A STUDY OF NON-COMMERCIAL DAIRY FARMING SYSTEMS IN THE WESTERN DIVISION OF FIJI

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ABSTRACT

The purpose of this study was to describe the smallholder dairy system(s) in the Western Division of Viti Levu, the largest island of Fiji. The role and contribution of non-commercial dairy cows to the income, nutrition and cultural well-being of Indian families in these systems was assessed.

In common with such dairy systems elsewhere in the developing world there is a dearth of available information on the non-commercial dairy sector of Fiji. A Farming Systems Research (FSR) approach provided the framework for the field survey which was carried out in the Western Division of Fiji over an eight week period from February to March 1991. Nineteen farmers selected at random were interviewed for this study. These farmers together owned a total of 36 non-commercial dairy cows. Information was obtained from these farmers on their farming resources and operations and in particular, on the roles, production and reproductive performance of their cows. Using data from these farms and other limited secondary data which was available, a whole farm budget for a typical farm in the survey area was prepared, identifying the revenue and costs of commercial and subsistence crop enterprises and the two-cow system.

For the 'typical' farm, the total net revenue from the combined crop enterprises (commercial and subsistence) was F$5433/year, with sugar cane providing the main source of income from the farm. The imputed net value of production from the two-cow system was estimated to be about 38% of the net crop revenue.

Per capita consumption for Indian farm families of fat and protein from liquid milk were estimated to be 11.6kg and 10.5kg per year, respectively. Survey results show that liquid milk is a significant source of protein to these families. Farmers reported that if a cow was not owned a reduction in the nutritional welfare, health and income of the family would most likely occur. Longitudinal field studies in these smallholder farming systems are recommended to allow the essential dynamics of the livestock enterprises and the relationships between these enterprises, the cropping systems and the farmers' families to be established..

It is concluded from the field studies that non-commercial dairy cows make a significant contribution to the nutrition and economic and cultural well being of the families which keep them, and that these cows are maintained and produce using resources of low opportunity cost to the farm family.

Key words: smallholder dairy systems, Farming Systems Research, Fiji agriculture, tropical dairy production.

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Personal interest in dairy production systems and developing countries in the tropics initiated this study, firstly focusing upon Africa and later on the Pacific islands of Fiji. A specific goal of the writer was to gain more knowledge on the dairy farming systems of developing countries and to identify past research and development on dairy development especially through the use of FSR. This, in turn, would provide the basis for my long-term goal of development work in third world countries.

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LIST OF ABBREVIATIONS

ALTA	Agricultural Landlord and Tenant Act
AH&P	Animal Health and Production
CP	Crude Protein
EP&S	Economic Planning and Statistics
FCA	Fiji College of Agriculture
FSR	Farming Systems Research
GDP	Gross Domestic Product
MAF	Ministry of Agriculture and Fisheries
MFE	Milk Fat Equivalents
NLTB	Native Land Trust Board
MPI	MInistry of Primary Industries
PNG	Papua New Guinea
RCDC	Rewa Cooperative Dairy Company

1.0 INTRODUCTION

1.1 INTRODUCTION.

Smallholders dominate crop and livestock production throughout developing countries. Some 1.4 billion people, or over a quarter of the human population depend on this form of agriculture for their livelihoods. Smallholder farmers are seldom specialist livestock producers. Rather they keep ruminants and non-ruminants as an adjunct to, but integrated with, their cropping systems.

Ruminants play a special role in smallholder farming systems. They can utilise crops and crop byproducts and pastures which can not otherwise be used, and convert them into products of high nutritional value such as meat and milk. Milk from smallholders' dairy enterprises underpins the protein supplies of many millions of rural families in developing countries. Hrabovszky (1981) reported that 'most of the poorest people in developing countries are in agriculture. Thus, if any major improvement is to be achieved in reducing the gap between the poor and the rich, then the focus will need to on the poor in agriculture.' Given the vital contribution of livestock to these people, research into and subsequent development of their smallholder dairy production systems can be a potent means of ensuring the nutritional wellbeing of them.

The world's cattle population in 1989 was approximately 1.3 billion head (FAO, 1989), of which some 68% were distributed throughout the developing countries (as defined by FAO,1989). The majority of cattle in developing countries are in Asia, South America and Africa, which have 391m, 261m and 185m head respectively. These cattle are predominantly maintained under traditional systems of small-scale mixed cropping and livestock farming. These systems are heterogeneous in character and function with differences being due to factors such as climate, land type and class, cultural influences and econo-political setting.

Throughout Africa, Latin America and Asia some of the traditional smallholder mixed farming systems have been described and assessed. However, there are still a large proportion of small-scale mixed production systems in developing countries which require initial description and analysis, identification of possible on-farm constraints and opportunities for improvements through the adoption of new technologies. Little research has been carried out on these farming systems in the South Pacific region. Nations such as Tonga, Papua New Guinea and the Solomon Islands have received some attention. However, there are still a number of island nations relying upon these smallholders, for crop and livestock production, which remain undescribed and assessed. Smallholder dairy systems have been the subject of even less research endeavours than have smallholder cropping systems.

The modestly resourced study reported in this thesis was undertaken to contribute to the pool of

publicly available knowledge and understanding of these important farming systems. The study was done in the Oceanic developing country of Fiji with the focus on the non-commercial dairy systems of the Western Division of Viti Levu, the largest Fijian island. In 1978, the national cattle population of Fiji was estimated at 247,430 head, of which the dairy cattle population was estimated to be 95,000. A large proportion of the dairy cattle are in the Western Division. There is no commercial production of milk in this Division; and farmers keep dairy cattle mainly for subsistence purposes. Nearly 84% of dairy cattle in Fiji are kept for non-commercial purposes.

The study focusses on the non-commercial production of milk by small-farmers in Fiji. The farming systems approach to research was adopted to fulfil the goals and objectives of this study, as the farmer and farm household will be the target for new technologies and development.

1.2 STUDY OBJECTIVES

The main aims of this study are to describe the smallholder farming system(s) and assess the role and contribution of non-commercial dairy cows to the income, nutrition and cultural well-being of Indian families in the Western Division of Viti Levu.

Two hypotheses were to be tested through the field studies. First, that the smallscale cow herds, typically one or two cows, make a significant contribution to the nutrition and economic and cultural well being of the families which keep them. Second, that these small herds are maintained and produce using resources of low opportunity cost to the farm family. If these two hypotheses can not be rejected, and opportunities can be identified significantly to improve these systems, again of low total resource costs, then the case may be made for the investment of public monies into their future development. While this latter question of public investment is not addressed in this study, opportunities for the improvement of the systems are identified and discussed.

The specific objectives of the study are:

1. To collect, describe and analyse primary and secondary information on the production and contribution of the non-commercial cow to the income, nutrition and cultural well-being of Indian farm families in the Western Division of Fiji;
2. To examine and identify possible problems or constraints on the productivity of non-commercial dairy cows;
3. To assess opportunities for improvements of these systems and to provide recommendations for further research and development on them to the Fijian Government, agricultural researchers, extension personnel and educational institutions.

1.3 STUDY PLAN

The Farming Systems Research (FSR) methodologies provided the framework for the study. A

review of the evolution of FSR, and the key concepts and processes embodied in it are presented in Chapter 2. The descriptive or diagnostic stage of FSR is described in detail, with special reference to this study.

An introduction to Fiji is presented in Chapter 3. The resources of the country are described. An overview of the Fijian economy, effects of land tenure upon agriculture and the main farming systems is presented. Dairy production in Fiji is discussed in two parts; the commercial dairy sector and the non-commercial dairy sector.

Chapter 4 describes the methodology followed in the study, and the procedure used for sampling of the farmer-subjects interviewed, and for the field operations. Comments are offered on the practicalities of undertaking these field studies in Fiji.

The results gained from field studies preformed in the Western Division are presented in Chapter 5. Background information on the farmers surveyed, the production histories of cows owned by surveyed farmers and the husbandry and management of these cattle are reported. The value of non-commercial dairy cow(s) to the farm and family in terms of her monetary worth and nutritional value of milk and milk products to the farm household is estimated and assessed.

The final chapter provides a brief summary of the results gained from this field survey. The methodological issues, implications and recommendations for future research are discussed. Finally, the conclusions to this dissertation are presented.

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

A review of selected literature on Farming Systems Research (FSR) is presented in this chapter. Section 2.2 briefly describes the evolution of FSR, which was mainly a response to the inadequacies of conventional reductionist research methods. Some of the key concepts and processes incorporated into FSR are addressed in Section 2.3.1. A detailed discussion of the initial descriptive or diagnostic stage of FSR, with special reference to the field study in Fiji, is presented in Section 2.3.2.

2.2 EVOLUTION OF THE CONCEPT OF FARMING SYSTEMS RESEARCH

FSR emerged in the post Green-Revolution era in response to the growing concensus that the mainstream, conventional agricultural research and extension institutions were not providing or disseminating technologies widely adopted by small-scale, resource-poor, farmers (Byerlee et. al., 1980; Shand, 1985; Sands, 1986b; Chambers et. al., 1990).

The diagnosis of this problem, as reported by Sands (1986b) and Chambers et. al. (1990), was that agricultural researchers and development planners, the usual generators and disseminators of new technology, had employed a fundamentally 'top-down' approach to technology development. In this traditional or classical agricultural research approach, the priorities were determined by scientists. The scientists generated new technologies on research stations and in laboratories, and these were then transferred through extension services to farmers. Commentators on the agricultural research and development process stressed that agricultural researchers and development planners lacked sufficient first hand understanding or documentation of the management conditions under which smallholder farmers in Third World countries operate.

In response to this situation, FSR proponents argued firstly, that development of relevant and viable technology for small-farmers must be grounded in a full knowledge of the existing farming system and secondly, that technology should be evaluated not solely on the terms of its technical performance, but in terms of its conformity to the goals, needs and socio-economic circumstances of the targeted small-farm system (Sands, 1986b; Shaner et. al., 1982).

FSR has contributed fundamentally to reconsideration of the view of many researchers and developers that smallholder farming systems in the tropics and sub-tropics were static and primitive. It is now more widely realised and accepted that they are complex, dynamic systems

which have evolved in response to particular agro-climatic, ecological and socio-economic conditions (Sands, 1986b).

Smallholder farmers had not been rejecting new technologies, the 'improvements' being provided by the top-down research/extension establishment, out of sheer ignorance, traditionalism or sloth. They had not adopted them because they were pursuing goals and employing criteria for evaluating tecnologies different from those used by agricultural scientists (Sands, 1986b; Simmonds, 1986).

Instead of starting with the knowledge, problems, analysis and priorities of scientists, FSR starts with the knowledge, problems, analysis and priorities of farmers and farm families. Instead of the research station as the main focus of action, it is now the farm. Instead of the scientist as the central experimenter, it is now the farmer, whether woman or man, and other members of the farm family with the involvement of the researcher. Farming systems research is therefore more likely to design technologies that are appropriate and acceptable to small farmers because the FSR approach stresses an understanding of the farming systems and the farmer's environment. (Shaner et. al, 1982)

2.3 KEY CHARACTERISTICS AND PROCESSES OF FSR

Before addressing the procedures involved within the FSR approach, some intrinsic concepts defining FSR are discussed. These are presented in Section 2.3.1., followed by a discussion on the stages of FSR in Section 2.3.2. Aspects relating to this study are also discussed in Section 2.3.2 with respect to the procedures carried out in the field.

2.3.1 Important concepts defining FSR

The basic unit of the FSR approach, as stated by Weinschenck (1989), is the farm-household system comprising of the household, the production system, the off-farm component and the natural resource component.

Farming systems are defined by their physical, biological and socio-economic setting and by the farm families' goals and other attributes, access to resources, choices of production activities (enterprises), and management practices (Shaner et. al., 1982). FSR considers the farmers and their problems in a comprehensive manner using an interdisciplinary approach that complements existing research and development activities, and is iterative, dynamic, and responsive to society (Gilbert et. al., 1980; Shaner et. al, 1982; Sands, 1986b).

The primary objective of FSR is to improve the well-being of individual farming families by increasing the productivity of their farming system, given the constraints imposed by resources and the environment. FSR consists of two thrusts towards increased productivity (Norman & Collinson, 1985; Norman and Gilbert, 1982; Shaner et. al, 1982). Firstly, by the development and dissemination of relevant improved technologies and practices. Secondly, through the implementation of appropriate policy and support systems to create opportunities for improved production systems and to provide conditions conducive to the adoption of technologies already available. However, before improvements can be made the current farming system must be described and understood. This is the aim of the study in Fiji.

Research can be considered to be FSR if it has the following characteristics (Norman and Collinson (1985); Norman and Gilbert, 1982). First, the farm as a whole is viewed in a comprehensive manner with a recognition of the interdependencies and interrelationships within the natural and human environment in which the farming system is operated. Second, the choice of priorities for research reflects initial study of the whole farm. Research on a farm subsystem is legitimate FSR, provided the connections with other subsystems are recognised and taken into account. Third, the evaluation of research results explicitly takes into account linkages between subsystems. These characteristics are consistent with the aims and objectives of this study, since the FSR methodologies provide the framework of this research.

Shaner et. al (1982) reported that FSR researchers may focus on any part of the whole farming system or they may concentrate on a predetermined subsystem. However, both approaches require some study of the whole farming system. The first approach requires an understanding of all subsystems and their interactions, while the second approach demands detailed knowledge only of the selected enterprise and its relationship with the rest of the subsystem. The second approach was adopted for this study in Fiji. The specific enterprise selected was non-commercial dairy cow(s) owned by sugar cane farmers in Votualevu. The aims of this study are such that a description of the whole farming system is necessary before the role and contribution of the non-commercial dairy enterprise to the farm family can be fully assessed.

FSR programs can be classified two ways, as 'upstream' or 'downstream' FSR (Norman and Gilbert, 1982; Shaner et. al, 1982). Upstream (on-station) FSR, also called resource management research, uses a systems approach on an experimental station to provide prototype solutions aimed at alleviating major constraints to agricultural improvement. The information received concerns the technical feasibility of innovations under ceteris paribus conditions which may differ markedly from the conditions on farms in the targeted area. Downstream (on-farm) research has an adaptive orientation and aims at developing and introducing strategies that will improve the productivity of farming systems for target groups of farming families in the short run. It means the testing of technical innovations under the practical conditions of farm and household. On-farm

research and on-station research should be seen as complementary and not competitive. The combination of upstream and downstream research is often considered as FSR. This is currently the most widely used methodology, especially in international agricultural research centres (IARC's) (Doppler, 1989). However, for the purpose of this study, the downstream approach of FSR is considered and discussed in Section 2.3.2.

2.3.2 The main processes involved in on-farm FSR with special reference to the diagnostic stage

The main components of the FSR processes are briefly presented. This is followed by a detailed discussion of the initial diagnostic stage, which is central to this study.

The FSR process can be described in four distinct and linked stages. Figure 2.1 summarises the process (Byerlee et. al., 1980; Shaner et al., 1982; Norman and Collinson, 1985). The stages are:
1) The descriptive or diagnostic stage where the target and research area are selected. This stage seeks to determine the constraints farmers face and to ascertain potential flexibility in the farming system (Steps 1 and 2 from Fig.2.1);
2) The design or planning stage (problem identification and development of a research base) involving the identification of a range of strategies that are considered to be relevant in dealing with the constraints (Step 3: Fig.2.1);
3) The testing stage which involves on-farm research, where the most promising strategies identified are evaluated under local farming conditions (Step 4: Fig.2.1); and,
d) The recommendation and dissemination stage in which the strategies identified and screened during the design and testing stages are implemented (Step 5: Fig.2.1).

The methodology adopted in this study accepts and follows the framework provided in the above procedure, although the main focus is on the first stage. The objective of the initial descriptive or diagnostic stage, as reported by Norman and Collinson (1985), is to select target areas to divide the frame of farming families into target groups as recommendation domains, and to ascertain the major constraints on farming in that area and also the degree of flexibility that exists to modifying the farming systems.

The target area selected for this study was the Votualevu District of the Western Division of Viti Levu. Indian sugar cane farmers in this area were the focus of the field studies because they owned cows for non-commercial dairy production and were known to account for virtually all dairy production in that part of Fiji.

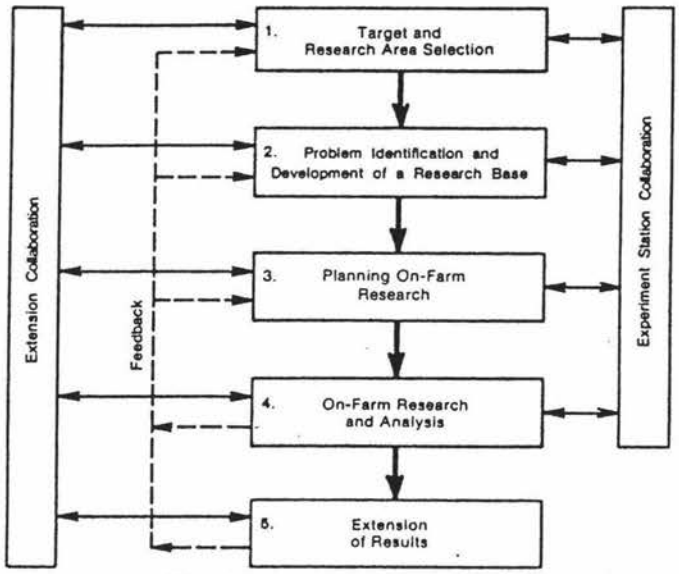

Figure 2.1 The five basic activities of on-farm research in Farming systems research and development.

(Source: Shaner et al., 1982: Figure 3.1)

The next step involved in the FSR process is the identification of problems or constraints in chosen farming systems. Shaner et al. (1982) describes three basic steps taken as part of problem identification. Firstly, the identification of existing farming systems, seeking to understand them and their environment. Secondly, to identify problems and opportunities for improving the system or the environment, or both. Finally, to set priorities for research and implementation. Within these steps there are various parts to the problem identification process, as summarised in Figure 2.2. The objective of this phase of the process is to help the agricultural scientists - who are developing technology for small farmers, and development planners - who are designing projects to transfer the technology, to know the circumstances and needs of their client.

The first preliminary analysis (2a. of Figure 2.2) is based on information obtained during the selection of the target and research areas. At times enough will be known about the problem to go directly to planning research activities. However, more often the interdisciplinary team will need to learn more about the farming systems and the environment of the area. This was the case for the study of non-commercial dairy Indian farmers in Fiji. Since no previous research had been carried out in this area any information was recognised as an advance towards gaining an understanding of the current farming systems adopted in Fiji. A literature review of past animal research on smallholder producers' problems in Sub-Saharan Africa (Richardson, 1990) highlighted potential issues of relevance to the Fiji situation, and enabled the writer to form tentative hypotheses about the nature of the Fijian smallholder dairy systems. The limited resources available for this study prevented a 'standard' FSR field team from being assembled. This important departure from

recommended FSR practice limited the field work to diagnostic activities. This researcher was supported in the field by two Government officials.

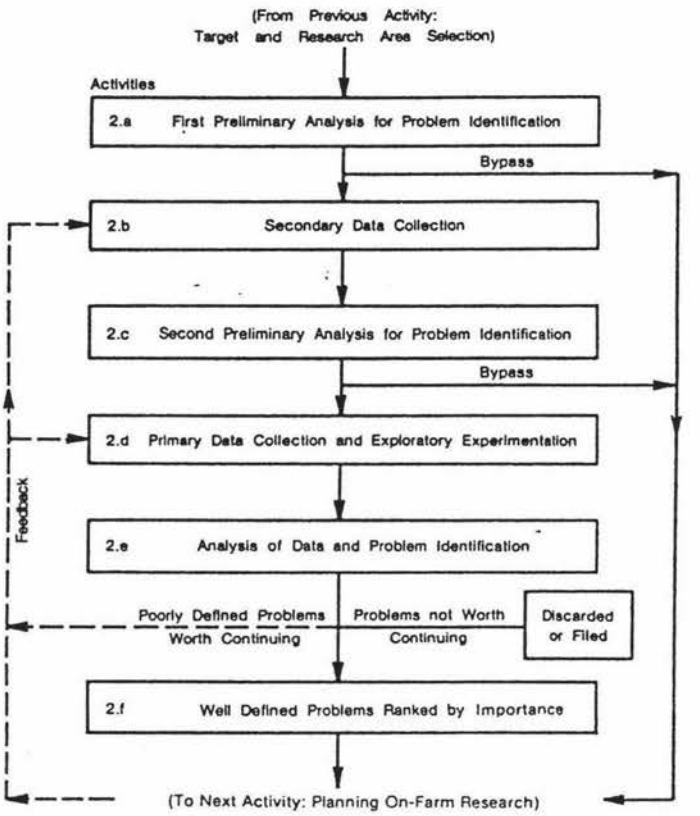

Figure 2.2 A flow chart for the problem identification and development of a research base

(Source: Shaner et al., 1982: Figure 5.1)
Note this figure is an expansion of box 2 in Figure 2.1.

The next step in the FSR process involves the collection and analysis of secondary data (2b. and c.). Full use of secondary information, either published or unpublished, regarding the research area is necessary so that resources are not squandered on 'reinventing the wheel' or time wasted in the field (Byerlee et al., 1980; Gilbert et al., 1980; Sands, 1986a). Collection and analyses in New Zealand of available secondary materials were performed before going to Fiji. Resources at the University of the South Pacific in Suva were also examined throughout the visit. The literature provided a useful background to the field study, however it emphasised the scarcity of information available on the non-commercial dairy sector.

Primary data (2d of Figure 2.2) can be gathered from farmers and from others who have a knowledge of the farmers' circumstances in the target area. The interviews to gather this data may be conducted relatively informally through, for example, conversations between researchers and farmers, or more formally by single and/or multiple interviews using a questionnaire. Sands (1986a) recommended starting with interviews with professionals familiar with the targeted region

such as government officials, extension personnel, merchants dealing with farmer's products and supplies, local agricultural scientists, and political leaders as 'they can often focus attention on key problem areas in the small-farm sector, but their hypotheses should be tested in interviews with farmers.' Discussions were held with Fijian Government officials, agricultural researchers and extension workers prior to and throughout field visitations in Fiji. The conversations highlighted the lack of available information on the non-commercial dairy systems. However, the informal discussions provided useful data for the selection of a target research area for field visits. Although the discussions were useful they did not suggest any 'key' problems areas for further investigation in the field. This was mainly attributed to the lack of knowledge on the production systems.

The exploratory survey, also generally known as a quick, informal, or reconnaissance survey is a method of primary data collection that usually follows secondary data collection (Byerlee et. al., 1980; Shaner et al., 1982). The review of the secondary material should be completed before conducting the field research so that questions framed for field reconnaissance are appropriate. The regional reconnaissance is a critical phase in the research process because it is the period in which problems are initially defined and research priorities established, it is also the first stage of research in the field with farmers. It is also the most vulnerable to funding constraints because the pressure for producing concrete results as quickly as possible is strong (Sands, 1986a). The exploratory survey enables a lot of information (both facts and impressions) to be collected in a short amount of time.

Sands (1986a) also recommends that a descriptive and diagnostic regional reconnaissance should be made by an interdisciplinary team of both technical agricultural scientists and social scientists trained in smallholder agriculture. While a team approach was not possible for this study, the principle is acknowledged as being beneficial.

According to Sands (1986a), the primary goals of regional reconnaissance should be to:

a) initiate dialogue with the farmers so that their needs and priorities are incorporated into the initial stage of the technology development process;
b) develop an overview of the physical, economic, social, and political environment in which the small-farmer operates;
c) describe the major farming systems in the region and develop criteria for dividing them into more or less homogeneous types with similar needs, constraints and areas of flexibility;
d) generate hypotheses of principal constraints to increased productivity for each type.

These goals were adopted by the writer for this study as a guideline for the type of information to be gathered.

Informal methods of primary data collection usually refer to surveys undertaken without the use of questionnaires. The casual nature of the informal method allows the interviews to be conducted in a relaxed and friendly manner. However, there are associated disadvantages with the informal surveys (Shaner et al, 1982). Firstly, data gathered informally have some limitations because rigorous methodologies are not followed. For example, the farmers may have been selected purposively and not randomly, therefore the data can not be subjected to statistical analysis. Another disadvantage is that without the use of a written questionnaire from which to work, interviewers may not ask the same questions of all farmers, nor are they likely to ask questions in the same way. One way to overcome such disadvantages is combine informal investigations with formal ones, for example combining the use of a questionnaire with informal conversation and questioning about matters concerning the questionnaire.

The formal methods of primary data collection are generally undertaken to test and otherwise clarify the interdisciplinary team's reconnaissance and other findings, and to follow up on important topics. Verification comes primarily through statistical procedures, but also through insights gained by experienced researchers. The two main methods associated with the formal approach are single and multiple interview surveys. The single interview survey follows soon after the reconnaissance phase. A questionnaire is administered to farmers usually selected according to formal sampling procedures. The multiple interview surveys involve collecting data from a limited number of farms on a repetitive basis. This may continue for a year or more, or for the period needed to ensure that phenomena with the longest duration cycle of interest in the system can be described and documented. This type of survey is well suited for collecting continuous data, such as cash flows and food consumption (Shaner et al., 1982).

By analysing the secondary and primary data (2.e of Figure 2.2) the problems and opportunities can be divided into those that are well-defined, poorly-defined, and not presently worth pursuing (Shaner et al., 1982). Well-defined problems and opportunities are those that can serve as the basis for the next research activity. Poorly-defined problems and opportunities require further study and definition. Those not worth pursuing are problems with apparently no practical solution under present conditions or whose payoffs are substantially lower than those realised from other possibilities.

An informal reconnaissance survey was made of Indian farmers in Votualevu with the use of a questionnaire to aid discussion and collect similar information from farmers. The interviewer and farmers were not fluent in a common language which prevented direct conversation between the interviewer and farmers. An interpreter was used to translate from Hindi to English and vice versa. The aim of the survey was to gain as much general information as possible about the farming systems employed by sugar cane farmers, and then to focus more upon the roles, and productivity of the cow(s) they owned. Possible constraints on and opportunities for improved cow productivity

could then be identified. In turn this information would provide the basis for initial and practicable recommendations for improvements to these farming systems. The FSR approach described earlier detalis the next step, the design or planning stage, in the process of on-farm or down-stream FSR. However, further formal methods of primary data collection such as mulitple interview surveys, are recommended to confirm the problems and opportunites reported in this study before definite planning of on-farm research can proceed to test new technologies or recommendations for change to the current farming system.

2.4 SUMMARY

The evolution of FSR and its approach to agricultural research in developing countries has been presented and discussed. The initial diagnostic stage of FSR, involving the analyses of secondary information and the collection of primary data has been discussed in detail. The activities for this research reported in this study have been described in the contaxt of the FSR approach, and in relation to the diagnostic stage of FSR in particular.

Farming systems research was developed mainly because of the perceived failure of traditional or classical 'top-down' agricultural research to solve the problems of the small farmer operating in less favourable natural environments. Farmers in these environments were not adopting new technologies because the scientists and developers had only limited understanding of the management conditions and resources under which those small farmers operated and as a consequence were developing iprovements poorly suited to the farmers' needs.

FSR places the small farmer and the farm family at the centre of the research process. This research approach identifies smallholder farming systems in developing countries as being complex and dynamic, having evolved due to the agro-climatic, ecological and soci-economic conditions facing the farmers (Sands, 1986b). FSR proponents argue that the development of relevant and viable technology for small farmers must be grounded in a full knowledge of the existing farming system. New technologies should also be evaluated not solely on the terms of its technical performance, but in terms of its conformity to the goals, needs and socio-economic circumstances of the targeted small-farm system.

The primary objective of FSR is to improve the well-being of farming families in the target area by increasing the net productivity of their farming system, given the constraints imposed by resources and the environment and the objectives of farmers. Two main thrusts are used to increase productivity. First, the development and dissemination of relevant improved technologies and practices. Second, through the implementation of appropriate policy and support systems, to

create opportunities for improvement, and to provide conditions conducive to the adoption of technologies already available.

The four main stages of FSR are presented as, a) the descriptive or diagnostic stage; b) design or planning stage (problem identification and development of a research base); c) testing stage (on-farm research); and, d) recommendation and dissemination stage. Since this field research in Fiji is of the diagnostic type, the issues central to diagnostic studies using the FSR framework have been discussed in detail. The main aim of this diagnostic study is to help Fijian agricultural scientists and developers gain an understanding of the smallholder farmers in Votualevu, and the dairy enterprises they operate in particular and identify researchable opportunities for improvements to their systems.

Votualevu, a district in the Western Division of Viti Levu, was chosen as the research area. The target for research was those sugar cane farmers who owned cow(s) for non-commercial production of milk. Shaner et al. (1982) reported three important steps in the problem identification stage, the identification of existing farming systems, identification of problems and opportunities for improving the system, and the setting of priorities for research and implementation. Information about farmers can be gained from studies of the target research areas, and through the collection and analysis of secondary and primary data. The advantages and disadvantages of informal vs formal methods of primary data collection, as described by literature, are discussed.

The FSR approach has been followed in this study. Resource constraints for the field work necessitated important departure from recommended practices for diagnostic studies, the most important of these was that a multidisciplinary team could not be mounted for the study. Otherwise the writer aimed at following the procedures discussed in the problem identification stage of the FSR process. Collection of secondary information was carried out before and during the visit to Fiji. Analysis of this information showed a lack of available information on non-commercial dairy farmers. The collection of primary data was undertaken by an exploratory survey aided by a questionnaire. Further research into this particular farming system through more detailed formal surveys and on-farm research is needed before recommendations for change can be implemented. Following the introduction to Fiji and the dairy farming systems of the country in the next Chapter, Chapter 4 presents the methodology undertaken in this study, regarding the selection of farmers, the type of information received and problems associated with the field study in Votualevu.