# JOINT PROCEEDINGS


TROPICAL REGION

## 21st Annual Meeting of the Caribbean Food Crops Society and 32nd Annual Meeting of the American Society for Horticultural Science — Tropical Region

# technology for agricultural development

**Hilton Hotel, Port of Spain, Trinidad**
**8 - 13 September 1985**

*Host Institutions*

— Caribbean Agricultural Research and Development Institute

— Ministry of Agriculture, Lands and Food Production, Trinidad & Tobago

— Faculty of Agriculture, University of the West Indies

*Published by the Caribbean Food Crops Society, Box 506, Isabela, Puerto Rico 00662*

# MARKETING TILAPIA: INNOVATION RESEARCH CONSIDERATIONS AND AN ANALYSIS OF NEW PRODUCT DIFFUSION AND ADOPTION

**Kenneth E. Green**

College of the Virgin Islands
Agricultural Experiment Station

**ABSTRACT**

This paper explores selected theoretical tenets of innovation diffusion/adoption in the context of product technology and product marketing. The approach discusses the need to integrate the underpinnings of demand-supply diffusion strategies and ecological variation factors in technological research. The introduction of tilapia as the topic of study provides a suitable model for ex post facto examination of the process of advancing technological innovation in under-developed settings. Data collected in a recent survey of trial tilapia consumers provides some possible predictive indicators for market assessments, consumer adoption studies and posits some relative issues of strengths and weaknesses for research design considerations. In sum, consumer adoption behaviors tend to depend on adequacy of the new product to substitute for both supply and demand situational requirements plus socio-ecological conditons.

**RESUMEN**

Esta presentación, explora reglas teóricas selectas sobre la adopción y difusión innovativa en lo que se refiere a la tecnología y mercadeo de productos. Se discute la necesidad de, integrar la base de la oferta y demanda de las extrategias de difusión y de los factores de variación ecológicos, en el campo de la investigación technológica. La introducción del pescado, Tilápia, como el tópico de estudio, ofrece un modelo adecuado para llevar a cabo indagaciones subsecuentes del proceso de innovaciones técnicas avanzadas, cuando se las encuentra en situaciones de subdesarrollo. Datos recolectados en una reseña de prueba, reciente, de los consumidores de la Tilápia, ofrecen algunas predicciones para, asesorar el mercado, para llevar a cabo estudios los cuales indiquen la aceptación que el consumidor muestre hacia el producto y, postulan algunos puntos relativos de las ventajas y desventajas que se encuentren, para asi considerar, diseños de investigación. En total, se deduce que la aceptacion y preferencias del consumidor dependen de la calidad del producto y de las condiciones socio-ecologicas y, para que asi, exsista una situación de oferta y demanda.

Keywords: Tilapia; Marketing

Over the past forty years or so a growing body of knowledge has and is being generated which directly relates to how new ideas or newly generated knowledge is being and should be utilized. One of the most broadly-used phrases for this area of inquiry is the "diffusion of innovations". The definition proposed by Katz *et al.* (1963) is one of the best for describing the concept of diffusion as it applies to the spreading of the acceptance of new ideas. They define diffusion as the cumulative acceptance over time of some specific idea, or practice by individuals, groups, or some other adopting unit, linked to specific channels of communication, to a social structure, and to a given system of values or culture. The idea, practice, or product is most commonly referred to as an innovation. This implies that the particular product being proposed for acceptance is not now being used by the particular adopting unit and is therefore perceived as "new" by them.

Within the forty-year span of diffusion of innovation interest, distinct thoughts about the concept have emerged, The earlier works on the conceptual framework conducted by Lionberger (1960), Katz (1960), and Rogers (1962) focused on the processes of adoption based on the conditional needs and attributes of individuals. Today, this kind of perspective is often referred to as the "demand-side" of diffusion/adoption. In more recent works, Brown (1981) introduces the "supply-side" perspective of diffusion/adoption. This approach views the innovation as a product that is limited in quantity and marketed to a specific target population. Finally, during roughly the same recent period in time, the factor of socio-ecological conditions emerged in context with the diffusion of innovation models. In effect, the socio-ecological conditions encompasses the overlooked aspects of societial influences (institutions and customs) which impact the overall success and/or failure ratio of adoption, regardless of which perspective (supply or demand) is taken. Works conducted by Demerath (1975), Blaikie (1975) and Weinstein (1975) underscore the significance of needed intimate familiarity and understanding of the social situations trying to be affected by the diffusion practitioner.

The existing body of knowledge pertaining to diffusion and adoption studies imply that certain tenets are necessary in the theoretical model. Traditional emphasis on the factor of communication has been softened to a great degree by more recent findings that suggest the importance of the "market and infrastructure perspective" (Brown, 1982). From this perspective, the emphasis or focus is placed on the process by which innovations and the conditions for adoption are made available to individuals or households. Thus, communications of the product and the product's distribution or availability constitute the overall process of diffusion. On the other side of the issue, the decisions to adopt the product are dependent upon social and/or economic characteristics and conditions.

Figure 1 depicts the conceptual model that was introduced by Brown (1982).

In sum, the review of literature on the topic of diffusion of innovation reveals perspective models which attempt to best explain and/or predict adoption behaviours. This exploratory study dealing with the diffusion and adoption of a food product (tilapia) examines the concept in a comprehensive manner in an effort to understand and rationalize an effective approach for research practitioners to follow in the development of future studies and programs on diffusion.

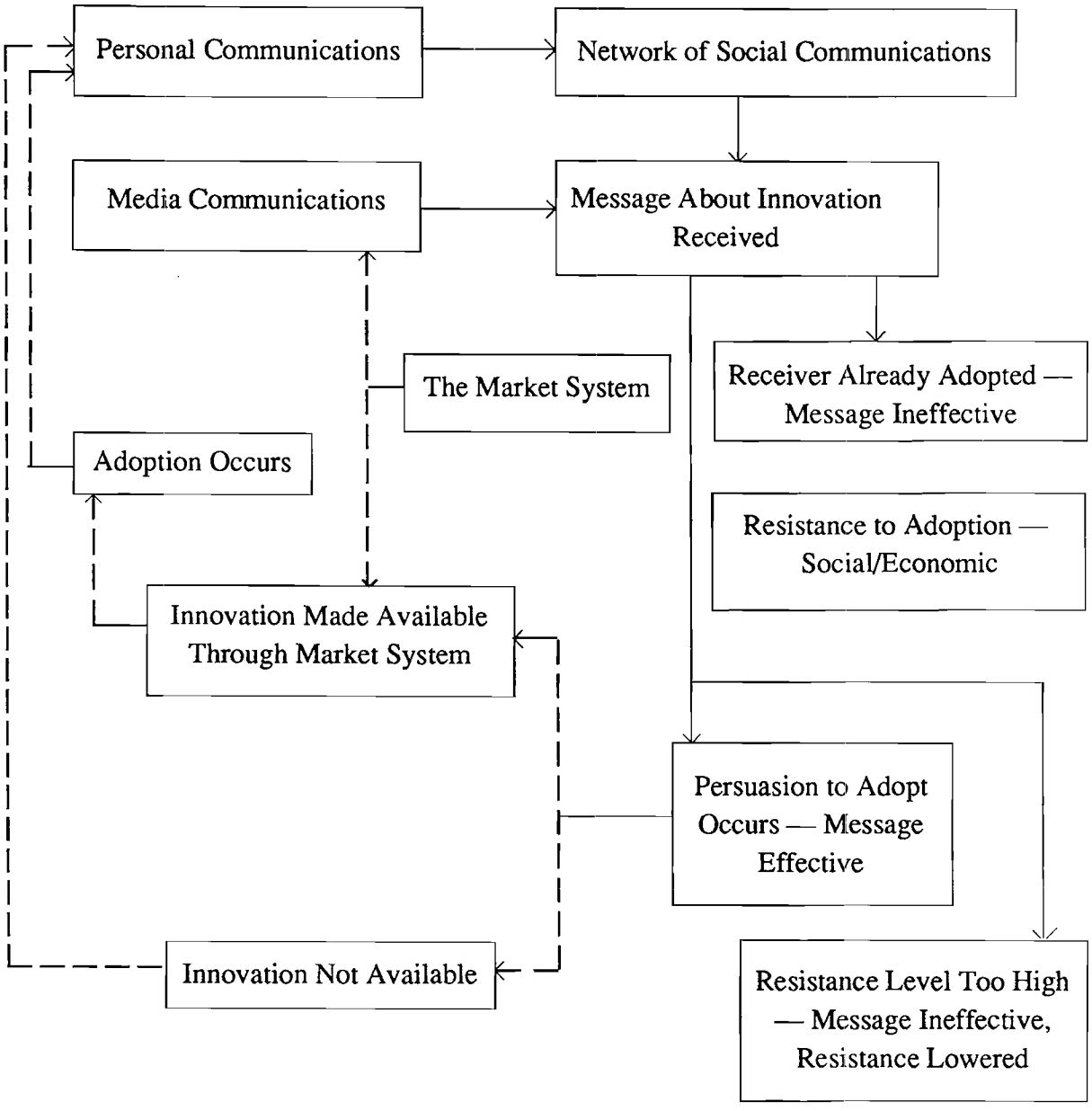


Figure 1: Flow diagram of the adoption perspective (Brown, 1982)

**The application of diffusion/adoption research in tilapia marketing on St. Croix**

The population of the U.S. Virgin Islands is in a unique situation. Exposure to innovations of all kinds is a routine of daily life, and such exposure is evidenced on the islands by previous adoption behaviour artifacts like commercial radio and cable television, advanced telephone systems, daily newspapers from New York and Miami, and a multitude of other items which grows longer every day. Even with the advanced daily opportunities of exposure to new products or innovations, there are limitations. These relate to availability, patterns of distribution, socio-economic characteristics and conditions. For example, cable television is present, but not available for everyone, and there are existing empty buildings that only a year or so ago represented modern discount department store technology. Who is responsible for these limitations and failures? The supplier? The consumer?

Rather than attempt to resolve specific answers to the aforementioned questions, researchers at the College of Virgin Islands-Agricultural Experiment Station CVI–AES decided to look more directly at a production issue they have been involved with for the past five years. Fish consumption in the Virgin Islands and throughout the Caribbean is a traditional, a normative and a natural (given the vast water resources) phenomenon. A survey conducted on St. Croix revealed 80% of a sample of 312 respondents ate fish at least once a week, and 68% indicated that they usually purchased their fish fresh. The issues of concern that prompted the Experiment Station to pursue aquacultural experiments focused on three points: 1) The assumption that fish was important to the local diets (as was confirmed by a 1979 survey and governmental censuses of commercial fishing activities in the Virgin Island waters), 2) The concern about ciguatoxin (human affliction of ciguatera poisoning from reef fishes) and 3) Reducing the high levels of fish and seafood importations.

The preliminary results of the aquaculture experiments in freshwater pond, cage, and closed-circuit (hydroponic) environments indicate that there is solid economic feasibility for production. The scientists are now expanding their research under saltwater conditions. One very important factor which has resulted from the years of study involves the type of fish that is best suited for aquaculture on the islands, both in terms of physical attributes and economic viability. The fish which emerged as the most appropriate was the tilapia, a hearty species which thrives under the conditions that are offered in the Caribbean environment. These fish are very common in the diets of many regions in Africa and Asia, but are not a familiar fish in the Virgin Islands. Thus, a new issue evolved from the production-related research; that which involves diffusion and adoption.

### Factors Affecting Diffusion and Adoption on St. Croix

The contemplation of factors to consider under a multidimensional construct of diffusion and adoption offers a particular challenge when one must select the relative variables for study. Assessment of supply and demand, channels of communication, preference choices, and socio-economic situations pose an array of avenues for determining probabilities of adoption or rejection. As mentioned previously, the economic feasibility model of raising tilapia has been developed, but the actual commercial venture is yet to occur. Thus, there exists the absence of a supply-side case, and a demand-response case as well. Therefore, the exploratory study must rely upon data provided by a trial market which was established at the experiment station facilities.

A set of assumptions provided the guidance for the development of a survey instrument. Basically, these assumptions were reasoned from considerations of communications, socio-cultural, and socio-economic situations known to exist on St. Croix. Because of the size of the Island, established social networks, travel patterns and local news media utilization, it was assumed that sales information could be adequately disseminated to the general public via the local newspaper and the posting of signs on the primary traffic artery. Secondly, it was assumed, from official fishing activity statistics, that the probable trial sale customers would be consumers of pot-fish (rather than the commercial-restaurant buyers who purchase most of the locally-caught deepwater fishes) and would prefer the red variety of tilapia (because of its resemblence to snapper) over the black tilapia. Finally, it was assumed (because of taste tests conducted in 1979 which indicated a 96% taste acceptance) that a sample of repeat customers would indicate their priority of selection based on taste preference over other kinds of fish.

### Methodology

During the winter through mid-summer of 1985 fish sales were conducted each Friday on the St. Croix campus of the College of the Virgin Islands. In order to facilitate a sampling of previous purchasers/consumers of tilapia, a decision was made to conduct a survey during the last month of sales. A survey was designed to collect data on social and ethnicity characteristics, consumer behaviors, personal preferences, and comparative opinions. From such data it was anticipated that analysis could give some indications of whether or not CVI-AES as a supplier, created its own clientele, whether or not there was an emerging demand for the food source offered, and whether or not a pattern based on socio-ecological conditions was being effected.

### Sample characteristics

The sample taken over the four Friday sales days in June and July was relatively small with only 31 respondents. This sample of previous buyers represented 63% of the total customers during this buying period. Surveys were administered by Experiment Station personnel, and respondents were offered a free fish for their willingness to participate in the study. Selected characteristics of the sample are illustrated in the following table.

Table 1. Selected sample characteristics of talapia consumers (N=31)

| | | |
|---|---|---|
| Ethnic Identity: | West Indian | 63% |
| | Puerto Rican | 0% |
| | Continential | 26% |
| | Asian | 11% |
| | | 100% |
| Average number of persons residing in household | | 3.42 |
| Range | | 1–9 |
| Percent of people in household who like to eat fish | | 100% |
| Average age of respondent | | 41.4 years |
| Sex distributon of respondents | | 53% Female |
| | | 47% Male |
| Length of residency in the Virgin Islands | Entire Life | 84% |
| | > 10 yrs. | 8% |
| | > 5 yrs. | 5% |
| | < 5 yrs. | 3% |

### Patterns of responses on selected items/questions

The response patterns for items and questions relating to consumer behaviors, preferences and comparative opinions are presented in Table 2.

Table 2. Responses to selected items/questions on behaviours, preferences and opinions of talapia consumers

| | | |
|---|---|---|
| 1. How do you prefer to buy fish? | | |
| | Fresh | 100% |
| | Live | 58% |
| | Dressed | 42% |
| 2. How do you prefer to prepare fish: | | |
| | Boiled | 58% |
| | Fried | 35% |
| | Other | 7% |

3. Type of fresh find normally purchased: Ranking

| | |
|---|---|
| Snapper | 1 |
| Blue Runners | 2 |
| Dr. Fish | 3 |
| Grouper | 4 |
| Goat Fish | 5 |

4. Average amount spent on fish purchases each month

| | |
|---|---|
| Mean | $54.16 |
| Range | $20.00 to $100.00 |

5. Taste comparison between tilapia and ocean fish:

| | |
|---|---|
| Prefered tilapia | 16% |
| Preferred ocean fish | 26% |
| No preference | 58% |

6. Would you prefer to buy tilapia over other fish if it was available in the local markets?

| | |
|---|---|
| Only if fresh ocean fish is not available | 53% |
| Yes, even if fresh ocean fish is available | 47% |

7. Would you prefer to buy red-coloured tilapia to the fish you are buying now?

| | |
|---|---|
| Yes | 11% |
| No | 26% |
| No preference | 63% |

8. Would you be willing to pay more if the tilapia were cleaned and/or filleted?

| | |
|---|---|
| Yes | 68% |

9. How important are the following criteria in making your choice of which fish and how much to buy?

| | | Very Important | Somewhat Important | Not Important |
|---|---|---|---|---|
| *a* | Price | 53% | 15% | 32% |
| *b* | Freshness | 95% | 5% | - |
| *c* | Taste | 79% | 21% | - |
| *d* | Convenience to market | 26% | 37% | 37% |
| *e* | Ciguatera fish poisioning | 32% | 32% | 36% |

10. How did you originally find out about the fish sale at CVI-AES?

| | | |
|---|---|---|
| *a* | Informed by someone else | 21% |
| *b* | Saw the signs on the roadway | 47% |
| *c* | Read the notice in the newspaper | 26% |
| *d* | Heard the radio announcement | 6% |

**Implications from the responses**

Exploratory studies such as this one on tilapia marketing are intended to derive fundamental tendencies or baseline information that will improve future research efforts. The implications from the responses to the Ten items measured provide certain directions and confirmations for diffusion/adoption research on St. Croix. However the data should not be generalized for the development of hypotheses or tests of hypotheses in other social settings.

With respect to preference questions (1,2,5,6,7), the sample generates a descriptive pattern which implies a strong preference for fresh fish (regardless of whether it is tilapia or ocean fish), that the sample population tends to be native and traditional (based on their preferred methods of fish preparation), and that there is only a slight preference for purchasing fresh ocean fish over fresh tilapia. In general, the overall response patterns indicate that there is not an overwhelming specific demand for tilapia, but there is a very high demand for fresh fish. A preliminary conclusion from this finding would be that some other factor (i.e., market shortages, increased cost for ocean fish, significant discounted market priced tilapia) is required to accelerate adoption.

The supply-side perspective is also somewhat vague with respect to the response patterns. Respondents indicated a willingness to pay more for a dressed product, but were not influenced significantly by other important supply-criteria considerations (question 9). Convenience to market and the availability of a poison-free product; plus, the opportunity to purchase a red variety of tilapia (which resembles their #1 choice in fresh ocean fishes), has little incentive for predicting adoption based on supply.

Responses to the awareness of the innovation (communication channels: question 10) did confirm the notion that the population has adopted a multi-dimensional use of information systems. The overall implication from the response to this item is that researchers and extension personnel can rely upon these media to effectively disseminate on the island.

**Summary**

It is evident by the exploratory study that generalizations and assumptions which emerge in the well-intended activities of research and extension can be hampered by shortcomings in a basic knowledge of socio-ecological conditions. The logic of a supply and demand approach to solving problems with innovation is often thwarted by the less-logical norms, values, customs, traditions and behaviors of people. Problem identification by professionals always carries some risks of being incorrect or misdirected. It is necessary to recognize that the more sophisticated the effort taken in problem identification, the more likely that the research conducted to resolve the problem will be effective and the more likely the research effort itself will be more efficient. It is unlikely, for example, that the high incidence of fish consumption on St. Croix, the high level of importation of fish, and/or the presence of a ciguatoxin threat will significantly affect an increase in the adoption of tilapia as a substitute food product. Basic information about the population's needs, attitudes toward changes in behaviours, and preferences can stimulate an entirely new perspective in problem-solving research. Social and situational analysis is a

highly-recommended pre-requisite for innovation diffusion/adoption practices.

In sum, the baisc tenets of the multi-dimensional model of diffusion/adoption appear accurate, as well as interdependent. The cyclical scenario generated by the tilapia study implies that supply and demand are not sufficient conditions to merit or predict absolute adoption, even with the effectiveness of communications. Social and cultural considerations appear to constitute an equal conditional status. Further study involving the tilapia issue will be conducted in 1986 to examine the effects of commercial marketing on adoption rates in St. Croix.

**References**


Brown, L.A. (1982) *Innovation diffusion: A new perspective.* Methuen, New York.

Busch L. (1979), Marketing tilapia in the Virgin Islands. *Proceedings of the 10th Annual Agricultural Food Fair of the Virgin Islands.* College of the Virgin Islands-Cooperative Extension Service, St. Croix, U.S. Virgin Islands.

Katz E. (1960), Communication research and the image of society: Convergence of two traditions. *American Journal of Sociology,* 65, 435-440.

Katz E., Levin M.L. and Hamilton, H. (1963) Traditions of research in the diffusion of innovations. *American Sociological Review.* April 27, 237-252.

Rogers, M. (1962) *Diffusion of innoviations.* The Free Press of Glencoe, New York.