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HOUSEHOLD GRAIN STORAGE AND MARKETING DECISIONS IN SOUTHERN AFRICA:

A review of conceptual and methodological issues with particular reference to Zimbabwe's communal farming sub-sector

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1. INTRODUCTION

1.1 Recent experience in the Zimbabwean smallholder sub-sector

The dramatic rise, since independence, in smallholder production and marketed surplus of some of Zimbabwe's major food and cash crops (notably maize and cotton and to a lesser extent sorghum) has been documented in Stanning (1985b). Over the period 1970-1979, estimated smallholder maize production averaged 479 000 tonnes per annum (30 percent of national production) of which less than ten percent was delivered to the parastatal Grain Marketing Board (GMB). Smallholders' contribution to total GMB intake in this decade averaged only some 5 percent per annum. Over the period 1980-1984, smallholder maize sales increased sixfold to an average of 272 700 thousand tonnes per annum (42 percent of smallholder production) and accounted for 23 percent of total GMB intake. Similar growth has also been experienced in smallholder cotton production. Over the period 1970-1979, cotton output from the small scale sector averaged 33 500 tonnes per annum (22 percent of national output). Smallholder cotton production almost doubled between 1980 and 1984 averaging 63 300 tonnes per annum and contributing 33 percent to total sales.

In 1985, smallholders' contribution of maize and cotton sales to the marketing boards is expected to reach around 40 percent and 50 percent of total intake respectively.

1.2 Future research issues

The explanation for this exceptional increase in smallholder production and share of sales to statutory marketing boards can probably be found in a combination of factors, including the priority placed by the post- independence government on developing agricultural and service infrastructure in communal farming areas, producer price incentives, and the end to the disruption of transport channels caused by the war. However our understanding of the process of integration of small-scale producers into the national marketing system is incomplete,and a number of important questions remain to be resolved:

To what extent and in what manner does the market participation of smallholders vary between regions within Zimbabwe and amongst households in the same area? If expanded producer price incentives and market opportunities have had a differential impact on different groups of producers, what are the reasons for this?

Is the present level of marketed surplus sustainable? What factors have contributed to the achievement of current levels of marketed surplus?

Does there exist potential for further increases in marketed surplus from the small-scale sector? Is this potential likely to be realised within the existing agricultural policy framework or will it require new policy initiatives orientated specifically to areas or groups of farmers not currently participating in the market?

In terms of such vital interests as national food security, the performance of the smallholder sector is becoming increasingly critical. A fuller understanding of the process of integration of smallholders into the national marketing system, together with answers to the above questions, can only be found through the disaggregation of national statistics. Further, in order to understand and measure some of the observed association between marketed output and government policies, and to derive generalisable results therefrom, one requires more detailed information than is currently available on agricultural decision making at the farm household level. A study that addresses some of these issues has recently been initiated by Stanning (1985a) for the communal farming areas of Zimbabwe in co-operation with the Food Security Research Project in Southern Africa.

1.3 Objectives of study

The investigation will examine the differential impact on different groups of communal farmers of government policies regarding price and marketing services. Through an analysis of household storage and marketing decisions, appropriate socio-economic models of the factors which influence the flows of food grains through the local and national marketing systems will be developed. These models will be used to assess the impact of optional policy scenarios on farm level storage and marketing.

1.4 Scope of study

Most marketing studies in developing countries, concern themselves primarily with measuring agricultural market performance in the

"structure, conduct and performance tradition" (See Lele 1967, Gilbert 1969, Hays 1974, Harriss 1982). The Zimbabwean study, however, is essentially an analysis of agricultural marketing decisions - what goes into them and what effects they have once they are made. Consequently the analytical methods used in conventional market studies are likely to be of limited use.

1.6 Components of study

The proposed analysis of household grain marketing and storage decisions in the communal areas of Zimbabwe may be decomposed into five components.

These are:

A. Delineation of different groups of producers within the communal farming sub-sector.

B. Qualitative characterisation of how farmers[1.] make storage and marketing decisions.

C. Development of socio-economic model(s) to analyse grain marketing and storage behaviour.

D. Estimation of model(s) with data drawn from farm surveys.

E. Use of the estimated model(s) to predict impacts of government policy or other socioeconomic changes on farmers' grain storage and marketing actions.

[1.] The term farmer is applied to the members of the farm family who are ,individually or collectively, actively involved in and responsible for making decisions. It may therefore be used collectively and is not intended to describe any particular individual in the farm family.

Before discussing the methodological issues associated with each of the above components, it is helpful first to distinguish various approaches to agricultural decisions analysis and comment on their appropriateness.

2. SOME APPROACHES TO AGRICULTURAL DECISION ANALYSIS

In examining the approaches to agricultural decision analysis, it is useful to distinguish between normative and descriptive analysis, i.e. between those studies with a prescriptive purpose and those of a behavioural nature. Prescriptive studies are usually aimed at determining what people ought to do given specified goals whilst behavioral studies typically seek understanding of what people do and why. The distinction between prescriptive studies and behavioural studies is not always a sharp one and the same analysis may incorporate both aspects; opportunities for confusion are minimised however by keeping this distinction in mind (Hardaker 1983).

Basic normative principles, derived from conventional micro-economic theory, provide a powerful calculus in helping to determine the choice of a grain storage and marketing strategy that would maximise attainment of farmers'goals, but they are nevertheless a misleading first approximation to behavioural generalisations. This is because of the complexity in the farm-household decision process, the multiplicity of farmers' goals and the important influence of uncertainty and risk on farmers' actions. It seems therefore that descriptive, or behavioural agricultural decision studies may be more useful than normative ones.

There are broadly two approches to such studies which that can be categorised as the " natural decision making approach" and "the statistical behavioural approach" (Chibnik 1980).

The natural decision making approach has been used largely by anthropologists and involves studying how individuals actually make economic decisions. Sophisticated ethnoscientific methods have been used to isolate what people consider when deciding where to market commodities (Gladwin 1975) and where to plant different crops (Johnson 1974).

The statistical behavioural approach to economic decisions involves statistical analysis of the relationships between observed characteristics of decision makers and the environment in which they act and the choices they make. This approach requires neither assumptions about the complete rationality of economic actors nor extensive elicitation of the rules people use when making decisions. The actual decision process in seen to be a "black box"; individual variation is expected; and group patterns become the focus of research (Bartlett 1980). Analyses of this type have been carried out by Bartlett (1977) and Acheson (1980).

The advantages of the statistical approach over natural decision analysis have been reviewed by Chibnik (1980). The main advantage is that this approach can provide numerical indices of the relative importance of and inter-relationship amongst the variables which influence farmers' choices. Statistical relationships of this type are not always obvious and can easily be missed by the researcher who relies only on unsystematic observation and elicitation of decision rules. However quantitative analysis in isolation from

qualitative of data would also not be particularly informative. Statistical analysis needs to consider information gathered in interviews or casual conversations as well as other socio-cultural data since some of the variables chosen in correlations are often selected as a result of such information, although others may be incorporated for theoretical reasons.

A behavioural approach to agricultural decision analysis is therefore most appropriate given that the research objective is to understand and predict household grain marketing and storage actions. Neither natural decision making nor statistical behavioural analysis alone however a completely describe description of economic choice. A combination of these two analytical methods is likely to provide the most complete information on choice place given the opportunities that exist for decision making.

3. METHODOLOGICAL PERSPECTIVES ON RESEARCH COMPONENTS

3.1 Delineation of Different Groups of Producers within the Communal Farming sub-sector - developing a strategy for data collection

The communal farming sub-sector is not homogenous. It contains farm households operating in various agro-ecological zones, under different resource constraints, with disparate access to marketing opportunities and agricultural support services.

Such differences affect farm household production opportunities, the degree of commercialisation of agricultural production and the type and level of food security risk, all of which in turn influence

farmers' actions. In order to conduct research capable of providing policy recommendations that take into account differences between communal farming areas in terms of determinants of farmers' actions, it is helpful to disaggregate the communal farming sub-sector into various grain producing systems. This procedure helps to formulate an appropriate strategy for data collection by demonstrating the relative importance of areas for which relevant farm surveys already exist or are underway, and by identifying areas for future data collection. The selection of typical areas for farm survey would also be more easily avoided.

The district is probably the most appropriate unit in terms of data availability on which to base a classification of Zimbabwe's communal areas. Classification would proceed by grouping districts according to certain criteria of similiarity, a method typically refered to as "classification from below" (Haggett, Cliff and Frey 1977).

The identification of different types of communal farming areas and the development of a data collection strategy require the following five steps[2]:

1. Define/propose hypotheses as to the determinants of grain production, storage and marketing actions.

2. Obtain relevant data on these determinants for each area.

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2. I am indebted to Rick Berstein who helped to calify my thinking in this area.

3. Develop multi-dimensional criteria to form the basis of a typology of grain producing areas.

4. Identify the relative importance of each typology.

5. Identify types into which existing surveyed areas fall and select new sites for data collection representing important typologies not included.

Space precludes a detailed consideration of each step outlined above, however an idea of the indicators which may be useful in step 1 together with likely data sources are shown in Table 1.

It is anticipated that some form of multivariate analysis will be required in step 3. A useful introduction to the scope of multivariate analysis likely to be used can be found in a study by Kydd (1982) who used cluster analysis to identify different groups of farmers in Malawi.

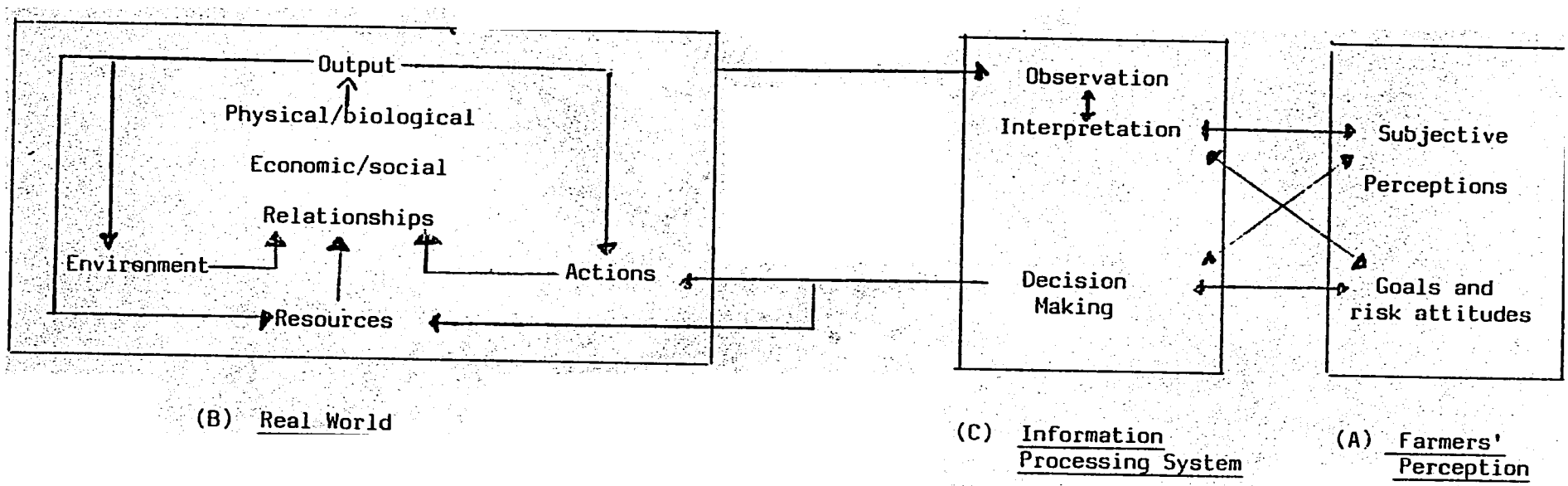
3.2 Qualitative Characterisation of how farmers make storage and marketing decisions

Grain storage and marketing decisions involve choices and actions based on farmers' processing of information about their goals, resources and physical/socioeconomic environment. The information farmers' use will be derived from reality but it is unlikely to correspond to it exactly because of their subjective perceptions. Three components of the decision making system can be identified and are illustrated in Figure 1. Component (A) consists of goals and

Table 1: Some suggested indicators for classifying smallholder farming areas

Indicator			Source of Data
a. Population			
man: land ratio			census
rate of increase			census
male : female ratio			census
land : livestock			Veterinary Department
b. Environmental			
rainfall amount and variability			meterology
soils			soils map
terrain			Surveyor general
agricultural potential			Whitlow 1980
c. Institutions			
Extension support	:	Farmers/Agent	Ministry of Agriculture
Registered producers	:	registration/ farmer	Statutory Marketing Board
Credit access	:	loan/farmer	Finance Corporation
Market access	:	distance to depots	Statutory Marketing Board
d. Farming System			
Cropping patterns	:	dominant food grain and cash crop	Ministry of Agriculture
Cattle production	:	offtake	"
Crop output	:	Kg grain per capita value/ hectare crop-land	"
Grain marketing	:	Kg/capita or hectare crop-land	Statutory Marketing Board
	:	rate of increase cropland last 5 years	
Fertiliser use	:	Kg/hectare cropland	Fertilizer Distributors

Figure 1 : Principle Components in a Farmer's Decision making System



Source : Adapted from Dorward (1984)

information on which decisions are based; that is subjective perception of the behaviour of the system. Component (B) is the real world of which the information is a model. Mediating between these is the third component (C), the information processing system which interprets observations of the real world to build up information and understanding and organise decisions. The result is interaction between reality, perception and action which will be repeated through time (Dorward 1984).

This conceptual framework may be used to guide the examination of variables that relate to, account for or predict farmer's storage and marketing behaviour. Access to land and wealth, together with market forces, are probably the key variables in the real world likely to structure decisions to sell or store grain. In addition, each farmer usually makes decisions in the context of the farm household and is therefore influenced by household needs. Farmers' responses to these factors would generally be influenced by a long list of qualitative variables including attitudes toward taking risks and profit accumulation, past experience, management ability and certain personal characteristics such as education and age which directly or indirectly predispose a farmer to act in certain ways (Beal and Sibley 1965). The inter-relationships amongst some of the abovementioned variables may be hypothesised in one or more ways: (a) from theory, which in this case are theories about marketing and consumption in the context of the "new farm- household economics" (see Timmer 1983, Low 1982, Low 1984),(b); from a review of past research (Bartlett (1980) and Roumasset, Boussard and Singh (1979) provide useful starting points); or (c) from observation and explanation of farmer behaviour.

3.3 Socio-economic model[3].

While it would be premature at this stage of the research to attempt to formulate a fully specified model, some elements of the model can be seen immediately. Assume that the short run supply of grains is fixed, i.e. storage and marketing decisions are made after harvest is completed. At any point in the year, a farmer may decide to place grain in storage (by bringing it in from the field if it is harvest time or by purchasing it if it is not harvest time), or take grain out of storage and sell it. At harvest time, a farmer's grain storage includes what he has standing in the field, so "take-out-of-storage" includes grain sold directly after harvest.

To reflect two courses of action, one might specify two separate behavioural equations as shown in Figure 2. One problem that has not been considered yet is how different food grains should be treated in the model.

Another aspect to consider is seasonal pricing. It would be best to estimate equations such as that above for several different seasons of the year, say for each quarter.

The appropriateness of some of the explanatory variables listed in Figure 2 will only be determined by trial and error. For example,

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3. I'd like to acknowledge the help of Steven Buccola in the formulation of this model.

Figure 2 : Socio-economic Model

$Q^{RS} = f(G^{fr}, ST_{t-1}, P^{gf}, CAP, P^{cf}, CONS, CHAR)$

$Q = f(Q^{h}, ST_{t-1}, P^{gr}, CAP, P^{gs}, Y, CONS, CHAR$

Where :

Q^{RS} is quantity removed from storage*

Q^{PS} is quantity placed in storage

Q^{h} is quantity harvested

ST_{t-1} is quantity in storage at close of last period

P^{gf} is farm gate price of grain

P^{gr} is retail price of grain (or meal)

CAP is farm storage capacity

P^{cf} is farm price of relevant cash crops

CONS is consumption requirements in household

CHAR is various farmer characteristics (eg. risk aversion fulltime/ parttime farmer)

Y is household income (farm and non-farm)

* Sales from storage depend on farm gate price (P^{gf}) and purchases into storage depend on retail price (P^{gr}). Thus the difference ($P^{gr} - P^{gf}$) affects the volume of grain taken out of storage and subsequently put back into it and is therefore a crucial aspect of government policy.

instead of fixed farm storage capacity one might substitute the cost of storage. In addition depending on the extent to which communal farmers retain grain to feed animals such as cattle and pigs, it may be necessary to distinguish between human and livestock consumption needs in the household.

3.4 Estimation of model

Data collection using farm surveys would provide observations on most of the variables listed in the model. Fieldwork areas should be selected with reference to the typology of grain producing areas.

The study already underway in Zimbabwe utilises two types of questionnaires to collect information on farm household grain production and disposal together with measurements on related variables[4].

A baseline questionnaire, administered at the beginning of the fieldwork elicits information on farm household characteristics (size, composition, non-farm employment); household resources (land, livestock, remittances, on-farm storage facilities); cropping patterns and disposal of grains in the two most recent agricultural seasons.

A monthly questionnaire, concerned primarily with farm household-level grain flows, income and expenditure.

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4 Copies of questionnaires are available on request for those who might find them helpful.

Experience has shown that considerable care and thought are required in designing and testing such surveys to ensure that information on all relevant variables is collected in the format appropriate to the analysis proposed. In addition, whilst the overall aim is to collect accurate information on aggregate household grain production and disposal, in households where more than one member has access to land, it will be necessary to enumerate cultivators individually and to take cognisance of intra household grain flows.

One of the advantages of monthly visits to farm households is that it enables the researcher to "fine tune" the questionnaire if adjustments are necessary and to investigate hypotheses that arise during the process of data collection. Experience in Zimbabwe shows that monthly visits enabled research teams to establish good working relationships with most sample households and to collect reliable information.

An interesting question in the context of Zimbabwe is how to obtain variations in grain prices since official prices do not vary by locality. There are two possible approaches to this: (a) actual prices may differ by locality if local farmers or grain traders charge/pay prices different from the official ones; (b) even official prices differ by locality in the sense that transport costs to grain depots vary according to distance from depot. Because of (b), it is realistic to use transport cost from household to depot as a proxy for price differences. There is a well established precedent for this in travel cost demand models for recreation.

To use transport cost as a proxy for price variations requires the collection of detailed information on grain transport in the farm

survey and variation in distance to market amongst farm households in the sample. Consequently stratification by distance to market is an important component of sample design.

In 1985, surveys have been conducted in Hurungwe and Binga districts in northwestern Zimbabwe. Hurungwe represents communal farming in an area of good-to-fair agropotential where a substantial surplus of grains is marketed. Binga is a district with extensive areas of poor land, low rainfall, very limited access to official marketing channels and a grain deficit area in most seasons. Surveys will continue in these areas in 1986 and be expanded into additional locations.

3.5 Policy Implication

The estimated model(s) will be used to provide policy makers with information about the likely impact of various policies on aggregate levels of farm storage and the volume of grain offered to and demanded from the marketing board by different groups of communal farmers. Policies that could be explored include: changes in grain prices, retail maize meal prices, cash crop prices, subsidisation of farm storage materials and crop tranpost costs.

Since it is the practice of the Zimbabwe Government to leave producer price announcements to late in the season when national crop production can be fairly accurately assessed, such policy-focused models could play a very practical role in examining the likely impact of various prices on grain storage and marketing behaviour, enabling prices to be set at levels which achieve specified aims relating to either national food requirements or agricultural development.

4. CONCLUSION

The study of farm-household grain marketing and storage behaviour raises many complex questions. These include issues relating to data collection and organisation in the early stages and extend in later stages to issues of integrating diverse disciplinary perspectives into a single manageable and comprehensive framework.. This paper has reviewed some of the conceptual and methodological issues involved in such a study in order to develop guidelines for similar research in other parts of Africa..

The aggregate consequences of thousands of individual farmers' decisions regarding grain marketing and storage determine several critical dimensions of national food security. As goverments in Southern Africa try to confront their food problems they need to understand how farmers' choices, interact with government policy. In this context the proposed analysis of household grain marketing and storage decision in the communal farming area of Zimbabwe has an valuable contribution to make.

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