A Study of Livelihood Dependency and Its Spatial Pattern in Three Villages in Bagamoyo District, Tanzania

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by

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Abstract

This study has searched for spatial pattern for the differences in people's dependency on their income sources for three villages (Pande, Buma and Kerege) in Bagamoyo District, Tanzania through the use of available multidisciplinary data collected during the fieldwork project of Professional Master students of NRM programme at ITC in 2004. The households' coordinates were entered into the spreadsheet and the table imported on Ilwis software. The columns of households' attributes were added on it, point maps created out of it and overlaid on topographic map of the study area with roads and forest reserve boundary digitised over it. The resulting maps so obtained were compared and related with available multi-disciplinary data to observe spatial pattern and explore reason for differences.

Different spatial patterns were observed for dependency of people on their income sources and for fluctuation in their dependency. In general, those near to the centre of the villages and near the main road were found to be dependent on diverse income sources than those far away from it. Dominance on agriculture dependency was found away from the village centre. The same clusters of households were found to be more susceptible to the fluctuation in their dependency for income sources. For Kerege, people didn't show high dependency on tree crops for their income in spite of dominance of TROF cover. Family size and number of income sources didn't show any significant correlation. Use of interdisciplinary data to understand spatial pattern in terms of people's dependency on income sources and to explain the reason for differences on them was useful. The spatial pattern of households within a village in terms of their income sources and dependency was difficult to draw due to their clustered location. However, the spatial pattern between the villages was better understood.

Key words: *Income, Dependency, Trend, Livelihoods, Interdisciplinary, Spatial pattern, Household survey, Matrices, Ilwis, Attribute table, Point map, TROF, TRIF.*

Acknowledgements

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Acronyms

B	Banana
Ca	Cassava
Ch	Cashew
Ci	Citrus
Cl	Charcoal
Co	Coconut
DFID	Department for International Development
F	Fish
FSD	Forestry for Sustainable Development
FW	Fieldwork
GPS	Global Positioning System
Ha	Hectares
ITC	International Institute for Geo-information Science and Earth Observation
LIS	Line Intersect Sampling
M	Mango
MDGs	Millennium Development Goals
M.Sc.	Master of Science
NRM	Natural Resources Management
O	Others
P&C	Planning and Coordination
Pi	Pineapple
PM	Professional Masters
Pt	Petty trade
Ri	Rice
SA	Sustainable Agriculture
Sh	Shop
Sp	Sweet Potato
T	Timber
TM	Thematic Mapper
TRIF	Tree resources inside forest
TROF	Tree resources outside forest
UNDP	United Nation Development Programme
V	Vegetables
XCL	Excel

1.   INTRODUCTION

1.1.   General introduction

A quarter of the world's population, 1.3 billion people, lives in severe poverty (UNDP, 2004). The Millennium Development Goals (MDGs) call for reducing the proportion of people living on less than $1 a day to half the 1990 level by 2015. After decades of limited success in eliminating rural poverty, new ideas about rural development are emerging (Carney, 1998). The idea of sustainable livelihoods emerged a decade ago in the report of the World Commission on Environment and Development as an approach to maintain or enhance resource productivity, secure ownership of and access to assets, resources and income- earning activities as well as to ensure adequate stocks and flows of food and cash to meet basic needs. The 1992 United Nations Conference on Environment and Development (UNCED) moved the concept towards an action agenda especially in the context of Agenda 21, and advocated for the achievement of sustainable livelihoods as a broad goal for poverty eradication focused on the poor who live in marginalized areas. Agenda 21 stated that sustainable livelihoods could serve as an integrating factor that allows policies to address development, sustainable resource management and poverty eradication simultaneously (Singh & Gilman, 2000). A number of prominent agencies are currently revising their rural development strategies in broadly similar directions (Carney, 1998). This approach is being adopted as a new way of thinking about scope, objectives, and priorities for the development (especially in order to enhance progress towards poverty alleviation/elimination. Incorporation of the concept of sustainable livelihood approach in development programs is expected to efficiently address the priorities of poor people, both at policy and grass root level.

1.2.   The concept of livelihoods

Generally speaking, a livelihood is manner of living or means of living (Concise oxford dictionary, 1976). Livelihoods describe how people access resources, what gets in the way of access, how resources are used to build assets and how assets crucially reduce people's vulnerability to disasters. A livelihoods approach is a useful tool for understanding complex issues and for charting the links between disasters and development. Most importantly, the start and end points are vulnerable people themselves (CARE International UK, 2004). According to the Department for International Development "livelihood comprises the capabilities, assets (both material and non-material), and activities required for a means of living". Livelihoods could be sustainable when they are resilient towards external shocks and stresses, are not dependent on external support (if they are, this support itself should also be economically and institutionally sustainable), maintain the long term productivity of natural resources and do not undermine or compromise the livelihood options open to others (DFID, 1990).

Building on the earlier relevant work, UNDP and other international agencies have developed a methodology (or approach) for the design, implementation and evaluation of Sustainable Livelihoods (SL) programmes at the country level. The approach consists of a five step process described briefly below (Singh & Gilman, 2000):

- A participatory assessment of the risks, assets, entitlements and indigenous knowledge base found in a particular community. These are usually manifested in the coping and adaptive strategies pursued by men and women. Coping strategies are often a short-term response to a specific shock such as drought. On the other hand, adaptive strategies entail a long-term change in behaviour patterns as a result of a shock or stress. Both have implications on the composition of the assets (i.e., depletion, regeneration) from which they are derived;
- Analysis of the macro, micro and sectoral policies, and governance arrangements which impinge on people's livelihood strategies;
- Participatory assessment and determination of the potential contributions of modern science and technology that complement indigenous knowledge systems in order to improve livelihoods;
- Identification of a macro-micro investment strategy, which at the macro level follow an investment led transformation approach based on mobilization of domestic resources. This macro strategy is implemented in harmony with micro finance schemes; and
- The foregoing four stages are integrated and interactive in real time.

This study assesses only a few components of the first step mentioned. These components are: how people are using resources to build on their economic assets, the spatial dimensions and the dynamics over the years of this resource use. By providing authorities concerned with the information, the study is expected to contribute to adopting sustainable livelihoods approach in the area in order to help reduce poverty.

1.3. NRM professional master student fieldwork project

The fieldwork project work is a partial requirement for the fulfilment of the Professional Master degree in Natural Resources Management at ITC. There are six specialization groups studying at ITC under Natural Resources Management programme. Planning and Coordination in Natural Resources Management (P&C) is one of them. The author of this report was one of the active members of the P&C team. All six-specialization groups of PM students of 2004 carried out their fieldwork group project in Bagamoyo District, Tanzania. The field work enabled the participants to use the knowledge and skill acquired during the course to analyse real life situations on different socio-economic issues related to the use and management of natural resources in an inter disciplinary manner.

The overall objective of the P&C study group was to analyse changes in income dependency, expenditure pattern and energy consumption pattern aspects of livelihoods of three villages in Bagamoyo District, Pande, Buma and Kerege, by recording income, expenditure and energy consumption changes at household level. The purpose of the study was to obtain insight into the change in the use of natural resources in these villages and to learn the spatial variability of different

uses of natural resources. The present study is largely based on data collected during the fieldwork project by P&C group and other specialization groups including "Forestry for Sustainable Development" group and "Sustainable Agriculture group".

1.4.   Problem definition

The data collected by P&C study group revealed interesting differences among villages regarding the income part of their livelihoods. But some questions still remained unanswered due to lack of time. The key questions that could not be explained by the P&C fieldwork report are the problem definitions for the current study and they include:

- What patterns of dependency on income sources exist in the study area?
- What are the factors that dictate the variation in the pattern of dependency on income sources?
- Which interdisciplinary data sets collected during the fieldwork could be employed to explore those factors?
- Can the pattern of dependency on income source be mapped and if so how?

1.5.   Limitations

- One of the significant limitations of the study is available time. Within 10 days 75 households were surveyed. Time was not adequate for collecting information other than for the designed fieldwork questionnaire. That is the reason why the IFA had to be based on fieldwork data only. Another implication of the short fieldwork duration was that only limited aspects of livelihood could be addressed. In addition, data generated by all the study groups could not be reviewed due to lack of time.
- The P&C livelihoods survey focuses only on the aspect of people's dependency on their income. No information on subsistence livelihood was collected. Data on people's dependency on their income are in relative (percentage) figures thus depriving the study to undertake statistical tests of significance (*e.g.* chi square, t test).

1.6.   Objectives

The general objective of the study is to observe the spatial variation in people's dependency on different sources of income in the three villages of Bagamoyo district, Tanzania.
The specific objectives are:
- to determine the income sources and the dependency of people on them for the years 1995, 2000, and 2003 in the three villages,
- to determine dominant income types in the three villages in the years 1995, 2000, and 2003,
- to detect change in the income sources and shifts in people's dependency on them in the three villages,
- to explore the possibility of observing spatial patterns of income dependency in the three villages using topo map and remotely sensed imageries, and
- to explore the common reasons for livelihood differences among villages from available relevant multidisciplinary data collected during the fieldwork project.

2. METHODS AND MATERIALS

2.1. Study area

There are a total of 82 villages within Bagamoyo district. Three villages, namely Pande, Buma and Kerege were purposively selected for the study (to represent differences within the district)[1]. Some of the prominent reasons for their selection were:

- economic influence of the coastal area,
- newly constructed road from Dar-e-salaam-to-Bagamoyo, and
- role of adjacent forests on the livelihoods of locals.

On the coast out of four villages (Pande, Kaole, Mlingotini and Kondo), Pande was the selected village. Along the main road, Kerege was selected leaving out Mapinga, Zinga and Kiromo. On the main upland Buma was selected leaving Mataya and Yombo. Figure-1 shows the location of the study villages.
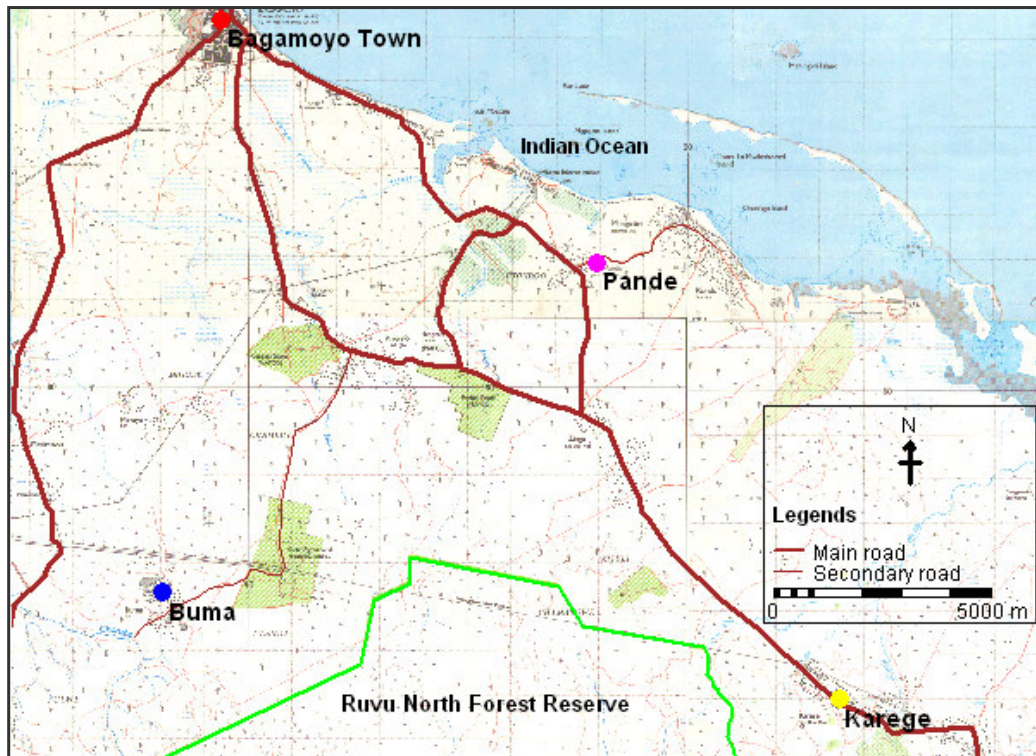
Figure 1: Location of the study villages

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[1] Time limitation for fieldwork is one the main reasons for selecting these 3 villages. Purposive sampling design was employed; different spatial location leading to different livelihoods opportunity was the main criteria for selection of villages).

2.2. Fieldwork

Before the multidisciplinary data can be reviewed and analysed according to the objective, it is necessary to shortly explain how they had been obtained. The study team was categorised in 5 groups to undertake discipline oriented data generation. They were:

a. Planning and coordination (P&C) group,
b. Forestry for sustainable development (FSD) group,
c. Sustainable agriculture (SA) group,
d. Environments System Analysis and Management (ESAM) group plus Rural Land ecology (RLE) group, and
e. Soil Information System and Land Management (SISLM) group.

The present study deals with data of only the first 3 groups. The details on the fieldwork of these groups are presented below:

2.2.1. Planning and co-ordinating group's livelihood survey

2.2.1.1. Sampling design

The list of households in each village was the population for this study. In each village, 25 households were selected randomly and interviewed. The selection of the households was performed using random number generators to achieve random distribution of the samplings. These 25 households sampled from each village made a sampling intensity of more than 5% for that specific village. The names of the households' heads, which were sampled, are listed in the appendix 3.

2.2.1.2. Field matrices

Three matrices were prepared to collect information on income, expenditure and energy consumption trends. The respondents were asked to show relative income in three different time periods in terms of heaps of beans. The total income represented by heaps of beans in the year 2003 was considered the base for comparing income in the year 2000 and 1995. The individual percentage contribution of a particular source of income was calculated using a spreadsheet. To enable comparison of individual sources of income over the years, the income represented by beans were standardized using the formula:

*Standard income = No. of beans representing income from particular source of income/total beans for year 2003*100*

Please refer to annex 1 for the matrices used in the field.

2.2.2. Forestry for sustainable development group's TROF survey

2.2.2.1. Villages selection

The same three villages namely Pande, Kerege and Buma were selected for the assessment of the tree resources outside the forest (TROF). The selection of villages was based on their spatial location, which has influence on the type of livelihoods opportunities and interactions with their tree resources.

2.2.2.2. Sampling design

Line Intersect Sampling (LIS) method was adopted to survey TROF parameters. In each village, 25 randomly selected points were laid on the selected grid (2X2 Km) covering the village. A fifty meter long transect line was laid from these points in random compass direction to record TROF parameters such as diameter at breast height, tree height, crown diameter etc. (Figure-2).
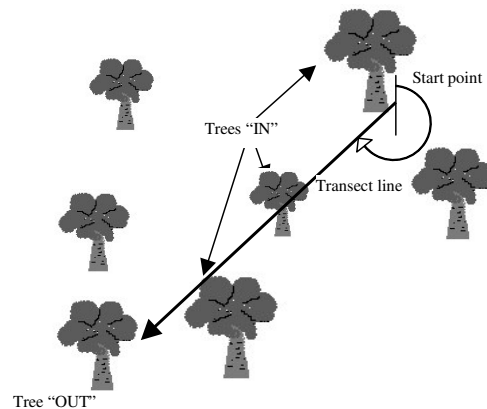
Figure 2: Line intersect sampling design

2.2.2.3. Image classification

Out of three villages, only Kerege and Pande are covered by the both the TM image of 1995 and the SPOT image of 2003. The Buma village is covered only with the TM image of 1995. The sub-maps of Pande and Kerege were created from the SPOT 2003 image while the TM 95 was used for Buma village. Sub-maps of each village from TM 95 and SPOT 2003 were classified (supervised) based on training samples and existing data base to stratify the whole village under TROF and Other area and to see changes in TROF cover (FSD Group ITC, 2004).

2.2.3. Sustainable agriculture group's land cover mapping

2.2.3.1. Navigation and recording

Data collection of the samples from the study area was performed at village level using ipaq together with GPS for navigation and recording.

2.2.3.2. Delineation and analysis of the features using remote sensing data

Diversification of crops to overcome risks and uncertainties due to climatic and economic factors prevails in the study area. This has affected the size of plots cultivated by a number of farmers, which are small and being traditionally managed. Conscious of the drought situations, the majority of the farmers have diversified their farming system to cope with that reality by using different combinations of crops in one land use type on the same piece of land. Against this background, arises the complexity and the difficulty of mapping such type of land use systems. In view of these circumstances, the classification was done in line with data collected from the study area using the following seven classes: Cassava, Maize, Rice, Mixed crops, grass with shrubs, trees and water body to represent the major land use types. The SPOT 2003 image was used to classify the different land use types in the study area. A plot size of greater than 50x50 meters was adopted as the minimum mapable unit. For each observed plot, three four by four (4x4) meter sub-plots were identified and sampled for land cover (SA Group ITC, 2004).

2.3.   Study approach of the present study

The data on income part of livelihoods collected by P&C group is the basis for this study. In addition, information from FSD and SA groups was also analysed to identify the spatial variation in the dependency on income sources in the villages. The information on income sources in the three villages ws analysed to determine the dominant income generating sources at both household and village level. Dependence of people on those sources over the years was determined by analysing the percentage contribution of each income source to the households' total income. The shift and or/change in number and types of income sources were determined by counting the frequency of occurrence of each income source at household level over the years. A table with household attributes was prepared to create point maps to be overlaid on the Land cover and/or Land use map of the study area. Finally, spatial patterns were observed through overlaying attribute maps to explore reasons for the existing pattern and differences from available multidisciplinary data.

2.3.1.   Income source clustering and change and/or shift count

Households were grouped into clusters on the basis of their dominant dependency among different income sources for the latest year (2003). If a particular household has an income source that contributed more than 40% to its total income, that particular income source becomes the dominant income source for that particular household. Households having the same dominant income sources were grouped into one cluster. The total cluster obtained from such a classification determined the total dominant types of income sources in the village. This classification was necessary for observing some meaningful pattern of households' dependency on income among villages. A section of the database in which the clustering was performed is presented as an example in table-1.

Table 1: An example of household clustering based on dominant income sources in 2003, (Buma Village)

| HH ID | Income types and their percentage contribution in household income | | | | | | | Total income in % | Cluster |
	TROF	Trade	Fruits	Wage Labour	Field Crop	TRIF	Others		
15	74	14	-	-	7	5	-	100	TROF
20	70	-	20	-	-	10	-	100	TROF
16	55	11	5	-	18	11	-	100	TROF
7		100			0			100	Trade
18	30	50				10	10	100	Trade
…	…	…	…	…	…	…	…	…	…
…	…	…	…	…	…	…	…	…	…

Changes and/or shifts in number of income sources in different years were obtained per household level by counting the number of income sources in three different years per households. A section of the database in which the shift analysis was performed is presented as an example in table-2.

Table 2: An example of change and/or shift counting in terms of numbers of income sources, (Buma village)

| HH ID | Number of Incomes sources in different years | | | Change and/or shift |
	1995	2000	2003	
15	6	6	6	No change
20	5	5	5	No change
16	8	8	8	No change
7	-	2	1	Change
8	6	6	4	Change
…	…	…	…	…

2.3.2. Analysis of Pattern

The coordinates of the households recorded with GPS during fieldwork were entered into spreadsheets and imported in Ilwis software. The columns of the cluster and change obtained from the analyses were added into the coordinate table to come up a with household attribute table (figure-3). The point maps of household attributes were created to be overlaid on an image of the study area (See Chapter-4). The topographic map of the study area was georeferenced and roads, rivers and the forest reserve boundary were digitised on it. The point maps were then overlaid in the topographic map so digitised and on the TROF cover map of the study area. Succinct observations were made from the resulting map so obtained to explain the different spatial patterns of the three villages.

Figure 3: An example of household attribute table (Kerege)

2.4.   Exploration of reasons for differences

The land cover maps of the study area were compared with the household's dependency in income sources and their trend over the year to establish reason for those differences. The number of income sources per households was compared with family size in an attempt to explain the reasoning behind differences observed among households. Verbal communication, observation and other information during household survey were linked as well. Figure-4 summarises the study approach in flowchart.
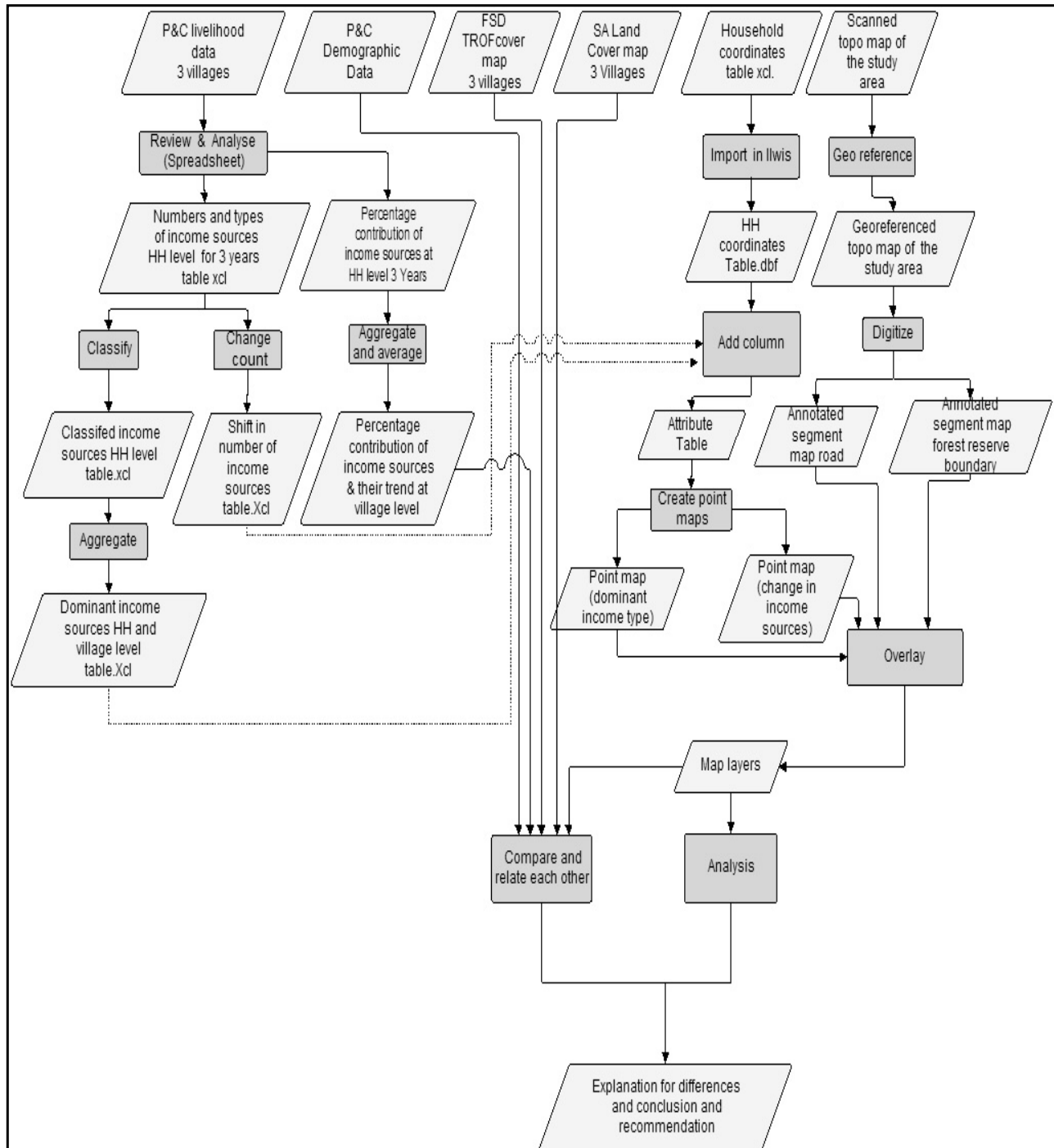
Figure 4: Flowchart summarizing the study approach

2.5.   Materials

2.5.1.   Topographic maps

Topographic map sheets of scale 1:50,000 covering Kawe (Sheet No 186/1 and part of 186/2), Yombo (Sheet No 185/2) and Bagamoyo (Sheet No 168/4 and parts of 168/3) were used for locating the villages and georeferencing the topo map. These maps were published by Survey and Mapping Division, Ministry of Lands, Housing and Urban Development, Tanzania, United Republic of Tanzania, 1989.

Kerege, Pande and Buma villages lie in Kawe, Bagamoyo and Yobmo topo-map sheet respectively.

2.5.2.   Global positioning system (GPS) receiver

Garmin 12 XL GPS receiver was used to record the X and Y coordinates of the households surveyed during the field.

2.5.3.   Software

ILWIS3.2 software was used to geo-reference, and digitise the topo map. Microsoft Excel was used to calculate percentage contribution of income sources and to count the shift in income sources.

3.   RESULTS

3.1.   Overall income trend

The overall income in Pande and Buma village is found to be declining since 1995. Different reasons can be attributed to this. Among them are the drought in 2000 and 2003, the traditional way of farming, the decrease in fish catch (fishing is only in Pande), the low productivity of mango and cashew due to their old age and, dependency on only Dar-es-Salaam city for the market (Verbal communication, Pande and Buma village 2004). The overall trend for Kerege village was found to be fluctuating, the year 2000 being a good income giving year. The most common reasons for the high income in 2000 were the construction of the Bagamoyo to Dar-es-Salaam highway where many villagers were employed and the abundance of drought resistant crops such as citrus, banana and pineapples in the village, which fetched a good price in the market in 2000. The overall income trend in the three villages is presented in figure-5 (P&C Group ITC, 2004).
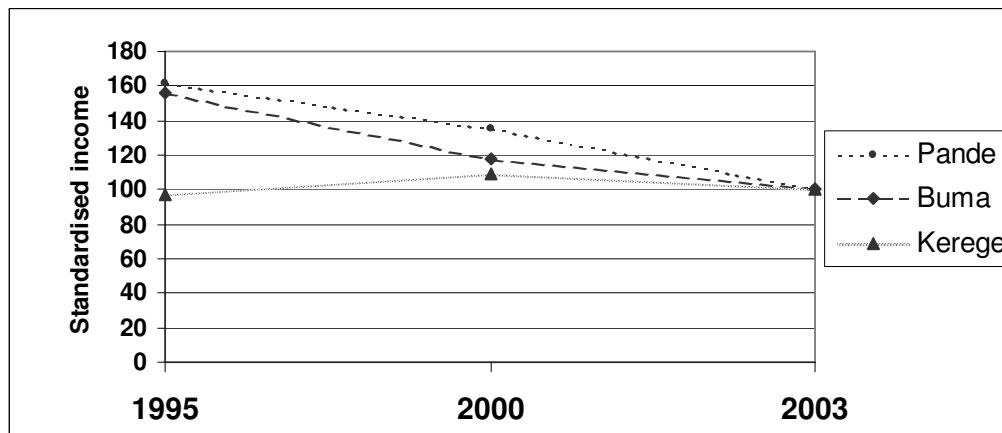
Figure 5: Overall income trend in Pande, Buma and Kerege Village

3.2.   Types of income sources

The three villages are very similar in terms of the types of income sources they are dependent on except in the degree of dependency on them. All three villages are primarily dependent on tree crops (mango, cashew nut and coconut). Pande village is unique from other villages in the sense that fishing is its most important income source. Buma differs because of its high dependency on tree resources inside forests (TRIF) in the form of timber and charcoal making, while Kerege is mostly dependent on wage labour. The income sources identified in the three villages in the order of dependency over the years is presented in table-3.

Table 3 : Income sources and order of dependency on them, Pande, Buma and Kerege Village

Order of Dependency	Villages								
	Pande			Buma			Kerege		
	1995	2000	2003	1995	2000	2003	1995	2000	2003
I	Tree crops	Tree crops	Tree crops	Tree crops	Tree crops	Tree crops	Wage labour	Tree crops	Tree crops
II	Fishing	Fishing	Trade	Field crops	Field crops	Trade	Tree crops	Wage labour	Trade
III	Trade	Trade	Fishing	TRIF	Trade	Field crops	Field crops	Fruits	Wage labour
IV	Others	Others	Others	Trade	Fruits	TRIF	Others	Trade	Others
V	Field crops	Field crops	Wage labour	Fruits	TRIF	Fruits	Trade	Field crops	Field crops
VI	Wage labour	Wage labour	Field crops	Others	Others	Others	Fruits	Others	Fruits
VII	Fruits	TRIF	Fruits	Wage labour	Wage labour	Wage labour	TRIF	TRIF	TRIF
VIII	TRIF	Fruits	TRIF	-	-	-	-	-	-

3.3. Contribution of income sources in total income

Figure-6 presents the major income sources and their contribution in the total income for Pande, Buma and Kerege Village (P&C Group ITC, 2004).

The main sources of income in Pande village are tree crops (Mango, Cashew nut and Coconut), petty trade, and fishing. Fishing has a fluctuating trend in its contribution to the total income while the contribution trend for tree crops and field crops is declining. The contribution trends for trade and wage labour were found to be increasing.

For Buma village, again the tree crops is the best income sources followed by field crops (cassava, rice and sweet potato), tree resources inside the forest (TRIF) and trade. Fruits also give good contribution to the total income in the village. The contribution trend for trade has been found increasing while for tree crops, TRIF, field crops and fruits it is fluctuating.

For Kerege village also tree crops are the most contributing income source. Next to the tree crops is wage labour, which was the number one contributor in year 1995. Trade shares next to wage labour. The contribution from field crops and fruit is also significant. Fruits contributed a very high share in the year 2000. The contribution trend for tree crops and trade is found to be increasing while for TRIF, fruits, field crops and others it is fluctuating. The contribution from wage labour is in a declining trend.

In summary Pande village showed a high dependency on tree crops, trade and fishing. For Buma village the high dependency is on tree crops, field crops, TRIF and trade and finally for Kerege village, people were found to be highly dependent on wage labour, tree crops, trade, and field crops for their income.
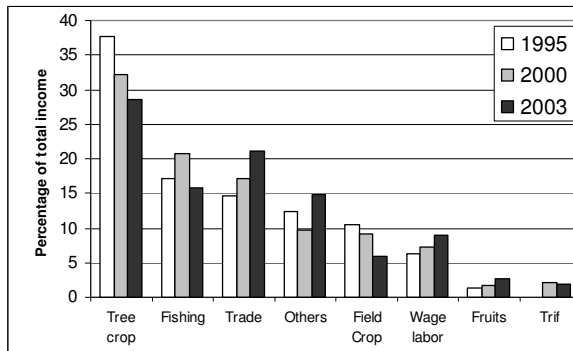
Figure 6 A
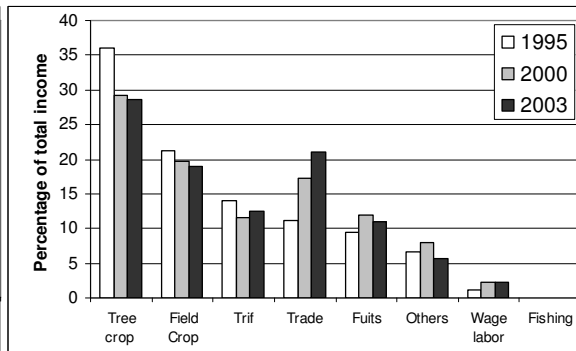
Figure 6 B
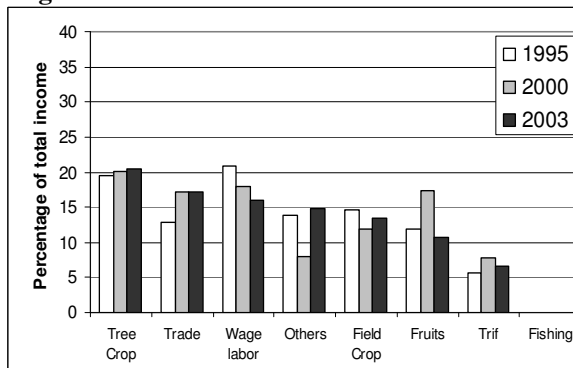
Figure 6 C

Figure 6 A: Major income sources and their percentage contribution in total income Pande Village.

Figure 6 B: Major income sources and their percentage contribution in total income Buma Village.

Figure 6 C: Major income ources and their percentage contribution in total income Kerege Village.

3.4. Change and/or Shift in people's dependency on types of income sources

All three villages showed a change and/or shift in number of income sources and in their dependency over the years. The number of income sources per households were summed for each year to get the aggregate frequency of occurrence of income sources in village level. Figure-7 presents the aggregate frequency of occurrence of different income sources in three villages summed over 3 different years. Individual descriptions of change and/or shift in income sources on them are as follows.

3.4.1. Pande

When mango, cashew nut and coconut are grouped together as tree crops, it forms the highest contributing income source for all three years. But when dealt with separately, fishing was the most contributing source of income followed by mango, petty business and coconut in 1995. In 2000, the contribution from fishing increased sharply, the reason being severe drought, because of which most of the people had no choice but to depend on fishing for their livelihood. In the year 2000, petty trading is the second best source of income and mango the third best. Coming to the year 2003, petty trading was the first best income source, fishing and mango being the second and the third best. Thus we can see, fishing, petty trading and mango have always been the major sources of income for the people although their contribution in different years have changed. Income from mango, coconut, cashew nut, citrus, and food crops are in a declining trend, while income from petty trading wage labour and shops are in an increasing trend (P&C Group ITC, 2004).

The number of income sources per household has also been fluctuating since 1995. In 1995, the total frequency of occurrence of income sources among households counted to 74, then 80 in 2000 and finally to 89 in 2003. During these periods out of 25 households surveyed, 13 households indicated fluctuation and 12 households remained constant in terms of their types of income sources.

3.4.2. Buma

For Buma as well, when mango, cashew nut and coconut are grouped together as tree crops, it forms the highest contributing income source for all three years. But when dealt with separately, cashew nut was the most contributing income source followed by field crops and tree resources inside forest (timber and charcoal) in 1995. In 2000, the contribution from petty trade increased sharply, cashew nut become second best income source, TRIF and fruits became third and fourth contributing income sources. Coming to the year 2003, the same pattern is maintained, petty trade number one, cashew nut number two, TRIF number three and fruits number four contributors in total income. Thus it can be seen that cashew nut, TRIF, petty trade and fruits have been the main income sources over the years. Income from petty trade and TRIF is in inclining trend while income from the rest is in fluctuating trend (P&C Group ITC, 2004).

The number of income sources per household has also been fluctuating since 1995. In 1995, the total frequency of occurrence of income sources among households counted to 93, then 132 in 2000 and finally to 136 in 2003. During these periods out of 25 households surveyed, 11 households indicated fluctuation and 16 households remained constant in terms of their types of income sources.

3.4.3. Kerege

For Kerege also, when mango, cashew nut and coconut are grouped together as tree crops, it forms the highest contributing income source for all 3 years. But when dealt with separately, wage labour was the most contributing source of income followed by petty trade and field crops in 1995. In 2000, the contribution from fruit crops (Citrus, Banana, Pineapple) increased sharply, wage labour still became the second best source of income and petty trade the third best. Coming to the year 2003, both petty trading and wage labour were the first best income sources, cashew nut and field crops being second and third best. Thus we can see that wage labour, petty trading, field crops and fruit crops had always been the major sources of income for the people although their contribution in different years have changed. Income from cashew nut, fruit crops, field crops, coconut and charcoal plus timber are in fluctuating trend, mango and wage labour are in declining trend, whereas income from petty trading and shops are in increasing trend (P&C Group ITC, 2004).

The number of income sources per household has also been fluctuating since 1995. In year 1995, the total frequency of occurrence of income sources among households counted to 86, then 95 each in 2000 and 2003. During these periods out of 25 households surveyed, 14 households indicated fluctuation and 11 households remained constant in terms of their types of income sources. The increase in frequency of occurrence of income sources is in line with the increase in total income in the village except for the year 2003 when the total income declined as compared to 2000.

Analysis of shift in income sources over the years reveals that there have been no new types of income sources added over the years. Among the same prominent types of income sources, their occurrence has been found to be fluctuating. On average, there were three types of income sources per

households in Pande village in 1995. Coming to the year 2000, the average number of income sources increased to four. The same average number of income sources was maintained in the year 2003.

For Buma the average number of income sources per household was 4 in 1995 and increased to 5 in later years (2000 and 2003). In Kerege, average number of income sources has remain constant over the time periods. However, 44% of the households have experienced fluctuation in income types.

The increase in the average number of income sources is attributed to the increase in frequency of trade in all the three villages. The fluctuation in average number of income sources is largely attributed to the local market condition (price and availability of market) and unreliable climatic condition (verbal communication, 2004) in all three villages.
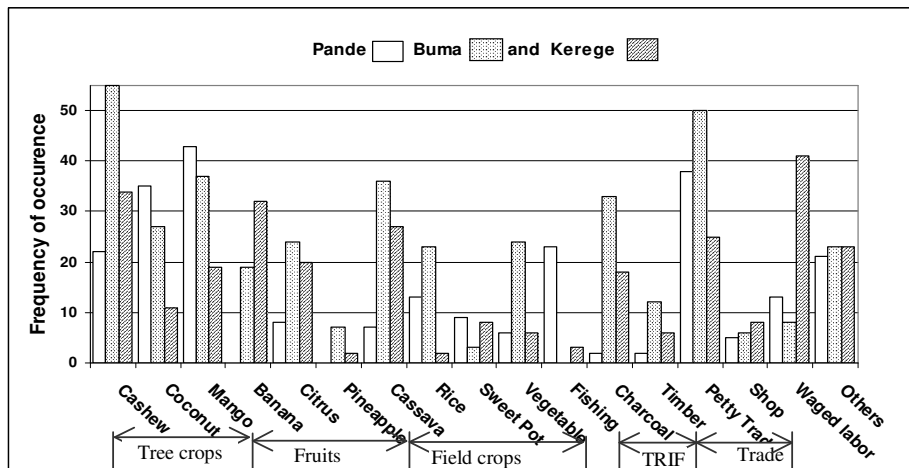
Figure 7: Aggregate frequency of occurrence of income sources, Pande, Buma and Kerege Village

3.5. Income dependency pattern

Looking at the findings so far, the villagers have been found to follow a distinct pattern of dependency for their income. The types of livelihood sources in all villages can be grouped into 8 broad categories. People earn their livelihood from fishing (Pande only), trade, tree crops (mango, cashew nut, coconut) field crops, fruits, tree resources inside forest (TRIF), wage labour and others.

TROF (tree crop) as income source was found to be adopted by 76% of interviewed households (25) in Pande, 80% in Buma and 56% in Kerege, meaning that tree crops is the integral part of people's life in terms of their livelihood. Petty trade as livelihood source was found in 60% households in Pande, 88% households in Buma and 56% households in Kerege. The frequency of trade in Buma is the highest. Fishing is confined only in Pande and 32% of the households were found to be earning from fishing. Field crops as income source were found in 24% households in Pande, 64% in Buma and 32% in Kerege. Likewise, fruits as income source occurred highest in Buma (56% of households), followed by Kerege (55% of households) and few in Pande (12% of households). Similarly, 20% of households were found to be earning income from wage labour in Pande, 4% in Buma and 40% in Kerege. Occurrence of dependency on tree resources inside forest is the highest in Buma (36% of households) followed by Kerege (32% of households) and only 4% in Pande.

Obviously, Pande being near to the coast, people's dependency on fishing is a common phenomenon. Although only 32% of the households were found to be earning from fishing, the majority is doing the same for their subsistence (verbal communication, Pande village, 2004). Buma and Kerege, being near to Ruvu North Forest reserve, have higher dependency on TRIF. With regards to reasons for other differences such as Buma having the highest number of people dependent on trade and field crops than other villages, these could not be explained properly from the available sets of data. Figure-8 presents the main income sources and number of households dependent on them.
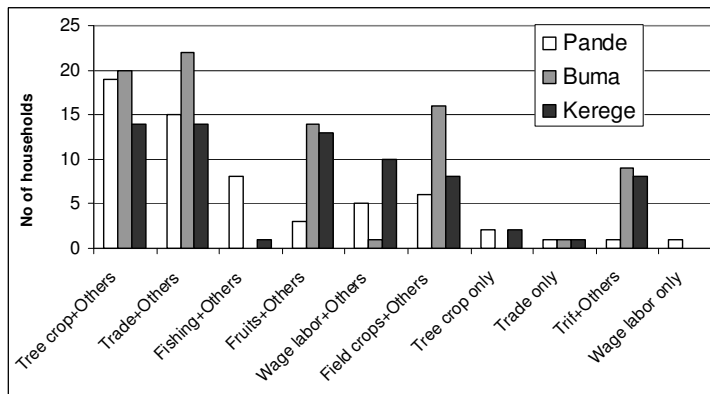
Figure 8: Number of households dependent on different income sources, Pande, Buma and Kerege village

3.6.   Family size and number of income sources

Family size and the number of income sources were plotted in an attempt to understand whether family size is a determining factor for the number of income sources. The result shows no significant correlation between them. Figure-15 presents scatter plot of family size versus number of income sources in three villages.
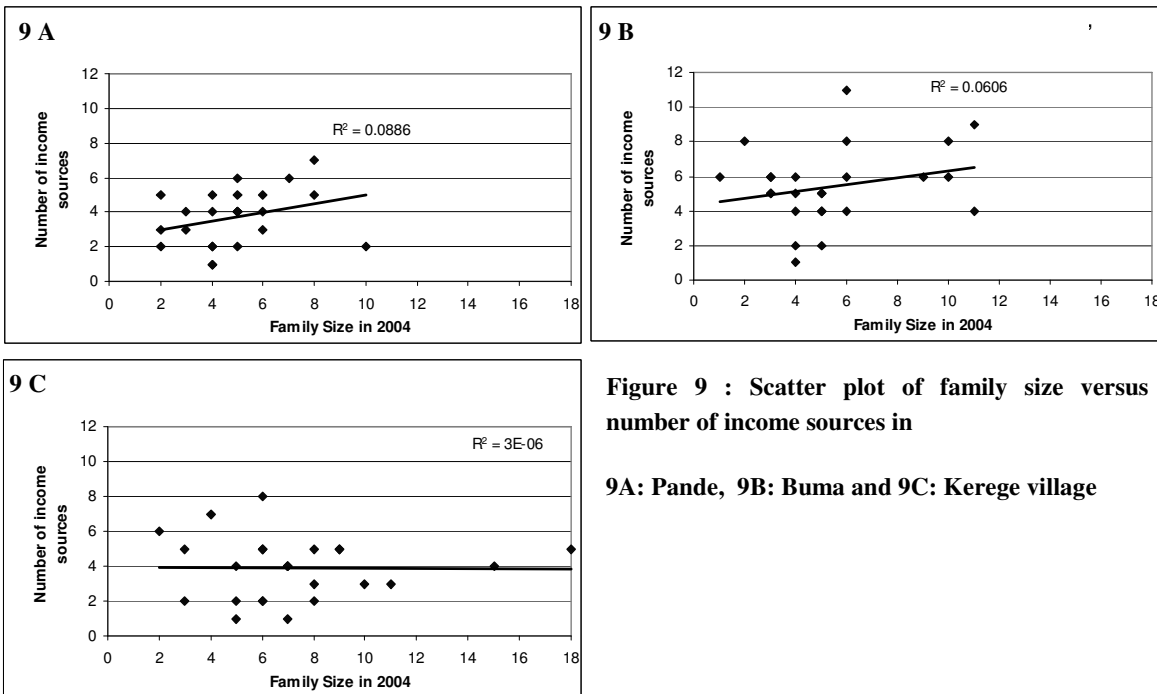
Figure 9 : Scatter plot of family size versus number of income sources in

9A: Pande, 9B: Buma and 9C: Kerege village

4.   EXPLORING THE SPATIAL PATTERN

4.1.   Dominant income sources

Tree crops have been an integral part of life of people from time immemorial in the study area. The practice of planting fruit trees like Cashew, Mango and Coconut dates back to the 18th century, before the time of German Colonization (Verbal Communication with Pande Villagers, 2004). Why tree crops became integral part of people's livelihoods in the area is largely explained by the economic reason. Figure-1 (topographic map of the study area) gives a general idea of the location of the study area with main differences in the three villages. This topographic map was georeferenced and point maps with households' attributes were overlaid on it to observe the spatial pattern. The observations of the spatial pattern made in terms of dominant income sources in the three villages follows one by one.

4.1.1.   Pande

No one was found to be dependent on forest resources directly in Pande village. The reason behind this might be the distance factor. Pande is located far from the forest area thereby making it unfeasible for them to use tree resources inside the forest as their livelihood sources. The nearest forest from Pande is the Ruvu North Forest Reserve, which is located 8 km far from the village (see figure-1). Only two households among the sample households were found to be doing business of charcoal and timber selling. They were not making charcoal and timber by themselves but buying it from people in other villages to sell in their own village. Pande village has fishing as a unique source of income, which is not occurring in the other villages. Obviously this is due to the proximity to marine resources. The village is located within a range of 1 to 2 km from the sea. It is 2.6 km far from the Dar-es-Salaam to Bagamoyo highway. The village enjoys the benefit of a tarmac road, which connects the highway to the Mbegani Fisheries Development Centre situated within the village, making the environment favourable for economic activity such as petty trading.

Households with their dominant income types were overlaid on a sub-map of the topo map of the study area. (see figure-10 A). A clear and distinct pattern could not be observed in terms of income source distribution among households for the reason that households are located close to each other. The majority of households is located at a distance of less than 100 meter apart from each other. The households, which experienced a change in the number of income sources over the years, also didn't show any spatial pattern (see figure-10 B). Figure-10 C shows households with their dominant income type overlaid on the classified TM image of June 1995. Those households with tree crop as their dominant income found to fall on TROF area. However, the majority of households with no tree crops as their dominant income also fell on the TROF area. This suggests that location of households were not necessarily directly at places of income sources.

Figure 10 A

Figure 10 B

Figure 10 C

Figure 10 A: Distribution of income sources among households, overlaid on a part of top sheet of the study area, Pande village

Figure 10 B : Distribution of households (overlaid in a part of top sheet) experiencing changes in income sources over the years, Pande Village

Figure 10 C : Sub-map showing TROF and other categories (Supervised Classification), overlaid with the distribution of households with their dominant income source and the road, Pande village

4.1.2. Buma

In Buma village, its proximity to the Ruvu North Forest Reserve could have made conditions favourable for people to earn income from forest resources (charcoal making and timber extraction). The village is situated 2 km away from the reserve. However, field crops, tree crops and fruit crops are the income sources mostly occurring and mostly contributing in total income in the village in addition to TRIF. The high frequency of occurrence of field crops, tree crops and fruit crops might indicate favourable soil and micro climate in the area, which needs further study to ascertain whether that is the exact reason. The average number of income sources per household is 4, indicating a bit more options and opportunities than in Pande village in terms of income sources.

The overlaying of household positions with their attributes on the topo map showed some spatial pattern in Buma village (see figure 11 A, B). Households in the centre of the village were found to be dependent on tree resources inside forest. Again, people in the centre of the village were found to have tree crops as their predominant income sources. Households far away from the centre and roads

were found to be primarily dependent on agriculture. The reason might be that the people nearby the main road and in the village centre have easy access to the market and thereby a high dependency on tree crops (mango, cashew nut and coconut) and TRIF (charcoal making and timber). Regarding the change in income sources, no role of the spatial location of households could be observed as households both near to and far from the road and village centre were found to experience a change in their income sources. This change is largely attributable to the local market and unreliable weather conditions. Figure-11 C shows households with their dominant income type overlaid on the classified TM image of June 1995. In Buma also, the majority of households fell in the TROF area, but not all of them were found to have tree crop as their dominant income source. This again, suggests that households do not necessarily earn income from TROF even though they are located in TROF surroundings.

Figure 11 A

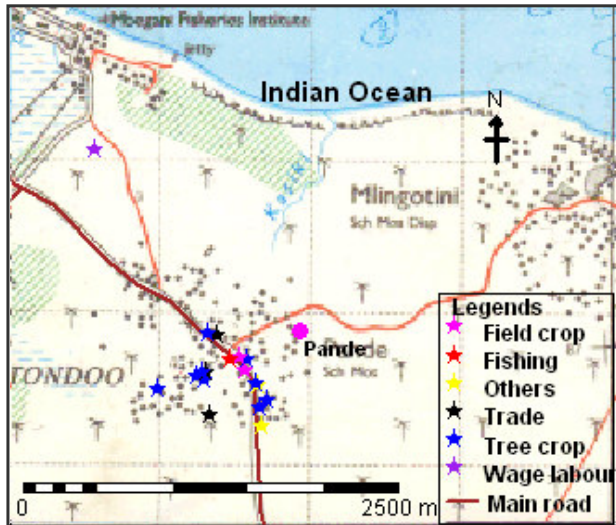**Figure 11 B**

Figure 11 C

Figure 11 A: Distribution of income sources among households, overlaid on a part of top sheet of the study area, Buma village

Figure 11 B: Distribution of households (overlaid in a part of top sheet) experiencing changes in income sources over the years, Buma Village

Figure 11 C : Sub map showing TROF and other area (Supervised Classification), overlaid with the distribution of households with their dominant income source and the road, Buma village

4.1.3. Kerege

Kerege Village is unique in the sense that it shares characteristics with both Pande and Buma village. Fishing is practiced (however, only one household was found to be earning income from it) and people are dependent on TRIF as well. It differs from the other villages for its high dependency on wage labour. Tree crops, trades, fruits, and field crops are equally important income sources in the village. The average number of income sources per household is 4, indicating a bit more option and opportunity than Pande village in terms of income sources.

As can be observed in figure-12 A, households only in the north of the highway are dominantly dependent on tree crops for their income. To the south of the highway exists a large area of TROF but nobody in that part is found to be dependent on tree crops as their dominant income source. The reason might be that the area of TROF in the south belongs to the people in the north and is not accessible to the people there. For other income sources no special pattern could be observed; they all were found to be distributed over the area more or less homogeneously. Regarding the change in income sources, those households around the highway were found to have a fluctuation in their income types (see figure-12 B) over the years (just as two outliers which are far away from the highway). The reason might be that people in or around the highway are offered by more opportunity but more risk also. The change in income sources occurred for only those households depending on field crops, tree crops, trade and wage labour meaning that these income sources are not stable over the years. This change is largely attributable to local market and weather condition (verbal communication, Kerege, 2004).
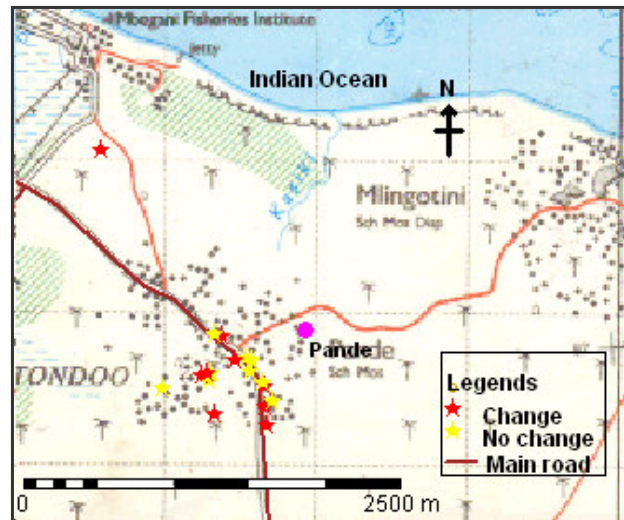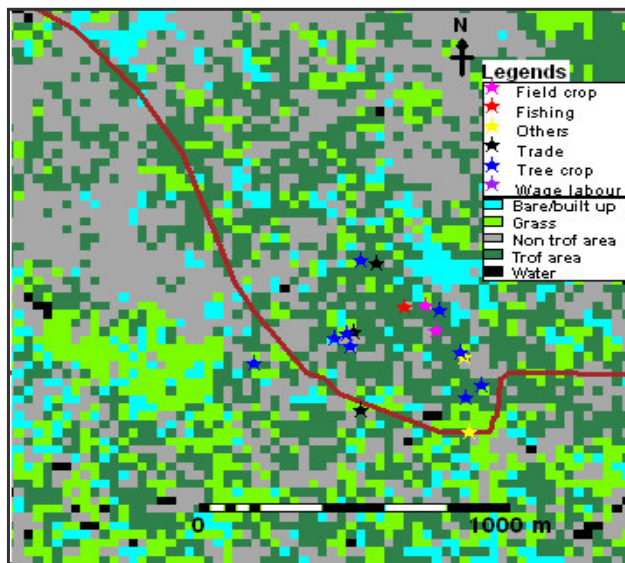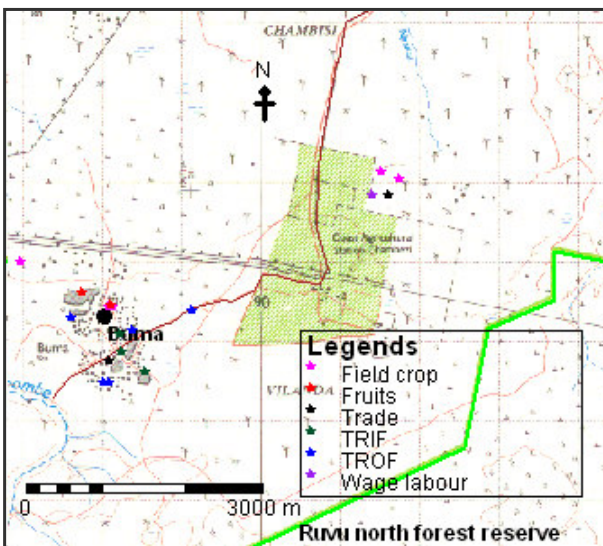

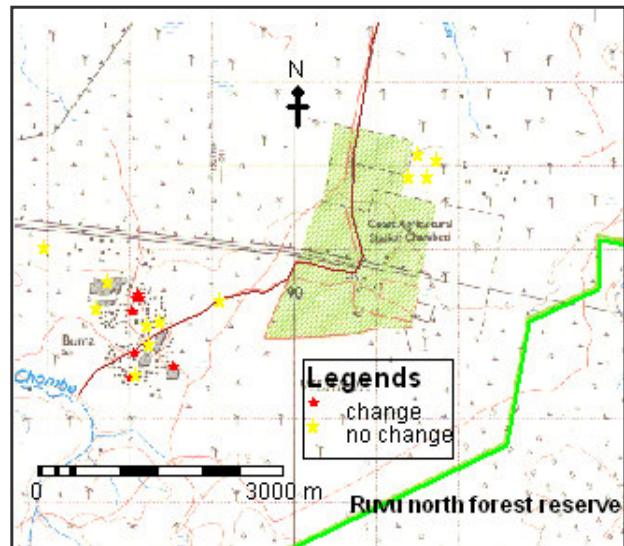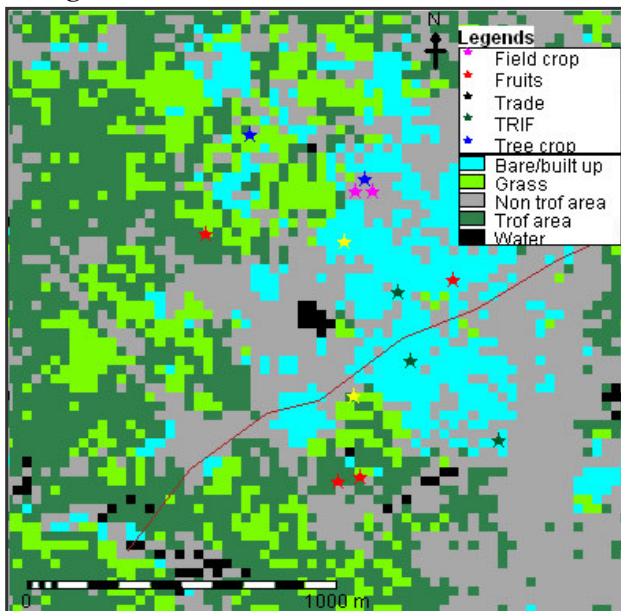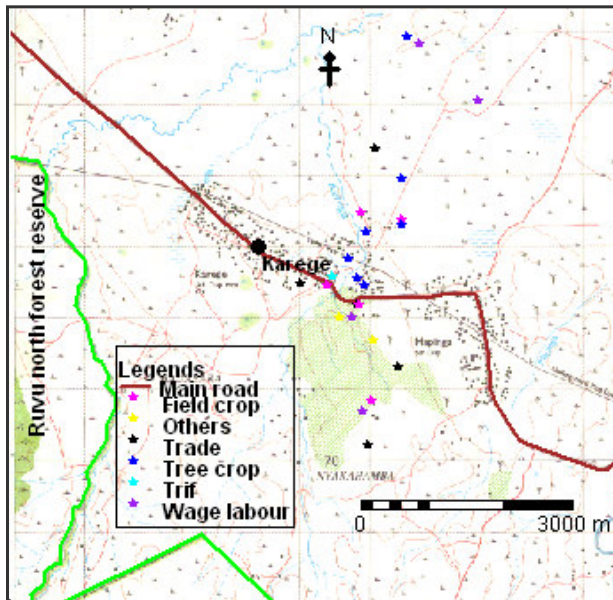**Figure 12 A: Distribution of income sources among households, overlaid on a part of top sheet of the study area, Kerege village**
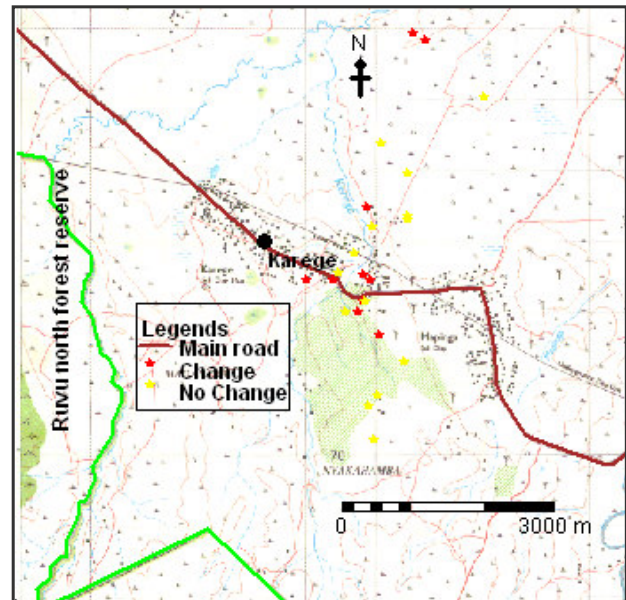
Figure 12 B: Distribution of households (overlaid in a part of top sheet) experiencing changes in income sources over the years, Kerege Village

4.2.   Declining income trend

Both Pande and Buma villages showed a declining income trend and Kerege showed a fluctuating income trend. There are various reason for these trends. Kerege enjoys the benefits of the Bagamoyo to Dar-es-Salaam highway thereby having easy access to the Dar-es-Salaam market and getting a competitive price for their products from middlemen. Pande and Buma are too far to get these benefits.

The market for products such as mango and cashew nut has not been the same since 1995. But generally, the year 1995 was the best year in terms of production of cashew nut and coconut due to the favourable weather conditions and good market (Verbal communication, Pande, Buma and Kerege, 2004). Since the year 2000 the area has been experiencing severe drought. As a result there is low production. Even though there is low production almost all the villagers are now engaged in trading in cash crops especially mango. As a result the supply of mango is very high in Dar-es-Salaam thereby reducing the price. In Kerege there is a seasonal market for cashew, coconut and mango.

Looking at yield data for 2002 and 2003 for Bagamoyo district in general, the agricultural yields were found to be declining (Figure-13). The most obvious reason for this decline could be less rainfall in 2003 (Figure-14). This gives an indication of the reason why the overall income declined.
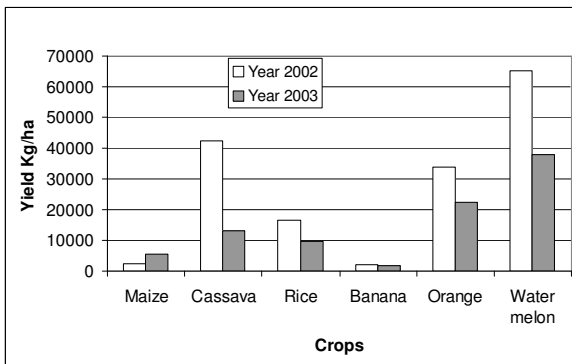
Figure 13 : Crop yield (kg/ha) for 2002 and 2003 Bagamoyo District (Source: District Ag office Bagamoyo, 2004)
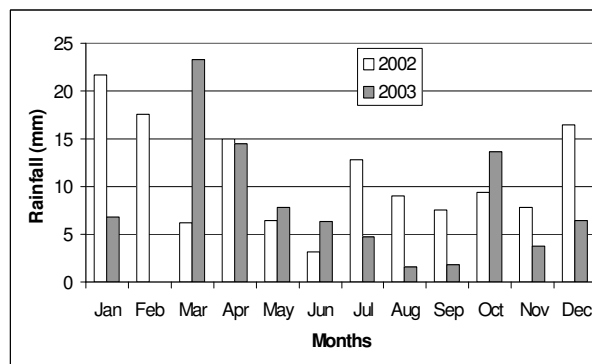
Figure 14 : Average monthly rainfall 2002 and, 2003 in Bagamoyo District, (Source: District Ag office, Bagamoyo, 2004)

4.3.   Large number of people dependent on TROF

Tree resources outside the forest is an integral part of the income sources of the majority of people in the village. Why TROF has become an integral part of life could be explained largely in terms of the economic reason. Thus the existence of area under TROF in the village itself could be the consequence of people's large dependency on it. However, evidence of new plantation is almost none. Why people are not replanting tree crops is explained largely in terms of the collapse of the market for cashew, producing apathy in people to replant and care for tree species. The landuse comparison in the three villages is presented in figure-15 (FSD Group ITC, 2004).

Looking at the classified image, the area under TROF (tree crops) was found to be increasing from 1995 to 2003 in Pande. For Kerege, TROF area is found to be decreased from 1995 to 2003 (Figure-15). The land use change could not be derived for Buma as it is off the image scene in the 2003 SPOT image. The increase in area under tree crops does not say anything about their yield. The increase or decrease in TROF area doesn't match with the increase or decrease in overall income. Although there has been an increase in TROF area, the percentage contribution of TROF in the total income was found to be declining. The obvious reason for this discrepancy are, unreliable climatic condition (drought in year 2000 and 2003) and general decline for cashew, mango and coconut giving less income to the village (verbal communication, Pande village). However, these reasons are not enough to explain exactly why the income has gone down from 1995 and needs further study.
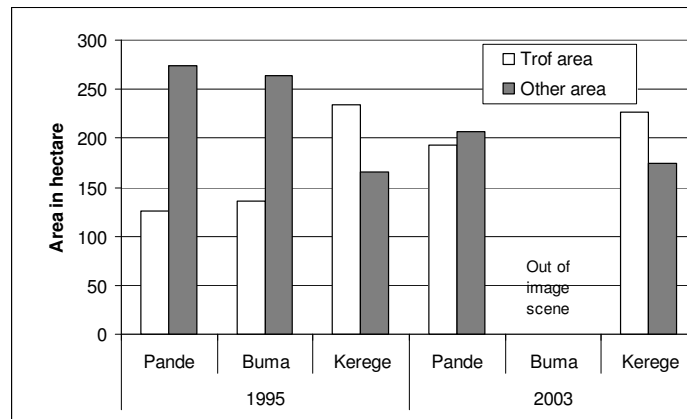
Figure 15: Land use comparison based on supervised classification of TM 95 and Spot 2003 image (Pande, Buma and Kerege village). (FSD Group ITC, 2004)

4.4.   Dependency trend in agriculture

There are reasonable grounds to explain that agricultural production has declined and thereby, its percentage contribution in total income. Among them are the existence of traditional ways of farming, unreliable climatic condition, crop damage by wild animals (especially monkeys) and apathy in practicing agriculture among the younger generation (verbal communication, Pande, Buma and Kerege village, 2004). The general yield data for Bagamoyo district supports the fact that agricultural products have diminished over the years (See figure-13).

Generally, crop yields are higher for the year 2002 as compared to 2003. This may be ascribed to the good rainfall figures recorded for 2002 as compared to figures recorded during the year 2003. The total average monthly rainfall as observed at Bagamoyo Agriculture Extension Office is 133.03 mm for the year 2000 and 90.85 mm for the year 2003 (See figure-14) (SA Group ITC, 2004).
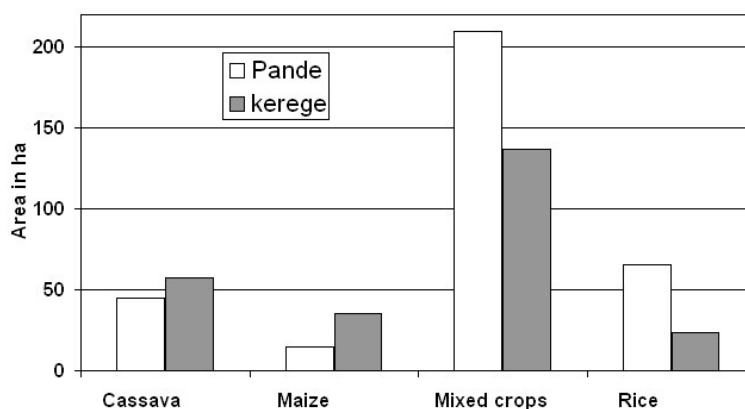
Figure 16 : Agriculture land use comparison, Pande and Kerege village (SA Group ITC, 2004)

Comparing the three villages together, Buma was found to be dependent on field crops most for its income then followed by Kerege and Pande. But the agriculture land use map prepared by the SA group reveals that the agricultural land use area in Pande is higher than in Kerege. From this it can be inferred that in Pande the field crops grown is mostly for subsistence use. Since the classification was done in the SPOT 2003 image, the land use for Buma is not available (Buma is out of the image scene in SPOT 2003). But why Buma and Kerege have more people doing agriculture than Pande village is largely unexplained from available data set. Figure 16 presents comparative agriculture land use in two villages.

4.5.   Dependency trend in TROF (tree crops)

In all three different years, the contribution of income from TROF is above 30% but the trend is declining for Pande while it is almost the same for Buma and Kerege. In 1995 it contributed 39%, in 2000, 34 % and in 2003 only 31 % for Pande (figure-6A, 6B, 6C). The general reason for this decline according to villagers is the decline in prices for cashew, mango, coconut and citrus and also because only one market is available for those products (Dar-es-Salaam). The reason why the prices fell and production went down is not explainable from the available set of data. There is need for further study to explore it.

The species composition in Pande village shows coconut to be dominant (62%) followed by cashew (17%), mango (12%) and others (9%) (table-4). But the contribution to income as such is the highest from mango, then from coconut and then from cashew nut.

Table 4: Species composition of TROF in Pande, Buma and Kerege: (FSD Group ITC, 2004)

Species	Species Composition in %		
	Pande	**Buma**	**Kerege**
1 Cashew	17	36	30
2. Coconut	62	17	26
3. Mango	12	2	19
4. Others	9	46	25
Total	**100**	**100**	**100**

In Buma, cashew is the dominant species (37%) followed by coconut (17%); mango occurring very few (only 1%) and others being non tree crop species. (table-4). Accordingly, cashew was the highest income giving species among the tree crops followed by mango and then coconut. Although mango is

few in composition it gave a good contribution to the total income in Buma. Kerege shows the same pattern of species composition as Buma, the cashew nut being in highest abundance (30%) followed by coconut (26%), mango (19%) and others (25%) (table-2). Looked into diameter distribution, 50% of cashew were found to be in higher diameter class (greater than 50 cm) meaning that half of cashew in the area is rather old and therefore possibly less productive. Around 4% of cashew are in the growing phase (less than 10 cm in diameter).

4.6.   Dependency trend on TRIF (tree resources inside the forest)

Dependency on tree resources inside forest (charcoal making and timber extraction) is mainly confined to Buma village and then only a bit in Kerege village. No dependency on TRIF is found in Pande village. Its trend in Buma was fluctuating with most income coming from it in 1995, decreased in 2000 and slightly increased again in 2003. For Kerege income from TRIF was the highest in 2000 but declined again in 2003. The license requirement from the government for charcoal burning might have caused this fluctuation. However, the exact reason for fluctuation in dependency from TRIF is not explainable from available sets of data.

4.7.   Dependency trend in fishing

Fishing is only confined to Pande village except for one household in Kerege. It is important to note that only part of (32%) of the households are earning income from fishing but contribution of fishing alone to the total income in the village is 17 to 21% The reason why fishing contributed high in households' income in 2000 could be explained in terms of the severe drought in that year, people having few options but to depend on the marine resources. Its contribution to total income in 2003 has declined. The possible reason why this happened could be a decline in fish catch. The people were pointing out the problem of a low fish catch and conflict between large fishermen and small fishermen. However, the exact reason of fluctuating income trend from fishing could not be ascertained from available data and needs to be studied further.

4.8.   Dependency trend on trading and wage labour

In recent years, the contribution from petty trading and waged labour has been found to increase for all three villages. This is an indication of people's shift to cope with changing socio-economic environment. With the income from natural resources going down, people have adopted an alternative strategy for their income in the form of petty trading and waged labour. Petty trading includes very small business like fish frying and selling, cassava frying and selling, tea stalls, grocery shops, etc. The reason why people are shifting towards petty trading and wage labour could not be well established from the available set of data. All households having petty trade as their income sources were found to be located around the main road in the villages. According to the villagers, petty trading is a profitable income source nowadays. Further study is required to ascertain the exact reason behind people's tendency to follow petty trade. As regards wage labour, its trend is declining in Kerege though its contribution in total income is large. The reason people gave for this decline was the completion of construction of the highway in 2000, in addition to drought in the year 2000 and 2003 giving few production and few opportunity for wage labour. For Buma wage labour is not a common income source. For Pande the number of people doing wage labour has grown over past years.

5.   CONCLUSION AND RECOMMENDATION

5.1.   Conclusion

The study is an attempt to make use of multidisciplinary data to understand the existing socio-economic and environmental situation, especially the livelihood dependency of different villages and their link with the spatial differences. It presents results and discussion of one aspect of livelihood, people's dependency for their income, with special focus on spatial pattern that could be observed. The study has obtained insight into the change in use of natural resources by three villages and has helped to learn the spatial differences in natural resource use between those villages.

The three villages are very similar in terms of the types of income sources except for the degree of dependency on them and some spatial differences such as differences in proximity to the ocean and forest reserves. The income dependency revolves around tree crops, petty trade, field crops (rice, cassava and sweet potato), fruits (citrus, banana and pineapple) , TRIF, wage labour and others. All three villages are primarily dependent on tree crops (mango, cashew nut and coconut). Tree crops have been an integral part of livelihood of people from time immemorial in the study area. Cashew nut is dominant among the TROF in Kerege and Buma while coconut is dominant in Pande. Pande village is unique from other villages in the sense that fishing is its most important income source. Buma differs in its high dependency on tree resources outside forests (TRIF) in the form of timber extraction and charcoal making while Kerege is mostly dependent on wage labour.

Both Pande and Buma village show a declining income trend and Kerege shows a fluctuating income trend. Kerege enjoys the benefit of the Bagamoyo-to- Dar-es-Salaam highway thereby having easy access to the Dar-es-Salaam market and getting a competitive price for its products from middlemen. Pande and Buma are too far to get these benefits. In summary, the declining income pattern in the villages could be attributed to the unreliable climatic condition (drought in the year 2000 and 2003) and general decline of product prices and/or poor market condition. However, these reasons are not enough to explain exactly why the income has gone down from 1995 and further study is needed.

The market for products such as mango and cashew nuts has not been the same since 1995. But generally the year 1995 was the best year in terms of production of cashew nuts and coconut due to the favourable weather conditions and good market. The yield data for 2002 and 2003 for Bagamoyo district in general, showed that the agricultural yields were declining. Looking at the classified image, the area under TROF were found to have increasing from 1995 to 2003 in Pande. For Kerege, TROF area was found to have decreased from 1995 to 2003. The land use change could not be derived for Buma as it is off the image scene in 2003 spot image.

Fluctuations in people's dependency for their income was found in all three villages. No new income sources have emerged since 1995; but their frequency of occurrence among households has increased. Petty trade and wage labour are recently growing as income sources. Construction of the Bagamoyo to

Dar-es-Salaam highway has had an important influence on people's economy, those nearby it having more options and opportunity for their income than those, which are far away. Drought in the year 2000 and 2003 had a profound effect on people's economy and livelihoods, which can be reflected in terms of people's high dependency for those years in natural resources than in other years and their shift towards petty trade and wage labour. In recent years, the contribution from petty trading and waged labour has been found to be increasing for all three villages. This is an indication of people's shift to cope with changing socio-economic environment. With the income from natural resources going down, people found an alternative strategy for their income in the form of petty trading and waged labour. The increase in average number of income sources is attributed to the increase in frequency of trade in the village. The fluctuation in average number of income sources is largely attributed to local market condition (price and availability of market) and unreliable climatic condition.

Looking at the spatial pattern, people in and around the centre of village and near the road were found to have trade and wage labour as their income sources. The same cluster of households was also found to be more sensitive to fluctuation in their dependency. Another observation made is that households do not necessarily earn income from tree crops even though they are located in abundant TROF surroundings (South of highway in Kerege). The spatial pattern of households within a village in terms of their income sources and dependency was difficult to draw due to their clustered location. However, the spatial pattern between the villages was better understood. The number of income sources was also found to be independent to the family size.

The findings of this study can be a way forward in adopting the sustainable livelihood approach to improve the identification, appraisal, implementation and evaluation of development programmes in the area, so that they better address the priorities of poor people, both directly and at policy level. As the scarcity of resources in general is a problem for the district, knowledge of spatial differences between villages can enable the district authorities to allocate their resources more efficiently, i.e. where needed the most.

5.2. Recommendation

5.2.1. Usefulness of the study

- The study has given an insight into the dependency of people on income sources and their spatial pattern in the three different villages. The information coming out of this study can be useful to the district authority to plan and manage natural resources in the area and hence it is recommended that this study be used by district authorities.
- The results of remote sensing analysis should be carefully used for socio-economic inferences. What we see in remotely sensed imagery may not coincide with people's socio-economy in reality. For example, TROF can be seen abundantly in Kerege but no people found to be dependent on them for their income especially to the south of the highway.

5.2.2. Further study

Because the complete multi-disciplinary information of the study area was not available in one hand and whatever information was available, they could not be analyzed in detail due to time factor on the other hand, the main recommendation for further study in the area are:

- to ascertain exact reasons for fluctuation in people's dependency over the years, as the information available at present is not adequate,

- to study the differences in natural resources dependency over the years between villages and statistically test them. A complete analysis of livelihood sustainability could be carried in the area by assessing livelihood assets, people's resilience against shocks, trends and seasonality and, policy and institutional environment in the area,

- to study in more detail the influence that the highway construction had on the local people. For instance, Kerege being near to main highway, was found to have better opportunity in terms of market prices and diversification of income sources.

- to study about market condition in more detail with the spatial dimension in view, since the poor market condition had been reported as on of the main problem in the area.

- The Professional Master fieldwork should be more directed towards mutual collaboration so as to provide a complete set of information about natural resources use and management for the area in which the study is carried out.

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ANNEXES

ANNEX 1: HOUSEHOLD DATA COLLECTION FORM (MATRICES)

Date: HH ID   Recorder:

Village: X:
Hamlet: Y:

Matrix 1: Age group

Age group	M	F
<16		
17-40		
41-60		
>60		
Total		

Matrix 2: Household Income

Income	'03	'00	'95
Total			

Matrix 3: Household Expenditure

Expenditure categories	'03	'00	'95
Total			
Food Clothes Water			
Education			
Health			
Transport + Social			
Agricultural inputs			
Energy/fuel			
Other (specify)			
Savings			

Matrix 4: Household Energy Consumption

Energy use	'03	'00	'95	Unit
Charcoal				
Fuelwood				
Kerosene				

Living in village since:
Migrated from where:
Reason for migrating:
When started economic activity:
Economic Activities of HH members

Other comments:

ANNEX 2: AN EXAMPLE OF ANALYSIS OF INCOME DEPENDENCY AND SHIFT IN NUMBER OF INCOME SOURCES

HH ID	Types and Numbers of income Sources			Change from 1995	Contribution in total income			
	2003	2000	1995		0-10%	10-20%	20-30%	30-40%
1	Sp,Ri,Ca,Pt,O **5**	Sp,Ri,Ca,Pt,O **5**	Sp,Ri,Ca,Pt,O **5**	No		Sp,Ri,Ca,Pt	O	
2	M,Pt,Sh,Co,Ch **5**	M,Pt,Sh,Co,Ch **5**	M,Pt,Sh,Co,Ch **5**	No		M,Pt	Sh,Co	Ch
3	M,W,F,Pt **4**	M,F,Pt **3**	Ch, M,W,F,Pt **5**	Yes	M		F,W	Pt
4	M,Ri,Ch,Pt **4**	M,Ri,Ch,Pt **4**	M,Ri,Ch,Pt **4**	No	M	Ri		Ch, Pt
5	Ri,Sp,V,Ca,Co,M,Pt **7**	Ri,Sp,V,Ca,Co,M,Pt **7**	Ri,Sp,V,Ca,Co,M,Pt **7**	No	Ri	Ca,Co,Sp,V	M,Pt	
6	W **1**	W **1**	W,O **2**	Yes				W
7	Co,F **2**	Co,F **2**	Co,F **2**	No			Co	F
8	F **1**	Co,Ch,F **3**	Co,Ca,M,F,Ch **5**	Yes				F
9	Co,Sh,V,Sp,W,Pt **6**	Pt,Sh,Co,V,Sp,W **6**	Co,V,Sp,Pt, **4**	Yes	Co,Sh	V	Sp,W,Pt	
10	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11	O,Ri,Co,Ch,M,F **6**	O,Co,Ch,M,F **5**	M,F,Ch,O,Ri,Co **6**	Yes	O,Ri,Co	Ch		M,F
12	Pt,O **2**	Pt,Ri **2**		No				Pt, O
13	Pt,O **2**	O **1**	O **1**	Yes		Pt		O
14	M,O,T,F,Pt **5**	M,O,T,F,Pt **5**		No		M,O,T	F	Pt
15	Co,M,Pt,Cl **4**	Co,M,Pt,Cl **4**		No			Co,M,Pt	Cl
16	Co,Ch,F,M,W **5**	F **1**	Co,Ch,M,W,F **5**	Yes		Ch,Co	M,F	W
17	M,O **2**	O, M **2**	M **1**	Yes			M	O
18	Ci,M,Pt **3**	Ci,P,M **3**	Ci,P,M **3**	No				Ci,M, Pt
19	Ch,Ci,Pt,M,Co **5**	Ci, M,Ch,Co,Pt **5**	Ci,Pt,M,Co,Ch **5**	No		Ch,Ci	Pt,M	Co
20	M,Co,F **3**	Co,F **3**	M,Co,F **3**	Yes		M	Co	F
21	Ch,M,Co,W **4**	Ch,M,W,Co **4**	Ch,M,W,Co **4**	No		Ch	M	Co, W
22	Ch,M,O,Co **4**	O,M,Co **3**	Ch,O,M,Co **4**	Yes	Ch		M,O	Co
23	O, Pt **2**	O,Pt **2**	O,Pt **2**	No				Pt,O
24	M, Ci,Co,Pt **4**	Ci,Co,M **3**		Yes		M	Ci	Co,Pt
25	M,F,Pt **3**	F **1**	F **1**	Yes		M		Pt,F

ANNEX 3: LIST OF PERSON INTERVIEWED

S.N.	Name of the Person Interviewed		
	Pande	**Buma**	**Kerege**
1	Mrs. Juma Mohamed	Mr. Kostasia Maro	NA
2	Mrs. Nkondo Munegelo	Mrs. Fatuma Juma	Mrs Rakiya Mohammad
3	Mrs. Amosi shija	NA	Mrs Ramadani Sabani
4	Mrs. Shabani Mohamed	Mr. Mwanahamise	Mr Mohammad Ratif
5	Mr. Ponda Mkiwa	Mr. Ubaya abdallah	NA
6	Mr. Maisha Hamisi	Mr. Mohamedi Mazingara	Mr. Davydy Tazi
7	Mr. Shaweji Nassoro	Mrs. Muanaheri Saidi	Mrs. Amina Mohamedi
8	Mr. Ushindani Rajabu	Mr. Idrisa Rwadlani	Mr. Saidi Pila
9	Mr. Marium Said	Mrs Issa Maarifa	Mrs. Dokas Paul
10	Mrs. Asha Juma	Mr. Ayubu Maarifa	Mrs. Naomi Williami
11	Mr. Sultan Waziri	Mr. Ali Mohamedi	Mrs. Levina Mlangila
12	Mrs. Mashaka Thomas	Mr. Abasi Sabani	Mrs. Khadia Kazewbe
13	Mrs. Tabiya Hussen	Mr. Dogo Saidi	Mrs. Biata O Berta
14	Mr. Mwanamvua Issa	Mr. Kaeyayo Yousif	Mrs. Hadiya Saidi
15	Mr. Sefu Athuman	Mr Mkukola	Mr. Ahmed Ali
16	Mr. Mutumwa Mohamed	Mr Maksood Ramadani	Mrs. Salima Merishu
17	Mr. Rajabu Mohamed	Mrs Gharib Muhassin	Mr. Daudi Lazima
18	Mr. Lilian Mvungi	Mr. Mukhssin Ali	Mr. Desderiya Damiyan
19	Mr. Kondo Juma	Mr. Edi Yousif	Mr. Mwanaidi Ari
20	Mr. Japo Kondo	Mrs. Bakari Kajyab	Mr. Rasidi Jeuri
21	Mrs. Halidi Hamisi	Mr. Tatu Dahani	Mr. Samuel Maguguta
22	Mr. Kasimu abdala	Mrs. Iddi Sabani	Mr. Tatu Rasid
23	Mrs. Khadija Mwinyi	Mr. Mohammedi Ibrahim	Mr. Vincet Gabrier
24	Mr. Ally Maneno	Mrs. Ramadani	Mr. Ehko Ngomeke
25	Mr. Mohamed Kingwande	Mrs. Fatuma	Mrs. Elika Musihiri