	.045086	2.38052	[.017]
ZFRVG1	-.105717	.065023	-1.62584	[.104]
ZFRVG2	-.018645	.047541	-.392193	[.695]
ZFRVG4	.274734	.034145	8.04605	[.000]
ZFRVG5	.239188	.042460	5.63325	[.000]
ZFREQ1	-.101363	.060003	-1.68930	[.091]
ZFREQ2	-.120635	.063086	-1.91224	[.056]
ZFREQ3	-.256291	.073064	-3.50775	[.000]
ZFREQ4	-.179047	.100632	-1.77923	[.075]
ZFREQ5	.468105	.102380	4.57225	[.000]
ZORG1	-.177225	.039227	-4.51796	[.000]
ZORG2	-.226899	.039772	-5.70497	[.000]
ZORG4	.139352	.039546	3.52383	[.000]
ZORG5	.238384	.046241	5.15522	[.000]
ZHLTH_BP	.060777	.031200	1.94801	[.051]
ZHLTH_DB	-.032341	.034222	-.945049	[.345]
ZHLTH_CL	.104420	.030720	3.39905	[.001]
ZHLTH_AG	.048412	.033122	1.46161	[.144]
ZHLTH_OB	.045852	.030153	1.52062	[.128]
ZHLTH_MB	-.020400	.035888	-.568447	[.570]
ZHLTH_SI	.087996	.034508	2.55000	[.011]
ZDIV2	-.141550	.067240	-2.10515	[.035]
ZDIV3	-.310776	.068149	-4.56027	[.000]
ZDIV4	-.278200	.078865	-3.52753	[.000]
ZDIV5	-.144905	.066403	-2.18220	[.029]
ZDIV6	-.416698	.093510	-4.45619	[.000]
ZDIV7	-.129242	.072665	-1.77860	[.075]
ZDIV8	.014923	.074460	.200422	[.841]
ZDIV9	-.086457	.068893	-1.25495	[.209]
PRWHOLE1	-.063851	.047886	-1.33338	[.182]
CCKT0T0	.625248E-03	.280638E-03	2.22796	[.026]

Appendix (C): Market Intensity Model

Since by definition whole mangos are purchased in whole units with the numbers being 1,2,3,4,5, After considerable consideration of differ models dealing with count data (i.e., 1,2, 3,...), the intensity model was estimated using an Ordered Probit specifications. Basically, Ordered Probit models recognize the increasing order of binary mutually exclusive responses. That is, at a point in time a household purchased only 1, 2, 3,4,...etc . Across the households the probability of each number is estimated and then the predicted intensity is:

Whole Mango per household = $\text{Prob1} \times 1 + \text{Prob2} \times 2 + \text{Prob3} \times 3 + \text{Prob4} \times 4 + \dots + \text{Probk} \times k$. The model simply shows how each probability changes with the model variables including the NMB's programs. The variables are the same as the Probit model except that the reasons for buying (see Figure 14) are included among the independent variables. Table C.1 provides the Ordered Probit estimates and as seen near the bottom, the effect of the NMB is positive but statistically much weaker than seen for the market penetration model. See Appendix B for the variable definitions.

Ordered Probit

estimation

Choice	Frequency	Fraction
0	440	0.2174
1	395	0.1952
2	442	0.2184
3	199	0.0983
4	179	0.0884
5	82	0.0405
6	122	0.0603
7	6	0.0030
8	34	0.0168
9	18	0.0089
...		
13	30	0.0148

Dependent variable: QT_WHOLE1

Number of observations = 2024 Scaled R-squared = .533513

Log likelihood = -3476.20

Mean of dep. var. = 2.68874 LR (zero slopes) = 1409.29

[.000]

Std. dev. of dep. var. = 2.89116 Schwarz B.I.C. = 3834.00

Parameter	Standard			
	Estimate	Error	t-statistic	P-value
C	-11.7793	.814207	-14.4673	[.000]
ZINC2	.257071	.075563	3.40205	[.001]
ZINC3	.122312	.088953	1.37502	[.169]
ZINC4	.175281	.089984	1.94791	[.051]
ZINC5	.183328	.091854	1.99585	[.046]
ZEDU2	.069883	.074238	.941340	[.347]
ZEDU3	.241703	.108554	2.22657	[.026]
ZEDU4	.411080	.185409	2.21716	[.027]
ZRACE1	-.677765	.108307	-6.25782	[.000]
ZRACE2	-.179949	.099137	-1.81515	[.070]
ZRACE3	-.154915	.096219	-1.61002	[.107]
ZRACE4	.850004E-02	.116145	.073184	[.942]

ZAGE2	- .051334	.081566	- .629361	[.529]
ZAGE3	.027147	.099001	.274212	[.784]
ZAGE4	.165384	.103613	1.59617	[.110]
ZCAL1	.185792	.084534	2.19785	[.028]
ZCAL2	.142628	.082211	1.73491	[.083]
ZCAL4	- .031326	.088556	- .353736	[.724]
ZCAL5	- .130276	.101954	-1.27778	[.201]
ZMTH1	- .164500	.137052	-1.20028	[.230]
ZMTH2	.045043	.130823	.344301	[.731]
ZMTH4	.122106	.104370	1.16994	[.242]
ZMTH5	.284017	.101999	2.78450	[.005]
ZMTH6	.213819	.099267	2.15398	[.031]
ZMTH7	.109023	.112693	.967434	[.333]
ZMTH8	.017690	.128840	.137305	[.891]
ZMTH9	- .229798	.136286	-1.68614	[.092]
ZMTH10	- .422288	.232603	-1.81548	[.069]
ZMTH11	- .371966	.169232	-2.19796	[.028]
ZMTH12	- .010610	.142126	- .074653	[.940]
RHWD	.714788	.115917	6.16640	[.000]
ZEXPR1	- .465565	.170167	-2.73593	[.006]
ZEXPR2	- .202807	.102961	-1.96975	[.049]
ZEXPR4	- .087680	.071529	-1.22579	[.220]
ZEXPR5	.243371	.093143	2.61288	[.009]
ZEXER1	- .163958	.103358	-1.58630	[.113]
ZEXER2	- .169381	.091179	-1.85767	[.063]
ZEXER4	- .220926	.088526	-2.49560	[.013]
ZEXER5	.101821	.078747	1.29301	[.196]
ZHLTH1	.410265	.122807	3.34074	[.001]
ZHLTH2	.307105	.109765	2.79783	[.005]
ZHLTH4	.079043	.077414	1.02104	[.307]
ZHLTH5	.071384	.099125	.720142	[.471]
ZFRVG1	- .395485	.148351	-2.66588	[.008]
ZFRVG2	- .326436	.106655	-3.06068	[.002]
ZFRVG4	.155247	.086684	1.79095	[.073]
ZFRVG5	.298100	.099288	3.00237	[.003]
ZFREQ1	.060135	.120547	.498853	[.618]
ZFREQ2	- .019599	.128853	- .152104	[.879]
ZFREQ3	- .538570	.150603	-3.57608	[.000]
ZFREQ4	.303237	.206722	1.46688	[.142]
ZFREQ5	.727901	.226516	3.21346	[.001]
ZHLTH_BP	- .020010	.068796	- .290853	[.771]
ZHLTH_DB	.659367E-02	.074349	.088685	[.929]
ZHLTH_CL	.161112	.069657	2.31294	[.021]
ZHLTH_AG	.049144	.071251	.689732	[.490]
ZHLTH_OB	- .204712	.069934	-2.92722	[.003]

ZHLTH_MB	.343621E-03	.080136	.428795E-02	[.997]
ZHLTH_SI	.049775	.076832	.647839	[.517]
ZDIV2	.943484E-02	.145931	.064653	[.948]
ZDIV3	-.126853	.160557	-.790080	[.429]
ZDIV4	-.026823	.185835	-.144337	[.885]
ZDIV5	-.159335	.147249	-1.08208	[.279]
ZDIV6	-.265066	.222960	-1.18885	[.234]
ZDIV7	-.145248	.163488	-.888431	[.374]
ZDIV8	-.070547	.159960	-.441026	[.659]
ZDIV9	.887329E-02	.147042	.060345	[.952]
WPRICE	-.273144	.028080	-9.72749	[.000]
ZPRICE	.575849	.037397	15.3984	[.000]
ZCOLOR	.592351	.042069	14.0804	[.000]
ZSIZE	.580207	.042277	13.7240	[.000]
ZORGANIC	.626895	.053130	11.7992	[.000]
ZCOOL	.621673	.064761	9.59954	[.000]
ZSTORE	.566965	.045777	12.3855	[.000]
ZADVER	.441569	.077117	5.72599	[.000]
ZFRESH	.561845	.038469	14.6052	[.000]
ZPACKG	.528854	.060270	8.77470	[.000]
ZRIPE	.609260	.036903	16.5096	[.000]
ZAROMA	.592310	.045771	12.9408	[.000]
ZAPPEAR	.611849	.038537	15.8770	[.000]
ZQUALITY	.622819	.039691	15.6917	[.000]
CCKTOT1	.551773E-03	.496643E-03	1.11101	[.267]
IMILLS	.528711	.220307	2.39988	[.016]
MU2	.915503	.041387	22.1204	[.000]
MU3	1.67159	.048527	34.4467	[.000]
MU4	2.02550	.051393	39.4117	[.000]
MU5	2.39215	.054768	43.6779	[.000]
MU6	2.59615	.057101	45.4659	[.000]
MU7	2.99098	.063104	47.3972	[.000]
MU8	3.01508	.063549	47.4453	[.000]
MU9	3.16646	.066638	47.5175	[.000]
MU10	3.26007	.068840	47.3575	[.000]
MU12	3.53333	.076953	45.9155	[.000]
MU13	3.94254	.096180	40.9914	[.000]