

PMHAR 257

PRIORITIES FOR PACED GROWTH  
IN MAHALAPYE, BOTSWANA

A Survey of Residents' Perceptions  
of Change and Its Affordability



Interviewing for the Survey

This study, requested by the Government of Botswana and carried out by the Cooperative Housing Foundation under a USAID Operational Program Grant, was prepared by John P. Mason and Jesse Jones, Jr. during April 19-May 23, 1981.

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## ABBREVIATIONS

AID	United States Agency for International Development
CHF	Cooperative Housing Foundation
DC	District Council
DT	Development Trust (Mahalapye)
DTRP	Department of Town and Regional Planning
GOB	Government of Botswana
MLGL	Ministry of Local Government and Lands
MP	Member of Parliament
SHHA	Self-Help Housing Agency
VDC	Village Development Committee

Note: One Pula = Approximate U.S.\$1.25

We would like to express our thanks and appreciation to those persons listed in Appendix IV for giving their time and effort to the study. We would like to acknowledge the contribution of the following enumerators: Samuel Gauthuse, Dorcas Kolaatamo, Serufe Modise, Felicia Morara, and Constance Tlholego.

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Finally, Steve Turner and Nomtuse M'Bere, Applied Research Unit, DTRP, are commended for their initiation of the study and their cooperative assistance and warm encouragement during the consultants' stay in Mahalapye and Gaborone.

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## EXECUTIVE SUMMARY

### AIM

Carried out at the request of MLGL, this survey intends to assist in implementing GOB's National Settlement Policy through assessing perceptions, preferences, and affordability of improved standards of public and community services in the village of Mahalapye. It also serves to advise MLGL on Mahalapye's spatial plan, given that the village has been chosen as a pilot 'primary village center.' The survey is intended to be replicable in other such centers.

### METHODOLOGY

Preceded by a very useful informational campaign, the survey (566/600 respondents) and several non-randomly selected interviews with local, regional, and national influentials were carried out in Mahalapye between April 20-May 15, 1981. A questionnaire developed in Washington D.C. and adapted and translated to Setswana in Gaborone included 39 categories; it was partly based on an earlier study done in Botswana by one of the consultants. Sample selection was done randomly using aerial photos and planning maps. A numerical and percentage summation of responses for each question is provided on the questionnaire in Appendix I.

### FINDINGS: The People

Survey findings indicate respondents' average age at fifty, their origin in Central District, and residence in Mahalapye averaging 16 years. Most residents work in agriculture and cattle herding as well as Government and other non-farm employment. Average household income is Pula 8,64 per week, which is generated not simply by formal but certain informal activities carried out on rather large plots (3/5ths of over 2,000m<sup>2</sup> plots). Seventy-four percent of residents prefer 4-5 rooms, which translates into the same number of separate dwelling units.

#### Present Services

While 70% have at least some access to water--mainly shared, often distant standpipes--there is only limited access to other services. For example, 2/5ths have no sanitation facility. Serviced roads, street lights, and refuse collection are negligible. Ranked preferences for how much money residents are willing to pay for services show street lights as far and away the strongest, with water and roads next in strength. Sanitation is valued much less, since residents are able to provide their own pit latrines for a somewhat modest price. Pula 4,62 is the average amount residents are prepared to pay for services per month.

#### Preferences

Preferences which bear on planning functions are for large houses on equally large plots, more of the shared standpipe system presently in use, pit latrines--also as used presently--and introduction of a roadway/pathway lighting system to neighborhoods.

## Affordability

Based on what appears to be a highly realistic assessment of their needs and preferences concerning services and how much they are able and willing to pay for these, residents opt for a process of gradualism for their village's development. For example, 3/5ths would like to see more stores and markets spread over the village rather than concentrated in one central market place. Over 2/3rds chose the response, "I would like Mahalapye to remain as it is but with more jobs and services." For low-income housing solutions, more than 2/3rds said they would apply for a serviced plot--as in SHHA's program--though the majority indicated they would be able to afford only Pula 5,00 a month for this.

## RECOMMENDATIONS

Several crucial relationships which bear on willingness and ability to pay were tested statistically and translated into planning recommendations. Some of these recommendations are listed below:

- 1.) WATER STANDPIPES: A greater number of shared standpipes in the traditional part of the village appears to be supportable on willingness-to-pay grounds.
- 2.) PIT LATRINES: Were economically-priced pit latrines offered to residents or if materials for self-constructed units provided, an interest based on ability to pay would most likely emerge.
- 3.) ACCESS ROADS: Since the relationship between access roads and their perceived monetary value is weak, it would be difficult to propose a fully-serviced road system to the traditional village; initial planning stages should de-emphasize the role of roads.
- 4.) REFUSE COLLECTION: If a refuse collection system is proposed, an initial program should be small and experimental.
- 5.) STREET LIGHTS: Although the testable relationship is not strong due to the scarcity of lighted roads or footpaths, other data offer evidence for residents' high priority and willingness to pay for area lighting.
- 6.) DEGREE OF CHANGE: Long-term residents prefer a moderate degree of change in Mahalapye, versus planned changes which are radical and 'town-like,' yet which would provide job opportunities and increased service opportunities to the village.
- 7.) PLOT SIZE - INTEREST IN SHHA: Since plot owners with 2000m<sup>2</sup> or over (3/5ths of total) express no interest in a SHHA plot at this time, it is recommended that any SHHA activity in Mahalapye be tied mainly to housing demand from new residents; a portion of a SHHA project might be reserved for existing residents, to be implemented experimentally and costed at the variable income levels of residents applying.

- 8.) INCOME - PAY FOR SERVICES: Given a clear association between overall income and willingness to pay for services, it is recommended that data on residents' inclination and ability to pay for specific services be accepted by planners as being reasonably accurate.

## INTERVIEWS WITH INFLUENTIALS

In non-randomly selected interviews with 'influentials' in Mahalapye, many interesting points of agreement on Mahalapye's development were found. Highlights of these points are:

### Findings

- 1.) While primary village center service levels should be more commensurate with those of the towns, village character should be maintained.
- 2.) Allocation of financial resources for basic services should be concentrated in the existing community, as opposed to District authorities.
- 3.) Water should be extended currently to presently under- and unserved parts of the village.
- 4.) Income-producing activities should precede the development of fully serviced lots if they are to be affordable by existing village residents.
- 5.) The uncertainty of an adequate water supply is defined as a potential major constraint for the development of Mahalapye as a primary village center.
- 6.) The business community should have a greater involvement in the planning and implementation of any changes anticipated in the village.
- 7.) The land tenure system should be adopted to allow commercial property ownership to be used as collateral for financial loans.

Interviews of 'influentials' were also held in Serowe and Gaborone, the findings of which contribute to a framework for national, district, and village level participation in the village planning process.

## STRATEGY FOR PARTICIPATION

For purposes of community participation in the planning process, a series of meetings between planners and local representatives on a sectoral basis is recommended. Furthermore, it is suggested that an assessment of available resources in both planning and community participation terms be carried out, particularly so as to avoid potential conflict in regional development. In that village leaders perceived such a potential conflict, a dialogue in this sensitive arena would seem especially urgent.

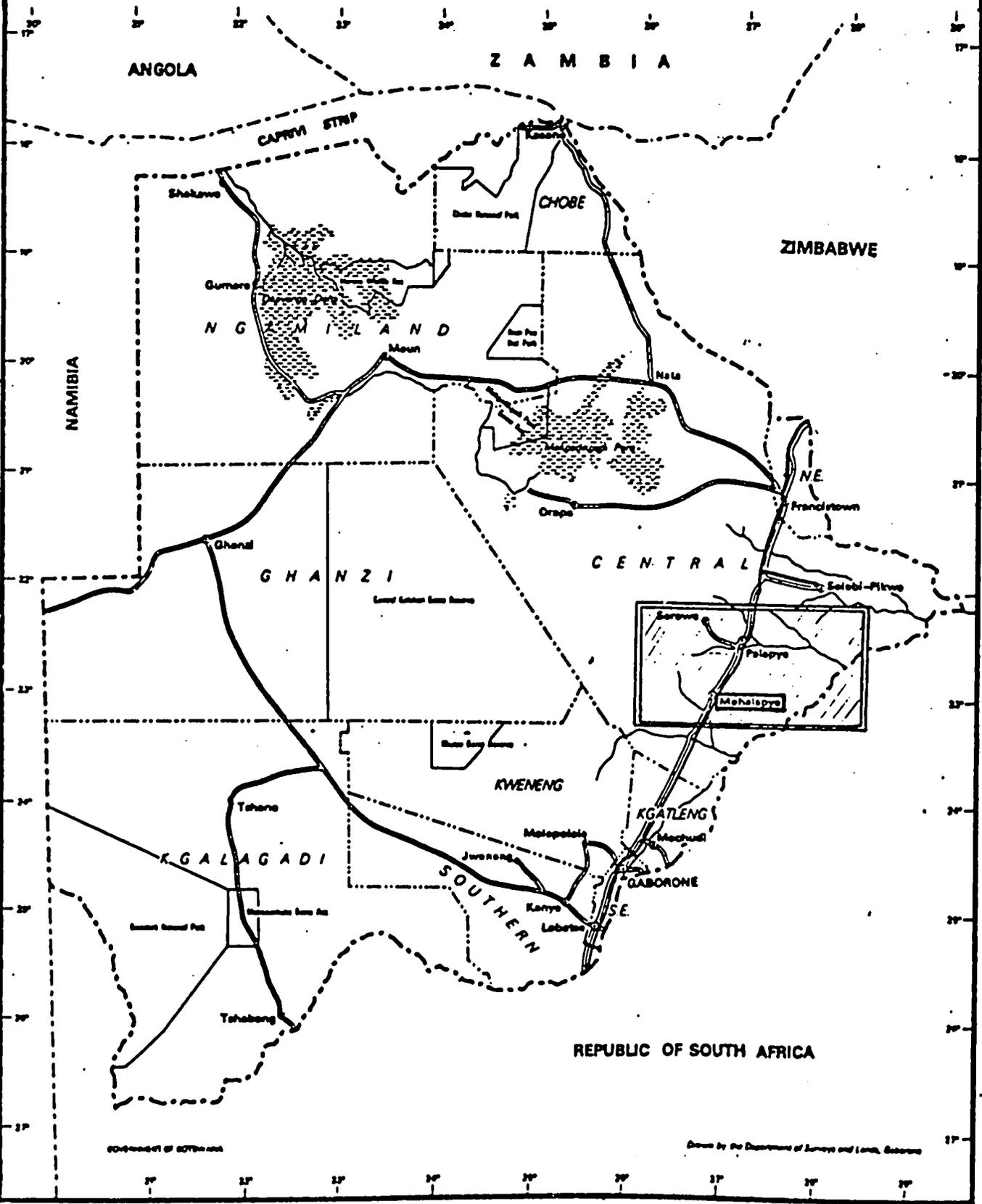
The study is concluded on a note of optimism concerning its use as a model for subsequent primary village studies.

IV

Map 1,1 Republic of Botswana



- Road \_\_\_\_\_
- Railway \_\_\_\_\_
- District Boundary \_\_\_\_\_
- National Park \_\_\_\_\_
- River \_\_\_\_\_



GOVERNMENT OF BOTSWANA

Drawn by the Department of Surveys and Lands, Gaborone

## I. AIM OF THE MAJOR VILLAGES SERVICES STUDY

This major village pilot survey has been carried out at the request of the Ministry of Local Government and Lands (MLGL), Applied Research Unit. It is intended to assist the Ministry in implementing the Government's new National Settlement Policy through an assessment of perceptions, preferences, and affordability of improved service standards from the village end of the planning and development continuum. It also aims at advising the Ministry as to how the findings might impinge on its spatial development plan for the pilot major village selected for the study--Mahalapye--since that village is the first to have had such a plan prepared for it.\* The draft plan for Mahalapye was prepared in an advisory manner by MLGL's Department of Town and Regional Planning. Since the survey is intended to be replicable in Botswana's other primary centers, a methodology which can be subjected to tests of reliability and validity has been evolved.

The approach to integrated town and village planning has only recently become of some urgency to Botswana, given the fact that the country has not undergone many of the classic problems of greatly imbalanced rural-urban development. Botswana is fortunately at this moment in a strategic position to positively influence its national growth and development pattern. It wishes first, however, to take into account local, grass roots opinions and attitudes before it subjects its plan for Mahalapye to the test. Thus the Government has requested CHF to design and carry out a survey which assesses villagers' attitudes and behaviors concerning present services and their desire for and ability to pay for possible future services. Included in the request was a study of Mahalapye inhabitants' perceptions of certain planning features such as plot size, land tenure, service levy, self-help housing, site and service areas, market zones, village vs. town life, among others.

MLGL also requested CHF to present findings and recommendations on community and public services for major villages in general. Furthermore, a funding structure by which major villages would attain a certain level of services was requested. For this purpose, a series of semi-structured, open-

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\*Mahalapye Village Development Plan, (Draft), DTRP Francistown, 1980.

ended interviews was designed to discover local, district, and national level officials and leaders' views on Mahalapye's development and potential ways of funding it. Coupled with the survey and other procedures of the MLGL, these interviews provide a strategy for future major villages studies which permits and encourages a broad range of participation in the planning process.

In order to place the present study of major villages services in perspective, the old and new approaches to Botswana's village planning are briefly presented below.

## II. TRADITIONAL VILLAGE PLANNING AND THE NEW APPROACH AS APPLIED TO MAHALAPYE

Historically in Botswana, village planning originated with the districts. Their procedure has been to plan for the villages on a sectoral basis--schools, health facilities, water, police, postal service, etc.--rather than on an integrated, regional developmental basis. Relationships between villages and between more important villages and towns in terms of their contributions to regional and national growth have traditionally been omitted from the rural planning effort. Now that has all changed.

With the recent development of a National Settlement Policy, Botswana is ready to deal with investment, growth, and migration through a hierarchically defined classification of its settlements. The Policy's goals are to reduce an ever increasing rural to urban movement through developing economic and other opportunities in the primary rural centers.\* As part of this process, those primary centers\*\* classified as 'major traditional villages,' including Mahalapye, are to be upgraded both so as to impede migration to the towns and to attract Government and private investment. The increased level of servicing provided to major village inhabitants, the subject of this survey, is expected to positively influence those desired results. Special funds in the national budget (labeled 'LG04')\*\*\* have been designated for improving major village infrastructure so as to attempt to reduce the difference in service standards available respectively in the towns and major villages.

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\*This Policy evolved hand-in-hand with the need to create an investment structure "...which recognizes the roles of the various settlements of the country in the development process and which should above all aim at changing the heavy bias on urban, especially Gaborone, investments." Draft Primary Centers of Botswana, DTRP, 1979, p.1.

\*\*Primary centers include the four towns and six most important villages, all of which have populations greater than 15,000 and accounting for 20-30% of the country's total population.

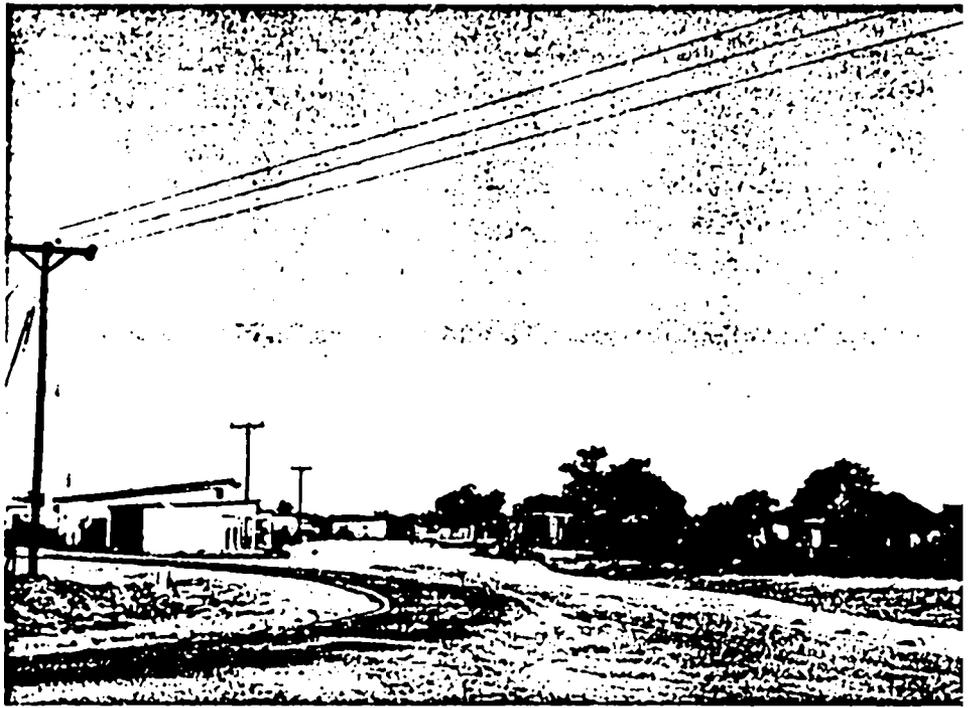
\*\*\*National Development Plan, Ministry of Finance and Development Planning, November 1980, p.359. —

DTRP, which prepared the draft Village Development Plan, served in an advisory/liaison role, tapping the popularly-based kgotla tribal organization, the kgotla-elected Village Development Committee, and representatives made up of village councillors and the Member of Parliament from Mahalapye. The draft plan was approved in late 1980 by the local-level Village Development Committee and Subordinate Land Board and in early 1981 by the Central District Ngwato Tribal Land Board.

Major elements of the plan consist of developing Mahalapye as a primary center, including upgrading of the physical and communications infrastructure, identification and preparation of layouts for expected residential development of road system for the village, among others. The general geographic direction of development proposed for the village, including a planned residential zone, is east of the Mahalaptswa River. An easterly direction has been chosen because of constraints in the other directions.

Insomuch as it bears on the present survey, an important objective of the Plan is to utilize local participation in discussions which affect the welfare and well-being of the village. As part of this effort CHF was invited to plan, carry out, and report on the survey of Mahalapye residents' preferences, willingness, and ability to pay for improved services. Additional studies which complement the planning task are one on increased water needs and resources and another on the engineering side of the physical planning activity, including its costing.

The new approach to village planning outlined here--including beneficiary participation through kgotla meetings and the primary villages survey--represents a new and promising experiment in Botswana's growth and development. It is expected that this approach can be repeated in the other major villages of the country. This survey and the methodology used to obtain a variety of opinions and perceptions on Mahalapye's development is part of the overall goal of making the approach both comprehensive and replicable.



This paved street in central Mahalapye is one of very few in the village.



A residential compound with a blend of traditional, transitional, and modern housing.

### III. LOCAL INFORMATIONAL CAMPAIGN ON SURVEY

Preceding the survey itself, in March and April, an informational campaign was conducted by the Mahalapye Development Trust (an arm of the Village Development Council) in cooperation with the Applied Research Unit and Informal Training Unit of MLGL. Its purpose was to apprise the village population of the survey through a series of Kgotla (tribal council) meetings. The Campaign was launched by the presentation of printed sheets to the inhabitants in which four issues to be addressed by the survey were introduced. Readers were advised to discuss these basic issues with family members and friends and then to be prepared to participate in their more formal consideration at kgotla meetings.

The four key issues were described in the printed sheets as (1) National Settlement Policy, (2) potential new services for Mahalapye, (3) a 1980 draft of the Mahalapye Village Development Plan, and (4) the details of the survey.

First, Mahalapye residents were told of the Government's new policy to bring more jobs and services to rural-regional centers such as their village. This development would benefit the majority of Batswana, who in fact live in close proximity to the country's half dozen or so large and regionally important village centers. One objective of such a policy, the residents were informed, is to channel more financial benefits to the major villages so as to increase production and attract investors, including Government and private enterprise. Service standards would have to be improved to achieve this goal, however.

Second, residents were informed that they would be questioned in the survey about their preferences for certain services and their ability to pay for these, the latter of which is crucial to the success of the National Settlement Policy.

They were told that if Mahalapye were to accommodate expansion and at the same time reduce the cost of providing services, then present plot sizes might have to be reduced. Preference for what, if any, services, how much one could afford to pay for the most desirable services, and the possibility of having plot sizes reduced were indicated as possible sources of questioning in the survey.

The third issue for discussion in the Campaign concerned essential elements of planning crucial to Mahalapye's overall development. Such factors

as new road links to the hinterland, central village changes conducive to attracting new businesses and offices, and certain governmental and industrial developments in and around Mahalapye were presented.

Finally, the fourth part of the Campaign consisted of promoting the local cooperation necessary to the success of the survey. Mahalapye residents were advised of the need to answer survey questions frankly and forthrightly. They were instructed, furthermore, to respond not according to others' expectations but according to their own convictions.

Generally, the Campaign seems to have been a valuable tool for readying the population for a survey that is intended to tap their perceptions and feelings about what might become of the village they live in. One reservation about the substantive side of the Campaign is that no fewer than six times did the distributed sheets imply or state outright that if services in Mahalapye were to improve, existing plot sizes would probably have to be reduced. If it is assumed that the aim of the survey was to ascertain just what actions or sacrifices the population is willing to undertake to improve its lot and benefit itself directly, then a suggested reduction of plot size introduces a possible bias into the survey. Although such a bias could not be directly ascertained during the survey, it is clear from the data analysis presented later in the report that large plots were definitely preferred over service improvements. Any potential threat or warning about plot size reduction presented in the printed sheets, depending on how widely this material penetrated the village communication process, could have biased the responses in this important arena.\*

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\*It is suggested for future primary village studies that the Campaign information sheets and discussions be evaluated and monitored for possible bias such as that pointed out above. Otherwise, control over survey results is made all the more problematic.

#### IV. METHODOLOGY

##### A. Sample Base

The sample selected for the survey was set at the 20% level or one residential plot of every five. The population total for Mahalapye, which is edging towards the 25,000 mark, is based on recent estimates. Moving forward from a 1971 national census count of 15,413 for the village, a 1977 aerial photograph suggests an approximate increase of about 1,500 for a 17,000 total. This figure assumes an average of six persons per household. Further increases have been inferred from allocations of land by the local tribal authority (sub-land board) in Mahalapye. Eight hundred new households were on record for land allocation by 1980, giving a population total of 21,750 for late 1979.

The actual sampling level was fixed through a combination of time/personnel resources and the use of DTRP's most up to date photo-mapping exhibits. Five interviewers (enumerators) were employed for a total of three weeks' fieldwork. Three of these were University sociology students while two were interviewers regularly utilized by Government ministries for their innumerable surveys of the Batswana on every possible topic (of which the Batswana are unusually tolerant!).

A 1979 base map of 1:5000 scale updated from a 1977 aerial photograph and a June 1980 aerial photograph 1:15000 blown up to 1:5000 scale were used for plotting the sample. For purposes of selecting the sample, existing quadrants of the 1979 base planning map were used. Eighty-eight (88) inhabited squares on the map were combined to a more manageable group of twenty-two (22) blocks of four (4) each. Nevertheless, every block (88) was counted for its existing residential compounds (lolwapa) and totaled for the four block grouping. Each grouping was then proportioned to the total of 2,943 compounds which were counted.\*

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\*The figure 2,943 contrasts with the Office of the Census' estimate of 4,084 households which have just been assigned numbers for the purpose of the 1981 national census. Such a difference reflects the census' focus on households versus this study's emphasis on compounds, which is a function of dissimilar objectives (total accounting of all people as distinct from a sample survey) and of different levels of measurement and analysis. In short, this study has counted from the air (for an approximate 20% random sample), while the census counts from the ground (for a 100% count).

A random sample of six-hundred (600) was set, based on a twenty (20) percent representation of the compounds in Mahalapye. Industrial and central business districts were eliminated from the survey, which included some Government and private, modern housing and facilities. The rationale for their non-inclusion is that the study's thrust is aimed at the potential for transition of Mahalapye from its traditional, village base to a more central, regional type of settlement.

The 600 selected compounds extend from west of the central business zone, demarcated by Government facilities, a commercial and industrial zone, and the main north-to-south railway line and highway which parallel one another from the Sough Africa to Zimbabwe borders. An equally important boundary for the sample is the Mahalaptswé River (dry much of the time) on the eastern border of Mahalapye, which serves a partial though by no means insurmountable barrier to development to the village's east.

Actual selection proceeded from use of a random numbers table. The 600 compounds were selected from the twenty-two clusters (4 blocks each equal 88 blocks) proportionate to the total. Thus, compounds in thinly populated clusters had as equal a chance of being represented in the sample as those in densely inhabited clusters. Marginal areas on the village's edge are represented proportionately to those in thickly settled areas. Counting in the four-block clusters for sampling purposes was done in the same manner in which the overall count was made, starting at the bottom left of the quadrant and working around the blocks in clockwise direction. Cluster sizes range from four (4) to three hundred sixty-two (362) compounds, with an average (mean) of one hundred thirty-four (134). The cluster samples range from one (1) to seventy-four (74) compounds, averaging twenty-seven (27) per cluster.

Each cluster was then surveyed, using the 1980 aerial photos as the guide to locating on-the-ground, the randomly selected compounds. Close, direct supervision of enumerators was provided throughout the survey, but especially at the initial stages, in order to provide assistance in locating aerially-photographed compounds and in using the questionnaire.\* Field supervision and assistance was maintained throughout the course of the survey.

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\*Training in research activities such as those carried out here is strongly recommended for University social science programs. This training could include field training in sample design and map and aerial photo reading, in order to provide know-how in locating (randomly selected) plots or compounds in large heavy-density, intricately patterned villages such as Mahalapye.

Due to some pressures created by the need to code the questionnaires, mark the sensor data cards, and process the latter, the field survey was terminated on the twelfth day on the completion of the five hundred sixty-sixth (566th) questionnaire. That number represents one per cent (1%) below the original twenty per cent (20%) goal or nineteen per cent (19%). The overall sample still comes close to one residential compound of every five.

Systematically every compound which was selected for the sample and which had no one present who could responsibly respond, was approached up to four times before being eliminated from the sample. Replacements were randomly chosen from the not-at-homes, abandoned, or vacant compounds in about sixty (60) cases. Given the timing of the survey, April-May, the showing is quite good--since many residents were off at their fields, more especially as school children were free on vacation to accompany their parents there during late April-early May.\*

No refusals were encountered, which is a testimony perhaps to the pre-survey Campaign if not the good will of the Batswana in these matters. In some cases certain convincing had to be done, but not one resident in the end refused to cooperate.

The consultants, with the help of the Applied Research Unit, supervised each step of the survey and were present in the field for the duration of the study.

#### B. The Questionnaire

Because the data presented later in the report directly invoke the questions asked in the survey, they are not detailed here. Those questions

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\*July-October is perhaps the best time to carry out a survey such as this since residents are most apt to be found at home just prior to the rainy season when planting is commenced. This, of course, is why the 1981, ten year census was selected for that time period and that is precisely why the present survey had to be completed before June. All surveys were required to be carried out before June in order to make way for the ensuing National Census.

from the earlier survey\* which bore on this study and which had tested meaningfully in that survey were reused in light of their reliability. The new questions, which comprise the majority, were devised with the explicit aim of reflecting Mahalapye inhabitants' subjective views and perceptions about the possibility that their village and thus their lifeway might transform into something considerably different from what it is now.

C. Formal Interviews with Local and District Leaders and Other Government Officials

Besides the survey questionnaire, interviews with local, district, and national officials and certain key members of the community were held by the two consultants. The purpose of these interviews, which were based on topics and questions fixed in advance, was to supplement the more formal questionnaire used in the sample survey. Since local leaders and other officials perceive Mahalapye's potential growth from a position of responsibility, authority or power, it was felt their views should be discussed openly and frankly. The names and positions of those who participated in these interviews are listed in Appendix IV.

Furthermore, meetings and interviews were held with officials at the District Council headquarters for Mahalapye in Serowe and with Ministry of Local Government and Lands officials in Gaborone. The aim of these discussions was to bring to bear on this study a comprehensive approach and analysis of how finance and planning decisions for Botswana's so-called major villages are presently made and how that process might be improved in the future.

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\*See Appendix I for the English version of the questionnaire. Some of the questions were adopted from an earlier survey, "Social Research of Resident Preference, Need and Ability to Pay: Towards a Framework for Physical Planning Standards in Botswana's Self-Help Housing in Site and Service Areas," FCH, September 1979. Most questions, however, were framed for the Mahalapye context in response to the Terms of Reference for the Major Villages Service Study, January 1981 in consultation with the MLGL Applied Research Unit. Mr. Rufus Molokomay of the Ministry's Informal Training Unit is recognized for his generosity in translating the questionnaire.

A related study of preference and affordability was recently carried out by Ms. Nomtuse M'Bere in a new, planned mining town in Southern District; "Report on Jwaneng Site and Service Affordability Study," MLGL, Applied Research Unit, April 1981.

The leaders interviewed represent several levels of authority, power, and interest. Since most of these persons are affected by what happens to Mahalapye, they obviously would prefer to be in a position where change influences them positively. In Mahalapye itself, business and politics are as if one, which from the business growth point of view is a very healthy sign. The local political structure which governs Mahalapye; however, feels several strong pulls on its power--both from the traditional authority which rests in Serowe and the national governmental body in Gaborone. With important representatives of both of these sources of power in Mahalapye--Senior Tribal Authority from District Council in Serowe and District Officer of MLGL's District Commission also in Serowe--local authority is somewhat eclipsed. Yet another source of power lies in the elected representative from Mahalapye who sits in the National Parliament. As well, the leader of the major opposition national political party (rather small but growing) resides in the village of our attention.

Given the context briefly sketched above, it is essential to determine what the constraints on such a major village as Mahalapye's development are from the political-administrative point of view. These are addressed in a later section, where the interview findings are presented.

## V. SURVEY FINDINGS:

The findings are presented and discussed in a different sequential order than that of the questions in the questionnaire.\* A profile is drawn first of the villagers and their work, then of the existing conditions of their services, followed by their preferences, willingness, and ability to pay for potential, new services. The mode of presentation uses summations of numerical data, including percentage responding in specific categories. For a later analysis of the same data, cross-tabulations of selected questions are made to determine the degree of correlation.

### A. Who They Are

The vast majority of those interviewed--total interviewed equal 566--were household heads, including both men and women. Their average age is just over fifty years.\*\* Each compound has between three and four children (3.37). While most residents interviewed hail from the area in which Mahalapye lies, Central District, they have resided in the village for an average of about 16 years. This is not surprising, given the fact that Mahalapye was a settlement of only a few thousand as recent as three decades ago and is now growing towards the 25,000 mark.

Farming is the most important economic activity of the respondents, taking under its wing both agriculture and cattle raising. This type of work is reflected in the dual residence pattern, whereby over one-fifth (1/5) of the respondents are at their cattle posts or lands for more than two months a year. Most, however, remain in the village at least ten months per year.

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\*The questionnaire--See Appendix I--lists a summation of the numbers and percentages of responses for each question. These are listed on the right hand side of the page.

\*\*See Appendix II for table showing the statistical technique for averaging. Since no upper age limit was set in the question itself, one was established for purposes of establishing a mid-range or interval mid-point.

Table 1

Mahalapye Work Pattern

<u>Occupation</u>	<u>No.</u>	<u>Percent</u>
Farmer (including agriculture and cattle herding)	394	43.6
Government Employee	217	24
Railway Worker	35	3.8
Merchant	33	3.6
Non-Farm/non-merchant self-employed	224	24.8
TOTAL*	903	99.8

\*Total reflects some two-occupation situations

The majority of the Mahalapye sample has at least one full-time working member, while many compounds show an incidence of additional, part-time employment. On a household basis, the income averages out to Pula 8,64 per week. Of that average figure, however, more than one in three respondents reports an income of less than P3,00 per week. This is somewhat offset by a portion of the other two-thirds which earns somewhere between P10,00-23,00 a week. These figures are treated later in relation to questions about affordability.

Table 2

Household Weekly Income

<u>Pula* Per Week</u>	<u>No.</u>	<u>Percent</u>
Less than P5,00	200	36.0
Between P5,00-7,00	116	20.8
Between P7,00-10,00	71	12.8
Between P10,00-15,00	70	12.6
Over P20,00**	99	17.8
TOTAL	556	100

\*1 Pula = about US\$1.25

\*\*See Appendix for computed mean

\*\*\*Because of omissions and occasional errors in recording a response, totals do not always = sample number of 566

### B. Dwelling Types and Plot Size

Most compounds observed or surveyed in Mahalapye showed a mixture of dwelling types. The most prominent types were rondavels and rectangular, concrete block units. A considerable degree of self-help effort was seen to be taking place in housing, resulting in a unique blend of traditional and western-style abodes. Rondavels made of blocks or bricks and roofed with zinc, bloci-made rectangular houses roofed in thatch, and an interesting marriage of the traditional round and newer angular designs all in the same structure are very common sights in Mahalapye's housing scene. Very little in the way of makeshift homes were observed. ("Flats" in the questionnaire was interpreted by certain interviewers to be the same as concrete block. In fact very few, if any, apartment dwellers are found in Mahalapye.)

Renting a house is most uncommon in the village, the vast majority (94.5%) of the homes being owned outright. Since land is not possessed in a freehold manner, it being allocated by the Tribal Sub-Land Board, private dwellings cannot be used as collateral against bank loans. Despite the absence of bank loans for home improvements, a great deal of self-help building of shelter is presently being carried on.

Probably because residential land in the village is not bought but rather is accorded by the Tribe, the size of plots is extremely large. The

Table 3

#### Residential Plot Size

<u>Size</u>	<u>No.</u>	<u>Percent</u>
Less than 500m <sup>2</sup>	5	.97
501m <sup>2</sup> -1,000m <sup>2</sup>	15	2.91
1,001m <sup>2</sup> -1,500m <sup>2</sup>	60	11.62
1,501m <sup>2</sup> -2,000m <sup>2</sup>	131	25.38
Over 2,000m <sup>2</sup>	305	59.10

size of plots was measured from an aerial planning map based on an aerial photograph. As the table shows, almost three-fifths (3/5) of the residents questioned lived in a compound over 2,000m<sup>2</sup> in size. In this commodious space such economic activities as beer making, poultry farming, some kitchen gardening, and storage are carried out. Social activities are important



One type of Government housing provided to police assigned to Mahalapye.



Building materials alongside a typical Mahalapye home will be used for new or improved self-help housing.

contenders for the large open areas of the compound. Not unimportantly, the physical distance between dwellings in the compound, so as to separate parents from older children and other dependents, requires a fair amount of space. This spatial requirement is also reflected in the level of stated preference (74%) for four and five rooms, which is usually translated into four or five separate traditional units. The role played by the presence of large plots on service level preferences is discussed in a subsequent section.

C. Services - What They Have and Pay For

Present services in the traditional village of Mahalapye are somewhat limited in scope. A summary list shows that while seventy percent of the respondents have at least some access to water--mainly standpipes--they have very limited access to other services. Street lights and refuse collection, for example, are practically non-existent, while sanitation, in the form of a straight drop pit latrine, is presently the responsibility of each household.

Table 4

Services Presently Available

<u>Service</u>	<u>No.</u>	<u>Percent</u>
Sanitation	57	7.6
Water	532	71.0
Refuse Collection	11	1.5
Roads	145	19.4
Street Lights	4	.53
TOTAL	749	100.00

A more detailed look at each service shows, that for sanitation, almost two-fifths (2/5) of the sample has no toilet facility whatsoever. When probed further, respondents indicated that in lieu of their own facility, they either use a neighbor's or the bush. In contrast, waterborne facilities are possessed by a small number, those who live right near the serviced part of Mahalapye.

Water delivery is preponderantly (83%) made by means of shared standpipes, which are located anywhere from a minute to over half-an-hour's walk from the

compound. Where a standpipe is not available sinkholes are made in the riverbed and the water carted away. As Table 5 shows, over two-thirds (2/3) of the respondents share a standpipe with more than 20 households, meaning

Table 5

Water Standpipe Ratio

<u>Ratio to Household</u>	<u>No.</u>	<u>Percent</u>
1:Less than 5	1	.2
1:5-10	49	10.1
1:11-15	42	8.7
1:16-20	67	13.8
1:More than 20	325	67.1
TOTAL	484	100

that a large number of residents must expend a fair amount of time collecting water each day. In some cases, over two kilometers must be covered each way in obtaining that valued commodity.

Serviced roads in traditional areas are very scarce, with the exception of main roads (mainly improved dirt) which pass between villages. Most respondents live in areas where either footpaths or unworked dirt roads have been created. One clear reason for the lack of improved roads is the infrequent ownership of motor vehicles. Related to road or pathway access is the element of drainage, of which very little exists in the traditional parts of Mahalapye. Where there is drainage, except in the newer sector of the village, it is either poorly or not maintained.

Payment for those limited services which are available to the residents in the sample is almost negligible. Water, more than any other, is the service paid for by residents. But even there, less than one-sixth (n = 96)\* of those who have the service actually pay for it. Only very small numbers pay for sanitation (n = 2), refuse collection (n = 10), roads (n = 5), and

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\*n = number of respondents

street lights (n = 5), while three-fifths (n = 371) pay for no services at all. Payment for 'other services,' meaning non-public, such as roof thatching or house building, accounted for one-fifth (n = 124) of the sample.

D. Services: What They Think They're Worth and What They'd Rather Have and Pay For

Here, a profile is presented of the ranked preferences of how much residents might pay for services were these to become available and of what kinds of improvements they would be willing to pay for.

Using photographs depicting services offered in municipal areas generally and a handful of coins amounting to Pula 5,00, respondents were asked to pay what they believed the services to be worth. For coding purposes, intervals of 25 Thebe (100 Thebe to the Pula) were used up to Pula 2,00 and from Pula 2,00-5,00, one Pula intervals were used. The rationale for those intervals was based on the fact that 'payments' of less than one Pula were the most common.

Table 6 shows the overall monetary values of the services as depicted in average amounts residents would be willing to spend on typical municipal

Table 6  
Ranked Monetary Value of Services as Derived from  
the 'Money Game'

<u>Service in Ranked Order</u>	<u><math>\bar{X}</math> Amount of Pula/Thebe Willing to Pay</u>
1) STREET LIGHTS	P. 1,10
2) WATER	89Th.
3) ROADS	76Th.
4) REFUSE COLLECTION	71Th.
5) ADMINISTRATION COSTS	71Th.
6) SANITATION	69Th.

services . The findings show some unexpected results: street lights, despite the general absence of motor vehicles in the traditional area of Mahalapye, are ranked highest on the scale of monetary value; the rationale for that preference seems to be the increased sense of security street lights provide. A similar finding was uncovered in the preference study referred to in the earlier part of this report. 'Street lights' in effect, then, should be read as 'area lighting.' Probably because of the time spent in obtaining water,

this service is ranked second in monetary value. From there down the scale the other four services are clustered much more closely than street lights and water.

It is noted that between street lights and sanitation--services which, respectively, they have none of and some of--there is a monetary difference of 41 Thebe, a significant amount given the presumed greater functional importance of sanitation. The point is that the respondents show a willingness to pay for a service they can obtain only by paying for it--street lights--in contrast to a service they can provide for themselves--a simple, straight drop pit latrine.

A more global interpretation and one that is perhaps useful for general finance planning objectives concerns how much money residents are prepared to pay for all services combined. Pula 4,62 is the computed average for what they say they would pay today. That figure represents about one-seventh of reported average monthly income.

Another set of measures of preference for services, while more indirect than ranked monetary value, shows the principle of trade-offs at work. Questions based on the quid pro quo of selecting between 'A' and 'B' versus 'C' and 'D' clearly elucidate what Mahalapye residents place their priorities in. Table 7 depicts priorities which could have a decided impact on physical planning standards, especially those modeled on western urban norms. Large houses on equally large plots have important implications for spatial considerations and questions of 'rationalizing' planning efforts. On the other hand, shared standpipes and pit latrines mitigate somewhat against the need to rationalize service delivery systems into grid-type patterns. Furthermore, an emphasis on street lights (read as 'area lighting') rather than streets themselves might balance off the need to regularize the existing roads.

Environmental health conditions are the main consideration in examining matters of pit latrines, shared water standpipes, and rubbish bin size and collection. So long as reasonably high standards of sanitation are maintained, these perhaps should not be of tantamount planning concern. What is important, however, is the upgradability of these services at a future time if and when residents' preferences significantly change and/or if demographic conditions warrant such changes.

One caveat concerning individual water connections and waterborne sanitation is that regardless of planning inclinations, basic planning in this area is contingent on the intended water resources research and analysis soon to be carried out in Mahalapye. Additionally, water demands in the scheduled mining activities in the surrounding region may also bear on water servicing patterns in Mahalapye.

Table 7  
Ranked Priorities of Elements Affecting Physical Planning Standards

	<u>Ranked Priorities</u>	<u>% (No.)</u>	<u>Physical Planning Aspect</u>
I	Big House with Pit Latrine <u>Vs.</u>	86 (480)	Spatial/Reticulation
	Small House with Waterborne Sanitation	14 (77)	Water Availability
II	Large Plot with Pit Latrine <u>Vs.</u>	86 (477)	Grid Pattern/Water Availability
	Small Plot with Waterborne Sanitation	14 (78)	
III	Poor Drainage with Street Lights <u>Vs.</u>	71 (399)	Maintenance Standards
	Better Drainage with No Street Lights	29 (159)	
IV	Have Own Rubbish Bin with Bi-Monthly Collection <u>Vs.</u>	60 (337)	Maintenance Standards
	Share Large Rubbish Bin with Bi-Weekly Collection	40 (224)	
V	Shared Standpipe with Large Plot <u>Vs.</u>	59 (328)	Spatial/Reticulation
	Own Water Supply with Small Plot	41 (228)	Water Availability
VI	Shared Standpipe @ P1,05/mo. <u>Vs.</u>	53 (292)	Materials/'Import' Labor Cost
	Individual Meter Supply @P2,25/mo.	47 (258)	

### E. Willingness and Ability to 'Pay For' Changes

So far, a certain resistance to the new is evidenced in the data. Such resistance is probably not just stubborn unwillingness to change. Rather it is partly a matter of the typical Mahalapye villager hedging his or her bets in such a way that he can know what the change might mean for him, his children, and grandchildren. It is also a matter of knowing how to adapt to new conditions. And, perhaps as important as any, is the villager's sharp perception of economic cost. This is coupled with his knowledge that new service standards may not only cost him a lot more money but that he might also have to sacrifice other economic resources, such as a large plot, several houses, among others.

The tendency of the responses about modernizing Mahalapye is generally towards a process of gradualism, tempered by economic realism. About equal numbers of respondents want to see, respectively, improved footpaths, better roads, and more regular street patterns. For markets, almost three-fifths (59%) would like to see more stores and markets distributed over the village, rather, than concentrated in one central marketplace. "I would like Mahalapye to remain as it is but with more jobs and services" was a response chosen by over two-thirds (65%), which seems to reflect resistance to both no change at all and abrupt change.

Several questions about the possible development of a Self-Help Housing Agency (SHHA) in Mahalapye elicited some interesting responses. The SHHA concept is one used in Botswana's towns basically as a response to the potential growth of squatter areas enveloping the urban fabric. It is also a means of providing a self-help scheme for assisting the economically disadvantaged to obtain their acceptable, but economic housing.

More than two-thirds (67%) of the sample indicated that if there were a SHHA program in Mahalapye, they would apply for a serviced site. Tempering that response somewhat, however, was the all important affordability criteria, as described in Table 8. Here, the previous response is clarified, in that the majority of respondents answered that they could afford little more than P5,00, while 6,00-8,00 Pula could be afforded by about one-third. Mahalapye's inhabitants do not presently have a strong need for serviced sites, given their abundance of space and effective self-help house construction efforts.

Table 8

Affordability of SHHA\* Serviced Site

<u>Amount Affordable</u>	<u>%</u>	
Up to P6,00	58	$\bar{X} = P5,03$
P6,00-8,00	29	
P8,00-10,00	9	
P10,00-12,00	4	

\*SHHA = Self-Help Housing-Agency

However, as demographic pressures on Mahalapye mount and the village develops in the direction of a more fully urban center, SHHA serviced sites and building materials loans may become realistically desirable as well as affordable.

## VI. SOME RELATIONSHIPS THAT COUNT AND SOME THAT DON'T\*

It was decided to test several relationships bearing on the crucial matter of willingness and ability to pay for services. These relationships are stated, then briefly analyzed.

### A. Standpipe Ratio vs. Monetary Value of Water Service

Since water was ranked by respondents as the second-most valued service, after street lights, and because the ratio of standpipes to household is so high--it was thought that the relationship might hold up statistically. Although the relationship is not very solid, a closer examination of the tables on pages 4-5 of Appendix III shows that there is some clustering of high ratio of shared water and high monetary value placed on water. So, while the correlation is not 'statistically significant,' a convincing case can probably be made for an association between residents' greater perception of water's value and the high ratio of shared standpipes. Translated to planning language, a greater number of standpipes in the traditional village would probably be supportable on willingness-to-pay grounds.

### B. Sanitation Facility vs. Monetary Value of Sanitation Service

The critical feature of this relationship (see Appendix III, pp.6-7) is that residents without sanitation facilities express a willingness to pay for that service. While the monetary value placed on such a service is generally not very high, a willingness to spend at least limited amounts occurs. Therefore, it is safe to say that were an economically priced pit latrine offered to residents presently in need or at least if the materials for a self-constructed unit were provided, one could expect an interest to emerge.

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\*See Appendix III for the statistical analysis of correlation between specific responses.

C. Access to House vs. Monetary Value of Roads

Here, the association between access and perceived value of serviced roads is unclear, though it appears to be on the weak side (see Appendix III, pp.8-9). It seems that where a relationship does occur it lies with those residents who presently have footpaths and unworked dirt roads leading to their houses and who also express a willingness to pay between 75 thebe and one (1) Pula for serviced roads. Since the relationship is weak if non-existent, however, it is difficult to propose a full-scale introduction of a serviced road system to the traditional villages.

D. Services Presently Used vs. Their Monetary Value

For purposes of analysis these services are grouped in the order in which they appear in the questionnaire. The relevant statistical tables in Appendix III are cited for each service.

1. Sanitation - the relationship to the value of sanitation service in monetary terms is unclear--i.e., the limited number of residents in possession of water-borne sewerage (Appendix III, pp.10-11) as against how much they would pay for that service is inconclusive. Based on an earlier question, it is presumed that since so many residents do not even have a pit latrine, they would neither be willing nor able to pay for sewerage facilities.

2. Water - It becomes quite clear that possession of water service (shared standpipe) by residents and their valuation of that service are related. Forty percent (40%) of the respondents who share a standpipe also value that service at between 75 thebe and one Pula. This degree of correlation could safely lead planners in the direction of providing additional water service facilities to the traditional areas.

3. Refuse Collection - So few residents presently have refuse collection that it is inappropriate to suggest a meaningful relationship between that service and the monetary value they place on it. Besides, the statistical correlation shows no significant association. It is very difficult therefore to project any definitive plan for refuse collection services perhaps until a small, experimental program is undertaken.

4. Roads - While serviced roads are only available to residents on a limited basis, there is a limited correspondence between that variable and the monetary value placed on it. However, the link is weak, making it more difficult to make a projection about the extent of serviced roads to be planned. The recommendation here, in part based on the single factor of perceived monetary value of serviced roads, would be to de-emphasize the role of roads in the initial planning stages.

5. Street Lights - So scarce are lighted roads in the traditional areas that it is almost impossible to make the linkage of their perceived value. It is possible, on the basis of the 'trade-off' question about preference for better street drainage with no street lights or poorer drainage but with street lights, to say that street lights are a priority item. Furthermore, as already suggested, residents placed the highest monetary value of all services on lighted streets.

E. Future Change in Mahalapye: Desirable and Affordable or Not?

Some crucial relationships are examined here which will illuminate the more general topic of the desirability and affordability of potential change in Mahalapye.

1. Should Mahalapye Change vs. Number of Years in Village

At a high level of statistical confidence (95%), it is possible to say that a degree of change in the village is desirable to long-term residents of Mahalapye (Appendix III, pp.24-25). And, most residents happen to be long-term inhabitants. However, the variable degree of change--to become a town like Gaborone or remain as it is now but with more jobs and services--is a useful indicator. Many more long-term residents would opt for the middle ground of the village as it is now but with more advantages than at present, in contrast to another Gaborone or a village with no changes at all. Thus, the recommendation is posed based on just that consensus--a moderate degree of change which is clearly advantageous to existing residents of Mahalapye.

2. Plot Size vs. Apply for SHHA Plot or Not

It was hypothesized initially that a resident with a large plot would be unlikely to apply for a considerably smaller serviced plot in a SHHA area--based on the traditional tendency to have relatively large plots. This is borne out somewhat by the correlation (see Appendix III, pp.2-3) which shows the large majority of residents in the population with plot sizes greater than 2,000m<sup>2</sup>--expressing a disinterest in a SHHA plot. This is not a definitive explanation, however, since one or more additional factors may play into their disinterested response--for example, their realistic assessment of affordability. Nevertheless, it is recommended that any SHHA activity in Mahalapye be tied essentially to new housing demand from NEW residents. A portion of a SHHA project might be reserved for existing residents, to be implemented experimentally and with care.

3. How Much Prepared to Pay for Services vs. Income Per Week

A fairly clear association occurs here, indicating that overall income and willingness to pay for services are closely linked (see Appendix III, pp. 22-23). This finding occurs with the earlier study of affordability carried out in SHHA programs: a strong tendency for Batswana to realistically assess their inclination to pay for services in relation to their incomes. It is therefore recommended that data on residents' willingness and ability to pay for specific services be accepted by planners as being reasonably accurate.

4. Afford How Much for SHHA vs. Income

As for the last association, there is an overall concurrence between what residents say they are able to afford and their level of income. Therefore, it is recommended that SHHA services and building material loans, were they to become available to existing residents, should be standardized and costed at the variable income levels of those residents.

5. Prepared to Pay How Much for Services vs. Would Apply for a SHHA Plot?

A close association is found to exist between residents' ability to pay for services and their inclination to apply for a SHHA plot. Far and away the greatest consensus lies in the category of resident who is prepared to pay the minimal cost for services and at the same time is not inclined to apply for a plot. So, once again, a realistic self-assessment seems to occur on the part of residents--such that they probably would not enter an agreement with SHHA to pay more for services than they felt they were able to.

## VII. NON-RANDOMLY SELECTED INTERVIEWS OF LOCAL AND DISTRICT 'INFLUENTIALS'

### A. Methodology

In addition to tapping the attitudinal views of the villagers in the questionnaires, open-ended interviews were carried out with community leaders in the traditional, political, administrative and business community of Mahalapye. These interviews varied in length from 40 to 90 minutes. Each respondent was asked a series of probing, open-ended questions about his perceptions of the existing and future levels of services, facilities, business climate, community acceptance, and the attributes or constraints which could influence development in Mahalapye. The questions were developed after reviewing basic documents and reports (Appendix V), initial briefing sessions with DTRP and AID staff members and selective questions from the survey questionnaire. Additionally, a copy of the Draft Development Plan for Mahalapye prepared by DTRP was discussed with interviewees in an attempt to gauge the existing degree of understanding of plans and drawings and for use as a possible technique for greater public participation.

Twelve of 16 selected leaders were interviewed, the four remaining leaders being unavailable at the time of the interviewing. A few of those interviewed were selected because of their influential community role and more specifically for their potential impact on events in Mahalapye. Others were selected because of their leadership positions in the tribal authority, business sector or the sub-district and the district Government offices in Mahalapye and Serowe. Staff members at the Development Trust (DT) provided the consultants with a list of community residents who were participants in their programs. The list from DT was seen as particularly important since the agency appears to successfully involve and maintain broad-based community support in its programs. Furthermore, it represented a sampling of individuals whose influence and position would have a definite impact on the political and future growth of Mahalapye and the District.

The interviews were generally conducted with a single respondent at his/her place of business with one or both of the interviewers. In one interview there were two respondents. The interviews were held in Mahalapye

and Serowe. An interim interview/meeting was held with DTRP staff in Gaborone which resulted in a closer look at the level of community participation.

1. Topics

In addition to the general questions on development preferences, the following topics were covered:

- a. Development phasing
- b. Level of community participation and acceptance and/or understanding of plans
- c. Plot sizes
- d. Spatial choices for market and shopping and commercial areas
- e. Types of preferred services and cost
- f. Affordability and payment expectation for services
- g. Land allocation pattern (existing/new)
- h. Employment
- i. Configuration of village/Gaborone vs. village layout
- j. Anticipated future growth with or without plans for primary village
- k. Types of developed lot - SHHA - Sites and Services
- l. Anticipated change from plan (factors)
- m. Investment climate - new business - expansion
- n. Industrialization needs/possibilities
- o. Priorities/needs of village

As a result of several stated assumptions by respondents linking Mahalapye's development as a primary center to a change in administrative responsibilities from Serowe to Mahalapye, a question on political jurisdiction was inserted in subsequent interviews. The jurisdiction issue did not surface as important in the community meetings held as part of the publicity campaign, probably because it was not raised as a topic of discussion. Below is a summary of the key responses from the interviews.

## B. Findings

1. There was a general consensus that the level of service for the major urban center and the villages should be the same, provided that the special needs of the village are not overlooked; however, the change should not radically alter the village character. Equality of service does not necessarily mean establishing or maintaining the same minimum standards in the village as found in the urban center. The type of employment and the lifestyle of residents of Mahalapye require plot sizes much larger on average than are typical of urban centers. Most respondents think that the minimal plot size for the village should be 40 x 40 meters.

2. The allocation of financial resources for basic services must be concentrated in the existing community.

3. Water should be extended currently to unserved sections of the village, even though many of the lots and road networks are irregular.

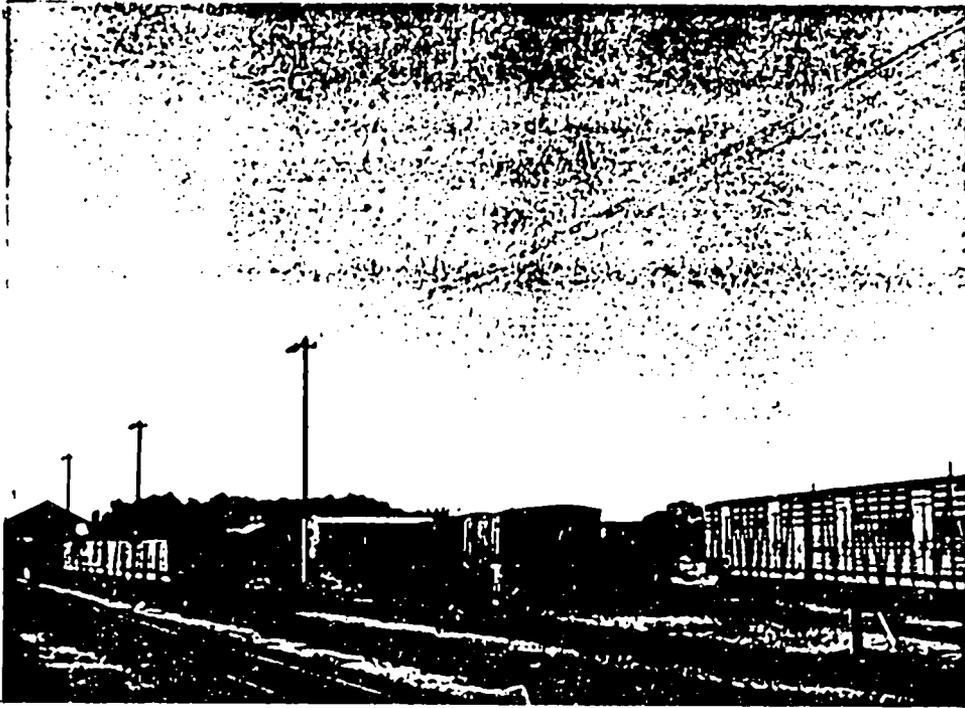
4. New section(s) designed for future development should complement the existing village layout, avoiding an obvious schism between traditional and new quarters of the village.

5. Income/employment generating activities should precede the development of fully serviced lots if they are to be affordable by existing village residents.

6. Concerning the choice of serviced plot with or without dwelling unit: Government employees prefer fully serviced lots with houses, while those employed in the private sector prefer only a serviced lot, which would permit them greater freedom in building their own shelter.

7. The uncertainty of an adequate water supply is defined as a major constraint on the development of Mahalapye as a primary village center.

8. The Government's stated policy of possible decentralization from the capital city would be welcome; however, where Government was the prime provider of jobs, the financial resources required for developing commerce and industries would be limited.



While most villagers are employed in farming and cattle herding, an important source of jobs is the Botswana Railway crewing station.



Mahalapye's hospital serves the village and surrounding region.

9. The business community should have a greater involvement in the planning and implementation of any changes anticipated for Mahalapye.
10. The land tenure system should be revamped to allow ownership of commercial property which can be used as collateral for financial loans. This would, however, not apply to residential land.
11. Government employees in Gaborone would gladly accept assignments in Mahalapye because of its central location, access to the lands and cattle post, and a perceived lower cost of living.
12. Although there exist a number of unemployed school leavers in the village, their level of skills and education is often too low to be utilized by the business community; a partnership between Government and private capital would be required to train local residents for future employment.
13. Land assignments should be made in the overall land use plan for future social and community facilities. However, immediate expenditure for such facilities was not regarded as a high priority.
14. The water reticulation system for the existing and future sites in the village should be "over designed" with additional provisions for numerous tapping points.
15. A clear land reservation or zone extending 2-3 kilometers in each direction from the existing village should be established and restricted for grazing cattle. As the village grows, it will be necessary to prohibit cattle grazing in the village center.
16. Although there exists a desire for economic growth and the provision of additional services, the community leaders feel that Government, local and central, should control the potential size (controlled growth) of Mahalapye in order to maintain a village-like environment.
17. With or without a primary center plan, natural growth in the traditional village should be controlled. The central Government working with the sub-land board should ensure that existing land allocation follows an orderly pattern capable of being fused with a new planning area.

18. Although current plans call for Mahalapye's development as the nation's first primary center, it was felt that if the allocation of resources was controlled by Serowe and not the local leaders, the plan might not reach the implementation stage.

19. The quality of service and lack of sufficient numbers of trained nurses, at too few health posts were defined as growing problems.

20. A strongly expressed need for an additional school to provide education beyond the primary level.

Representatives speaking on behalf of the business community have felt for many years that Mahalapye was ideally located for development because of its access to the rail line and its central location. However, the main constraint on economic activity had and continued to be an unreliable water source for the village. As late as 1966, a six month water survey was initiated by the Government to determine if the rate of flow from the Mhalapshwe river or from a series of boreholes was adequate to meet the development needs. The rumored results were not encouraging. There was no follow up to inform the business community of the official results.

There was a positive attitude towards the survey, a feeling engendered at least in part by the publicity campaign. Further, the major speech by the President on the future of Mahalapye was encouraging to her businessmen. However, the business community expressed pessimism on the seriousness of the plan since members of the Chamber of Commerce had not been consulted in the development of the draft plan. "Who knows better than the businessman if this place has potential?" was a typical response in this domain.

There was general agreement that Gaborone had received a disproportionate share of Government resources at the expense of the rural areas. It was also felt that Gaborone possessed more existing infrastructure (railway, roads, telephone) than any other area for moving heavy equipment, freight, and supplies required by commerce and industry. Further, it was stated that the concentration of distribution points in Gaborone added overhead expenses for businesses. The Government decision to close the local airport without consulting the business community was mentioned as another example of this group's feeling that it has been omitted from the local communication channels.

### C. Business Climate and Investment Opportunities

When questioned on their willingness to invest in or expand existing businesses, most of the businessmen expressed a reluctance to commit more of their own resources to new enterprises in Mahalapye and they took the general attitude of 'wait and see.' One respondent indicated he was opening a new business in Jwaneng, a new mining town. He did not have similar plans for Mahalapye. In addition to an inadequate water supply, the present system used by the land board to allocate and regulate commercial land was defined as a constraint. One specific area pointed up concerned land tenure regulation: the terms of current lease only give business owners protections and a guarantee on the land for a period of 5 years.

1. It was expressed that the basic lease is one-sided in favor of the land board while guaranteeing a business establishment tenure after the initial five years.

2. The method of determining the annual lease payments was not limited to a dependable system which a business firm requires to project costs for a long term period.

3. Because of the uncertainty, and control of land the land lease arrangement cannot be used as collateral in securing funds at financial institutions.

Because of these constraints, the business community would like to see a complete revision of the land tenure system for commercial purposes.

On the positive side, the lower cost of land in Mahalapye for industry and commerce coupled with cheaper rail rates and the availability of constructing railway spurs were viewed as an attraction by the businessmen interviewed.

### D. Generalized Perceptions of Community-wide Needs

A specific request was made by DTRP to include comments on the community participation process used in Mahalapye. The request followed the interim meeting with DTRP, at which comments were discussed concerning some of the Mahalapye business community's sense of being "left out" of the planning process. The comments were somewhat surprising to DTRP since the traditional community channels, VDC, MP's, Council, and administrative leaders had in fact been consulted in the data gathering process used to prepare the draft

physical plan. This discrepancy may simply represent an exception due to non-random sampling.

That the present study was requested at all is, of course, a clear indication of the Government's desire to involve and promote public participation in the planning and implementation of its major projects. Yet two significant points become evident:

1. The village is comprised of several different groups, each with its own communication channels.

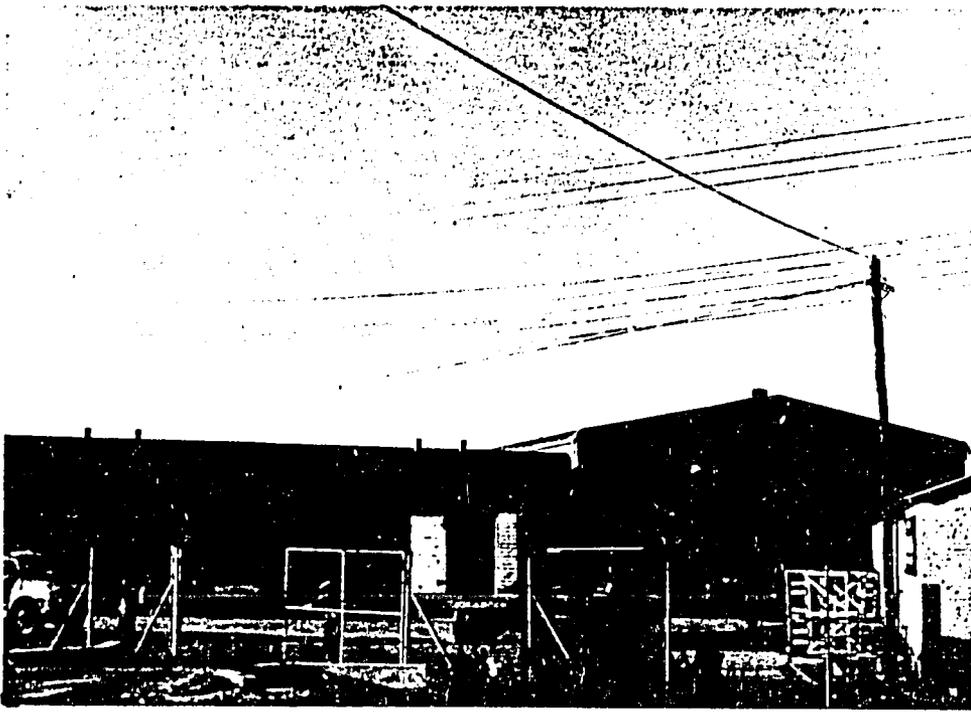
2. Because of village size, divergent views within the community, and special interest groups, a more expansive participatory effort would seem necessary. There are certainly overlaps in the perceived needs of the various groups, but their ranking of the priorities vary. When asked to rank the main concerns of village, the following list was given by the DT local community worker who was intimately involved in the publicity campaign for each ward:

- a. Progress on the proposed dam (water system)
- b. Introduction of industry to the area
- c. Development of unoccupied areas between the river and the open lands
- d. Start planning efforts in other proposed settlement areas in a modern "town like" manner.

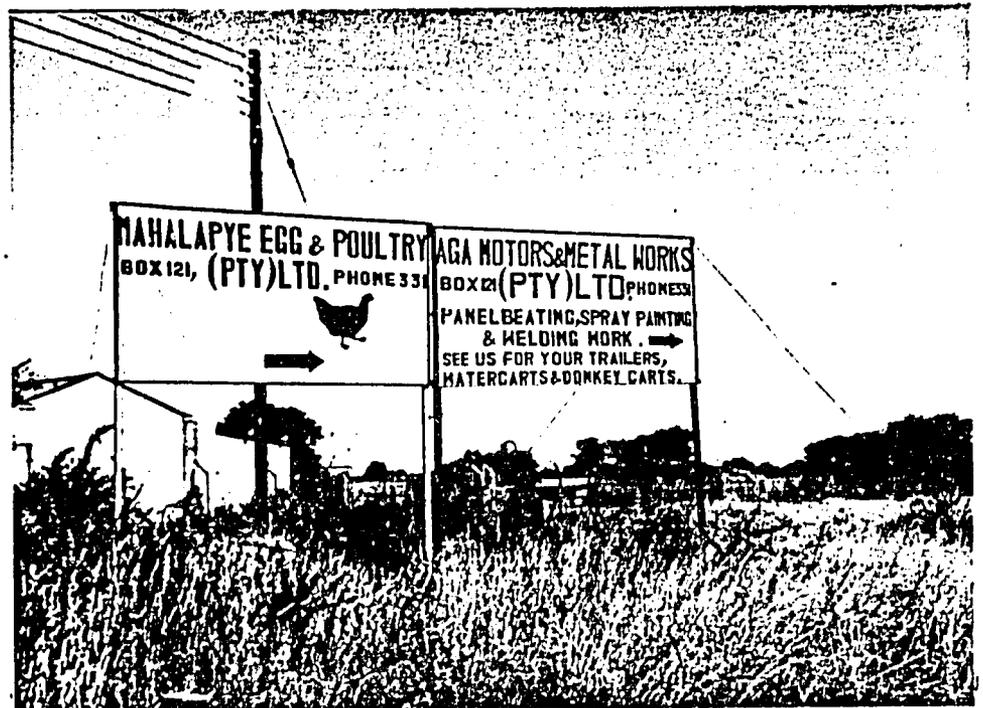
3. A variant prioritized list of perceived needs based on a different constituency within Mahalapye was provided by the community development worker employed by the District Council:

- a. Improvement in the quality people assigned to health posts
- b. Construction of better facilities for tribal councils (kgotlas)
- c. Housing for indigent women
- d. More water
- e. Jobs
- f. Schools

Many of Mahalapye's public officials are concerned about such factors as jobs, more police officers, additional housing for Government employees,



One of the largest private employers in the village, this wholesale distributing company has an active training program for its employees.



The industrial zone is intended to promote industry and jobs.

the large number of unemployed youth, and the abandonment of traditional values. Another concern is the perceived unfairness of some residents paying a fee for water while families in the traditional section of the village received their's free. Finally, they stated that street lighting was a top priority and that there are too many cows in the central village area.

The sub-land board representatives are concerned about the public demand for new plots in the area northeast of the river, increased applications to sink water boreholes, and increased requests from returning pensioners for presently unavailable plots. Of particular importance here is the sub-land board's admitted unawareness of DTRP's plans for new sites with varied lot sizes. As far as they knew, all plots in each section would be 40 x 40. Furthermore, the board had been notified to reserve plots in certain areas, whereas it was already assigning them in undesignated areas.

A common theme deriving from all interviewed employers was to "go slow", that any future development must start with an extension of the water supply in traditional areas and slowly move into the area designated for new housing. A second theme was that the older generation felt they had already been offered and rejected the option of accepting municipal status immediately after independence. Third, some village residents had expressed their fear of losing plots and that any attempt to relocate families in the area designated for commercial areas would heighten that fear. Fourth, the possibility of charging levies for plots serviced with water, electricity, roads, and including administrative cost, would be seen as violating traditional values.

When these divergent views and interests are considered in the context of existing administrative mechanisms for establishing priorities and allocating resources and the problems of obtaining broad-based community participation, the vast dimension and complexity of Mahalapye's development as a primary center emerge in full light.

#### E. Notes on a Framework for Community Participation

It would seem appropriate, based on the interviews discussed above, that a series of meetings should be scheduled to allow an exchange of

ideas between planners and designated primary village communities on the needs and potential solutions for each component of the proposed plan.

The rationale for this is:

1. To ensure that decision makers in each Government agency are aware of the need expressed by the community as they prepare the annual budgets for existing and future projects or programs for that community.

2. To provide local residents with the overall awareness of the funding process and constraints facing each agency; the agencies' priorities; proposals for the area; the projected time frame for completion of the overall plan; and what part of the budget can be completed in one year.

3. To avoid a loss of interest by the community, the planning process should include meetings on a sector-by-sector basis to secure maximum input and exchange of views.

4. Since Government departments are often the first link to private sector plans, because private groups must apply to Government for permits or applications to expand or open new business ventures, these various links can be used as building blocks for the planning process and for greater community development.

It is clear that a more informed public can provide greater input to the planning process. Planners should consider providing community residents with sufficient background information on the plan, such as the relevant ministerial agency, available resources, possible time frame, and existing program linkages whereby the plan is seen as a building block to something already happening and not simply an exercise. It is necessary for the community to understand the sectoral linkages required for each segment of the planning package. Ministry programs which include plans for such sectors as agriculture, commerce, and industry should be reviewed to determine their appropriateness for inclusion in the development plan for primary village centers.

Just as the broad sheets were used to introduce the primary village concept, reports (such as this one) should be reviewed with community

representatives and feedback solicited and utilized in the next phase of the planning process. Participation should be geared to the audience. Representatives from the private sector often understand the language of the technicians but, more importantly, the felt need for community involvement. Influential people from the community should be seen as important contributors to the plan. They should be placed or appointed to key, publicized positions, since their relationship to the community often enhances the opportunity for representative input to and from the interest group.

#### F. Potential Conflict

The assessment of available resources is not only important as a planning tool but extremely important in avoiding potential conflict in regional development. Just as the village is comprised of special interest groups, the same applies to the District level. Interviewees in Mahalapye and Serowe are aware of potential conflict between the village and District levels in the allocation of funds and manpower. Further, it was felt that the plan would remain simply a plan unless Serowe and Palapye were also allocated village development funds of their own.

Community residents were aware of these potential pitfalls. So, too, the planners should recognize that just as limited private and Government resources require control, the political, social and economic links to the surrounding areas require a delicate balance.

These possible conflicts may be minimized by answering a few key questions:

1. Since Mahalapye is defined as the first primary village center, does the administrative relationship with Serowe remain the same?
2. What traditional tribal authority roles and values are threatened if there is an administrative change?
3. Does the allocation of resources to the village threaten existing or future development in Serowe or Palapye?
4. Should there in fact be a three-part (Mahalapye, Serowe, Palapye) integrated plan to avoid conflict?
5. Would the two new areas with recently discovered coal deposits siphon-off the private and Government resources necessary for

the development of Mahalapye or perhaps enhance the allocation of resources to Serowe?

There are just some of the questions which the community participation process might contribute to answering.

## VIII. CONCLUSION

The survey has pointed to clear indications of villagers' realism about what services they want and the percentage of their income they might spend on improvements in Mahalapye. An incremental mode of growth is suggested by the responses of both survey respondents and village 'influentials.' Rather than radical, costly and thus probably unrealistic forms of change, respondents would seem to opt for a prioritized, paced growth in services and facilities.

It can be stated that the results of the survey should enhance the primary village planning process. On the other hand, it represents only one of the more obvious, formal steps of the continuing process. Some of the required steps have been touched upon here as well as discussed with the town and regional planners in Gaborone and with Mahalapye's influentials. There is, of course, always more to be done and more especially in the realm of community participation. Finally, it is hoped that this study accurately reflects community needs and perceptions about its future and, further, that it will serve as a useful model for subsequent primary village studies.

APPENDIX I

Washington, DC  
April 13, 1981  
Revised  
Gaborone - April 22, 1981

CHF Survey on Physical Planning Standard Preferences and Affordability

Our purpose is to use your ideas to help in planning and improving villages and towns, including Mahalapye. We would like to have you tell us about some of your needs and desires so that these may be considered in improving town and village life. The problems of the future of Mahalapye have recently been discussed in the four broadsheets distributed during March and April and in a number of Kgotla meetings held in Mahalapye. This study is being done for the Ministry of Local Government and Lands, which hopes to improve services in Mahalapye in the future. Although we are not sure how or when this may happen we will be interested in your views. We appreciate your cooperation.

		<u>No.</u>	<u>%</u>
(1) INTERVIEWER:	(2) DATE OF INTERVIEW:		
(3) WARD:	(4) CLUSTER OR BLOCK:		
(5) DESCRIPTION OF HOUSE:	<input type="checkbox"/> 1 RONDAVEL (SPECIFY NUMBER _____)	438	49.3
	<input type="checkbox"/> 2 CONCRETE BLOCK/BRICK	69	07.7
	<input type="checkbox"/> 3 WOOD	10	01.1
	<input type="checkbox"/> 4 MIXED MATERIALS	39	04.3
	<input type="checkbox"/> 5 TEMPORARY	160	18.0
	<input type="checkbox"/> 6 FLATS	<u>171</u>	<u>19.2</u>
		887	100.00
(6) PLOT SIZE (APPROX.): (TO BE SET BY D.T.R.P. FROM PLAN)	<input type="checkbox"/> 1 LESS THAN 500M <sup>2</sup>	5	.969
	<input type="checkbox"/> 2 501M <sup>2</sup> - 1000M <sup>2</sup>	15	2.91
	<input type="checkbox"/> 3 1001M <sup>2</sup> - 1500M <sup>2</sup>	60	11.628
	<input type="checkbox"/> 4 1501M <sup>2</sup> - 2000M <sup>2</sup>	131	25.387
	<input type="checkbox"/> 5 OVER 2000M <sup>2</sup>	305	59.108

QUESTIONNAIRE  
PAGE TWO

		<u>No.</u>	<u>%</u>
(7) WATER DELIVERY:	<input type="checkbox"/> 1 TRADITIONAL SUPPLY (NON-PIPED)	101	17.354
	<input type="checkbox"/> 2 WATER STANDPIPE	481	82.646
	<input type="checkbox"/> 3 INDIVIDUAL HOUSE CONNECTION	<u>101</u> 582	<u>17.354</u> 100.00
(8) IF STANDPIPE, HOW MANY HOUSEHOLDS DO YOU SHARE WITH?	<input type="checkbox"/> 1 LESS THAN 5 HOUSEHOLDS	1	.207
	<input type="checkbox"/> 2 BETWEEN 5-10 HOUSEHOLDS	49	10.124
	<input type="checkbox"/> 3 BETWEEN 10-15 HOUSEHOLDS	42	8.678
	<input type="checkbox"/> 4 BETWEEN 15-20 HOUSEHOLDS	67	13.843
	<input type="checkbox"/> 5 MORE THAN 20 HOUSEHOLDS	<u>325</u> 484	<u>67.149</u> 100.00
(9) SANITATION FACILITIES (OBSERVATION)	<input type="checkbox"/> 1 NONE	226	38.24
	<input type="checkbox"/> 2 PIT LATRINE	301	50.931
	<input type="checkbox"/> 3 WATERBORNE	16	2.707
	<input type="checkbox"/> 4 OTHER (SPECIFY _____)	<u>48</u> 591	<u>8.122</u> 100.00
(10) ACCESS TO HOUSE (OBSERVATION)	<input type="checkbox"/> 1 FOOTPATH	229	40.603
	<input type="checkbox"/> 2 UNWORKED DIRT ROAD	287	50.886
	<input type="checkbox"/> 3 IMPROVED DIRT ROAD	43	7.624
	<input type="checkbox"/> 4 PAVED ROAD	<u>5</u> 564	<u>.886</u> 100.00
(11) ROADWAY DRAINAGE (OBSERVATION)	<input type="checkbox"/> 1 NOT APPLICABLE (NO ROADWAY)	79	14.082
	<input type="checkbox"/> 2 NONE	342	60.962
	<input type="checkbox"/> 3 NON-MAINTAINED	129	22.995
	<input type="checkbox"/> 4 MAINTAINED	<u>11</u> 561	<u>1.961</u> 100.00
(12) WHICH SERVICES DO YOU PRESENTLY HAVE?	<input type="checkbox"/> 1 SANITATION	57	7.61
	<input type="checkbox"/> 2 WATER	532	71.028
	<input type="checkbox"/> 3 REFUSE COLLECTION	11	1.469
	<input type="checkbox"/> 4 ROADS	145	19.359
	<input type="checkbox"/> 5 STREET LIGHTS	<u>4</u> 749	<u>.534</u> 100.00

QUESTIONNAIRE  
PAGE THREE

(13) WHICH SERVICES THAT YOU  
HAVE DO YOU PAY FOR?

	NO.	%
1 SANITATION	2	.326
2 WATER	96	15.66
3 REFUSE COLLECTION	10	1.631
4 ROADS	5	.816
5 STREET LIGHTS	5	.816
6 NONE OF THESE	371	60.52
7 OTHER (DESCRIBE) _____	124	20.228
	<u>613</u>	<u>100.00</u>

(14) HERE ARE PICTURES OF THE MAJOR  
SERVICES YOU MIGHT BE PROVIDED  
WITH SOME DAY. IT IS ASSUMED  
YOU WOULD BE EXPECTED TO PAY FOR  
THESE. LET US SAY THAT THEIR  
TOTAL CHARGE WOULD BE PULA 5,00  
PER MONTH. WE HAVE P5,00 IN COINS  
AND ASK THAT YOU PAY WITH THESE  
COINS FOR EACH SERVICE ACCORDING  
TO WHAT YOU THINK THEY'RE WORTH BY  
PUTTING THE MONEY ON THE CORRECT  
PICTURE. YOU MUST SPEND ALL OF THE P5,00.

CODE (14-19) FOR MONETARY VALUE

1 = 0-25thebe	6 = P1,26-1,50
2 = 26-50t	7 = P1,51-1,75
3 = 51-75t	8 = P1,76-2,00
4 = 76-Pula 1,00	9 = P2,01-3,00
5 = P1,01-1,25	10 = P3,01-5,00

1	2	3	4	5	6	7	8	AVER.
26	148	77	150	12	30	2	7	68.889
37	149	77	208	9	30	3	15	71.585
12	78	52	268	33	44	9	27	88.562
26	120	43	209	24	31	4	11	76.273
7	45	35	206	34	73	17	89	109.782
20	117	62	165	9	18	4	6	70.83

	$\bar{x}$
1 _____ SANITATION (PULA, THEBE)	68.889
2 _____ REFUSE COLLECTION	71.585
3 _____ WATER	88.562
4 _____ ROADS	76.273
5 _____ STREETS LIGHTS	109.782
6 _____ VILLAGE ADMINISTRATIVE COSTS	70.83

(15) THE COST OF THE SERVICES  
MAY BE MORE THAN P5,00  
UP TO HOW MUCH ARE YOU  
PREPARED TO PAY FOR ALL  
THE SERVICES COMBINED?

1 NO MORE THAN P5,00	304	54.775
2 BETWEEN P5,00 AND P6,00	117	21.081
3 BETWEEN P6,00 AND P8,00	59	10.631
4 BETWEEN P8,00 AND P10,00	50	9.009
5 OVER P10,00	25	4.504
	<u>555</u>	<u>100.00</u>

40

QUESTIONNAIRE  
PAGE FOUR

(16) IF YOU COULD AFFORD IMPROVEMENTS, WHICH OF  
THE FOLLOWING WOULD YOU BE WILLING TO PAY FOR?  
(CIRCLE A OR B FOR 16-21)

	<u>NO.</u>	<u>%</u>
(A) A SMALLER PLOT THAN YOU HAVE NOW, WITH WATERBORNE SANITATION.	78	14.054

OR

(B) A LARGER PLOT, WITH WITH A PIT LATRINE	<u>477</u>	<u>85.946</u>
	555	100.00

(17) REPEAT STATEMENT (16)

(A) YOUR OWN WATER SUPPLY AND A SMALLER PLOT	228	41.007
--	-----	--------

OR

(B) A SHARED WATER STANDPIPE BUT WITH A LARGER PLOT.	<u>328</u>	<u>58.993</u>
	556	100.00

(18) (A) A BIGGER HOUSE WITH A PIT PATRINE	480	86.176
--	-----	--------

OR

(B) A SMALLER HOUSE WITH WATERBORNE SANITATION	<u>77</u>	<u>13.824</u>
	557	100.00

(19) (A) BETTER STREET DRAINAGE WITH NO STREET LIGHTS	159	28.495
---	-----	--------

OR

(B) POORER DRAINAGE BUT WITH STREET LIGHTS	<u>399</u>	<u>71.505</u>
	558	100.00

(20) (A) SHARE ONE LARGE REFUSE BIN (BARREL) WITH OTHERS WITH COLLECTIONS TWO TIMES PER WEEK.	224	39.929
--	-----	--------

OR

(B) HAVE YOUR OWN BIN BUT HAVE IT COLLECTED ONLY EVERY TWO WEEKS.	<u>337</u>	<u>60.071</u>
	561	100.00

(21) (A) AN INDIVIDUALLY METERED WATER SUPPLY OF YOUR OWN AT P2,25 PER MONTH	258	46.909
---	-----	--------

OR

(B) A COMMUNAL STANDPIPE BUT AT THE CHEAPER RATE OF P1,05 PER MONTH.	<u>292</u>	<u>53.091</u>
	550	100.00

1/1

QUESTIONNAIRE  
PAGE FIVE

		<u>NO.</u>	<u>%</u>
(22) WHAT KIND OF PLAN WOULD YOU LIKE TO SEE FOR YOUR TOWN IN THE FUTURE?	<input type="checkbox"/> 1 NO CHANGE IN PRESENT SYSTEM OF FOOTPATHS AND ROADS--LIKE IT THE WAY IT IS NOW	51	9.075
	<input type="checkbox"/> 2 SAME ROADS BUT WIDER FOOTPATHS	135	24.021
	<input type="checkbox"/> 3 BETTER ROADS	196	34.875
	<input type="checkbox"/> 4 STRAIGHT STREETS JUST LIKE IN THE BIGGER TOWNS	<u>180</u>	<u>32.028</u>
		562	100.00
(23) FOR THE PLACEMENT OF STORES AND MARKETS, HOW WOULD YOU LIKE TO SEE MAHALAPYE?	<input type="checkbox"/> 1 JUST THE WAY IT IS NOW	76	13.523
	<input type="checkbox"/> 2 MORE STORES AND MARKETS IN THE TOWN BUT IN A MORE ORGANIZED MANNER	331	58.897
	<input type="checkbox"/> 3 MORE STORES AND MARKETS PLACED IN ONE CENTRAL AREA	<u>155</u>	<u>27.580</u>
		562	100.00
(24) COMPARED TO THE TOWNS (E.G. (E.G., GABORONE), HOW DO YOU FEEL ABOUT MAHALAPYE?	<input type="checkbox"/> 1 I WOULD LIKE IT TO BECOME A TOWN SUCH AS GABORONE	179	32.136
	<input type="checkbox"/> 2 I WOULD LIKE IT TO REMAIN AS IT IS BUT WITH MORE JOBS AND SERVICES	359	64.452
	<input type="checkbox"/> 3 I WOULD NOT LIKE IT TO CHANGE	<u>19</u>	<u>3.411</u>
		559	100.00
(25) IF THERE WERE A SHHA (EXPLAIN, SITE AND SERVICE, E.G.) AREA IN MAHALAPYE, WOULD YOU APPLY FOR A PLOT THERE?	<input type="checkbox"/> 1 NO	150	26.834
	<input type="checkbox"/> 2 YES	374	66.905
	<input type="checkbox"/> 3 DO NOT KNOW	<u>35</u>	<u>6.261</u>
		559	100.00

42

QUESTIONNAIRE  
PAGE SIX

(26) IF YOU WERE TO MOVE TO A SHHA AREA, HOW MUCH COULD YOU AFFORD A MONTH TO PAY FOR THE SERVICE LEVY AND BUILDING MATERIALS LOAN?

	<u>NO.</u>	<u>%</u>
1 NO MORE THAN P6,00	305	54.561
2 BETWEEN P6,00-8,00	153	27.370
3 BETWEEN P8,00-10,00	49	8.765
4 BETWEEN P10,00-12,00	21	3.756
5 BETWEEN P12,00-14,00	31	5.545
6 P15,00 AND ABOVE	0	-
	<u>559</u>	

(27) WOULD YOU PREFER TO JUST STAY WHERE YOU ARE BUT WITH NEW AND IMPROVED SERVICES OR MOVE TO NEW HOUSING AREA?

1 STAY BUT WITH NEW AND IMPROVED SERVICES	476	84.697
2 MOVE TO NEW HOUSING AREA	61	10.854
3 DO NOT KNOW	25	4.448
	<u>562</u>	<u>100.00</u>

(28) IF YOU WERE TO MOVE TO A SHHA AREA, WOULD (MULTIPLE CHOICE)

1 EVERYONE ON THIS PLOT MOVE WITH YOU?	310	48.666
2 SOME FAMILY MEMBERS STAY ON THE PLOT?	243	38.148
3 YOU RENT THE PLOT?	84	13.187
	<u>637</u>	<u>100.00</u>

(29) HOW MANY CHILDREN UNDER 16 LIVE WITH YOU ON THIS PLOT NOW?

1 JUST ONE	45	8.443
2 TWO	84	15.760
3 THREE	117	21.95
4 FOUR	118	22.139
5 FIVE OR MORE	169	31.707
	<u>533</u>	<u>100.00</u>

(30) HOW MANY ROOMS DO YOU THINK ARE ENOUGH FOR YOUR FAMILY?

1 ONE	18	3.169
2 TWO	28	4.929
3 THREE	104	18.31
4 FOUR	161	28.345
5 FIVE OR MORE	257	45.246

4/3

(31) WHAT IS THE OCCUPATION OF THE MAJOR EARNER(S)?

	NO.	%
<input type="checkbox"/> 1 FARMER	394	43.63
<input type="checkbox"/> 2 RAILWAY WORKER	35	3.87
<input type="checkbox"/> 3 GOVERNMENT EMPLOYEE	217	24.03
<input type="checkbox"/> 4 MERCHANT	33	3.65
<input type="checkbox"/> 5 SELF-EMPLOYED (SPECIFY) _____	78	8.63
<input type="checkbox"/> 6 OTHER (WHAT?) _____	146	16.17
	<u>903</u>	<u>100.00</u>

(32) HOW MANY MEMBERS OF FAMILY CONTRIBUTE TO THE HOUSEHOLD INCOME?

<input type="checkbox"/> 1 JUST ONE FULL TIME	263	48.08
<input type="checkbox"/> 2 ONE PART-TIME	80	14.62
<input type="checkbox"/> 3 MORE THAN ONE PART-TIME	63	11.51
<input type="checkbox"/> 4 TWO OR MORE FULL TIME	141	25.77
	<u>547</u>	<u>100.00</u>

(33) DID YOUR HOUSEHOLD HAVE AN INCOME (ALL MONEY COMING IN) OF: (PRO-RATE MONTHLY SALARIES, WHERE APPLICABLE)

<input type="checkbox"/> 1 LESS THAN P5,00 THIS WEEK	200	35.97
<input type="checkbox"/> 2 BETWEEN P5,00 AND P7,00 THIS PAST WEEK	116	20.86
<input type="checkbox"/> 3 BETWEEN P7,00 AND P10,00 THIS PAST WEEK	71	12.77
<input type="checkbox"/> 4 BETWEEN P10,00 AND P15,00 THIS PAST WEEK	70	12.59
<input type="checkbox"/> 5 OVER P20,00 THIS PAST WEEK	99	17.80
	<u>556</u>	<u>100.00</u>

(34) WHAT IS THE DISTRICT, VILLAGE OR TOWN YOU CAME HERE FROM?

DISTRICT \_\_\_\_\_ VILLAGE \_\_\_\_\_ TOWN \_\_\_\_\_

(35) HOW LONG HAVE YOU BEEN LIVING IN MAHALAPYE?

<input type="checkbox"/> 1 LESS THAN ONE YEAR	34	6.00
<input type="checkbox"/> 2 BETWEEN ONE-THREE YEARS	24	4.24
<input type="checkbox"/> 3 BETWEEN THREE-FIVE YEARS	29	5.12
<input type="checkbox"/> 4 BETWEEN FIVE-TEN YEARS	56	9.89
<input type="checkbox"/> 5 MORE THAN TEN YEARS	423	74.73

(36) IF YOU LIVE AWAY FROM YOUR HOUSE IN MAHALAPYE DURING PART OF THE YEAR, HOW MUCH TIME DO YOU SPEND AWAY?

	NO.	%
<input type="checkbox"/> 1 LESS THAN TWO MONTHS PER YEAR	385	70.772
<input type="checkbox"/> 2 BETWEEN TWO-SIX MONTHS PER YEAR	123	22.61
<input type="checkbox"/> 3 MORE THAN SIX MONTHS PER YEAR	<u>36</u>	<u>6.618</u>
	544	100.00

(37) DO YOU OWN OR RENT THIS HOUSE (EQUIVALENT)?

<input type="checkbox"/> 1 OWN	523	94.575
<input type="checkbox"/> 2 RENT	16	2.893
<input type="checkbox"/> 3 OTHER (SPECIFY _____)	<u>14</u>	<u>2.532</u>
	553	100.00

(38) WHO IS THE HEAD OF THIS HOUSEHOLD?

<input type="checkbox"/> 1 I AM THE HEAD (CIRCLE) HUSBAND/ WIFE	529	94.296
<input type="checkbox"/> 2 MY SON/DAUGHTER	4	.713
<input type="checkbox"/> 3 MY GRANDPARENT	18	3.206
<input type="checkbox"/> 4 MY SISTER/BROTHER	9	1.604
<input type="checkbox"/> 5 MY GRANDCHILD	<u>1</u>	<u>.178</u>
	561	100.00

(39) ABOUT HOW OLD ARE YOU?

<input type="checkbox"/> 1 BELOW 20 YEARS	18	3.231
<input type="checkbox"/> 2 BETWEEN 20-30 YEARS	48	8.618
<input type="checkbox"/> 3 BETWEEN 30-50 YEARS	229	41.113
<input type="checkbox"/> 4 MORE THAN 50 YEARS	<u>262</u>	<u>47.038</u>
	557	100.00

(40) HOW MUCH DO YOU SPEND EACH MONTH ON

<input type="checkbox"/> 1 CHARCOAL P _____
<input type="checkbox"/> 2 GAS P _____
<input type="checkbox"/> 3 PARAFFIN P _____
<input type="checkbox"/> 4 WOOD P _____
<input type="checkbox"/> 5 CANDLES P _____
<input type="checkbox"/> 6 BATTERIES P _____
<input type="checkbox"/> 7 OTHER P _____

(41) DO YOU HAVE A MAINS ELECTRICITY SUPPLY?

- 1 YES  
 2 NO

45

QUESTIONNAIRE  
PAGE NINE

(42) HOW MUCH DO YOU PAY EACH MONTH?

- 1 LESS THAN 3 PULA
- 2 3 - 5 PULA
- 3 5 - 10 PULA
- 4 10 - 15 PULA
- 5 15 - 20 PULA
- 6 MORE THAN 20 PULA

(43) DO YOU INTEND TO BUY MORE EQUIPMENT?

- 1 LIGHTS
- 2 COOKER
- 3 REFRIDGERATOR
- 4 WATER HEATER
- 5 ELECTRIC FIRE
- 6 TELEVISION
- 7 RADIO
- 8 ELECTRIC KETTLE
- 9 ELECTRIC IRON
- 10 OTHER (SPECIFY \_\_\_\_\_)

(44) DO YOU INTEND TO APPLY FOR  
AN ELECTRICITY SUPPLY WITHIN  
THE NEXT TWO YEARS?

- 1 YES
- 2 NO

IF ANSWER IS YES TO Q. 44

(45) WOULD YOU BE PREPARED TO PAY A  
CONNECTION CHARGE OF P4,00?

- 1 YES
- 2 NO

QUESTIONNAIRE  
PAGE TEN

IF ANSWER IS YES TO Q. 45

(46) HOW MUCH WOULD YOU BE ABLE TO PAY  
EACH MONTH FOR ELECTRICITY?

- 1 LESS THAN 3 PULA
- 2 3 - 5 PULA
- 3 5 - 10 PULA
- 4 10 - 15 PULA
- 5 15 - 20 PULA
- 6 MORE THAN 20 PULA

(47) IF YOU HAD ELECTRICITY WHAT  
WOULD YOU USE IT FOR?

- 1 LIGHTS
- 2 COOKER
- 3 REFRIDGERATOR
- 4 WATER HEATER
- 5 ELECTRIC FIRE
- 6 TELEVISION
- 7 RADIO
- 8 ELECTRIC KETTLE
- 9 ELECTRIC IRON
- 10 OTHER \_\_\_\_\_

(48) DO YOU INTEND TO APPLY FOR A  
PRIVATE WATER CONNECTION?

- 1 YES
- 2 NO
- 3 UNSURE

47

MAHALAPYE SAMPLE FRAME-BASED ON AERIAL PLANNING MAP

<u>Block Code</u>	<u>Total No. Plots Ea. Block</u>	<u>Percent</u>	<u>Sampling No.</u>
A	26	.0088	5
B	79	.026	16
C	22	.007	4
D	4	.001	1
E	76	.025	15
F	97	.0329	20
G	72	.024	25
H	104	.035	21
I	131	.044	27
J	89	.030	18
K	325	.110	66
L	227	.077	46
M	101	.034	21
N	362	.123	74
O	215	.073	44
P	115	.039	23
Q	148	.050	30
R	176	.059	36
S	175	.059	36
T	123	.041	25
U	200	.0679	41
V	<u>76</u>	.0258	<u>16</u>
<b>Total</b>	<b>2,943</b>		<b>600 = 20% (.2038)</b>

Computed Means for Grouped Means

[Questions 15, 26, 33, 35, 39]

Question #15\* Maximum Pula Prepared to Pay for Services

	$\tilde{X}_i$	$f_i$	$\tilde{X}_i \cdot f_i$	
-P5,00	2,50	304	76,000	
P5,00-6,00	5,50	117	64,350	
6,00-8,00	7,00	59	41,300	
8,00-10,00	9,00	50	45,000	
10,00-15,00	12,50	24	30,000	
		555	256,650	$\bar{X} = 4,62.432$

\* $X_i$  = mid-range or mid-point of interval

$f_i$  = frequency

Question #26 Afford How Much/Mo. for SHHA Service Levy and Building Materials Loan

	$\tilde{X}_i$	$f_i$	
0-600	300	305	
600-800	700	153	
800-1000	900	49	
1000-1200	1100	21	
		528	$\bar{X} = 5,03.409$

Question #33 Weekly Income

	$\tilde{X}_i$	$f_i$	Pula	
0-5,00	250	200	5,00	
5,00-7,00	600	116	6,96	
7,00-10,00	850	71	6,04	
10,00-15,00	1250	70	8,75	
20,00-23,00	2150	99	21,29	
		556		$\bar{X} = 16.62$

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Question #35 How Long Living in Mahalapye

	$\tilde{X}_1$	$f_1$	
0-1	.5	34	
1-3	2	24	
3-5	4	29	
5-10	7.5	56	
10-30	20	432	
		556	$\bar{X} = 16.62$

Question #39 Age of Respondent

	$\tilde{X}_1$	$F_r$	
10-20	15	18	
20-30	25	48	
30-50	40	229	
50-90	70	262	
		557	$\bar{X} = 52.011$

## APPENDIX III

### STATISTICAL ANALYSIS

The purpose of the statistical computation given below is to search for the existence of any correlation between the given set of questions. To accomplish the analysis some assumptions had to be made and some rules established.

Since no information is given about the real distribution of population, to avoid inserting any kind of error in the calculation, a parametric test was not used. Thus, any assumptions about the population distribution (such as normality) were avoided.

The assumption was made that the sample taken from the population is a random sample. For each pair of questions the observation in the random sample is classified according to two criteria. Using the first criterion (question) each observation is associated with one of the  $V$  rows (multiple answers to question 1) and using the second criterion (question) each observation is associated with one of the  $C$  columns (multiple answers to question 2).

For each of the given contingency tables it is desirable to test the null hypothesis

$H_0$ : The first criteria is independent of the second criteria versus the alternative hypothesis

$H_1$ : The first criteria is not independent of the second criteria.

To test each one of these hypotheses, having the observed frequencies, it can be discovered what the expected frequencies are if the first and second criteria (questions) were in fact independent. The difference between these two frequencies will be the measure for dependency between 2 criteria. Thus, if this measure is large it is concluded that the difference between the observed values (for independence) is large and therefore one would reject  $H_0$  and accept  $H_1$ . Accepting  $H_1$ , says that the two criteria are in fact correlated. If this measure is small  $H_0$  is not rejected, which means there is insufficient evidence to indicate any correlation between the two criteria. A chi-square distribution will be used as an approximation to the distribution of the above test.

To be consistent throughout the statistical analysis, the significance level of 5% ( $\alpha = 5\%$ ) is used for all the tests. Furthermore the critical value of  $\chi^2$  ( $\chi^2_{\alpha}$ ) will be calculated for each one of the contingency tables.

Contingency Table #1

Let Col. No. 6 = Plot Size and Col. 30 = 1f SHHA: Apply PLOT/Not

The hypothesis to be tested is:

$H_0$ : Col. No. 6 is independent of Col. No. 30

against

$H_1$ : Col. No. 6 is not independent of Col. No. 30

The test statistic is given by

$$T = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

where

$O_{ij}$  = Observed frequency associated with row  $i$  and column  $j$  simultaneously.  
 $E_{ij}$  = Expected frequency associated with row  $i$  and column  $j$  simultaneously.

Col. No. 6 Versus Col. No. 30

The observed frequencies

30 \ 6	1	2	3	4	5	Total
1	3	3	16	37	81	140
2	4	13	41	87	203	348
3	0	1	3	8	15	27
Total	7	17	60	132	299	515

The above table is the table of the actual frequencies (observations) given by the random sample. For this table the expected frequencies will be found, based on the assumption that Col. No. 6 is independent of Col. No. 30. These values are given in the following table.

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Col. No. 6 Versus Col. No. 30

The expected frequencies

30 \ 6	1	2	3	4	5	Total
1	1.90 3	4.62 3	16.31 16	35.88 37	81.29 81	140
2	4.73 4	11.49 13	40.54 41	89.20 87	202.04 203	348
3	.37 0	.89 1	3.15 3	6.92 8	15.67 15	27
Total	7	17	60	132	299	515

$$\chi^2 = \sum_{i=1}^3 \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 2.2099$$

The critical value from  $\chi^2$  (chi-square) table with degrees of freedom  $(3-1)(5-1)=8$  is 15.51. Thus it is concluded that the observed and the expected values are very close. The test statistic is much smaller than 15.51. Therefore the decision is to accept  $H_0$ .

$\therefore$  With 95% confidence it is concluded that there is not enough evidence indicating the existence of any correlation between Col. No. 6 and Col. No. 30.

The critical  $\alpha \cong .40$ . The critical value of  $\alpha$  is even larger than 40%. This means there is 40% chance or even more to observe this sample when Col. No. 6 and Col. No. 30 were independent in the population.

$\therefore$  Col. No. 6 is independent of Col. No. 30.

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Contingency Table #2

Let Col. No. 8 = S/pipe ratio and Col. No. 16 = Services worth 'x' p.

The hypothesis to be tested is:

$H_0$ : Col. No. 8 is independent of Col. No. 16  
against

$H_1$ : Col. No. 8 is not independent of Col. No. 16

The test statistic is given by

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

where

$O_{ij}$  = Observed frequency associated with row  $i$  and Col.  $j$ .

$E_{ij}$  = Expected frequency associated with row  $i$  and Col.  $j$ .

Col. No. 8 Versus Col. No. 16

The Observed Frequencies

30 \ 6	1	2	3	4	5	Total
1	4	2	0	1	4	11
2	8	4	2	8	50	72
3	3	2	7	10	26	48
4	26	13	31	38	143	251
5	4	1	4	5	19	33
6	3	3	1	3	32	42
7	1	1	1	0	6	9
8	0	3	3	2	17	25
9	0	0	0	0	5	5
10	0	0	0	0	0	0
Total	49	29	49	67	302	496

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Contingency table #2

Col. No. 8 Vers s Col. No. 16

The expected frequencies

16 \ 8	1	2	3	4	5	Total
1	1.09 4	.64 2	1.09 0	1.48 1	.67 4	11
2	7.11 8	4.22 4	7.11 2	9.72 8	43.84 50	72
3	4.74 3	2.81 2	4.74 7	6.49 10	29.22 26	48
4	24.8 26	14.67 13	24.8 31	33.9 38	152.83 143	251
5	3.26 4	1.93 1	3.26 4	4.46 5	20.09 19	33
6	4.15 3	2.45 3	4.15 1	5.68 3	25.57 32	42
7	.89 1	.53 1	.89 1	1.21 0	5.48 6	9
8	2.47 0	1.46 3	2.47 3	3.38 2	15.22 17	25
9	.49 0	.29 0	.49 0	.68 0	3.05 5	0
10	0 0	0 0	0 0	0 0	0 0	0
Total	49	29	49	67	302	496

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 41.5902$$

degrees of freedom = (9-1)(5-1) = 32

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Contingency table #3

Let Col. No. 9 = Sanitation and Col. No. 14 = Services Worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 9 is independent of Col. No. 14.

against

$H_1$ : Col. No. 9 is not independent of Col. No. 14.

The test statistic is given by 
$$T = \sum_{i=1}^{10} \sum_{j=1}^4 \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

The observed frequencies

14 \ 9	1	2	3	4		Total
1	3	18	3	1		25
2	53	83	2	15		153
3	20	56	1	8		85
4	79	64	3	18		164
5	6	3	0	2		11
6	15	10	1	1		27
7	0	2	0	0		2
8	5	1	0	0		6
9	6	1	0	0		7
10	3	0	0	0		3
Total	190	238	10	45		483

5/6

Contingency table #3

The expected frequencies

14 \ 9	1	2	3	4	Total
1	9.83 3	12.32 18	.52 3	2.33 1	25
2	60.19 53	27.39 83	3.17 2	14.25 15	153
3	33.44 20	41.88 56	1.76 1	7.92 8	85
4	64.51 79	80.82 64	3.39 3	15.28 18	164
5	4.33 6	5.42 3	.23 0	1.02 2	11
6	10.62 15	13.3 10	.57 1	2.51 1	27
7	.79 0	.98 2	.04 0	.19 0	2
8	2.36 5	2.96 1	.12 0	.56 0	6
9	2.75 6	3.45 1	.14 0	.66 0	7
10	1.18 3	1.48 0	.06 0	.28 0	3
Total	190	238	10	45	483

$$T = \sum_{i=1}^{10} \sum_{j=1}^4 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 64.5$$

degrees of freedom = (10-1)(4-1) = 27

The critical value from chi-square table with 27 degrees of freedom is 40.113. Since the test statistic is larger than 40.113, the following results:

∴ With 95% confidence it is concluded that there exists a relation between Col. No. 9 and Col. No. 14.

The critical  $\alpha$  is less than 1%. This indicates that the percent of error in the decision that we made is only 1%.

∴ There exists a correlation between Col. No. 9 and Col. No. 14.

Contingency table #4

Let Co. No. 10 - Access and Col. No. 17 = Services Worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 10 is independent of Col. No. 17.

against

$H_1$ : Col. No. 10 is not independent of Col. No. 17.

Col. No. 10 Versus Col. No. 17

The observed frequencies

17 \ 10	1	2	3	4		Total
1	8	15	3	0		26
2	61	53	7	0		121
3	14	25	6	0		45
4	81	118	11	1		211
5	9	12	3	0		24
6	13	13	5	0		31
7	2	2	1	0		5
8	4	5	1	0		10
9	2	4	3	0		9
10	1	0	0	0		1
Total	195	247	40	1		483

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Contingency table #4

Col. No. 10 Versus Col. No. 17

The expected frequencies

17 \ 10	1	2	3	4	Total
1	10.50 8	13.30 15	2.15 3	.05 0	26
2	48.85 61	61.88 53	10.02 7	.25 0	121
3	18.17 14	23.01 25	3.73 6	.09 0	45
4	85.19 81	107.90 118	17.47 11	.44 1	211
5	9.69 9	12.27 12	1.99 3	.05 0	27
6	12.52 13	15.85 13	2.57 5	.06 0	31
7	2.02 2	2.56 2	.41 1	.01 0	5
8	4.03 4	5.12 5	.83 1	.02 0	10
9	3.63 2	4.6 4	.75 3	.02 0	9
10	.4 1	.51 0	.08 0	.01 0	1
Total	195	247	40	1	483

$$T = \sum_{i=1}^{10} \sum_{j=1}^4 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 27.1420$$

degrees of freedom = (10-1)(4-1) = 27

The critical value from chi-square table with 27 degrees of freedom is 43.773. Since the test statistic is smaller than 43.773  $H_0$  is not rejected.

∴ With 95% confidence it is concluded that there is not enough evidence to show any relationship between Col. No. 10 and Col. No. 17.

The critical  $\hat{\alpha}$  is between 50% and 30%. This indicates the chance of having the above sample drawn from a population within which Col. No. 10 and Col. No. 17 is independent.

∴ Col. No. 10 and Col. No. 17 are independent.

Contingency table #5

Let Col. No. 12 = present services and Col. No. 14 = Services worth 'x'P.

$H_0$ : Col. No. 12 is independent of Col. No. 14  
against

$H_1$ : Col. No. 12 is not independent of Col. No. 14.

Col. No. 12 Versus Col. No. 14

The observed frequencies

12 \ 14	1	2	3	4	5	Total
1	10	24	0	4	1	39
2	16	135	4	33	1	189
3	14	74	1	14	0	103
4	7	148	4	48	1	208
5	0	10	0	3	1	14
6	4	27	2	9	0	42
7	0	2	0	0	0	2
8	1	5	0	3	0	9
9	0	6	0	3	0	9
10	0	2	0	0	0	2
Total	52	433	11	117	4	617

Contingency table #5

Col. No. 12 versus Col. No. 14

The expected frequencies

12 \ 14	1	2	3	4	5	Total
1	3.29 10	27.37 24	.69 0	7.39 4	.26 1	39
2	15.93 16	132.64 135	3.37 4	35.84 33	1.22 1	189
3	8.68 14	72.28 74	1.84 1	19.53 14	.67 0	103
4	17.52 7	145.98 148	3.71 4	39.44 48	1.35 1	208
5	1.18 0	9.82 10	.25 0	2.66 3	.09 1	14
6	3.54 4	29.47 27	.75 2	7.97 9	.27 0	42
7	.17 0	1.4 2	.04 0	.38 0	.01 0	.2
8	.76 1	6.32 5	.15 0	1.71 3	.06 0	9
9	.76 0	6.32 6	.16 0	1.70 3	.06 0	9
10	.17 0	1.4 2	.04 0	.38 0	.01 0	2
Total	.52	433	11	117	4	617

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 51.7834$$

degrees of freedom = (10-1)(5-1) = 36

The critical value from chi-square table with 36 degrees of freedom is 50.964. Since the calculated test statistic is larger than 50.964,  $H_0$  is rejected.

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 12 and Col. No. 14.

The critical  $\alpha$  is between 5% and 1%. This means if the significance level of 5% is changed to 1%, it is no longer possible to reject  $H_0$ .

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 12 and Col. No. 14.

∴ With 99% confidence it is concluded that there exists no relationship between Col. No. 12 and Col. No. 14.

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Contingency table #6

Let Col. No. 12 = Present services and Col. No. 15 = Services worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 12 is independent of Col. No. 15

against

$H_1$ : Col. No. 12 is not independent of Col. No. 15.

Col. No. 12 Versus Col. No. 15

The observed frequencies

12 \ 15	1	2	3	4	5	Total
1	12	35	0	13	0	60
2	21	139	4	44	0	208
3	5	75	3	13	0	96
4	13	200	4	53	3	273
5	1	8	0	3	1	13
6	1	28	0	10	0	39
7	1	2	0	0	0	3
8	2	10	0	3	0	15
9	0	3	0	0	0	3
10	0	1	0	0	0	1
Total	56	501	11	139	4	711

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Contingency table #6

Col. No. 12 Versus Col. No. 15

The expected frequencies

15 \ 12	1	2	3	4	5	Total
1	4.72 12	42.28 35	.93 0	11.73 13	.34 0	.60
2	16.39 21	146.56 139	3.22 4	40.66 44	1.17 0	208
3	7.56 5	67.65 75	1.48 3	18.77 13	.54 0	96
4	21.5 13	192.37 200	4.22 4	53.37 53	1.54 3	273
5	1.02 1	9.17 8	.20 0	2.54 3	.07 1	13
6	3.07 1	27.48 28	.61 0	7.62 10	.22 0	39
7	.24 1	2.11 2	.05 0	.58 0	.02 0	3
8	1.18 2	10.57 10	.23 0	2.94 3	.08 0	15
9	.24 0	2.11 3	.05 0	.59 0	.01 0	3
10	.08 0	.7 1	.01 0	.20 0	.01 0	1
Total	56	501	11	139	4	711

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 49.2467$$

degrees of freedom = (10-1)(5-1) = 36

The critical value from chi-square table with 36 degrees of freedom is 50.964. Since the test statistic is less than 50.964,  $H_0$  is not rejected.

∴ With 95% confidence it is concluded that there is not enough evidence to indicate any relationship between Col. No. 12 and Col. No. 15.

The critical  $\alpha$  is between 5% and 10%. Therefore, if the significance level is changed to 10%,  $H_0$  will be rejected.

∴ With 90% confidence it is concluded that there exists a relationship between Col. No. 12 and Col. No. 15.

Contingency table #7

Let Col. No. 12 = Present services and Col. No. 16 = services worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 12 is independent of Col. No. 16

against

$H_1$ : Col. No. 12 is not independent of Col. No. 16

Col. No. 12 Versus Col. No. 16

The observed frequencies

16 \ 12	1	2	3	4	5	Total
1	3	9	0	1	0	13
2	17	71	1	23	1	113
3	8	47	2	13	0	70
4	10	256	7	67	1	341
5	2	33	1	6	1	43
6	5	43	0	14	0	62
7	1	9	0	2	0	12
8	6	25	0	5	0	36
9	1	5	0	1	0	7
10	0	0	0	0	0	0
Total	53	498	11	132	3	697

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Contingency table #7

Col. No. 12 Versus Col. No. 16

The expected frequencies

16 \ 12	1	2	3	4	5	Total
1	.99 3	9.29 9	.20 0	2.46 1	.06 0	13
2	8.59 17	80.74 71	1.78 1	21.40 23	.49 1	113
3	5.33 8	50.01 47	1.10 2	13.26 13	.30 0	70
4	25.93 10	243.64 256	5.38 7	64.58 67	1.47 1	341
5	3.27 2	30.72 33	.68 1	8.14 6	.19 1	43
6	4.71 5	44.30 43	.98 0	11.74 14	.27 0	62
7	.91 1	8.58 9	.19 0	2.27 2	.05 0	12
8	2.74 6	25.72 25	.57 0	6.82 5	.15 0	36
9	.53 1	5.00 5	.12 0	1.33 1	.02 0	7
10	0 0	0 0	0 0	0 0	0 0	0
Total	53	498	11	132	3	697

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 41.9346$$

degrees of freedom = (9-1)(5-1) = 32

The critical value from chi-square table with 32 degrees of freedom is 46.168. Since the test statistic is less than 46.168  $H_0$  is not rejected.

∴ With 95% confidence it is concluded that there is not enough evidence to show any relationship between Col. No. 12 and Col. No. 16.

The critical  $\alpha$  is between 5% and 15%.

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Contingency Table #8

Let Col. No. 12 = Present Services and Col. No. 17 = Services worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 12 is independent of Col. No. 17

against

$H_1$ : Col. No. 12 is not independent of Col. No. 17.

Col. No. 12 Versus Col. No. 17

The observed frequencies

17 \ 12	1	2	3	4	5	Total
1	5	23	0	7	1	36
2	13	112	4	39	1	169
3	2	42	2	13	0	59
4	13	197	3	58	1	272
5	5	23	1	3	1	33
6	8	31	1	9	0	49
7	1	5	0	3	0	9
8	2	10	0	2	0	14
9	5	8	0	1	0	14
10	0	1	0	0	0	1
Total	54	452	11	135	4	656

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Contingency table #8

Col. No. 12 versus Col. No. 17

The expected frequencies

17 \ 12	1	2	3	4	5	Total
1	2.97 5	24.80 23	.60 0	7.41 7	.22 1	36
2	13.91 13	116.45 112	2.83 4	34.78 39	1.03 1	169
3	4.86 2	40.65 42	.99 2	12.14 13	.36 0	59
4	22.39 13	187.41 197	4.56 3	55.98 58	1.66 1	272
5	2.72 5	22.74 23	.55 1	6.79 3	.20 1	33
6	4.03 8	33.76 31	.83 1	10.08 9	.30 0	49
7	.74 1	6.20 5	.15 0	1.85 3	.06 0	9
8	1.15 2	9.65 10	.23 0	2.88 2	.09 0	14
9	1.15 5	9.65 8	.23 0	2.88 1	.09 0	14
10	.08 0	.69 1	.02 0	.21 0	.01 0	1
Total	54	452	11	135	4	656

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 44.4404$$

degrees of freedom = (10-1)(5-1) = 36

The critical value from chi-square table with 36 degrees of freedom is 50.964. Since the test statistic is less than 50.964  $H_0$  is not rejected.

∴ With 95% confidence it is concluded that there is not enough evidence to show any relationship between Col. No. 12 and Col. No. 17.

The critical  $\alpha$  is between 5% and 25%.

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Contingency table #9

Let Col. No. 12 = Present Services and Col. No. 19 = services worth 'x' P.

The hypothesis to be tested is:

$H_0$ : Col. No. 12 is independent of Col. No. 19

against

$H_1$ : Col. No. 12 is not independent of Col. No. 19.

Col. No. 12 versus Col. No. 19

The observed frequencies

19 \ 12	1	2	3	4	5	Total
1	2	19	0	4	0	25
2	16	110	1	39	1	167
3	7	58	3	17	1	86
4	14	156	6	40	2	218
5	1	7	0	1	1	10
6	2	18	0	5	0	25
7	2	3	0	1	0	6
8	3	6	0	2	0	11
9	0	3	0	1	0	4
10	1	3	0	1	0	5
Total	48	383	10	111	5	557

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Contingency table #9

Let Col. No. 12 Versus Col. No. 19

The expected Frequencies

19 \ 12	1	2	3	4	5	Total
1	2.16 2	17.19 19	.45 0	4.98 4	.22 0	25
2	14.39 16	114.83 110	3.0 1	33.28 39	1.50 1	167
3	7.41 7	59.13 58	1.54 3	17.14 17	.77 1	86
4	18.79 14	149.9 156	3.91 6	43.44 40	1.96 2	218
5	.86 1	6.88 7	.18 0	1.99 1	.09 1	10
6	2.15 2	17.19 18	.45 0	4.98 5	.23 0	25
7	.52 2	4.13 3	.11 0	1.19 1	.05 0	6
8	.95 3	7.56 6	.2 0	2.19 2	.1 0	11
9	.34 0	2.75 3	.07 0	.8 1	.04 0	4
10	.43 1	3.44 3	.09 0	1.0 1	.04 0	5
Total	48	383	10	111	5	557

$$T = \sum_{i=1}^{10} \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 30.1555$$

degrees of freedom = (10-1)(5-1) = 36

The critical value from chi-square table with 36 degrees of freedom is 50.964. Since the test statistic is less than 50.964  $H_0$  is not rejected.

∴ With 95% confidence it is concluded that there is not enough evidence to show any relationship between Col. No. 12 and Col. No. 19.

The critical  $\alpha$  is between 25% to .50%.

69

Contingency table #10

Let Col. No. 20 = Maximum P prepared to pay and Col. No. 30 = If SHHA: apply Plot/Not

The hypothesis to be tested is:

$H_0$ : Col. No. 20 is independent of Col. No. 30

against

$H_1$ : Col. No. 20 is not independent of Col. No. 30.

The observed frequencies

30 \ 20	1	2	3	4	5	Total
1	58	27	31	22	9	147
2	232	81	23	23	4	373
3	16	8	4	0	2	30
Total	306	116	58	45	25	550

Col. No. 20 Versus Col. No. 30

The expected frequencies

30 \ 20	1	2	3	4	5	Total
1	87.79 58	31.0 27	15.5 31	12.03 22	6.68 9	147
2	207.52 232	78.67 81	39.34 23	30.52 23	16.95 14	373
3	16.69 16	6.33 8	3.16 4	2.45 0	1.37 2	30
Total	306	116	58	45	25	550

$$T = \sum_{i=1}^3 \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 47.5464$$

degrees of freedom = (3-1)(5-1) = 8

Contingency table #10

The critical value from chi-square table with 8 degrees of freedom is 15.51. Since the test statistic is larger than 15.51  $H_0$  is rejected.

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 20 and Col. No. 30.

The critical  $\alpha$  is less than .1%. It is concluded that the chance of making a wrong decision is even smaller than .001.

∴ There exists a correlation between Col. No. 20 and Col. No. 30. . . .

71

Contingency table #11

Let Col. No. 20 = Maximum P. prepared to pay and Col. No. 38 = Weekly income

The hypothesis to be tested is:

$H_0$ : Col. No. 20 is independent of Col. No. 38

against

$H_1$ : Col. No. 20 is not dependent of Col. No. 38.

The observed frequencies

38 \ 20	1	2	3	4	5	Total
1	166	21	4	4	0	195
2	70	35	9	1	0	115
3	29	24	13	2	3	71
4	18	13	16	13	5	65
5	19	23	14	25	18	99
Total	302	116	56	45	26	545

Col. No. 20 versus Col. No. 38

The expected frequencies

38 \ 20	1	2	3	4	5	Total
1	108.05 166	41.50 21	20.05 4	16.1 4	9.30 0	195
2	63.72 70	24.48 35	11.82 9	9.49 1	5.49 0	115
3	39.34 29	15.11 24	7.30 13	5.86 2	3.39 3	71
4	36.02 18	13.83 13	6.67 16	5.38 13	3.1 5	65
5	54.87 19	21.08 23	10.16 14	8.17 25	4.72 18	99
Total	302	116	56	45	26	545

$$\chi^2 = \sum_{i=1}^5 \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 237.5143$$

degrees of freedom = (5-1)(5-1) = 16

12

The critical value from chi-square table with 16 degrees of freedom is 26.30.  
Reject  $H_0$ .

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 20 and Col. No. 38.

The critical  $\alpha$  is much less than .001 or .1%. Making the above decision, the probability of making an error is reduced to .1%.

∴ There exists a relationship between Col. No. 20 and Col. No. 38.

Contingency table #12

Let Col. No. 29 = MAH. change/no change and Col. No. 40 = living MAH ? x time.

The hypothesis to be tested is:

$H_0$ : Col. No. 29 is independent of Col. No. 40  
against

$H_1$ : Col. No. 29 is not independent of Col. No. 40

Col. No. 29 versus Col. No. 40

The observed frequencies

40 \ 29	1	2	3	Total
1	8	26	6	40
2	8	17	0	25
3	9	15	1	25
4	21	32	3	56
5	134	276	11	421
Total	180	366	21	567

The expected frequencies

40 \ 29	1	2	3	Total
1	12.70 8	25.81 26	1.49 6	40
2	7.94 8	16.14 17	.92 0	25
3	7.94 9	16.14 15	.92 1	25
4	17.78 21	36.14 32	2.08 3	56
5	133.65 134	271.76 276	15.59 11	421
Total	180	366	21	567

$$T = \sum_{i=1}^5 \sum_{j=1}^3 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 19.4699$$

degrees of freedom = (5-1)(3-1) = 8

14.

The critical value from chi-square table with 8 degrees of freedom is 15.51. Since the test statistic is larger than 15.51  $H_0$  is rejected.

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 29 and Col. No. 40.

The critical value of  $\alpha$  is between 2.5% and 1%. This means if the significance level is changed from 5% to 1% it is no longer possible to reject  $H_0$  anymore.

∴ At the level of 99%, it is concluded that there is not enough evidence to show any relationship between Col. No. 29 and Col. No. 40.

1  
2

Contingency table #13

Let Col. No. 31 = Afford how much SHHA and Col. No. 38 = weekly income

The hypothesis to be tested is:

$H_0$ : Col. No. 31 is independent of Col. No. 38.

against

$H_1$ : Col. No. 31 is not independent of Col. No. 38.

Col. No. 31 versus Col. No. 38

The observed frequencies

38 \ 31	1	2	3	4	5	6	Total
1	161	35	3	1	0	0	200
2	70	40	3	1	1	0	115
3	33	31	4	2	1	0	71
4	18	14	20	9	5	0	66
5	22	27	16	7	25	0	97
Total	304	147	46	20	32	0	549

The expected frequencies

38 \ 31	1	2	3	4	5	6	Total
1	110.75 161	53.55 35	16.76 3	7.29 1	11.66 0	0 0	200
2	63.68 70	30.79 40	9.64 3	4.19 1	6.7 1	0 0	115
3	39.31 33	19.01 31	5.95 4	2.59 2	4.14 1	0 0	71
4	36.55 18	17.67 14	5.53 20	2.4 9	3.85 5	0 0	66
5	53.71 22	25.98 27	8.13 16	3.53 7	5.65 25	0 0	97
Total	304	147	46	20	32	0	549

$$T = \sum_{i=1}^5 \sum_{j=1}^5 \frac{(O_{ij} - E_{ij})^2}{E_{ij}} = 247.1568$$

degrees of freedom = (5-1)(5-1) = 16

16

The critical value from chi-square table with 16 degrees of freedom is 26.30. Since the test statistic is larger than 26.30,  $H_0$  is rejected.

∴ With 95% confidence it is concluded that there exists a relationship between Col. No. 31 and Col. No. 38.

The critical  $\alpha$  is less than .1%. The probability of making an error is less than .1%.

∴ There exists a relationship between Col. No. 31 and Col. No. 38.

Contingency table #14

Let Col. No. 12 = Present values and Col. No. 18 = Services worth 'x'P.

The hypothesis to be tested is:

$H_0$ : Col. No. 12 is independent of Col. No. 18.

against

$H_1$ : Col. No. 12 is not independent of Col. No. 18.

Col. No. 12 versus Col. No. 18

Observed values	3	4	0	2	0
Expected values	1.8	1.8	1.8	1.8	1.8

$T = 16.11$

The critical value from chi-square table with 4 degrees of freedom is 11.07. Since the test statistic is larger than 11.07,  $H_0$  is rejected.

$\therefore$  With 95% confidence it is concluded that there exists a relationship between Col. No. 12 and Col. No. 18.

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APPENDIX V

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