Sokoine University of Agriculture

BACAS
BUREAU FOR AGRICULTURAL CONSULTANCY AND ADVISORY SERVICE

FINAL REPORT

ON

COFFEE BASELINE REPORT

FOR

TaCRI
TANZANIA COFFEE RESEARCH INSTITUTE

August 2005

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List of Abbreviations

AKSCG	Association of Kilimanjaro Specialty Coffee Growers
BACAS	Bureau of Agricultural Consultancy and Advisory Service
CAN	Calcium Ammonium Nitrate
CBD	Coffee Berry Disease
CLR	Coffee Leaf Rust
DfID	Department of Foreign Development
DCSMS	District Coffee Subject Matter Specialist.
EU	European Union
FAO	Food and Agriculture Organisation
GoT	Government of Tanzania
ICO	International Coffee Organisation
KCB	Kilimanjaro Commercial Bank
KNCU	Kilimanjaro Native Cooperative Union
KNPA	Kilimanjaro Native Planting Association
MAFS	Ministry of Agriculture and Food Security
NCVIS	National Coffee Voucher Input Scheme
NGO	Non Government Organisation
PCB	Private Coffee Buyer
PCS	Primary Cooperative Society
R4D	Research for Development
SA	Sulphate of Ammonium
SAP	Strategic Action Plan
TaCRI	Tanzania Coffee Research Institute
TCA	Tanzania Coffee Association
TCB	Tanzania Coffee Board
TCGA	Tanzania Coffee Growers Association
TPRI	Tropical Pesticide Research Institute
TSP	Triple Super Phosphate
WB	World Bank
Y/ha	Yield per Area

Executive summary

Introduction

1. Recent macro-economic literature indicates that coffee is Tanzania's largest export crop. It contributes some $115 million to the country's export earnings per year. It also provides income to some 400,000 smallholders who produce 95% of the coffee on average plot sizes of 1-2 ha. Estates grow the remaining five percent.

2. The Tanzania Coffee Research Institute Limited (TaCRI), legally constituted in 2000 under the Companies Ordinance Cap 212 (Certificate of Incorporation No. 39799), became operational in September 2001. TaCRI is responsible for coffee research and technology transfer to support the rejuvenation of coffee the industry in Tanzania.

3. The incorporation of TaCRI and the development of the SAP represented a break from past approaches, placing a new emphasis on the role of stakeholder-led, demand-driven "RESEARCH FOR DEVELOPMENT" (R_4D)

4. Achievements and milestones to-date are impressive. The official pre-release of new improved Arabica varieties with good beverage quality and resistance to Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR) and strategies for the management of Fusarium wilt in Robusta coffee are among the key achievements during this short period.

5. The big challenge now is the accelerated dissemination of these technologies to coffee growers to increase productivity and quality, reduce costs of production, and improve incomes and the livelihoods of the more than 400,000 coffee growers and their families

The problem

6. Little is known about the contribution that coffee makes to the well-being of these families, and the social and economic factors that contribute to the sustainability and success of their contrasting agricultural and livelihood systems. If research and extension efforts are to be effective, the constraints to productivity and profitability need to be identified and evaluated, and appropriate interventions proposed, prioritized and evaluated. The above-mentioned problem led commissioning this consultancy work. This report is one of the outputs.

Objectives

7. The objective of this consultancy undertaken by Bureau of Agricultural Consultancy and Advisory Services (BACAS), was to establish database that will form the benchmarks for TaCRI impact assessment. Specifically BACAS, using comprehensive data collected during 2003/04 GoT/EU/World Bank Coffee Sector Study, was charged to undertake the following: Data cleaning, data analysis, data interpretation, which should lead to a comprehensive report which will comprise of the following details; a) the role that coffee plays in the livelihoods of farming families, b) major constraints to coffee productivity and profitability e.g. farm size, and marketing, and c) financially viable solutions to improve the livelihoods of coffee farmers suggesting researchable constraints. Others include d) recommend research & technology transfer and training priorities for TaCRI, and f) Establish baseline data for TaCRI impact assessment.

Methodology

8. This report which focused on coffee sector was built on previous research carried out by the Government of Tanzania (GoT) and the World Bank (see GoT/EU/World bank, 2003, 2004). In this respect, the methodology used in collecting information comprises; a*) Institutional Mapping of Coffee Industry (2003).* Qualitative data were collected from about 35 focus groups and nearly 80 in-depth key informant interviews from September to October 2003, with the objective of uncovering interests and incentives of various relevant actors to the sector and to develop an incentive consistent story of relevant institutions, their nature of influence on production and marketing, reasons for husbandry

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practices, processing, quality, prices received, industry development. b) *Household Survey of* nearly 1,606 coffee growers (from 107 villages) carried out from December 2003 to January 2004. Coffee growers were sampled from the three growing zones: North including both high and low elevations, South and the West, covering both Arabica and Robusta growing areas, and c) *review of Coffee Auction Data.* Auction data used for this report covered information on coffee sold at the Moshi Auction from 1992 to 98 and the years 1999-2000, 2002-2003, and 2003-2004.

9. Different methods of data analysis have been employed in this study depending on type of data and the methods of collection. Main analytical methods used include, descriptive statistics, comprising means, frequencies and cross tabulation. Where statistical validation was required, econometric analysis such as regression has been employed.

The Contribution of Coffee to the Livelihoods of Farmers in Coffee Growing Areas

10. The analysis of the contribution of coffee to livelihoods was based on the sustainable livelihood approach outlined in DFID's *Sustainable Livelihoods Guidance Sheets.* A livelihood comprises the capabilities, assets and activities required for a means of living. The findings presented here-under explores the following: (i) ownership and access to assets in the different coffee growing zones, (ii) use of the assets in productive activities including coffee production, processing and marketing, (iii) contribution of coffee in acquiring and improving access to the different assets.

11. Land is the most important natural resource for farming. For the sample as a whole, most (>50%) of the sample households owned between 0.5 and 2 hectares. Almost 2% of households owned no land at all and a further 5.5% owned holdings of less than 0.5 hectare. Households owning more than 5 hectares accounted for 10% of the whole sample. Variations in the proportions of households owning different land sizes across zones reflect the relative severity of land scarcity in different zones. For example almost 70% of the sample households in the north-high elevation zone owned less than 2 hectares and only 32% of the households in the southern zone owned less than 2 hectares of land, implying that land is scarcer in the north-high elevation zone.

12. The patterns of livestock holding found in the four coffee growing zones was variable. Chicken ownership was more widespread than the other livestock types. There are sharp distinctions of other stock ownership between West coffee growing zone and the two-north coffee growing zones. For example, while 72% of the respondents in west zone had no cattle, only about 16% of the respondents in the north-low elevation zone had no cattle. Average livestock herd/flock sizes were generally small.

13. Labour available for livelihood activities depends on the household size and age structure. The average household size for the sample as whole was 6 persons with a maximum of 10 persons and a minimum of one person. The south coffee zone had the largest household size while North-High elevation zone had the smallest average household size. The average number of active adults aged between 18 to 60 years for the sample as whole was 2, which was about 33% of the average household size. Household labour was the main type of labour used to perform farm activities including different coffee production activities. However, some households used hired labour and/or rotational work groups to supplement household labour during peak periods. For coffee production, hired labour and work groups were used in weeding, pruning, mulching, fertilizer/manure application, pesticide application, picking coffee berries and pulping.

14. Analysis of education level of the household head suggest that most (71%) of the respondents had attained primary school education. However, there was variation in the literacy level among the zones with the south coffee zone having the highest proportion of respondents without formal education i.e. 20% compared to 15% in other zones.

15. Distribution of consumer goods, and means of production and transport are often useful indicators of relative prosperity and ability to make a leaving. For consumer goods, ownership of a radio was widespread across all coffee zones. Approximately 4% of the sample households had television sets but most of these were in the two coffee growing zones in northern Tanzania. Bicycle ownership was widespread across the four coffee zones while fewer households owned other means of transport.

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Almost every sample household owned simple means of production like the hand hoe while fewer households owned tractors and ploughs.

16. The proportion of sample households owning tools for coffee production and processing such as pruning shears, spraying pump, coffee pulp and drying wires varied among the coffee zones. Less than 5% of the households in the western zone owned coffee pulp and spray pump while more than 40% of the households in the other three coffee growing zones owned these equipment. For the sample as a whole, pruning shears and coffee drying wires are owned by more than 50% of the sample households while the other coffee equipment/tools were owned by less than 50% of the sample households

17. The majority (91%) of the sample households cited farming as the main livelihood activity. Other livelihood activities indicated were wage employment, business, fishing, sale of forest products and sale of labour.

18. The main crops gown in the different coffee growing zones were coffee, bananas, maize and beans. Coffee is normally intercropped with bananas in North and West coffee growing zones. For the sample as a whole, more than 50% of the land was planted with perennial crops. In the north-high elevation zone, the average land planted with perennial crops was higher than the average total land owned, suggesting that some of the land was rented in. However, less than 30% of the land under perennial crops in this zone was planted with coffee compared with more than 90% of the land under perennial crops planted with coffee in the other coffee growing zones.

19. Overall, across the coffee growing zones, only 11% of farm incomes were derived from coffee. The contribution of coffee to the total farm income varied among the four coffee growing zones. Coffee appears to have the largest contribution to farm income in the southern zone where its contribution was almost four times the contribution in the other three coffee growing zones. Among the crops grown in these zones, the largest contribution to farm income was from bananas whose contribution was highest in the western zone. Livestock appears to be important across all coffee growing zones but a more important contributor to farm incomes in the north coffee growing zones (high and low elevation) than the remaining zones. In this zone, livestock contributed more than 45% of the estimated cash income.

20. Overall, most (32%) respondents indicated spending coffee income on purchase of food and consumables. Apart from using coffee income to purchase food and other consumer goods, the income was used to purchase the following: inputs for coffee such as pesticides and manure (22%), farm implements (3%), livestock (2%), paying school fees (19%), medication (5%) and house construction (7%). Other uses of coffee income including marriage ceremony expenses, entertainment and saving were mentioned by 8% of the respondents as a whole.

Coffee production trend

21. Tanzania's production of coffee is currently about 48,000 tons, or about 0.7 percent of the world's output of 7.02 million tons per year. For the past 15 years or so coffee production in Tanzania showed varying trends. Coffee production moderately declined from the early 1990s to 1998 after which it gradually increased until 2003. Coffee area expanded significantly during the 1970s and 1980s when prices were more favorable but declined thereafter. From 1980/81 to 1998/99 coffee sales (equivalent to total output) declined from 61,514 tons to 47,050 tons.

22. Tanzanian coffee yields relative to the rest of the world have gradually declined in the 1990s and early 2000s. With this trend, expanding the country's market share will require improvements both in productivity and quality. Mean yield for the sample was 500 kg/ha. Highest (798 kg/ha) was recorded at South and lowest (281 kg/ha) at North high.

23. Evidence from several studies in coffee growing areas in Tanzania associate low production/ productivity with reasons such as; farms have few and old trees, and growers practice poor husbandry, high intensity of intercropping particularly with banana (in the North and West) which increases the risks for diseases, and lack inputs or insufficiently use of inputs such as fertilizers and chemicals and weather related problems.

24. Analysis of collected data on number of trees per hectare varied between zones with overall average of 1015 trees per hectare. The Southern zone recorded highest number of trees of about 1992 trees per

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hectare compared to 873, 886 and 389 trees per hectare at North high elevation, North low elevation and West respectively. Also, rate of planting new trees is low. Analysis showed that except in the Southern coffee growing zone where about 198 plants have been planted by 354 respondents during the last 5 years, in all other zones less than 100 trees have been planted. Results show that on average coffee trees were about 30 years old. Oldest trees were found in North (high elevation) and West coffee growing zones with average of 40 and 30 years respectively. Youngest trees (average of 22 years) were recorded in the Southern coffee-growing zone.

25. Regression analysis on factors influencing profitability in coffee (revenue from coffee sale minus costs) showed age of household head (AgHH), education level of the household head (EdHH), size of land owned (LAND), use of organic fertilizer (OFERT), and amount of coffee sold (CKG) to be significant in explaining variation in coffee profitability at $\alpha=0.1$ and above.

Input supply and usage

26. During the 1970s and 1980s, chemical inputs were subsidized and supplied to growers through the cooperative system. The first reduction in input use became visible in 1992, when chemicals were supplied at market prices. After 1994, only a quarter of growers purchased inputs, primarily due to lack of credit. With the abolition of the monopsony power of the cooperative unions, credit became available only to few creditworthy, usually large farmers.

27. Analysis of collected data revealed that only 16% of the respondents used chemical fertilizer in 2002/2003 growing season. There was a huge variation across the study zones with highest (40%) in the South and lowest (2%) in west coffee growing zone. Calcium Ammonium Nitrate (CAN) and UREA were mostly used of which more than 90% and 50% of the users were respectively from the Southern coffee growing zone.

28. With respect to pesticides, the study noted that a number of agro-chemicals were sold per growing season. About 40% of the growers reported using different type of agro-chemicals. Highest proportion (>50%) of the growers using agro-chemicals was reported in North low and South coffee growing zones. In the West, use of agro-chemicals is almost not existing since only 0.7% of the respondents reported to have used in 2002/03 season

29. Private stockiests jewed to about 64% of the growers followed by cooperative union 21%. Analysis across the zones showed that private stockiests and cooperative unions were dominant in supplying inputs in North (both low and high) whereby private coffee buyers dominate southern zone as suppliers of inputs. Blue copper followed by Dusban was purchased by majority of the respondents.

30. Lack of affordability of inputs at market price has remained the inhibiting factor hindering input use by growers.

31. In order to increase farmers' input use, representatives of Ministry of Agriculture and Food Security (MAFS), Tanzania Coffee Board (TCB), Tanzania Coffee Association (TCA), Tanzania Coffee Growers Association (TCGA) established the National Coffee Voucher Input Scheme (NCVIS) in 1997. However, vouchers in the form of forced saving scheme for the next season have not been universally proformed by all farmers. The study revealed allegations of side dealing of vouchers, complaints about unavailability of adequate inputs at stockiest shops or sale of expired or inefficient inputs.

Extension service

32. Before the recent changes, coffee sector used to maintain own extension officers on the recognition that the extension service plays a hey role in the coffee sector. The officers were specifically for coffee farmers. However, in the recent past, the sector has been using extension agents who have general knowledge in agriculture. During the institutional mapping, it was established that in some divisions/wards, extension officers who were trained as livestock officers have been offering coffee related extension services. With respect to source of information about coffee husbandry and related, government extension officers account for 50%. Other sources include; radio (27%), market places (15%), primary cooperative societies (6%), relatives and friends (3) and TCB officials (2%).

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33. Evidence from the analysis of the farmers' perception about extension service offered for coffee production, suggests that 79% of the coffee farmers were satisfied with extension services offered by the government. Analysis across the zones show that growers from Western coffee growing zone were largely dissatisfied with the extension services compared to the other zones because they reputed that the quality of service is poor. Service of District coffee subject matter specialists is too inadequate to leave appreciable mark on the study.

Coffee marketing

34. Prior to reform, production and marketing were integrated into a single marketing channel within the cooperative system and the crop boards. Producers delivered coffee to primary societies, where they received an initial payment based on announced price of ungraded coffee. Coffee was then sent to central pulperies for primary processing, where parchment coffee was then graded. The cooperative unions collected coffee from primary societies, cured it at their own curing factories, and brought coffee to auction in Moshi, held by the Tanzania Coffee Marketing Board (TCMB). Growers received their final payment after all deductions had been done by the board, unions and the primary societies to recover incurred costs, often a year later.

35. With liberalization in the early 1990s, the system changed rapidly. In August 1993, the government passed a bill opening coffee marketing and production to the private sector, and further reducing government controls on pricing. The Coffee Board became responsible for coffee grading, issuing licenses and permits and operating coffee auctions. In 1994/95, private coffee buyers were invited to purchase coffee directly from growers.

36. Based on these changes, growers now have a choice of selling their produce through four marketing channels: Private Coffee Buyers (PCBs), Cooperative System, Farmer Groups, and Independent Primary Societies, that had split from the union system. Analysis of collected data show that about 60% of the farmers sold their produce to the Cooperative unions through Primary Cooperative Societies. Dependence on private buyers is highest in the Southern and Western coffee growing zones than in the northern zone

37. Evidence from the study revealed that some farmers still prefer to sell coffee through co-operative unions, because of the prospect of receiving a second payment. More than 80% of growers in the north indicated that they would like to sell through unions, compared to around 60% in south and west. In the south, where farmer groups and independent societies were numerous, only about 20% indicated that they would like to sell through unions. And in the west zone, little more than 20% preferred private coffee buyers. The prospect of receiving a second payment and price are strong factors in the choice of marketing channels.

38. The analysis of coffee marketing during 2002-03 shows that decisions that coffee producers made relating to which channel they sell to, the time of sale and location had significant influence on prices received. The analysis revealed that direct coffee sales to the auction by members of farmer groups yielded higher returns than any other marketing channel. As expected, the choices that producers make in marketing their outputs significantly affect their returns.

Primary processing and quality assurance

39. Coffee undergoes both primary and secondary processing before it is exported. Primary processing takes place at the grower's level. It involves handpicking of red cherries, pulping on same day of picking, washing, fermenting, drying and packaging. Prior to sale, farmers grade their coffee according to established grades. This should be done on the farm after pulping. Growers usually sell primary processed commodities except arabica coffee in the southern zone (in particular Mbinga) where, on an experimental basis, growers have been permitted to sell coffee berries to traders with pulping units. Although primary processes are simple in most cases, they have significant implications for quality.

40. Wet processing is common in the north and south coffee growing zones. On average 75% of coffee from these zones is wet processed. Dry processing account for 20% overall with highest proportion in Kagera and Southern coffee growing zone. More than 75% of all respondents interviewed in the

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Western coffee zone sold coffee as berries. Of the 50% of the respondents who did wet processing used their own pulping machines. The rest (40%) borrowed from neighbors and used common pulpier (6%) or hands (0.4%). Water is the most important ingredient in pulping and its quality has direct bearing on coffee quality. Analysis showed that except in the North zones, where more than 50% used tap water for pulping, elsewhere; ponds, rivers, springs, and canals were main sources of water for pulping. About 63% of the growers dried coffee on wire mesh placed above the ground. Highest proportion was reported in the North and South zones. It is important to note that there is substantial number of farmers, who dried coffee on the ground.

41. Analysis of Auction data revealed that on average, coffee quality based on class, has not changed significantly since the early 1990s. Examination of the class of mild arabica coffees produced in the north zone sold at the Moshi auction for four years before and four years after liberalization suggests that coffee quality in terms of class alone has not either deteriorated or improved.`

42. Quality profile of coffee brought to the auction by various institutions show that quality overall has not declined. PCBs, however, may be trading a greater share of lower quality coffees. However, in more recent years, coffee brought to the auction by private buyers has been of comparable quality to other institutions (according to data that also include coffee from the south). Estates produce higher quality coffee than other institutions, accounting for bulk of the highest quality coffee. Only about 3% of their coffee was of high quality in 1999, but went up to 32% in 2002 and came down to 23% in 2003. The unions did not supply highest quality coffee during these three years. Two percent of coffee marketed by private coffee buyers in 2002 fell into this category.

Emergence and role of independent organizations in production and marketing

43. Although liberalization has put considerable pressure on unions and cooperative societies, resulting into bankruptcy of many of them as they struggled to compete at market prices, new forms of producer organizations have emerged. They have begun to take advantage of opportunities available under liberalization, and to overcome some of the problems of product quality, marketing, and access to inputs and credit. These organizations include coffee farmer groups, primary cooperative societies that market coffee independently of their unions.

44. Independent organisations/groups bargain on behalf of members and seek higher returns by avoiding intermediaries in crop marketing and capture premiums for quality in the secondary processed product markets. The groups also gain access to credit, as they are able to exercise control over their members. Currently, only small proportions of the producers are members of such groups, but awareness of potential benefits from participation has resulted in widespread interest among producers. Private companies and NGOs have been instrumental in facilitating the emergence of coffee farmer organizations. Coffee farmer groups with growers registered as partnerships have commonly been established to market their coffee independently of co-operative unions.

45. About 60 farmer groups organized by TechnoServe have formed an Association of Kilimanjaro Specialty Coffee Growers (AKSCG). AKSCG helps its members access credit and bulk their coffee for marketing, akin to services provided by unions to their member primary cooperative societies. Also, there is evidence that some of the vertically integrated exporters are helping farmer groups in establishing central processing facilities to obtain high quality coffee. Farmer groups have been able to get higher returns on coffee, reflecting both premiums for quality and a reduction in intermediation.

Financially viable solutions to improve the livelihoods of coffee farmers and researchable options

46. On *production:* Improve yield through new trees, and high-yield and disease-resistant varieties, improved husbandry, agronomic management, intensified extension, access to credit including inputs, capital investment and farmer education on minimum size of farm in expansion areas. Given the above observation, it is also important to intensify efforts to develop specialty coffee (gourmet and organic) since we believe that one of the pillars of Tanzania's future coffee market is at the specialty coffee market, where coffee would get high premiums. This is a challenge to TaCRI which can be addressed through promotional activities, farmer training, support to farmer groups and research.

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47. *Extension:* while it is agreeable that extension officers are not adequate and cannot be recruited to cover all coffee producing villages in the near future, it is important to promote and strengthen farmer groups approach to give them "greater voice on matters affecting them", to be able to take advantage of economies of scale, quality and explore alternative marketing channels for better prices.

48. *Processing and quality:* Improve quality via training of farmers, extension, primary processing, access to, and proper application of inputs, introduce premium for quality coffee as incentive for farmers to better care for their coffee, and to cooperate with NGOs and private sector to establish and strengthen farmer groups to promote quality coffee.

49. *Marketing:,* Improve marketing to enhance competition, flow of information and income of farmers and promote domestic consumption – currently at 1.1% rendering sector dependent on export

50. Although reforms require the government role in major means of production in coffee sector, it has to be noted that the private sector has not yet developed enough to play an active role or act as the driver of the industry. Therefore, government interventions are justified, and necessary to the five constraints which are highlighted as challenge to the development of the industry. These are poor rural infrastructure, poor extension services, land tenure system, poor access to credit, and low budget for research. Government also need to strengthen TCB role as a regulator and encourage private sector, producer groups, professional groups and cooperatives to take a greater and active role in sector development.

51. Following researchable /training options are adviced on the part of TaCRI

   i. Research on coffee varieties, which are location specific with attributes, needed by farmers and consumers. Some of these attributes include; high yielding, drought resistant, fast growth, pest and disease resistant, and good cup taste.

   ii. Research on soil fertility status to identify most limiting nutrients in coffee production in all coffee growing zones.

   iii Research on appropriate group formation, dynamics and strengthening with respect to various social and economic settings.

   iv Research on various types of green manure (e.g. lablab, mucuna, dolichos etc.) which can be a cheap alternative for farmers to increase soil fertility in order to increase yield

   v. Research on appropriate intensity of intercropping that has effect on coffee production and productivity.

   vi. Since labour is the most limiting factor in coffee production, research on simple tools/equipment that can reduce drudgery in various stages of coffee production and harvesting is required

   vii. On-farm research and training on establishment and management of coffee nurseries at village level

   viii. Research on most cost effective production, processing and marketing methods thus to reduce cost and increase marketing margin to farmers

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1. Background information

1.1 Introduction

The Tanzania Coffee Research Institute Limited (TaCRI), legally constituted in 2000 under the Companies Ordinance Cap 212 (Certificate of Incorporation No. 39799), became operational in September 2001. TaCRI is responsible for coffee research and technology transfer to support the rejuvenation of coffee industry in Tanzania. Together with industry stakeholders, TaCRI has outlined a comprehensive Strategic Action Plan (SAP), which aims at the revitalization of coffee research through the establishment of a well managed, financially viable and internationally respected research institute, providing essential services to coffee growers.

The incorporation of TaCRI and the development of the SAP represented a break from past approaches, placing new emphasis on the role of stakeholder-led, demand-driven "RESEARCH FOR DEVELOPMENT" (R_4D). The SAP is a practical, action-oriented framework based on real needs and most important priorities for stakeholders. The SAP is also undertaking activities to rehabilitate and modernize the research facilities at TaCRI, to improve the organization and administration of research, improve scientific standards and reinforce the linkages between TaCRI, the farmers and industry stakeholders.

Achievements and milestones to-date are impressive. The official pre-release of new improved Arabica varieties with good beverage quality and resistance to Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR) and strategies for the management of Fusarium wilt in Robusta coffee are among the key achievements during this short period. The big challenge now is the accelerated dissemination of these technologies to coffee growers to increase productivity and quality, reduce costs of production, and improve incomes and the livelihoods of more than 400,000 coffee growers and their families. These families derive their livelihoods from coffee based farming activities in diverse geographic, ecological and socio-economic areas of Tanzania.

However, despite the role of coffee to these families, little is known about the contribution that coffee makes to the well-being of these families, and the social and economic factors that contribute to the sustainability and success of their contrasting agricultural and livelihood systems. It is envisaged that if research and extension efforts are to be effective, the constraints to productivity and profitability need to be identified and evaluated, and appropriate interventions proposed, prioritized and evaluated. The above-mentioned problem led to the commissioning of this consultancy work. This report is one of the outputs.

1.2 Organization of the Report

The report is organized as follows: subsequent to this introductory section, section two provides a brief review on the terms of reference as suggested by the client. Section three presents approaches used in collecting and analyzing collected data for extracting necessary information to answer the terms of reference suggested by the client. Section four presents results and discussion based on the findings of analyzed data. Finally, sections five and six present conclusions and recommendations respectively.

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2. Terms of reference

2.1 Objectives

The objective of this consultancy which was undertaken by Bureau of Agricultural Consultancy and Advisory Services (BACAS), was to establish database that will form the benchmark for TaCRI impact assessment. Specifically BACAS, using comprehensive data collected during 2003/04 GoT/EU/World Bank Coffee Sector Study, was charged to undertake the following:

- Undertake advanced data analysis and interpretation to describe and understand the diverse farming and livelihood systems in the coffee growing areas of Tanzania.

- Synthesize, simplify and interpret the data to identify and prioritize the current constraints to coffee productivity and profitability and propose solutions to identified constraints.

- Establish benchmarks for TaCRI impact assessment.

2.2 Tasks to be undertaken

- Data cleaning, data analysis, data interpretation, which should lead to a comprehensive report which will comprise of the following details:,

  o Give the role that coffee plays in the livelihoods of farming families
  o Determine major constraints to coffee productivity and profitability e.g. farm size, and marketing
  o Give financially viable solutions to improve the livelihoods of coffee farmers, suggesting researchable constraints.
  o Recommend research & technology transfer and training priorities for TaCRI.

- Establish baseline data for TaCRI impact assessment.

3. Methodology: Approach, Data Sources and Methods of Collection.

This report which has focused on coffee sector was built on previous research carried out by the Government of Tanzania (GoT) and the World Bank (see GoT/Eu/WB, 2004). In this respect, the methodology used in collecting information comprises those used during the mentioned studies.

3.1 Approach

The approach for this report involved mixed qualitative and quantitative methods. The study was carried out in a three-stage process as follows: The first stage involved designing the methodology for and piloting of institutional mapping in the coffee producing areas. The mapping was designed to identify key agents and stakeholders and to develop hypotheses for carrying out the household survey. The second stage involved conducting the household survey on coffee producing areas. And finally the third stage involved gathering information from a meeting with stakeholders to define reform options and ways to ensure their implementation with specific reference to the coffee sector.

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[1] Consultants: Dr. Joseph P. Hella (Agro/socio economist team Leader) Prof. Dr. Ntengua S. Mdoe (Policy analyst) and Mr. J. S. Lugole (Data analysts)

3.2   Data Sources

The report draws on both original data collection and analysis and a review of existing literature. Main data sources were:

- **Institutional mapping of coffee industry (2003).** Qualitative data were collected from about 35 focus groups and nearly 80 in-depth key informant interviews from September 2003 to October 2003, with the objective of uncovering interests and incentives of various relevant actors to the sector and to develop an incentive consistent story of relevant institutions, their nature of influence on production and marketing, reasons for husbandry practices, processing, quality, prices received, industry development, etc.   Samples for institutional mapping were drawn from representatives of the Board, Local governments, private buyers, exporters, processors, input supply agents, interest groups, NGOs, crop associations, primary societies, cooperative unions and farmer group associations.[2] Data were collected in north, south and west coffee zones.

- **Household survey of coffee growers.** In addition, report used data from a household survey of nearly 1,606 coffee growers (from 107 villages) carried out from December 2003 to January 2004. Coffee growers were sampled from the three growing zones (see Table 1 and Figure 1), namely: North including both high and low elevations, South and the West, covering both Arabica and Robusta growing areas. The information collected included production and marketing information for one year, socio-economic aspects of the households and their coffee related institutions. The three zones are characterized by differences in type of coffee grown, holding size and method of cropping.   The Northern zone was further split into zones at higher and lower elevations. At higher elevations, where disease incidence, and therefore, cost of production is higher, coffee has been neglected or uprooted to a far greater extent than in lower elevations. The distribution of the sample is as indicated in Table 1 below.

Table 1: Coffee growing zones and number of respondents interviewed

Zone	Regions	Area (ha)	Type of Coffee	Farm size	Alternative crops	Sample Interviewed
North (high)	Arusha/Kilimanjaro/ Manyara	45,000	Arabica – wet processed	Small	Intercropped	480
North (low)	Arusha/Kilimanjaro/ Manyara	45,000	Arabica – wet processed	Small	Intercropped	330
South	Mbeya/Ruvuma	80,000	Arabica – wet processed	Larger	Single stand	392
West	Kagera	75,000	Robusta – dry processed	Larger	Intercropped	404
TOTAL						1606

SOURCE: Calculated from GoT/EU/World bank study (2004)

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[2] Within crop-growing areas, districts were selected based on secondary spatial information obtained from the boards and included the following dimensions: (i) agro-climatic and bio-physical factors: suitability of soil and climatic conditions; yields, unique crop husbandry requirements; pest incidence; state of plantations; produce quality; (ii) socio-economic factors, i.e. land/asset holdings of growers; dependence on crop income; labor availability; gender relations; ethnic/cultural differences; employment opportunities; characteristics of local trading communities; (iii) infrastructure, that is, coverage and quality of roads; availability of public transport and communication; availability of public accommodation; density of buying posts; distance to processing facilities; and (iv) institutional factors such as level of taxation, licensing requirements and fees, decision-making processes and constraints within the institutional environment.

Target population for sampling was coffee growers rather than general pool of famers. The survey was used to benchmark yields and adoption of improved practices for assessing the impact of TaCRI. It was expected that for benchmarking, sampling from general population of coffee growers would be appropriate.
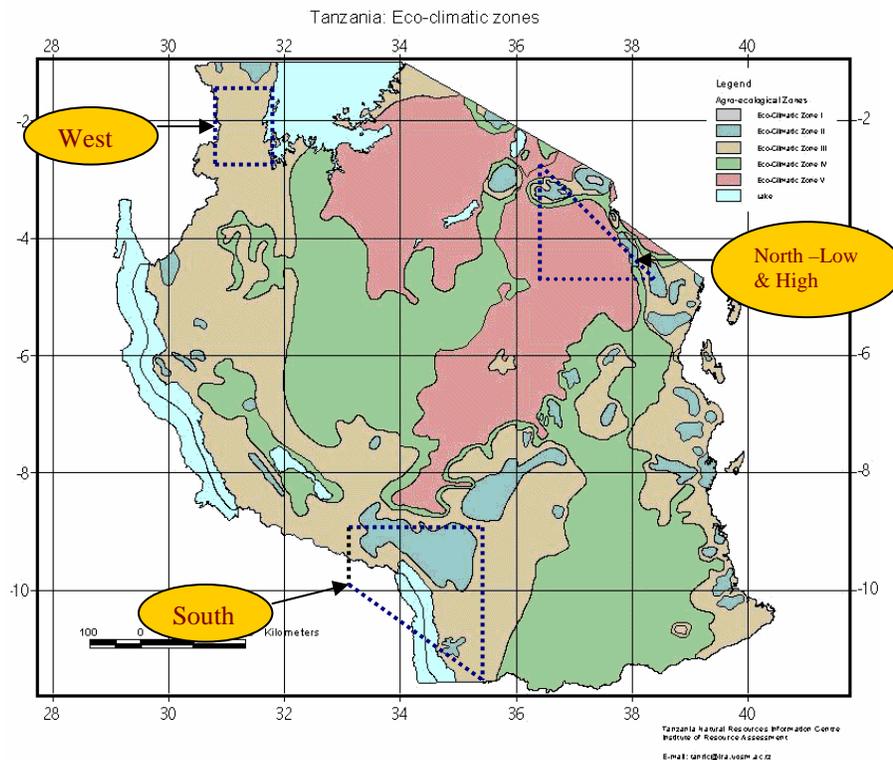
FIGURE 1: MAP OF TANZANIA SHOWING COFFEE SURVEY STUDY ZONES

- **Analysis of coffee auction data.** Auction data used for this report covered information on coffee sold at the Moshi Auction from 1992 to 1998 and the years 1999-2000, 2002-2003, and 2003-2004. The data for the first eight years include four years before and four years after liberalization, which permitted private buyers to buy primary processed coffee from growers. The analysis covers only mild arabicas for which classes are determined during liquoring, since the purpose was to examine the quality of coffee supplied to auction by different institutions. The information for the first eight years cover only northern coffee while the information for the three most recent years include both northern and southern coffees.

3.3 Data analysis

Different methods of data analysis have been employed in this study depending on type of data and the methods of collection. Main analytical methods used include, descriptive statistics comprising means, frequencies and cross tabulation. Where statistical validation was required, econometric analysis such as regression has been employed.

4. Main findings.

4.1 The Contribution of coffee to the livelihoods of farmers in coffee Growing Areas

The analysis of the contribution of coffee to livelihoods was based on the sustainable livelihoods approach outlined in DFID's *Sustainable Livelihoods Guidance Sheets.* A livelihood comprises the capabilities, assets and activities required for a means of living. The assets include natural, material and social resources such land, livestock, machines, tools, stocks of money, education, skills and social networks while activities include productive ventures such as farming and livestock keeping. Current understanding of livelihoods place considerable emphasis on the ownership or access to assets that can be put to productive use as the building blocks by which the poor can make their living (Ellis, 2000; World Bank, 2000). A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, without undermining the natural resource base (Carney, 1998).

A successful asset accumulation is often observed to involve use of assets in productive activities and trading-up assets in sequence, for example, chickens to goats to cattle to land; or, cash from non-farm income to farm inputs to higher farm income to land or to livestock. The findings presented here-under explores the following:

    (i)   Ownership and access to assets in the different coffee growing zones

    (ii)   Use of the assets in productive activities including coffee production, processing and marketing

    (iii)   Contribution of coffee in acquiring and improving access to the different assets.

4.1.1 Ownership and access to assets

Land is the most important natural resource for farming. Table 2 shows land owned and distribution of sample household during the 2002/2003 cropping season. Land areas owned varied among the four coffee growing zones. On average, households in the less scarce land southern zone had relatively large land than their counterparts in the other zones. For the sample as a whole, most (>50%) of the sample households owned between 0.5 and 2 ha. Almost 2% of households owned no land at all and a further 5.5% owned holdings of less than 0.5 ha. Households owning more than 5 ha accounted for 10% of the whole sample (Table 2 and Figure 2). Variations in the proportions of households owning different land sizes across zone reflect the relative severity of land scarcity in different zones. For example, almost 70% of the sample households in the north-high elevation zone owned less than 2 ha and only 32% of the households in the southern zone owned less than 2 ha of land, implying that land is scarcer in the north-high elevation zone.

Table 2: Average land area owned and distribution of households by coffee zones

Variable	Coffee Growing Zone				Total sample
	North-High	North - Low	South	West	
Average land owned (ha)	2.6	2.1	4.1	2.5	2.8
Maximum (ha)	180.0	94.0	141.0	20.0	180.0
Minimum (ha)	0.1	0.1	0.2	0.2	0.1
% households owning:					
None	0.4	0.9	0.8	4.7	1.7
Less than 0.5 ha	8.8	10.6	0.3	2.5	5.5
0.5-1 ha	40.1	34.2	7.8	22.0	26.5
1-2 ha	29.6	30.9	23.2	37.6	30.2
2-3 ha	12.1	10.7	21.2	8.7	13.1
3-5 ha	4.5	7.9	25.8	14.6	13.0
Above 5 ha	4.5	4.8	20.9	9.9	10.0
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)
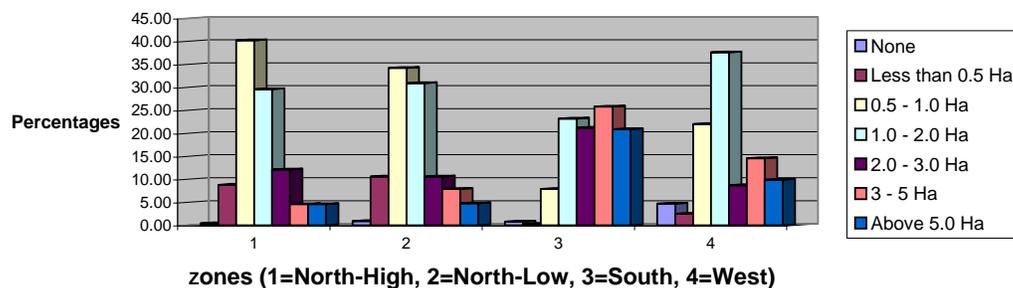
Figure 2: Distribution of sample households (%) by land area owned

The patterns of livestock holding found in the four coffee growing zones is shown in Table 3 while Table 4 shows the average number of livestock owned. As might be expected, chicken ownership was more widespread than the other livestock types. In general, there are sharp distinctions of other stock ownership between West coffee growing zone and the two north coffee growing zones. For example, while 72% of the respondents in west zone had no cattle, only about 16% of the respondents in the north-low elevation zone had no cattle.

Table 3: Distribution of ownership of selected livestock types by coffee growing zone

Number owned	% of households owning category				
	North-High	North - Low	South	West	Total
Cattle					
0	20.8	15.8	53.6	72.8	40.8
1-5	75.4	77.3	42.3	20.0	53.8
6-10	3.3	5.8	3.3	3.0	3.7
Above 10	0.4	1.2	0.8	4.2	1.6
Total	100.0	100.0	100.0	100.0	100.0
Goats					
0	43.3	50.3	54.6	66.3	53.3
1-5	44.0	34.2	35.2	23.8	34.7
6-10	11.3	11.5	7.9	7.4	9.5
Above 10	1.5	3.9	2.3	2.5	2.4
Total	100.0	100.0	100.0	100.0	100.0
Chicken					
0	23.8	35.2	15.5	49.0	30.4
1-5	32.7	23.9	21.2	19.6	24.8
6-10	24.2	22.1	30.4	25.5	25.6
Above 10	19.4	18.8	32.9	5.9	19.2
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

Average livestock herd/flock sizes are generally small (Table 4). For the sample as a whole, herd/flock size ranged from one animal per household for sheep and pigs to 8 birds per household. For each livestock type, average herd/flock sizes did not differ significantly between coffee zones despite the great variation in the number of households owning livestock between the zones.

Table 4: Distribution of ownership of selected livestock types by coffee growing zone

Livestock type	Number of livestock per household by Coffee growing zone				Total
	North-High	North-Low	South	West	
Cattle	2	3	2	2	2
Goats	3	4	2	2	2
Sheep	1	2	1	0	1
Chicken	8	9	10	4	8
Pigs	1	1	1	0	1

SOURCE: Calculated from GoT/EU/World bank study (2004)

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In addition to land and livestock, the key assets of rural families in Tanzania are their own labour (active adults in the household), their education attainment (measured here by years of education summed across active adults), and ownership of productive implements and tools.   Labour available for livelihood activities depends on the household size and age structure. The average household size for the sample as whole was 6 persons with a maximum of 10 persons and a minimum of one person. The south coffee zone had the largest household size while North-high elevation zone had the smallest average household size (Table 5). The average number of active adults aged between 18 to 60 years for the sample as whole was 2, which is about 33% of the average household size. The active adults are the ones who can effectively participate in livelihood activities such as farming, livestock keeping and non-farm activities.

Household labour was the main type of labour used to perform farm activities including different coffee production activities. However, some households used hired labour and/or rotational work groups to supplement household labour during peak periods. For coffee production, hired labour and work groups were used in weeding, pruning, mulching, fertilizer/manure application, pesticide application, picking coffee berries and pulping (Table 6). Hired labour was more widely used than work groups to supplement household labour deficit, albeit with specificity across different type of activities. For example, while hired labour was more widely used for coffee pruning than other coffee operations, work groups were largely used in weeding and picking coffee berries.

Table 5: Household size and age structure by coffee growing zone

Item	Number of persons by Coffee Growing Zone				
	North-High	North-Low	South	West	Total
Average household size	5	6	7	6	6
Maximum household size	10	10	10	10	10
Minimum household size	1	1	1	1	1
Number of persons below 18 years of age	2	3	3	3	3
Number of adults aged 18 to 60 years	2	2	3	2	2
Number of adults above 60 years of age	1	1	1	1	1

SOURCE: Calculated from GoT/EU/World bank study (2004)

Differences exist in the use of hired labour and work groups among the four coffee growing zones. For example, use of work groups in coffee production operations was almost non-existence in the north-low elevation zone while work groups were used in almost all coffee production operations in the southern coffee growing zone except for manure/fertilizer application.

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Table 6: Proportion of households using hired labour and working groups in coffee production activities

Operation/Type of labour	% by Coffee Growing Zone				Total
	North-High	North-Low	South	West	
Weeding					
· Hired labour	7.7	13.3	12.7	7.9	10.1
· Work groups	0.4	0.0	3.8	2.5	1.7
Pruning:					
· Hired labour	25.4	26.7	16.1	8.7	19.2
· Work groups	0.6	0.0	3.6	0.5	0.6
Mulching:					
· Hired labour	6.9	9.4	2.8	6.7	6.3
· Work groups	0.6	0.0	0.3	2.2	0.9
Manure/Fertilizer application:					
· Hired labour	2.1	3.9	2.0	1.5	2.3
· Work groups	0.2	0.0	0.0	0.2	0.1
Pesticide application:					
· Hired labour	7.9	10.9	5.1	0.5	6.0
· Work groups	0.4	3.3	0.0	0.0	0.8
Picking coffee berries:					
· Hired labour	9.6	15.4	18.9	6.7	12.3
· Work groups	0.4	0.0	12.0	0.5	3.2
Pulping:					
· Hired labour	1.9	2.7	7.9	0.2	3.1
· Work groups	0.4	0.0	3.1	0.2	0.9

SOURCE: Calculated from GoT/EU/World bank study (2004)

Analysis of education level of the household head suggest that most (71%) of the respondents have attained primary school education. However, there was variation in the literacy level among the zones with the south coffee zone having the highest proportion of respondents without formal education (Table 7) i.e. 20% compared to 15% in the other zones.

Table 7: Distribution of respondents by level of education

Education levels	% by Coffee Growing Zone				Total
	North-High	North-Low	South	West	
No formal education	15.7	16.7	20.4	14.6	16.9
Adult education	1.3	1.1	1.0	0.4	0.9
Primary	70.0	68.9	69.4	77.2	71.2
Secondary	12.4	12.7	8.8	7.3	10.4
College and university	1.3	1.1	1.0	0.4	0.9
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

Distribution of consumer goods, and means of production and transport are often useful indicators of relative prosperity and ability to make a living. Table 8 shows the proportion of households owning different assets by coffee zone. For consumer goods, ownership of a radio was widespread across all coffee zones. Approximately 4% of the sample households had television sets but most of these were in the two coffee growing zones in northern Tanzania. For means of transport, bicycle ownership was widespread across the four coffee zones while fewer households owned other means of transport. Almost every sample household owned simple means of production like the hand hoe, while fewer households owned tractors and ploughs. The proportion of sample households owning tools for coffee production and processing such as pruning shears, spraying pump, coffee pulp and drying wires varied among the coffee zones. For example, less than 5% of the households in the western zone owned coffee pulp and spray pump while more than 40% of the households in the other three coffee growing zones owned these equipment. For the sample as a whole, pruning shears and coffee drying wires were owned by more than 50% of the sample households while the other coffee equipment/tools were owned by less than 50% of the sample households (Table 8).

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Table 8: Ownership of assets by coffee growing zone (number)

Asset	% owning by Coffee growing zone				Total
	North-High	North-Low	South	West	
Consumer goods					
· Radio	71.0	71.5	77.5	54.7	68.6
· Television	6.5	6.4	1.3	1.7	4.0
Production assets					
· Bicycle	16.5	27.3	57.1	64.6	40.7
· Motorbike	1.3	0.6	1.0	4.7	1.9
· Pick-up	1.5	3.9	2.0	1.0	2.0
· Lorry	0.0	0.3	1.0	2.2	0.9
· Tractor	1.3	1.2	0.3	0.2	0.7
· Plough	2.7	6.7	8.9	0.7	4.5
· Cart	8.8	13.0	13.5	4.0	9.6
· Coffee pulp	45.0	44.8	44.4	1.7	33.9
· Drying wires	55.4	48.5	76.8	26.2	51.9
· Pruning shears	60.8	61.2	75.8	13.4	52.7
· Spray pump	40.6	49.4	53.3	5.2	36.6
· Hand hoe	91.7	90.9	97.4	90.3	92.4
· Ratio (fold) hoe	64.4	71.2	25.8	20.0	45.2

SOURCE: Calculated from GoT/EU/World bank study (2004)

4.1.2   Livelihood activities and incomes

Most households in the four coffee growing zones had several livelihood activities. Almost all households claimed to have two or more livelihood activities. The majority (91%) of the sample households cited farming as the main livelihood activity. Other livelihood activities indicated were wage employment, business, fishing, sale of forest products and sale of labour.

Farming as the main livelihood activity includes crop production and livestock keeping. The main crops gown in the different coffee growing zones were coffee, bananas, maize and beans. Coffee is normally intercropped with bananas in North and West coffee growing zones. These two crops are both perennial crops. The importance of coffee as a livelihood activity can be determined by looking at the proportion of agricultural land that was devoted to coffee production during the 2002/03 cropping season (Table 9). For the sample as a whole, more than 50% of the land was planted with perennial crops. In the north-high elevation zone, the average land planted with perennial crops was higher than the average total land owned, suggesting that some of the land was rented in. However, less than 30% of the land under perennial crops in this zone was planted with coffee compared with more than 90% of the land under perennial crops planted with coffee in the other coffee growing zones. This suggests that coffee is less important as a perennial crop in the north-high elevation zone, probably due to high incidences of CBD in that zone.

Table 9: Land availability and use (hectares per household) in 2002/2003 cropping season

Zone	Size of land owned	Land under annual crops	Land under perennial crop	Land under coffee	Coffee land as % of land owned	Coffee land as % of land under perennial crops
North-High	2.58	1.56	2.79	0.81	31.3	28.9
North-Low	2.05	1.10	0.84	0.82	39.8	97.2
South	4.08	1.77	1.15	1.13	27.6	98.4
West	2.52	0.89	1.48	1.43	56.7	96.5
Whole sample	2.82	1.35	1.66	1.04	36.9	62.7

SOURCE: Calculated from GoT/EU/World bank study (2004)
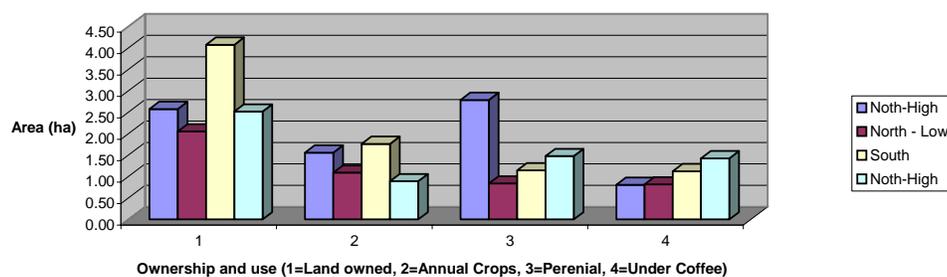
Figure 3: Land availability and use in hectares (ha) per household

Apart from establishing the proportion of land planted with coffee, the contribution of coffee to livelihood in the four coffee growing zones was examined by establishing the contribution of coffee to total farm income and the use of income from coffee in improving farmers' livelihoods.

Understanding the role that coffee plays in farm income is important for livelihood policies since it could help to determine, for example, the balance of public resource utilization between promoting increases in coffee productivity on the one hand, and providing support to other farm activities on the other (Table 10 and Figure 4). Overall, across the coffee growing zones, only 11% of farm incomes were derived from coffee. The contribution of coffee to the total farm income varied among the four coffee growing zones. Coffee appears to have the largest contribution to farm income in the southern zone where its contribution was almost four times the contribution in the other three coffee growing zones. Among the crops grown in these zones, the largest contribution to farm income was from bananas whose contribution was highest in the western zone. Livestock appears to be important across all coffee growing zones but a more important contributor to farm incomes in the north coffee growing zones (high and low elevation) than the remaining zones. In this zone, livestock contributed more than 45% of the estimated cash income.

Table 10: Composition of farm incomes by coffee growing zone (%)

Farm income source	Coffee Growing Zone				Total
	North-High	North-Low	South	West	
Coffee	5.8	8.0	25.5	7.1	11.5
Bananas	31.8	23.6	12.6	37.4	26.4
Other crops	19.3	21.0	25.2	20.7	21.4
Sub-total Crops	56.9	52.6	63.3	65.2	59.3
Livestock	43.1	47.4	36.7	34.8	40.7
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)
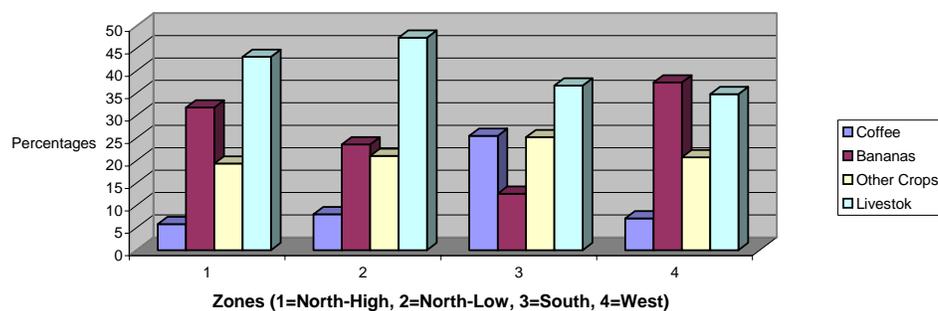
Figure 4: Composition of farm incomes by coffee growing zone

4.1.3   Contribution of coffee in acquiring/improving access to assets

Since livelihood means more than cash income, it was important to analyze the contribution of coffee to livelihoods by examining the pattern of expenditure of income from coffee over time. This analysis was carried out by asking the sample households to indicate the most important spending of income from coffee. Overall, most (32%) respondents indicated spending coffee income on purchase of food and consumables. This proportion varied from 18% in the southern zone to 43% in north-high elevation zone. Also, the coffee income was used to purchase durable consumer goods such as radios as indicated by about 2% of the sample households as a whole.

Apart from using coffee income to purchase food and other consumer goods, the income was used to purchase the following: inputs for coffee such as pesticides and manure (22%), farm implements (3%), livestock (2%), paying school fees (19%), medication (5%) and house construction (7%). Other uses of coffee income including marriage ceremony expenses, entertainment and saving were mentioned by 8% of the respondents as a whole. Therefore coffee income was used to acquire assets that either are a measure of improvement in the welfare of individual households or which can be used as productive assets and inputs in activities required for making a living. For example, livestock acquired using coffee income can provide milk/meat for home consumption and/or sale. The livestock can also be traded for land or sold for cash and the cash be used for farm inputs and so on.

4.2   Major constraints in coffee production and productivity

4.2.1   Coffee production trend

Recent macro-economic literature indicates that coffee is Tanzania's largest export crop Bafes (2003). It contributes some $115 million to the country's export earnings per year. It also provides income to some 400,000 smallholders who produce 95% of the coffee on average plot sizes of 1-2 ha. Estates grow the remaining five percent. Tanzania's production of coffee is currently about 48,000 tons, or about 0.7% of the world's output of 7.02 million tons per year. For the past 15 years or so, coffee production in Tanzania showed varying trends. Coffee production moderately declined from the early 1990s to 1998 after which it gradually increased until 2003. Area under coffee expanded significantly during the 1970s and 1980s when prices were more favorable but declined thereafter. From 1980/81 to 1998/99 coffee sales (equivalent to total output) declined from 61,514 tons to 47,050 tons.

Coffee output declined from a nine-season pre-1994-95 average of 50,918 tons of a five season post-1994/95 average of 45,065 tons, a 13% decline (Table 11). Yields also declined over a long term from 377 in 1972-73 to 401 in 1991-92 to 234 in 1998-99. The Tanzania Coffee Board estimates the current area of production in the country to be 250,000 ha compared to the area suitable for coffee production, which is 650,000 ha. Analysis of coffee production by type (Arabica or Robusta) is also presented in Table 11. Production of both Arabica and Robusta coffee was lowest in 1993/94. From 1993/94 production of Robusta picked up substancially and continued to date. Production trend for Arabica was not as steady as that of robusta (Table 11)

According to aggregate data, productivity of coffee in Tanzania relative to other sub-Saharan African (SSA) countries, measured as three-year average yields, declined from the early 1990s to 1994, remained relatively stable to 1998 and then increased in 2003. Tanzanian coffee yields relative to the rest of the world have gradually declined over the 1990s and early 2000s. With this trend (Figure 5), expanding the country's market share will require improvements both in productivity and quality.

Table 11: Production Trends 1989-2003

Years	Arabica	Robusta	Coffee Production (metric tons)
1989/90	n.a	n.a	53,420
1990/91	n.a	n.a	46,210
1991/92	n.a	n.a	56,030
1992/93	44, 229	15, 475	59,574
1993/94	25, 708	8, 443	34,151
1994/95	26, 483	15, 488	41,971
1995/96	40, 547	11, 943	52,490
1996/97	30, 752	12, 816	43,568
1997/98	21, 447	16, 555	38,002
1998/99	31, 674	14, 996	46,600
1999/00	34, 431	13, 380	47,900
2000/01	n.a	n.a	58,240
2001/02	n.a	n.a	36,200
2002/03	n.a	n.a	50,000

Average production	49,877
Period 1: 1989/90 - 1993/94	44,526
Period 2: 1994/95 - 1998/99	48,085
Period 3: 1999/00 – 2002/03	
Percentage change	
Period 1 to 2 above	-11%
Period 2 to 3 above	8%

Source: Tanzania Authorities & FAO

n.a data not available.
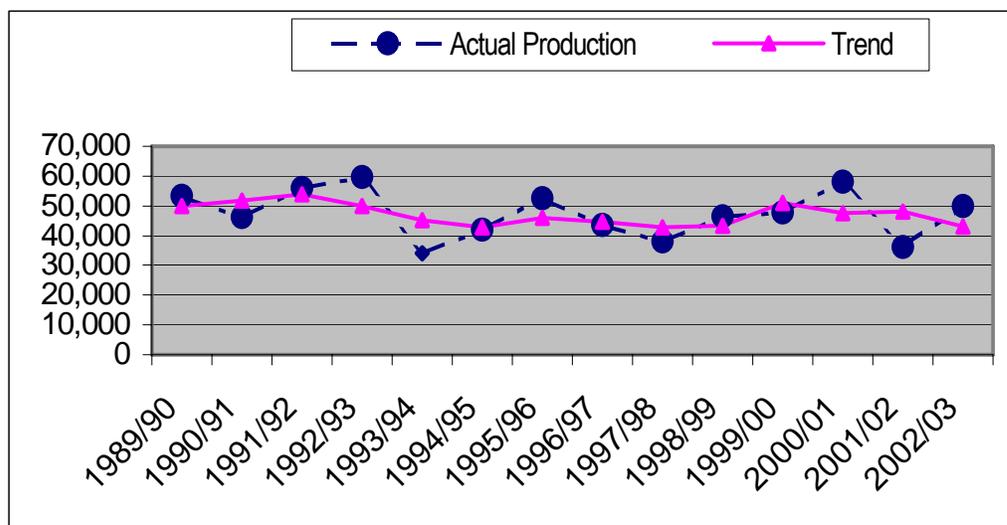
FIGURE 5: TREND OF COFFEE PRODUCTION IN TANZANIA BETWEEN 1989 TO 2003

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4.2.2   Factors related to coffee production and productivity

Production is the process in which a certain number of inputs are combined to result in the production of particular commodity. Agriculture commodity production is influenced by two major factors; technological relationship between inputs and institutional set up within producing location. The two factors are interdependent. The technological relationship refers to the various methods of producing a particular commodity i.e. coffee. The institutional set up deals with the relationship between decision-makers and actual producers. It is concerned with some of the basic decisions regarding production; what will be produced? Why will it be produced? Who will produce it and how will it be produced (Diwan, 1986).

Productivity is the efficiency with which output is produced by a given set of inputs. It is generally measured by the ratio of output to input. An increase in the ratio indicates an increase in productivity. Conversely, a decrease in the output/input ratio indicates a decline in productivity. As observed by James (1975), the most common productivity measures are yield per unit of land and average product per worker. Yield per hectare (Y/ha) is a function of efficiency and amount of other inputs used per area of land. This relationship is indicated by the production function for a crop. In this report factors such as farmers' own characteristics, land area characteristics, crop characteristics and institutional set-up in relation to production and productivity have been explored and are presented here under. The decline in production of estate farms after nationalization of the estates and dismal performance of Coffee production in northern zone which used to produce 50% of total coffee in 1972/73. Southern Coffee production has doubled from 13% in 1972/73 to 28% in 1991/92 (Appendix I and II). However increase in production on at the South has not off setted decline in production from the estates and northern zones

As explained earlier (see section 4.1.1), land is an important asset in smallholder agricultural systems since its ownership depicts owners' security and to some extent wealth. In Tanzania, land is owned by the state while the village governments are given a mandate to oversee its utilization. Almost all coffee growing areas in Tanzania are characterized by serious land scarcity. The type of ownership and size to greater extent predict type of crop to grow and intensity of intercropping. Average land owned by the household varied across the study zones with an average of 28 hectares ranging from less than 0.1 ha to 180 ha per household (see Table 2). The type of ownership showed slight variations across the study zones. More than 90% of the respondents cultivated coffee on family land while only 6% on legally occupied land (Table 12).

Table 12: Proportion of Type of land ownership by coffee growing zones

Ownership	% of respondents by Coffee growing zones				Total
	Northern high	Northern low	South	West	sample
Right of occupancy	8.2	2.0	4.9	8.1	6.1
Family land	89.7	94.6	85.6	89.4	89.4
Agreement	2.1	3.4	4.7	0.7	2.7
Leased	0.0	0	0.3	0	0.1
Share cropping	0.0	0	0.9	0.5	0.4
Inherited	0.0	0	2.8	6	1.1
Bought	0.0	0	0.5	1.1	0.2
TOTAL	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

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Evidence from several studies in coffee growing areas in Tanzania (e.g. see GoT/EU/World bank, 2003 and 2004 baffes, 2003) associate low production/productivity with farms have few and old tress, low yields, and growers poor husbandry practice, high intensity of intercropping particularly with banana (in the North and West) which increase the risks of diseases, and lack of inputs or insufficient use of inputs such as fertilizers and chemicals. Analysis of collected data on number of trees per hectare owned per household varied between zones. The Southern zone recorded highest number of trees i.e. 1962 and the West recorded the lowest (389 trees). For the whole sample, average number of trees/ha was 105 (Table 13). The low number of trees per hectare for Northern and Western coffee zones is understandable since intercropping is the most common practice.

In addition to the low number of trees, production per hectare in all zones is relatively lower that regional average. Analysis show that only 591 kg of dried been is harvested per hectare. There is huge variations across the zones with lowest (330.4) in North high zone and highest 938 kg per ha in the South. High intercropping intensity with banana and trees is a course for low yield performance in the other zones (Table 13). Low yield per tree (ie. 0.5kg) despite of high frequency of harvesting per season.

Table 13: Coffee productivity variables by coffee growing zones

Variable	Northern high	Northern low	South	West	Total sample
Frequency of harvest	3.76	4.05	3.09	1.48	3.04
Yield/ha (kg)	330.40	433.60	937.80	667.20	591.3
Yield/tree (kg)	0.38	0.49	0.48	1.72	0.53
Tree/ha (kg)	873.0	886.0	1962	389	1015

SOURCE: Calculated from GoT/EU/World bank study (2004)

The study also attempted to establish the rate at which new plants are planted in each coffee growing zones. Results of the analysis showed that except the Southern coffee growing zone where an average of 198 plants have been planted during the last 5 years, in the other zones, less than 100 trees have been planted (see Table 14). The lowest number of trees planted was recorded the Western and Northern-low elevation, zones the most likely because in these zones there is shortage of land. In addition to this, land in these zones has high opportunity for high value crops such as Vanilla (West) and vegetables such as tomato (North – Low elevation). Table 15 shows age of tress in all four coffee growing zones. Results show that on average, coffee trees were about 30 years old. The oldest trees were found in North (high elevation) followed by North low elevation coffee growing zones with an average of 40 and 34 years respectively. The youngest trees (average of 22 years) were recorded in the Western and southern coffee-growing zones.

Table 14: Number of coffee trees planted/replanted in last 5 years

Variable	Northern high	Northern low	South	West	Total
N	403	225	354	366	1348
Mean	84	66	198	48	10
Minimum	0	0	0	0	0
Maximum	5210	1200	7850	4000	7850

SOURCE: Calculated from GoT/EU/World bank study (2003)

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Table 15: Age (Years) of coffee trees by growing zones

Variable	Northern high	Northern low	South	West	Total
N	466	313	374	381	1541
Mean age	39.8	34.2	21.9	22.8	33.9
Minimum age	0.5	1.0	1.0	0.5	0.5
Maximum age	200.0	100.0	70.0	100.0	200.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

As a follow-up to information provided in Table 15 this study attempted to establish the major sources of seedling for establishing new farms, gap – filling or replanting dead seedlings. Table 16 and Figure 6 present the responses across the 4 study zones. About 45% of the farmers obtain seedlings from their own farms and 25% from private nurseries mostly located within or in neighboring villages. Unfortunately, the genetic potential of these seedlings is, in most cases, not known by either farmers or extension officers. Only 15% of respondents obtained seedlings from research stations with highest proportion (>20%) of farmers from North growing zones while both South and West had less than 10% of the respondents who planted seedlings obtained from research stations.

Table 16: Sources of seedlings for planting on farmers fields

Sources	% of respondents by coffee growing zones				Total
	North high	North low	South	West	
Own Seeds	31.2	35.7	35.5	54.3	44.8
Private Nurseries	23.4	16.1	30.0	10.8	25.0
Other Growers	8.5	11.3	19.6	25.9	19.2
Research Stations	23.3	25.6	8.9	5.7	15.1
Estates	8.5	8.9	4.8	1.4	6.7
Cooperative union	2.7	2.4	0.6	1.9	2.2
Primary Society	2.3	-	0.6	-	1.0
Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)
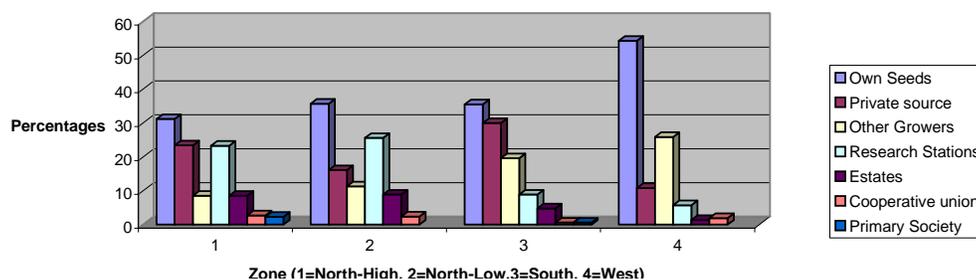
Figure 6: Source of seedlings for planting on farmers fields

Throughout the study zones, farmers' knowledge on variety of coffee sidings planted seemed to be limited. All respondents in North zones reported to grow Arabica coffee compared to 1.6% and 94% in South and West respectively. Only 2 farmers reported to plant variety from Lyamungu apparently they did not mention the same of the variety.

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To aggregate and further confirm the results of the cross tabulations presented above, a regression analysis was carried out. The hypothesis behind the analysis depict the fact that variations in profit (revenue from coffee sale minus costs) from one household to another is a function of several variables including those related with farmers themselves (age, education level), plant characteristics, husbandry practices, and production level which depicts the economies of scale.

Table 17 presents the results of the analysis. Age of household head (AgHH) and education level of the household head (EdHH), size of land owned (LAND), use of organic fertilizer(OFERT), and amount of coffee sold (CKG) were significant in explaining variation in coffee profitability at α=0.1 and above.

Age (AgHH), education level (EdHH) and size of land (LAND) are highly significant (α=0.01 and 0.05) and positively explain the level of profit from coffee sales. These observations suggest that profitability increases with increase in these variables. As expected, young and less educated farmers are less likely to get high profit in coffee production. The observation was expected since age of the farmers depicts experience in farming. Experienced farmers are more likely to adopt good husbandry practices and hence high profit. On the other hand, observation that increase in land area is positively related with profit suggests that in coffee production profit is more likely to be high on large farms than otherwise. Based on the principle of economies of scale, this proposition is acceptable, since production cost decreases with increase in area of operation up to a point beyond which it start to decrease.

Table 17: Regression result showing independent variables explaining variations in coffee profitability

Variables modeled	Std. B coefficient	t. value	Sig. level	Remarks
Age of household head (AgHH)	.062	2.293	.022	**
Education level (EdHH)	.105	3.882	.000	***
Size of land owned (LAND)	.298	11.350	.000	***
Age of coffee plants PIAGE)	-.019	-0.732	.464	
If used organic fertilizer (OFERT)	-.053	-1.802	.072	*
Form coffee sold (FSALE)	.008	0.292	.770	
Place of sale (PSALE)	.012	0.424	.672	
Buyer of coffee (BUYER)	-.027	-1.001	.317	
Price of coffee (Tsh) (CPRICE)	.041	1.437	.151	
Amount of coffee sold (kg) (CKG)	.278	10.470	.000	***
Constant		0.686	.493	
F statistics		29.396	000	***
R²			.200	

SOURCE: Calculated from GoT/EU/World bank study (2004)

*; **; ***, Significant at 0.1, 0.05 and 0.01 levels respective

The Variable OFERT was negative and significant at α=0.1 suggesting that the more organic fertilizer is applied the less profit is obtained. Despite the result, this was not expected because

under normal situations, at initial stage of input usage, yield and hence profit should increase with increase in quantity of organic fertilizer applied. The most likely reason is that, the quantity of farm yard manure applied is less than what is required to provide the necessary nutrients while the associated cost of application prohibit users to realize profit. The variable quantity of coffee produced has direct relationship with profit and highly significant at α=0.01. The result was expected based on economies of scale principle which suggest increase in profit as volume of production increases up to a certain point[3]. Based on this model, all marketing related variables such as type of buyer, price, location of sale and form coffee was sold of were not significant (at α=0.1) in explaining variability in revenue from coffee sale. Hence marketing related variable are not very strong influencing farmers' productivity than production related variables. Turning point in small holder farmers' profitability in coffee should be centred on improving husbandry practices to increase quantity and quality of the crop. In general, the predicted model was significant (Fstat = 29.39; α=0.01) although in totality, the independent variables explained only 20% of the variations in the dependent variable (Table 17).

4.2.3 Input supply and usage

During the 1970s and 1980s, chemical inputs were subsidized and supplied to growers through the cooperative system. The first reduction in input use became visible in 1992, when chemicals were supplied at market prices. After 1994, only a quarter of growers purchased inputs, primarily due to lack of credit. With the abolition of the monopoly power of the cooperative unions, credit became available only to few creditworthy, usually large farmers.

From the study, the proportion of users of farm inputs such as chemical fertilizers and pesticides have declined in recent years. Analysis of collected data revealed that only 16% of the respondents used chemical fertilizer in 2002/2004 growing season. There was a huge variation across the study zones with the highest (40%) in the South and lowest (2%) in the West coffee growing zone. According to the results presented in Table 18, Calcium Ammonium Nitrate (CAN) and UREA were the most common fertilizers of which more than 90 and 50% of the users were respectively from the Southern coffee growing zone.

Table 18: Number of respondents and suppliers by fertilizer use in coffee growing zones

Variable	Variable category	Number of respondents			
		TSP	CAN	SA	UREA
Supplier	Private buyer	3	51	9	33
	Stockiest	1	28	18	44
	Coop union	1	19	4	10
	TOTAL	5	98	31	87
Growing zones	North high	2 (40.0)	4 (4.1)	9 (29.0)	20 (23.0)
	North low	-	3 (3.1)	5 (16.2)	17 (19.5)
	South	2 (40.0)	91 (92.8)	17 (54.8)	50 (57.5)
	West	1 (20.0)	-	-	-
	TOTAL	5 (100.0)	98 (100.0)	31 (100.0)	87 (100.0)

SOURCE: Calculated from GoT/EU/World bank study (2004)
Figures in brackets are percentages

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[3] Before diminishing returns sets in

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With respect to pesticides, the study noted that a number of agro-chemicals were sold per growing season. Compared to fertilizer, which ware ported to be used by only 16% of respondents, about 40% of the growers reported to use different types of agro-chemicals. The highest proportion (>50%) of the growers was reported in North low elevation and South coffee growing zones. In the West, use of agro-chemicals was almost not existing since only 0.7% reported to have used them in the 2002/03 season (Table 19). Private stockiests served about 64% of the farmers followed by cooperative union (21%). Analysis across the zones showed that private stockiest and cooperative unions dominated the supply of inputs in North (both low and high) whereby private coffee buyers dominated the southern zone as suppliers of inputs. Blue copper followed by Dusban was purchased by the majority of the respondents (Table 19).

Table 19: Number of respondents by type of agro-chemicals and suppliers

Agro-chemicals	Private buyers	Stockiest	Cooperative unions	TCB agents	Total
Byton	1	7	4	1	13
Thiodan	12	70	13	1	96
Selecton	16	35	8	1	60
Fordan	0	0	2	0	2
Blue Copper	30	183	54	1	268
Sumithion	14	51	28	1	94
Red Copper	9	44	20	0	73
Cobox	3	21	6	0	30
Dusban	39	170	50	1	260
TOTAL	124 (13.8)	581 (64.8)	185 (20.7)	6 (0.7)	896 (100.0)

SOURCE: Calculated from GoT/EU/World bank study (2004)
Figures in brackets indicate percentages of the total

The inability to afford inputs at market prices has remained the determining factor for input use by growers. To increase farmers' input use, representatives of Ministry of Agriculture and Food Security (MAFS), Tanzania Coffee Board (TCB), Tanzania Coffee Association (TCA), Tanzania Coffee Growers Association (TCGA) established the National Coffee Voucher Input Scheme (NCVIS) in 1997. Without involving of growers, selected coffee industry representatives set up the respective regulations and processes. In the form of a forced saving scheme for the next season, vouchers are not the universally preferred by all farmers. There are allegations of side selling of vouchers, complaints about unavailability of adequate inputs at stockiest shops, or sale of expired or inefficient inputs.

The NCVIS is said to be the only available input scheme, except for loans to farmer groups/ primary societies by Kilimanjaro Cooperative Bank (KCB), or use of own funds. NCVIS administrative costs are met with 5% charges (auction price) to buyers. NCVIS was transformed into an independent trust with accountability to TCB. The board is comprised of industry representatives, comprising TCB, TCA, MAFS. No smallholder growers are represented.

The scheme is organized as a cycle: NCVIS sells vouchers private buyers who include the voucher value (50Tsh per kg) in their coffee prices for farmers. The Farmer receives inputs by claiming a voucher from stockists, who in turn claim voucher value back from NCVIS. There are transactions

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costs, as both buyers and stockists have to come in person to NCVIS, Moshi to collect vouchers and voucher value. NCVIS receives voucher value in form of checks from TCB.

Table 20 shows respondents' comments with respect to the use of vouchers scheme for input purchase. There are reports of voucher misuse involving side-selling, or obtaining have reported not receiving of vouchers from private buyers or cooperatives. Furthermore, growers have reported not receiving inputs at the right time receiving ineffective and out dated inputs. A major critique of the system, however is that the vouchers are not sufficient to cover input needs of smallholders. Since vouchers are tied to the volume of parchment sold, small growers receive small volumes of inputs that have no real impact on their future production. Based on the findings from this study, about 62% of the respondents do not prefer voucher because its value was less than the actual price of input especially when the volume sold is small. This reason was more important for farmers in Southern and Western coffee growing zones. Furthermore, about 22% of the respondents converted voucher to cash and bought consumables instead of farm inputs. Other reasons reported by 13% of the respondents was lack of farm inputs at the time when a voucher is presented to stockiest.

Table 20: Farmers' responses with respect to use of NCVIS in study area

Variable	Variable categories	% by coffee growing zones				TOTAL
		North high	North low	South	West	
Reason for spending less value of voucher(s)	Less voucher value than needs	40.0	44.4	84.0	100.0	61.8
	Used voucher to purchase consumables	25.0	44.4	12.0	-	21.8
	Needed inputs were not available	25.0	11.2	4.0	-	12.7
	gifted/sold	10.0	-	-	-	3.7
	Total	100.0	100.0	100.0	100.0	100.0
Suitability of Voucher system	(a) beneficial	57.4	81.8	47.1	9.4	150
	(b) not beneficial	42.5	18.2	52.9	90.6	184
	Total	100.0	100.0	100.0	100.0	334

SOURCE: Calculated from GoT/EU/World bank study (2004)

Input prices is a major concern to all farmers in all coffee growing zones.
There are regional differences in input prices, because stockiest charge different prices to cover individual costs and importer charges. In the South (e.g. Mbinga) there are problems with input supply due to the limited number of stockiest that are available. Stockiest are registered with Tropical Pesticides Registration Institute (TPRI), purchase inputs from importers and sell them through vouchers to farmers. TPRI registers pesticides per se, as well as importers, suppliers and stockiest issuing different licenses and permits. No generic pesticides are registered as registration is specific to brand and supplier to control authenticity of product quality. There are no controls of import volumes, but on types of imported pesticides. TPRI has several regional stations but lack adequate capacity and staff to enforce controls. There are about 300 stockiest across the country, concentrated mainly in the North and relatively less in South. There are very few stockiest in the West. Pesticides are ordered by large estates, or stockiest on demand.

Since the introduction of the "one license rule" by TCB, the input scheme cycle has been broken up, (resulting into sidelining the buyer from the cycle). As a result, the distribution of vouchers has

decreased since last season. To cater for this new institutional arrangement, a new scheme is developed providing input on credit basis and deductions on auction price. For example Kilimanjaro Cooperative Bank (KCB) provides inputs on credit to their primary society customers, where growers can access inputs from stockists guaranteed with KCB. The system seems to work quite well.

4.2.4   Extension service

In the coffee sector, extension service is an institution charged with the responsibility of raising farmer's awareness through the whole process of production and primary processing according to quantity and quality specification. Before the recent changes, the sector used to maintain own extension officers. The officers were specifically for coffee farmers. In the recent past the sector uses extension agents located at word level and the majority who have general knowledge in agriculture for each coffee growing district there is district coffee subject matter specialist (DCSMS). In addition there are a number of extension information to farmers. During institutional mapping, it was established that in some divisions officers who were trained as livestock officers have been offering coffee related extension services. Table 21 and Figure 7 show the main sources of information on coffee husbandry and related activities. Government extension officers account for 50%. Other sources includes; radio (27%), market places (15%), primary cooperative societies (6%), relatives and friends (3%) and TCB officials (2%).

Table 21: Sources of information on coffee husbandry practices

Source	Number of respondents by coffee growing zones				Total (%)	
	North high	North low	South	West		
Government extension officers	212	117	193	120	642	(48.6)
Radio	51	53	75	170	349	(26.5)
Town/Market places	74	68	6	48	196	(14.9)
Primary cooperative society	45	19	1	9	74	(5.6)
Relatives/Friends/Neighbors	24	5	6	-	35	(2.6)
TCB inspectors	6	5	3	9	23	(1.7)
TOTAL	412	267	284	356	1319	(100.0)

SOURCE: Calculated from GoT/EU/World bank study (2004)

Figure 7: Sources of information on coffee husbandry practices
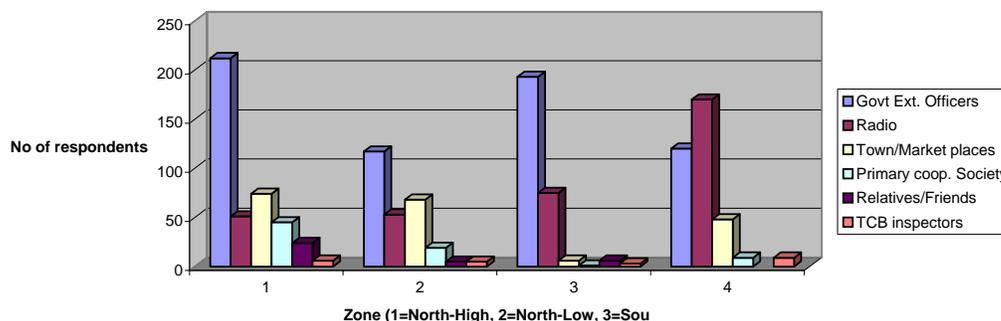
Further to this,, the study intended to know the current views of the farmers with respect to extension service offered. Tables 22 and 23 present farmers' perception about extension service offered for coffee production. Evidence from the analysis suggests that 79% of the coffee farmers

were satisfied with extension service offered by the government. Analysis across the zones show that farmers in the Western coffee growing zone were largely dissatisfied with extension service than any other zone (see Table 23) mainly because the quality of service offered was poor. The magnitude of the problem was not established by study.

Table 22: Usefulness of extension service offered

Perception	Number of respondents by coffee growing zone				
	Northern high	Northern low	South	West	Total
Beneficial	155	83	141	87	466
Not beneficial	28	23	22	48	121
Total	183	106	163	135	587

SOURCE: Calculated from GoT/EU/World bank study (2004)

Generally the study rated that specific extension service for coffee is not adequate. Citing example of Mbozi district, there is only one DC|SMS who is responsible for more that 16, 000 coffee farmers in 10 words. Extension services for coffee is rested on ward of extension officers majority of them are specialist in kiustode production

Table 23 present coffee farmers perception on the quality of extension services. About 43% of the respondents consider extension serve offered is good to very good. Highest proportion of farmers who considers extension service is good is recorded at Southern coffee growing zones. West and North high coffee growing zones consider service offered to be poor and very poor.

Table 23: Perception of quality of extension service by coffee growing zones

Level of Perception		Coffee growing zone				
		North High	North Low	South	West	Total
Very good	%	8.33	11.81	17.59	7.29	10.44
Good	%	33.97	37.50	37.04	26.53	32.61
Fair	%	20.83	24.31	21.30	23.32	22.27
Poor	%	26.60	11.81	10.65	31.49	22.76
Very poor	%	10.26	14.58	13.43	11.37	11.92
Total	%	100.00	100.00	100.00	100.00	100.00

SOURCE: Calculated from GoT/EU/World bank study (2003)

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The proportion of response indicated above are expected based on the situation of coffee extension services in Tanzania. Using Mbozi district as an example, the study revealed that ratio of formers to experts is too high. In the district, like other coffee producing districts, there is only on coffee subset matter specialist (DCSMS) who is supposed to carter for the whole district.

4.3   Coffee marketing
4.3.1   A review of coffee marketing in Tanzania
Prior to reform, production and marketing was integrated into a single marketing channel within the cooperative system and the crop boards. Producers delivered coffee to primary societies, where they received an initial payment based on announced price of ungraded coffee. Coffee was then sent to central pulperies for primary processing, where parchment coffee was then graded. The cooperative unions collected coffee from primary societies, cured it at their own curing factories, and brought coffee to auction in Moshi, held by the Tanzania Coffee Marketing Board (TCMB)[4]. Growers received their final payment after all deductions by the board, unions and the primary societies had been made for the incurred costs, often a year later. Central pulperies collapsed due to lack of investment, leaving farmers to pulp coffee at their own farms.

The first cooperative union formed was Kilimanjaro Native Planting Association (KNPA), in 1925, which became Kilimanjaro Native Cooperative Union (KNCU) in 1932. Kilimanjaro region had its own cooperative bank in 1950s, where primary societies acted as watchdogs for banks, and as guarantors for growers.

With liberalization in the early 1990s, the system changed rapidly. Due to this rapid liberalization, many existing institutional arrangements broke down, when alternative arrangements had not yet developed. This created an institutional vacuum between (a) the cooperative unions and the crop boards, and (b) the cooperative system, crop boards and the private sector. Changes included the collapse of the central pulperies, with huge implications for coffee quality. In 1990, the unions became responsible for payments to societies and growers. Their role changed from marketer to a marketing agent. Unions charged 1.6% of auction sale for their services. During 1992-93, the government stopped to announce prices, leaving decision on advance and total payments to farmers to the unions. In March 1992, the chemical input market was opened to private traders. Furthermore, coffee exporters were allowed to retain export earnings in foreign currency.

In August 1993, the government passed a bill opening coffee marketing and production to the private sector, and further reducing government controls on pricing. The Coffee Board became responsible for coffee grading, issuing licenses, and permits and operating coffee auctions. In 1994/95, private coffee buyers were invited to purchase coffee directly from growers. In the first years, PCBs used the curing facilities of the cooperative system, but many switched to build their own facilities due to dissatisfaction with the curing and grading processes of the cooperative mills. Market shares shifted to the private sector due to more competitive marketing and quality standards by private investors, and lack of financial viability of the unions.

In the first two years after liberalization, private traders equipped with investment capacity, entered the market realizing high margins. Further investment in the industry was made by increasing

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[4] The Tanganyika Cooperative Curing Company was owned with 50% by Kilimanjaro Native Cooperative Union, and 25% by Tanzania Coffee Grower Association

processing capacity, marketing efficiency and investment in new plants. Given increased competition, the Tanzania Coffee Association (TCA) was established in 1997 to resolve disputes among private traders and between traders and unions, and oversee private traders, millers, and exporters.

In 2002/03, TCB introduced the "one license regulation", breaking up vertical integration. One of the main implication is restriction of private buyers competition over parchment at village level, and increase of competition for cured coffee at the auction.

4.3.2   Post reform marketing channels

Based on the history of coffee marketing presented above, a major change from the pre-reform period is evident, that is, growers now have a choice of selling their produce through four marketing channels: Private Coffee Buyers (PCBs), Cooperative System, Farmer Groups, and Independent Primary Societies that had split from the union system. Analysis of collected data show that about 60% of the farmers sold their produce to the Cooperative unions through Primary Cooperative Societies. Dependence on private buyers is highest in the Southern and Western coffee growing zones than in the Northern zones (see Figure 3 for comparison). Even with this proportion, evidence suggest that with the multitude of marketing channels, better prices and terms of trade through alternative channels, the role of the cooperative system has decreased. It is important to note that there are regional variations in the incidence of the different channels with limited choices for farmers. For instance, in the Kilimanjaro and Arusha districts, all four channels are theoretically available to farmers (Table 24). A single channel, however, dominates other districts. According to the analysis (Table 24) prompt payment and possibility of receiving second payment are key factors favoring sale of coffee to PCB and cooperative unions respectively.

Table 24: Coffee marketing variable as perceived by farmers in four growing zones

Variable	Variable categories	% of respondents by coffee growing zone				Total
		Northern high	Northern low	South	West	
Location where coffee was sold	On farm	19.5	5.2	25.8	30.7	20.2
	Buying post	59.8	64.9	65.5	64.6	63.5
	Nearby market	20.7	29.8	8.7	4.7	16.3
	TOTAL	100.0	100.0	100.0	100.0	100.0
Type of buyer	Private	29.5	20.1	40.5	36.9	31.8
	Cooperative unions	66.9	73.0	37.5	56.6	59.0
	Ind. Coop society	1.2	3.7	6.6	2.1	3.4
	Farmers groups	1.6	2.0	13.9	0.0	4.7
	Another grower	8.0	1.2	1.5	1.4	1.1
	TOTAL	100.0	100.0	100.0	100.0	100.0
Reasons for choosing buyer	Payment for inputs	7.0	9.0	6.7	7.5	6.3
	Prompt cash payment	10.1	16.4	36.3	22.4	21.2
	Offer good price	15.9	11.7	21.6	10.3	15.3
	Only buyer	30.0	27.5	25.7	22.7	26.7
	Offer 2nd payment	34.8	35.2	7.9	43.4	29.3
	Rejected by others	2.0	0.0	0.7	0.0	0.8
	Strengthen union	0.2	0.2	1.1	0.0	0.4
	TOTAL	100.0	100.0	100.0	100.0	100.0
Where farmer prefer to sale	Cooperative unions	84.8	82.2	57.8	64.1	72.7
	Ind. Coop societies	2.5	2.2	8.0	8.7	5.3
	Farmers groups	1.5	1.6	22.7	0.9	6.7
	Licensed private buyer	10.0	12.1	9.9	22.2	13.7
	Other farmers	0.60	10.3	0.3	4.1	1.3
	Any with good price	0.60	1.6	1.3	0.0	0.9
	TOTAL	100.0	100.0	100.0	100.0	100.0
Reasons for preference	Offer good price	15.9	16.7	27.2	21.0	20.0
	Do not cheat farmers	9.8	16.1	24.2	11.1	14.9
	Pay 2nd payment	54.1	43.7	23.9	49.7	43.6
	Pay in single installment	4.7	6.1	8.5	8.5	6.8
	Available through season	11.5	8.4	3.6	6.3	7.7
	Allow bartering coffee with other products	2.3	8.0	0.0	3.4	3.2
	Loyalty to association	1.7	0.9	12.6	0.0	3.8
	TOTAL	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

The coffee producer survey suggests that some producers have a strong preference for selling coffee through cooperative unions. More than 80% of growers in the north indicated that they would like to sell through unions, compared to around 60% in the south and west. In the south, where farmer groups and independent societies were numerous, only about 20%t indicated that they would like to sell through unions. And in the west zone, little more than 20% chose private coffee buyers. The prospect of receiving a second payment is a strong factor in the choice of marketing channels. Nearly 55% of those who expressed preference to sell through unions and 35% of those who favored independent cooperative societies gave second payment as the main

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reason. Discussions with producers suggest that the notion that profits are being shared through second payments, and the timing of the second payment (when cash is required for payment of school fees) explain their preference for it. Collapse of or absence of credit systems for facilitating purchase of coffee inputs could be another reason for farmers preference of a system that would give two payments at specified time period. Price was an important consideration for those who selected private buyers and farmer groups. Immediate full payment and availability throughout the year were the factors associated with choice of petty traders reported by nearly 8% of the respondents. Figure 8 presents prices offered by different buyers in the 2003 season. Private buyers offered higher price in the northern zones than the South.
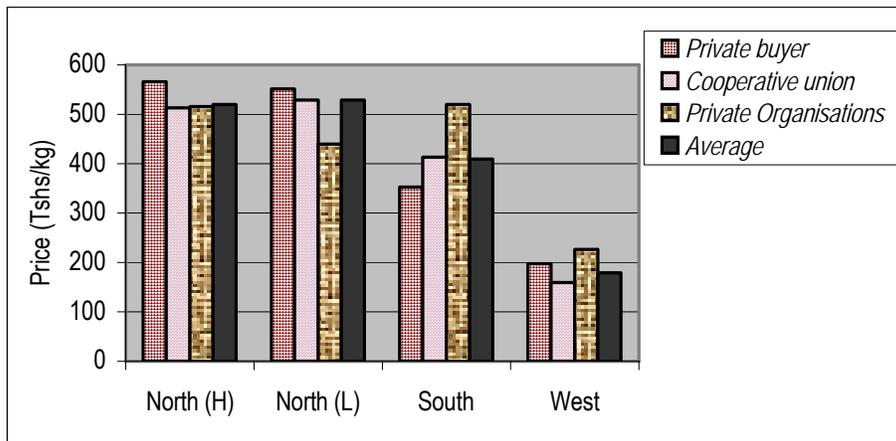

FIGURE 8: Prices offered by different buyers in coffee producing zone in 2004

In order to establish a firm understanding about suitability of marketing channels, econometric analysis was carried out. The analysis of coffee marketing during 2002-03 shows that decisions that coffee producers made relating, the time of sale and location had significant influence on prices received. The analysis revealed that direct coffee sales to the auction by members of farmer groups yielded higher returns than any other marketing channel. As expected, the choices that producers make in marketing their outputs significantly affect their returns. The effect of various factors on the price of mild Arabica obtained by growers in the south zone, where most coffee is grown, is presented in Table 25. The equation is estimated for sale through private coffee buyers from July to October 2002. The producers who took coffee directly to auction as members of farmer groups were able to get Tsh 162.56 per kg more than they were able to get by selling to a private trader. Taking coffee to auction as a member of an independent society or selling through unions also brought higher prices. Some of the differences in prices may reflect difference in quality.

Table 25: Marketing Channels and Timing of Sale are significant determinants of Prices
Received by Coffee Farmers – 2003-2004

Variable	Coefficient	t-statistic
Marketing Channel		
Sold through unions	40***	(2.70)
Sold through independent society	155***	(6.20)
Sold at auction by a farmer group	163***	(8.89)
Sold through other channels	-43	(0.81)
Timing of Sale to Private Traders		
Sold from January to May	136	(1.52)
Sold in June	-67	(0.91)
Sold in November and December	-56*	(1.83)
Number of buyers	6	(1.47)
Constant	357***	(25.12)
Number of observations	508	
F (numdf)	13.1	
R-squared	0.19	

∗; ∗∗; ∗∗∗, Significant at 0.1, 0.05 and 0.01 levels respective

Note: Dependent variable was sales through private traders in July – October in Tsh per kg in the south zone. The coefficients for other channels indicate the differences in prices received.

4.3.3   Primary processing and quality assurance

An overview of product transformation processes and functions carried by organizations in the sector is provided for an understanding of the nature of integration of activities in the sector. Coffee undergoes significant product transformation from farm to export. The crop undergoes both primary and secondary processing before it is exported. Primary processing takes place at the grower's level. Following the collapse of central pulperies, the growers on their farms do processing of coffee. It involves handpicking of red cherries, pulping on same day of picking, washing, fermenting, drying and packaging. Prior to sale, farmers should grade their coffee according to established grades. This should be done on the farm after pulping (Table 26). Growers usually sell primary processed commodities except arabica coffee in the southern zone (in particular Mbinga) where, on an experimental basis, growers have been permitted to sell coffee berries to traders with pulping units. Although primary processes are simple in most cases, they have significant implications for quality, which will be explored later in this section. Traders usually process the commodities subsequently at their own facilities for conversion into internationally traded products.

Table 26: Stages in processing of coffee

Stages	Description	Products/Process
Post harvest care and primary processing	Activities performed	Pulping fermentation, washing, drying
	Form in which producers sell the crop	Parchment and dry cherry; cherries, in some cases
Secondary processing	Activities performed	Removal of husk, polishing and grading
	Secondary processing facilities	Secondary processing facilities
	Form in which commodity is exported	Green coffee
Tertiary processing for final use in the country	Roasting and grinding	Instant coffee prod

SOURCE: GoT/World bank institutional mapping report (2004)

As indicated in Table 26, the second processing, curing or milling, is done in curing factories to which the growers transport their produce either directly, or through primary societies. Curing factories are run by cooperatives, or on a commercial basis, while a few private estate mills also exist. The cured coffee remains under the ownership of the primary society that cures coffee on behalf of its members, or the grower paying a service charge to commercial mills. As coffee remains in the curing warehouses until it is sampled, tested by inquirers, and blended with other coffee based on TCB instructions, growers tend to loose control over their coffee when it enters into the curing factory.

Literature suggest that the main reasons for declining quality are considered to be related with low quality coffee trees, poor husbandry practices and inadequate input use by farmers. Other reasons are said to include run down central pulperies requiring primary processing by farmers on their farms, spread of diseases such as coffee berry disease to all arabica growing areas since 1975 and leaf rust, mixing of grades at buying posts after 1994 due to inexperience of many traders and high competition over coffee because of processing over-capacity.

In coffee production premises there is a saying that " coffee quality which is made on a tree is spoiled during a short period of processing". This saying suggest that investment in husbandry practices must go hand in hand with improvement in processing. Analysis of collected data revealed that in recent years, all processes leading to quality seemed to have been to be by-passed farmers.

The issue of quality is both touchy and controversial. Extensive debate on whether quality has declined following liberalization, has been presented. This section begins by reviewing empirical evidence on coffee at the auction. The influence of production and processing practices on quality is examined. There is a consensus on a the decline of quality of coffee in Tz over the last two decades. In the past, Tanzania coffee was able to fetch premiums with prices just below those of Kenyan coffees. Today, Tanzanian coffee is said to be used as filler in coffee blends (ToG/EU/Wbank, 2004).

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Table 27 presents different methods and equipment used in processing, drying and storing coffee. Processing methods, equipment, and other raw materials used greatly affect quality of coffee especially at liquoring stage. Wet processing is common in the north and south coffee growing zones. On average 75% of coffee from these zones is wet processed. Dry processing account for 20% with highest proportion in Western and Southern coffee growing zones. More than 75% of all respondents interviewed in the Western coffee zone sold coffee as berries.

Of the 50% of the respondents who did wet processing used own pulping machines. The rest borrowed pulping machines from neighbors (40%), used communal pulpier (6%) or used hands (0.4%). Use of borrowed or communal pulping machines or use of hand can delay pulping time thus affect quality of coffee. Water is the most important ingredient in pulping and its quality has direct bearing on coffee quality. Analysis presented in Table 27 below shows that except in the Northern coffee growing zones where more than 50% used tap water for pulping, elsewhere ponds, rivers, springs, and canals from main source of water for pulping. In addition to poor knowledge about the quality of water, distance from water sources can limit the water quantity used for fermentation and cleaning with gross impact on quality of parchment coffee.

Table 27: Proportion of respondents by different methods of processing and drying

Variables	Variable categories	% by growing zones				TOTAL
		North high	North low	South	West	
Method of Coffee processing before Selling	Wet Processed	84.9	77.8	74.6	0.8	60.5
	Dry Processed	13.3	21.1	21.1	22.4	19.4
	Sold as Berries	1.8	1.1	4.3	76.8	20.1
	Total	100.0	100.0	100.0	100.0	100.0
Method used to perform Wet Processing	Using Own Pulpier	51.3	57.0	53.9	16.7	53.6
	Using Borrowed Pulpier	39.2	32.6	44.0	33.3	39.6
	Using Communal Pulpier	8.7	9.6	2.1	50.0	6.4
	Using Hands	0.8	0.7	-	-	0.4
	Total	100.0	100.0	100.0	100.0	100.0
Source of Water for Wet Processing	Tap Water	57.5	50.9	25.1	22.2	42.4
	River/Pond	23.3	20.3	61.4	66.7	38.6
	Private Well	1.5	2.9	6.7	0	3.9
	Spring Water	3.1	5.2	3.4	11.1	3.8
	Canal	14.6	20.7	3.4	0	11.3
	Total	100.0	100.0	100.0	100.0	100.0
Method Used to dry coffee berries	Above the Ground on Wires	81.0	79.5	84.9	2.3	63.1
	On Mats/Tarpaulin	15.9	9.4	13.3	50.8	24.1
	On Ground	1.0	1.1	1.6	46.9	12.2
	On House Roofs	2.1		0.2		0.6
	Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

After pulping parchment coffee is dried on a wire mesh placed about one meter above the ground surface. Results of the survey indicated that about 63% of the growers dried coffee on wire mesh placed above the ground. The highest proportion was reported in North and South zones. It is important to note that even here, a substantial number of farmers dried coffee on the ground.

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High quality coffee is dependent on several factors that are associated with production especially planting and husbandry practices, primary and secondary processing, and storage and transportation: excellent

Some of the factors associated with coffee quality are grouped into production, processing and storage as presented below.

a) *Production:*
- Favorable soils and climate
- Plants (seedlings) should be young
- Plants have to be properly cared for through use of fertilizers (chemicals or manure), weeding, pruning, irrigation, spraying (pesticides, insecticides, fungicides)
- Grown in shaded areas (fruit/other trees, or intercropped with bananas)

Primary processing – pulping
- Picking of only red and ripe fruits
- Pulping the same day using clean water, and a pulping machine that is properly adjusted to size of beans
- Washing of beans with clean water after pulping
- Fermentation in clean container for about 36-48 hours (depending on temperature: cooler temperature means longer fermentation needed)
- Washing with clean water after fermentation
- Drying coffee on drying wire (two (2) feet off ground), followed by drying on jute/sisal cloth without direct sunlight to a moisture content between 10-12.5% (long drying in cool conditions)
- Packaging in clean sisal bags that ensure ventilation

b) *Storage and transport*
- Storage off ground without contact to chemicals, smells, produce
- Cover during transport

With the mandate of quality control and maintenance, TCB and authorized officers can inspect coffee for quality purposes, including processing, storage facilities, warehouses, auctioning, and packaging for export with respect to International Coffee Organisation (ICO) weights. TCB, appointed agents or authorized officers have therefore the right to inspection and approval of (a) land to be used for future production, (b) coffee farms to ensure maintenance of trees and farm - including picking of ripe cherries, (c) husbandry and primary processing (pulping) practices and facilities, (d) curing factories to ensure equipment with necessary machineries and facilities to TCB standards regarding cleanliness, government authorized weight measurement facilities, proper processing machinery and plant, storage facilities or warehouses. In addition, TCB or agents further have the right to draw samples from stored or processed coffee for testing, and prohibit any building or processing facility to be used if they are not in compliance with the Act and Regulations.[5] Unfortunately, too few inspectors and those present tend to concentrate inspection at secondary tertiary production stages.

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[5] Failure to present necessary documentation or grant access to facilities for quality control is an offense subject to a fine (Tsh 500,000) and termination of license and/or registration. Obstruction and failure of cooperation is

Figure 9a and b present trend of coffee quality between 1968/69 to 1999/2000. As indicate, there is a steady decline of higher grade (high and medium) and increase in poor grade (low and poor) over years.
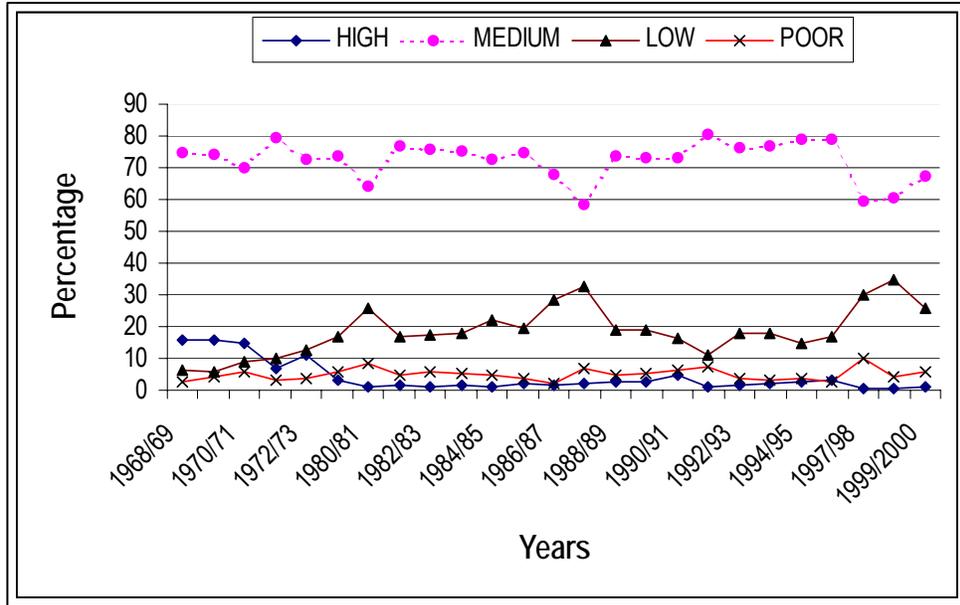

Figure 9a: Distribution of quality of mild Arabica coffee (1999 – 2000)
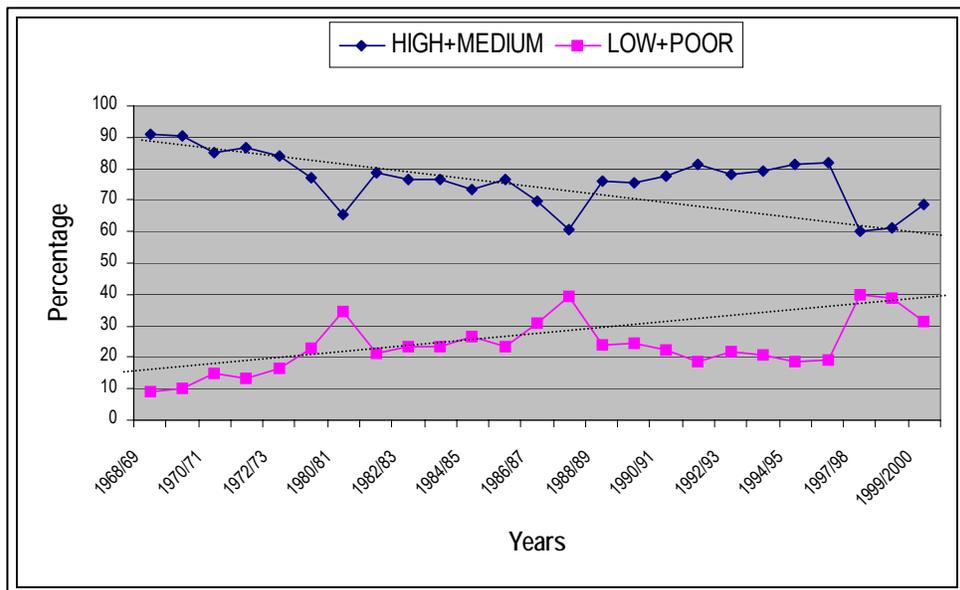
Figure 9b: Trend of quality of mild Arabica for (1999-2000)

an offense subject to a fine (Tsh 1 mio), and termination of license or . Also, tempering with sample or coffee lot is an offense subject to a fine (Tsh 2 mio) or imprisonment (6 months), or both. (Tanzania Coffee Industry Regulation 2003)

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Proportion of coffee grades from at three sources in Tanzania is presented in Figure 10. Proportionately, AA grade accounts for more than 30% of the marketed clean coffee for ex-Moshi and Makambako. AA grades is slightly lower for ex-Mbozi coffee. Looking at a table, there is significant difference across production areas for grade A coffee. While it accounts for more than 25% at Moshi, it is less than 5% at Makambako and Mbozi respectively. Generally lower coffee grades such as TT, C, E, F and UG are less for ex-Moshi than Makambako and Mbozi respectively. This provide managerial signals among extension and research particularly for southern growing zone.
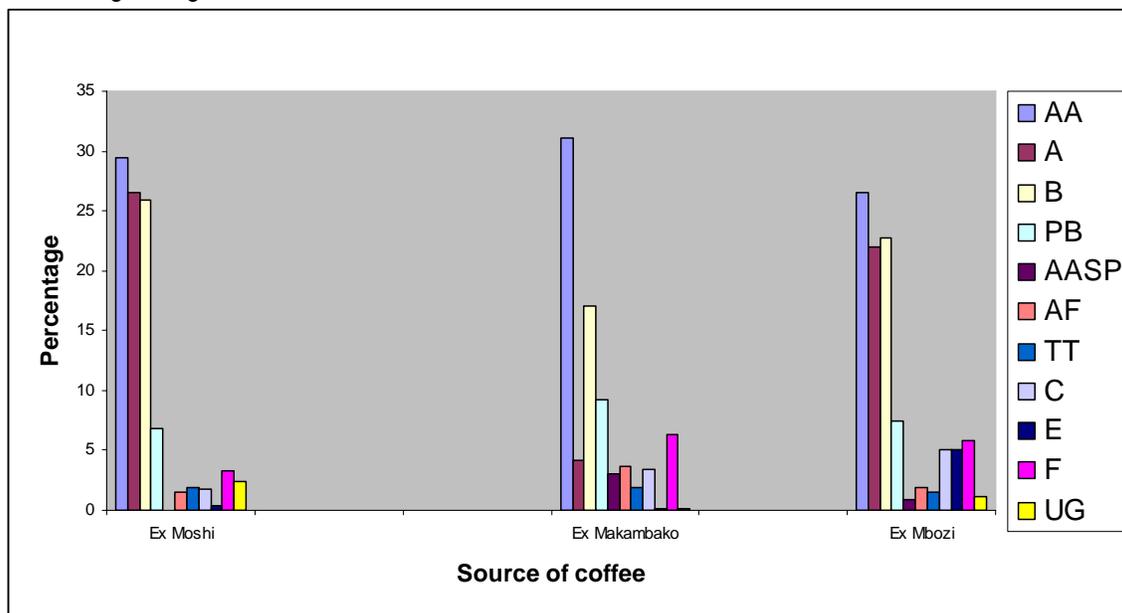

Figure 10: Proportion of Coffee grades for three sources in Tanzania (in 2002/2003 season. (Source TCB, 2003).

Discussion with key stakeholders revealed that evidence on the secular trends in quality is mixed, but decline may have begun even before liberalization. Nationalization of estates and reinstatement of cooperatives coincided with a sharp decline in coffee quality between 1972 and 1994 (Baffes, 2003). The breakdown of central pulping units long before liberalization is also likely to have been an important contributor to decline in the quality of coffee. Aging of coffee trees, and the spread of coffee berry disease also contribute to deterioration of quality (Ponte, 2001; Baffes, 2003). For the present inquiry, the key question is whether changes in the institutional structures of the coffee sector, either before or after liberalization, contributed to changes in quality, and, if so, whether this recognition can be used to facilitate improvements in quality.

Analysis of Auction data revealed that on average, coffee quality based on class has not changed significantly since the early 1990s. Examination of the class of mild arabica coffees produced in the north zone sold at the Moshi auction for four years before and four years after liberalization suggests that coffee quality in terms of class alone has neither deteriorated nor improved (Table 28). No trend is evident for recent years. In respective of modest improvement from 1999 to 2002,

quality seems to have worsened in 2003 with higher shares falling in to classes 9 to 12 and 13 to 17.

Table 28: Quality of mild Arabica sold at the Moshi auction before and after liberalization (% falling into various classes)

Class	1991-94	1995-98	1991-98	1999	2002	2003
1 to 4	0.18	0	0.1	00	0.39	0.21
5 to 8	41.04	44.12	42.4	30.79	41.13	35.95
9 to 12	52.15	51.36	51.8	65.47	55.16	59.02
13 to 17	6.45	4.52	5.6	3.74	3.32	4.81
Total	100	100	100	100	100	100

SOURCE: Calculated from GoT/EU/World bank study (2004)

Coffee brought to auction by private buyers is of comparable quality to other institutions. Quality profile of coffee brought to the auction by various institutions show that quality overall has not declined. PCBs, however, may be trading a greater share of lower quality coffees (Table 29). Never the less in more recent years, coffee brought to the auction by private buyers has been of comparable quality to other institutions (according to data that also include coffee from the south). The share of total coffee that is of highest quality (classes 1 to 5) and the share of various institutions vary from year to year. The proportion of total coffee that was of high quality was 1.9% in 1999, 5.6% in 2002, and 5% in 2003. Estates produce higher quality coffee than other institutions, accounting for bulk of the highest quality coffee. Only about 3% of their coffee were of high quality in 1999, but rose to 32% in 2002 and plummeted to 23% in 2003. The unions did not supply highest quality coffee during these three years. Two percent of coffee marketed by private coffee buyers in 2002 fell into this category.

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Table 29: Quality of mild Arabica brought to auction by different marketing institutions (% of total falling into various coffee classes) 1995-98

Class	Unions	Estate	PCB	PCS	Other	Total
1 to 4	0	0	0.08	0	0	0.04
5 to 8	45.9	75.42	42.9	50.17	15.59	44.12
9 to 12	50.53	20.57	53.32	49.61	62.44	51.32
13 to 17	3.57	4.01	3.7	0.22	21.97	4.52
Total	100	100	100	100	100	100

SOURCE: Calculated from GoT/EU/World bank study (2004)

It is important to note that prior to liberalization, and after the collapse of central pulperies in the mid-1980s, farmers received first payment on ungraded parchment coffee by primary societies. Without rewards for high quality parchment to farmers, incentive structures were lacking in producing and pulping produce and high quality coffee. After liberalization, PCBs bought the ungraded parchment at buying posts at uniform prices without quality-adjusted prices. Due to the bureaucratic system, differentiated prices could not be offered to growers to reward quality parchment. For PCBs engaged in export, the buying of ungraded parchment through their agents in the field involved high costs and risks, mainly due to the lengthy process to bring parchment to curing, auction and export in a volatile market.

4.3.4   Emergence and role of independent organizations in production and marketing

In recent years, independent producers/organizations are emerging and have began to address problems of product quality, marketing, and access to inputs at the farm level. Although liberalization has put considerable pressure on unions and cooperative societies, making many of them bankrupt as they struggled to compete at market prices, new forms of producer organizations emerged. They have began to take advantage of opportunities available under liberalization, and to overcome some of the problems of product quality, marketing, and access to inputs and credit. These organizations include coffee farmer groups, primary cooperative societies that market coffee independently of their unions. They collectively bargain on behalf of members, seek higher returns by avoiding intermediaries in crop marketing and capture premiums for quality in the secondary processed product markets. The groups also gain access to credit because they are able to exercise control over their members. Currently, only a small proportions of the producers are members of such groups, but awareness of potential benefits from participation has resulted in widespread interest among producers.

Private companies and NGOs have been instrumental in facilitating the emergence of coffee farmer organizations. Coffee farmer groups with growers registered as partnerships, have commonly been established to market their coffee independently of co-operative unions. The Kilimanjaro Coffee Company, a private entity, supported the emergence of farmer groups to gain access to high quality coffee markets by preventing pooling of good coffee with average coffee. NGOs, such as Technoserve have extensively supported farmer group formation. An estimated 168 farmer groups with a membership of 30 to 40 growers now take coffee directly to the auction; 137 in the south, 23 in the north and eight in the west. The Coffee Board is interested in group formation largely to provide growers with direct access to the auctions which improve group access to credit by guaranteeing repayment to their creditors. With these guarantees, during 2002-2003,

farmer groups and independent societies were able to obtain inputs worth Tsh 200 million and milling services worth Tsh 439 million on credit.   About 60 farmer groups organized by Technoserve have formed an Association of Kilimanjaro Specialty Coffee Growers (AKSCG). AKSCG helps its members access credit and pool their coffee for marketing, akin to services provided by unions to their member primary cooperative societies. Some of the vertically integrated exporters were helping farmer groups in establishing central processing facilities to obtain high quality coffee. Farmer groups have been able to get higher returns on coffee, reflecting both premiums for quality and a reduction in intermediation.

Primary societies are becoming more independent of Co-operative Unions, with associations of growers developing for other crops. Many primary cooperative societies (PCSs) that acted as agents of cooperative unions under single marketing channel have now disassociated themselves from unions wherever unions have failed to adequately finance purchases of primary processed coffee. Some PCSs have done so to avoid the large overhead costs of unions, unions' failure to secure high returns that are usually passed on to growers as second and final payments, and in many cases even make full first payments. In the northern zone, many primary societies have become independent. Of the 16 members of KNCU, for example, 12 were marketing coffee independently. The coffee auction data for 2002 and 2003 indicated that farmer groups and independent cooperative societies accounted for nearly 40% of the mild arabica brought to auction.

5. Financially viable solutions to improve the livelihoods of coffee farmers and researchable constraints

5.1   Viable solution to coffee sector
This section present a conclusive summary based on the finding of the study presented and discussed above. In normal circumstances this section presents views of the consultant emanating from the findings. However, in this special case, views of the consultant are preceded by respondents' opinions as presented in Table 30. The table not only presents a summary of farmers opinion on production and future prospects but also provide the direction for making valid and viable solutions that will improve the livelihood of farmers in Tanzania.

Table 30: Farmers on constraints and future prospects in coffee production

Constraints	Variable categories	% by zones				Total
		Northern high	Northern low	South	West	
Constraints to coffee production	Could not afford to buy inputs	75.2	55.1	58.5	25.5	51.9
	Poor weather	6.4	20.5	12.2	46.9	24.2
	Plants abandoned due low price	15.6	14.1	17.1	15.9	15.5
	Labour shortage	1.4	2.6	0.0	11.7	5.2
	Coffee trees still young	1.4	7.7	12.2	0.0	3.2
	Total	100.0	100.0	100.0	100.0	100.0
Plans for future coffee production	Plant coffee in new farms	14.2	20.1	23.9	71.3	28.9
	Replace old trees with other Crop	17.7	20.7	10.0	12.3	15.4
	Replace old trees with new ones	65.5	59.2	46.6	11.5	48.9
	Improve existing coffee trees	2.6	0.0	19.5	4.9	6.8
	Total	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculated from GoT/EU/World bank study (2004)

Majority of the farmers pointed the need for increasing production at farm level through replanting/replacement and expansion (49%) and improving the productivity of the old trees through husbandry practices (4.9%) as future plans. About 15% of the respondents especially from the North zones opted for killer solution to coffee industry, i.e. replacing trees with other crops with reason that it is no longer economical to produce coffee. These findings propel us to present the following suggestions.

On production:
Immediate actions required to improve the livelihood of the growers should be geared to those which will see substantial increase in yield at tree and plot level. This can be achieved through planting new trees, and high-yield and disease-resistant varieties, improved husbandry practices, agronomic management, intensified extension, access to credit including inputs, capital investment and farmer education on minimum farm size in expansion areas. It is also important to intensify efforts to produce specialty coffee (gourmet and organic) since we believed that one of the pillars of Tanzania's future coffee market is at the specialty coffee market, where coffee would get high premiums. This is a challenge to TaCRI through promotional activities, farmer training, support to farmer groups and through research.

Strengthening of existing e*xtension services*, and establishing cost effective approach:
It has been observed that extension officers are not adequate and cannot be recruited to cover all coffee producing villages in the near future. Extension achievements can be attained much faster if effort is made to promote and strengthen farmer groups to empower them "greater voice on matters affecting them", so that they take advantage of economies of scale in quantity and quality production.

Processing and quality:
It is suggested and recommended that improvement in these aspects should be done through via training of farmers, extension officers, primary processing, access to, and proper application of

inputs, introduce premium for quality coffee as incentive for farmers to better care for their coffee, and to cooperate with NGOs and private sector to establish and strengthen farmer groups to promote production of quality coffee.

Marketing:
This is one of the most important factors that influence farmers to produce and process for the required quality. Generally, farmers believe that price of coffee is low mostly without referring to the quality coffee produced for targeted customer. Parallel to this, it is important to improve marketing channels to enhance competition, flow of information and income of farmers by reducing number of intermediaries. Where possible, direct sale of coffee instead of selling through the auction by linking farmers to consumers should be encouraged. Finally, with only 1% of coffee sold in the domestic market, it is important to promote domestic consumption thus reducing the sector's dependence on export market

Government support:
Although reform requires freeing government from involvement in production, processing and marketing of coffee, it should be noted that within a decade of reforms, the private sector has not yet developed enough to play an active role or act as the engine of coffee industry. Therefore, government interventions are justified, especially on five constraints, which are highlighted as challenges to the development of the industry. These are poor rural infrastructure, poor extension services, current land tenure system, and poor access to credit, and low budget for research. The Government should also strengthen the TCB role as regulator and encourage the private sector, producer groups, professional groups and cooperatives to take greater and active role in the sector development.

5.2   Future research/training requirements

i.   Research on coffee varieties, which are location specific with attributes, needed by farmers and consumers. Such of these attributes include; high yielding, drought resistance, fast growth, pest and disease resistance, and good cup taste.

ii.   Research on soil fertility status to identify most limiting nutrients in coffee production in all coffee growing zones.

iii   Research on appropriate group formation, dynamics and strengthening with respect to various social and economic settings.

iv   Research on various types of green manure (e.g. lablab, mucuna, dolichos etc.) which can be a cheap alternative for farmers to increase soil fertility so as to increase yield

v.   Research on appropriate intensity of intercropping that has effect on coffee production and productivity.

vi.   Since labour is most limiting factor in coffee production, research on simple tools/equipment that can reduce drudgery in various stages of coffee production and harvesting is required

vii.   On-farm research and training on establishment and management of coffee nursery at village levels

viii.   Research on most cost effective production, processing and marketing methods thus to reduce cost and increase market margin to farmers

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