FARM STRUCTURE AND LAND TENURE SYSTEMS FOR A TRANSFORMED AGRICULTURAL SECTOR

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1. BACKGROUND

As agriculture is a land-based activity, it is important to understand how farming enterprises are organised and the type of land tenure systems prevailing in each country. In particular for farming activities, it is necessary to have information on characteristics such as the number of farming families, average size of farm land and its quality technology applied, commodities produced, access to infrastructure, credit etc. in order to appreciate the dynamics of a country's agricultural sector. As to be expected, these farming characteristics or farm structure, are influenced by, *inter alia*, natural factors such as climate, soils etc. and indeed the land tenure systems.

On land tenure systems, it is equally critical to know the rationale and justification for each land tenure system and the economic as well as political role/significance of each system. In addition to these broad social roles, the security of tenure transfer of rights, legal and other critical institutional supportive mechanisms also need to be fully understood. It is also necessary to include the role and the participation of the broader community in each country's land tenure system and administration.

The following sections of this paper will briefly explore experiences in other parts of the world about farm structure and land tenure systems. The paper will also analyse data from Botswana, Zimbabwe and South Africa. As a contribution to the Conference and its timely theme, the paper will also look at the implications of farm structure and land tenure systems to South Africa's agriculture and its challenges.

2. EXPERIENCES ON LAND TENURE SYSTEMS AND FARM STRUCTURE

In many parts of the world where major land reforms were instituted, the primary reasons for the change were political and economic. Historically, land ownership, access, distribution, etc. originated from feudalism, where the ruling class owned all land while the majority did not. In fact, good quality land has been owned in many parts of the world by a minority ruling class. Following decolonisation and other major political reforms etc., reform in land ownership, access, etc. were undertaken to achieve social stability, equity, cohesion and by so doing (presumably) promote peace and reduce exploitation by the landed gentry. By instituting these major political reforms on land, it has been assumed that the economic empowerment of the majority will also improve. It has in particular been assumed that equitable distribution of land would promote household agricultural production, which in turn, could increase employment and income opportunities. Basic food production, including raw materials for agro-industries were assumed to increase, if the majority of the farming population had access to land.

The thrust of land reforms in many parts of the world including regions such as Asia (Japan, South Korea), Latin America and Sub-Saharan Africa was primarily to achieve political as well as economic objectives. The inequitable feudalistic land tenure system was replaced by individual/freehold, leasehold systems and or co-operative/communal/state owned land systems. While in many countries the two systems co-existed only one land tenure system prevailed in other parts of the world. Those countries that pursued a free-enterprise capitalise economic system instituted freehold land tenure system while socialist countries advocated the co-operative/state owned land tenure system. Of course, each land tenure system has its merits and demerits subject to the prevailing social conditions.

This paper will not attempt to analyse the political as well as the economic advantages/disadvantages of each land tenure system; suffice to say that any land tenure system that marginalises and excludes the majority of the people from benefiting from natural resources etc. is not likely to be politically and economically sustainable and therefore stable.

Studies in fourteen (14) Latin American countries, indicate attempts to institute far reaching land reforms to achieve the political and economic objectives outlined in the preceding sector; De Janvry (1981), studying the results, observes that where the freehold/individual land tenure system was followed, farm production increased because of access to credit, infrastructure and modern technology. On the co-operative/peasant farms, from which several farmers benefited as a result of the re-distributive land reform carried out in Latin America in the 1950's, production did not improve significantly. Incomes and employment opportunities have also not increased in both tenure systems. On the whole, the social impact of land reform in Latin America indicates very little progress in income and employment growth and hence only a marginal effect on rural poverty.

As far as farm structure is concerned, while individual freehold farmers owned large tract of land (over 100 hectares), good quality land and were supported by infrastructure, access to credit, the peasant farm/co-operative structure owned/had access to poor quality land and infrastructure. Average cultivated land per farming family in the co-operative structure was not adequate to meet the basic needs of a rural household. Freehold/capitalist farmers specialised in high value crops for domestic and export markets including commercial cattle ranching, whereas the peasant farm/co-operative units tended to concentrate on basic crops (maize, beans, plantain, etc.). The adoption of modern inputs was very high in freehold farms.

The experience from Latin America indicates that a land tenure system should, in addition to improving ownership/access to land, ensure availability of infrastructure, technology and political commitment to allocate more material resources to promote the productive potential of the small farm sector in particular. Other considerations such as quality and suitability of land for various enterprises should also be

ascertained in order to improve income and employment opportunities. It is also worth noting that in most of Latin America, major land reforms were later abandoned or given low priority because of certain political considerations. In fact the capitalist/freehold land tenure system is dominant in Latin America.

In the People's Republic of China, where the smallholder farming system is dominant in a co-operative/state owned land tenure setting, farmers have benefited from both political and economic commitment to generate growth in the agricultural sector. China, with 22 per cent of the world human population, has experienced one of the highest annual average growth rate in agriculture since the 1980's. With an average farm size far less that 1 hectare, China has experienced, on the average, about 5% annual growth rate in agriculture from 1980 to 1993. This phenomenal growth, which is far higher than the average population growth rate in this country, has been achieved through the sustained application of agricultural science, technology and provision of infrastructure. High yielding crop varieties and hybrids and animal breeds have partly contributed to China's agricultural growth and productivity. Extension, human resource development and natural resource conversation programmes have also played a critical role in China's agriculture development.

Other parts of Asia (Japan, South Korea, etc.) have also supported an egalitarian but largely individual freehold land tenure system with strong resource commitment, science, technology, infrastructure, etc. By and large, smallholder farming system has been the backbone of most of Asia's success in agrarian reform.

In other parts of Africa, where land reforms were instituted and led to co-operative/state land tenure systems, per capita agricultural production has not been significantly increased. Income growth has not been realised while employment gains have also been limited unless if one assumes underemployment in most co-operative/state farms at high public cost. In those African countries where co-operative/state farm land tenure systems co-existed with freehold/capitalist land ownership, there has been general growth in the latter sector as this generated exchange etc. Overall Africa's land reform in both freehold and co-operative/state farm land tenure systems has not contributed to per capita income growth, nor reduced rural poverty. This is largely due to inappropriate macro-economic, marketing, and pricing policies and a poor political commitment to allocate resources etc. to the agricultural sector.

3. FARM STRUCTURE AND LAND TENURE SYSTEMS IN SELECTED COUNTRIES IN SOUTHERN AFRICA

While the previous section provided information about experiences in land reforms in various parts of the country, this part of the paper will briefly examine farm structure by land tenure in Botswana, Zimbabwe and South Africa. As elsewhere, the justification for land reforms in these three countries is promotion of economic as well as political objectives so that in the long term the living standards of people are improved. Table 1 describes farm structure by land tenure and country. While these countries have three land tenure systems, that is, communal, freehold/leasehold and state land, this paper will confine itself to the communal and freehold tenurial systems.

The three countries underwent colonialism which led to a dualist i.e. land tenure system. The majority of the farming population is in the communal land where the pressure on the land, due to rapid population growth rate, is very high. Most of these farmers are on poor agricultural land and social and physical infrastructure is underdeveloped. Botswana and recently Zimbabwe have improved the provision of social services (health, education, water, etc.) as well as physical infrastructure in the rural areas.

Since its independence in 1966, Botswana has improved the provision of these services in rural areas although this has not been directed at the potential agricultural land because of the unique human settlement pattern. Generally, in Botswana, people spend part of their time at the lands area, cattle posts and villages. The Government has concentrated the provision of services on villages, where the per capita development costs are very low unlike those in remote and sparsely populated agricultural production areas (arable lands and cattle rearing areas).

Zimbabwe is reported to have also improved her provision of social as well physical infrastructure in the rural areas. Prior to her independence in 1980, large scale freehold farmers had access to good social, physical and telecommunications infrastructure. Naturally, this access made it possible for the freehold farmers to sell their surplus produce more easily and cheaply.

As far as South Africa is concerned, it is evident that an overwhelming majority of smallholder farmers are concentrated in the communal land. These farmers, like elsewhere in Africa and other parts of the world, do not have access to infrastructure, social services, research, extension whereas their counterparts in the freehold land tenure are fully catered for through historical public investment.

Concerning land holdings per farming family, Table 1 shows that in Botswana both communal and freehold farmers have, on the average, more land than their Zimbabwe and South Africa counterparts. However, it should be noted that Botswana has a small human population (1,5 million) relative to the size of the country. Further, given the unfavourable climate, physical factors in this country, the quality of the agricultural land is in most cases very poor except for extensive livestock farming and recently game ranching. It is estimated that less than 5% of Botswana is suitable for productive arable farming.

In Zimbabwe, whereas a smallholder has, on the average, about 17,8 hectares, his/her freehold counterpart has 87,5 hectares or about five times as much. It is fully captured in the Report on Appropriate Land Tenure Systems (1994) that, besides the smallholder farming sector being located in overgrazed, overcrowded and poor agricultural land with low rainfall, this sector is poorly serviced by social as well as physical infrastructure. Further, it is also reported that, on the average, arable land per farming household is very small to sustain any meaningful food and income security. The freehold farmers, on the other hand, have access to large good quality land that can promote viable agricultural production to sustain a living. It should be

Table 1: Farm structure in Botswana, Zimbabwe and South Africa

Farm characteristics	Communal land tenure[2]			Freehold/Leasehold		
	Botswana	Zimbabwe	South Africa	Botswana	Zimbabwe	South Africa
Number of farmers	100 927	1,1 million	13,1 million	505	14 400	67 000
Average land holdings (hectares)	404	17,8	1,3	5 763	87,5	1 284
Main commodities produced	Sorghum, maize, beef, smallstock	maize, cotton sorghum, beef	maize, livestock	maize, fruits, vegetables, beef, game	tobacco, cotton, fruits, vegetables, dairy, beef	maize, wheat, vegetables, fruits, dairy, beef, game
Technology applied	little application of modern inputs, low crop and animal husbandry management	hybrid maize, modern inputs (fertiliser) although at low application	low application of modern inputs	hybrids seed, modern inputs, capital intensive inputs (tractors)	hybrid seed, modern inputs, capital intensive inputs (tractors, etc.)	hybrid seed, modern inputs, capital intensive inputs (tractors, combine harvesters)
Contribution of agriculture to gross domestic product (GDP)	BOTSWANA 5%		ZIMBABWE 15%		SOUTH AFRICA 5%	

Sources: - Botswana Agricultural Census, Ministry of Agriculture, 1993
- Statistical Bulletin, Central Statistics Office, Botswana, 1995
- Report of the Commission of Inquiry into Appropriate Agricultural Land Tenure Systems, Zimbabwe, 1994
- South African Agriculture: Structure, Performance and Options in the Future, World Bank, 1994.

noted that, in general, good quality land requires less capital investment in the form of nutrients to produce a crop.

In as far as South Africa is concerned, the inequality in average land holdings between the communal smallholder and freehold farmer is very great. In fact, the freehold farmer in South Africa has, on the average, about a thousand (1000) times more land than his communal smallholder counterpart. Like is the case in Zimbabwe, freehold farmers are found on good quality land which can easily sustain a secure farm income, ceteris paribus, and also make it possible to diversify into potentially viable agro-enterprises or farming activities. Through the Reconstruction and Development Programme (RDP) the democratic South Africa is expected to redress these inequalities and also come up with a comprehensive Agrarian Reform Policy to improve the income and employment opportunities of the communal smallholder agriculture.

Whereas smallholders in all the three countries concentrate on producing basic commodities (maize, sorghum) and beef, the large scale freehold farmers specialise in high value agricultural products such as fruits, dairy, vegetables and recently, game meat. Except in Botswana where on the average smallholders have bigger land than their counterparts in Zimbabwe and South Africa, it may not be possible in the latter countries for these communal farmers to diversify into potential viable farming enterprises without additional land.

Further, basic commodities face a low income elasticity of demand, such that to sustain high income growth may necessitate the production of agricultural commodities that have high income elasticities of demand (vegetables, fruits, dairy, etc.). Table 2 shows the estimated income elasticities of the various agricultural commodities. Basic cereals (maize), which are mainly produced by smallholder farmers face a low income elasticity of demand. The income growth for these farmers, if they continue producing basic cereals, could, inter alia, be increased probably through the sectoral linkage effect. For instance, if beef and chicken consumption increases, this may increase the demand for maize grain, a major feed ingredient.

Assuming that there is no substitution effect with other feed grains, the increase in demand for maize in the livestock feed industry may benefit small holders through producer price increases. There is overwhelming empirical economic evidence that as people's per capita income increases, in real terms, everything being equal, the budget share for basic cereal consumption/ expenditure declines which in turn may not increase significantly incomes of farmers who produce these commodities (maize).

On technology applied in the three countries, by and large, most communal farmers have adopted a low input method which also minimises production risks. However, it is interesting to note that in Zimbabwe, the smallholder subsector has adopted hybrid maize and uses modern inputs such as fertilisers although at a reduced rate compared to freehold farmers. The low adoption of productive technology among communal farmers could be a result of inappropriate technology, poor extension coverage, deficient input delivery systems, including access to credit, etc.

The freehold farmers in all the three countries, apply modern technology and have adopted high yielding crop varieties and livestock breeds. In addition, especially in

Table 2: Estimated growth in demand for selected food commodities (in %)

Variables		Food in aggregate	Fresh crops and -products			Livestock and -products						Horticultural products
			Maize	Bread	Wheat	Beef	Mutton	Pork	Poultry	Fresh milk	Fresh eggs	Potatoes
Income elasticity of demand		0,60	0,39	-0,12	0,30	0,73	0,44	0,73	1,12	0,44	0,41	0,84
2,46% annual population growth from	% - in per capita income scenarios											
1994-2000	0	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46	2,46
	1	2,08	1,35	-0,42	1,04	2,53	1,52	2,53	3,88	1,52	1,42	2,91
	2	2,68	1,74	-0,54	1,34	3,26	1,96	3,26	5,00	1,96	1,83	3,75
	3	3,28	2,13	-0,66	1,64	3,99	2,40	3,99	6,12	2,40	2,24	4,59
2,20% annual population growth from	% - in per capita income scenarios											
2000-2010	0	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,20
	1	1,92	1,25	-0,38	0,96	2,34	1,41	2,34	3,58	1,41	1,31	2,69
	2	2,52	1,64	-0,51	1,26	3,07	1,85	3,07	4,71	1,85	1,72	3,53
	3	3,12	2,03	-0,63	1,56	3,80	2,29	3,80	5,82	2,29	2,13	4,37
1,74% annual population growth from	% - in per capita income scenarios											
2000-2010	0	1,74	1,74	1,74	1,74	1,74	1,74	1,74	1,74	1,74	1,74	1,74
	1	1,64	1,07	-0,33	0,82	2,00	1,21	2,00	3,07	1,21	1,12	2,30
	2	2,24	1,46	-0,45	1,12	2,73	1,65	2,73	4,19	1,65	1,53	3,14
	3	2,84	1,85	-0,57	1,42	3,46	2,09	3,46	5,31	2,09	1,94	3,98

Source: Courtesy of Van Rooyen, J, Farmer's Weekly, August 30, 1996

* Variables here represent the various population growth and per capita income growth rates that influence the growth in demand for various food commodities. The higher the annual population growth rate (2,46%) and per capita income growth rate (3%) the higher the demand for food (poultry) subject to the relevant income elasticity. The functional relationship of the variables is $d = p + gn$ where d stands for demand, p for average population growth rate, g for per capita income growth and n for income elasticity of demand.

South Africa, these farmers have also acquired highly capital intensive inputs such as tractors and combine harvesters which could have substantially reduced the demand for both permanent and casual labour. The availability of capital, tax concessions, high agricultural tariffs etc. to freehold farmers has partly led to mechanisation, especially in South Africa and Zimbabwe. The macro-economic imbalances between the production/land tenure systems have, in turn, aggravated income inequalities which were historically influenced by access to good quality land by freehold farmers.

It should also be noted that access to credit/subsidised capital, tax concessions, infrastructure etc. by freehold large scale commercial farmers does not necessarily imply that these producers are therefore more efficient than their communal counterparts. For instance, the total factor productivity among large scale commercial farmers in South Africa is reported to have increased by only 1,08% per year from 1947 to 1991, and this is considered very low by international standards (World Bank, 1994). Comparison of economic efficiency between the two systems (communal versus freehold), requires an economic analysis of the costs and benefits/values of each system and also comparison with similar farming systems etc. Such data are currently lacking in most countries. Instead yield levels are used to measure efficiency, and this is inappropriate and misleading.

Despite the socio-economic transformation that these three countries have undergone and dualistic land tenure systems that prevail, the agricultural sector still has a role, although reduced in relative terms, to play in the economies of Botswana, Zimbabwe and South Africa. Whereas in Botswana and South Africa, the contribution of this sector to the Gross Domestic Product (GDP) is about 5 per cent, in Zimbabwe the sector has a greater contribution (15%). The majority of people in these countries are still in the rural areas and subsist on agriculture or related activities such as forestry, etc. In fact, when sectoral linkages are examined, it is evident that the role of agriculture in each of these countries' economies is greater than the aggregate GDP statistics indicate. It is therefore important to note that for the socio-economic transformation of these countries the emphasis on the role of the agricultural sector should be placed on sectoral linkages as opposed to conventional GDP contributions. The growth of certain manufacturing and service sectors depends on the income growth and therefore demand from agriculture! There is ample world-wide literature on sectoral linkages.

4. IMPLICATIONS OF FARM STRUCTURE AND LAND TENURE TO SOUTH AFRICA'S AGRICULTURE

While it is indeed true that there may be a certain minimum size of land necessary for economically viable agricultural enterprises, the information from several parts of the world indicates that this size depends on the quality of land, climatic factors, type of the enterprise, access to infrastructure, market, credit, technology, extension and indeed the quality of the human resources. For South Africa's agriculture, one cannot necessarily prescribe the optimum size of the land required to produce a particular commodity without taking into account some of these aforementioned factors, some of which are location, district, province specific. For instance, water efficient technologies such drip irrigation require less water and land compared to conventional sprinkler irrigation system. Further, dairy animals in a rainy area, may require less feed supplementation as compared to arid areas in certain parts of South Africa.

Over the years, there has been a growing tendency to discount state owned land tenure system as being inefficient and inherently unproductive as this does not provide individual incentive to invest and therefore improve productivity. The phenomenal growth of agriculture in the Peoples' Republic of China since the 1950s puts this economic paradigm or "blue print" into question. Besides the agricultural land being owned by the state and farmers granted user rights, the Chinese agriculture is almost based on smallholder agriculture.

In short, for South Africa, it may not necessarily be true that one land tenure system is superior to the other. The specific social, economic as well as political circumstances including the supportive administrative, legal and technical institutions are very critical in agricultural development, etc. Whereas the freehold private land tenure system may be appropriate for certain enterprises and areas, the system may not necessarily promote income and employment opportunities as indicated by experience in many parts of the world including South Africa itself. In a country where rural and indeed urban poverty is a serious social problem, any agrarian land reform which does not link itself to, *inter alia*, improving income levels of the rural people, in particular, may not be sustainable in the medium to long term.

Although as indicated, it is not possible to suggest the most appropriate land tenure system given the varying world experience on this matter, it is important to observe that any type of land tenure advocated by the new democratic South Africa must at least ensure security of tenure, effective and transparent administrative and legislative institutions to implement and enforce policy decisions. In a highly detailed and comprehensive Report on appropriate land tenure systems based on a nation-wide consultation in Zimbabwe (1994), it is observed that the security of the land tenure system and the supportive institutions that administer the system are more important than the type of tenurial system. In any case, which farmer, smallholder or freehold, would invest in an agricultural system in which the security of the land tenure system is not guaranteed by law and the institutions that implement or enforce policy decisions are moribund and ineffective. These elements in any land tenure system are critical for agricultural transformation.

In many countries, including South Africa, where the freehold large scale commercial farming has been the "engine" of agricultural development, there is ample evidence that this was achieved through heavy public investment in technology, extension, infrastructure, human resources and the availability of subsidised capital, fax concessions, tariff protection, etc. These macro-economic biases and indeed distortions, naturally, prejudiced the potential growth of the smallholder agricultural sector as indicated by the democratic government, macro-economic and sectoral investment priorities, etc., will need to be consistently accorded to this neglected subsector. Of course, while more

resources, in terms of research, extension, credit, infrastructure, etc. should be allocated to the communal small-holder subsector, extreme caution should be exercised against untargeted subsidies, tax relief including economically and politically unjustified protection.

Experience in many parts of the world indicates that blanket subsidies, tax relief and tariff dispensation, etc. that do not take into account sustainability, overall sectoral/economic competitiveness may in the long term hurt the prosperity of a country. In short, the fundamental question for South Africa's agriculture is not whether financial assistance is necessary but rather for whom, for what type of farming enterprises, for how long, and also ensuring that indeed this assistance actually benefits the intended group(s).

The world economy is becoming fully liberalised and integrated and hence the need for agriculture in all parts of the globe to adapt. The days when an agricultural sector or its subsector was over protected through unsustainable financial assistance are gone. It is therefore becoming increasing clear that to meet the competitive demands of a liberalised world economy, South Africa's agriculture, like is the case with other countries, cannot remain in the "intensive care unit" forever. South Africa as a member of the World Trade Organisation (WTO), Southern African Customs Union (SACU) and the Southern African Development Community (SADC) fully subscribes to the broad principles of liberalised trade. Further, the chronic budget deficits experienced by several African countries are partly due to financial drain caused by heavily protected agricultural sectors. Unfortunately, small scale farmers, who in most cases are net buyers of food and the low income urban working class do not necessarily benefit from this heavy protection of the agricultural sector. Beneficiaries generally include large commercial farmers, employees of monopoly parastatal organisations, etc.

Finally, ideas proposed by this author, who by the way is not an "expert" or "guru" on land tenure or agricultural development, depend on the political commitment to design policies, programmes, projects and allocate, in real terms, more resources to farming, and in particular, the smallholder subsector. A comprehensive agrarian land reform with impressive institutions, programmes, etc. without the necessary economic as well as financial resources will not deliver the goods. Experience in the world does in fact vindicate the critical role played by unwavering political commitment in agricultural transformation through consistent financial support.

5. CONCLUSIONS

This paper has attempted to shed light on how land tenure systems and farm structure can influence growth in agriculture. Experience and lessons from other parts of the world have been presented to amplify these two aspects of agricultural transformation.

For South Africa's agriculture, which still has great potential in certain enterprises/commodities primarily because of the varied climatic circumstance, it is therefore important that appropriate policies, programmes and institutions are put in place to improve the sector's contribution to economic growth and, in particular, generating scarce income and employment opportunities. Of course, all the sectors of the economy (industry, tourism, services, etc.) should also undergo fundamental technological and institutional changes for gains in agriculture to achieve maximum social benefits. Agricultural transformation alone will not solve poverty, income insecurity etc. without the simultaneous growth in other sectors of the economy. The current high unemployment rate coupled with rapid population growth rate requires all sectors of South Africa's economy to undergo radical transformation to reduce abject poverty.

Indeed these are some of the challenges of South Africa's agriculture now and in the 21st Century! A lot of strategic thinking, South Africa may benefit if a comprehensive agricultural sectoral review and agrarian land reform were undertaken to design a co-ordinated, dynamic and sustainable policy.

NOTES

1. Mr H.K. Sigwele is Director of Agricultural Planning and Statistics, Ministry of Agriculture, Botswana. Views expressed in this paper are those of the author.

2. While there is generally communal land ownership in these countries, it should be noted that, for crop framing, individual farmers have individual and inheritable rights on arable land. It is only in pastoral farming that land is owned communally.

REFERENCES

BOTSWANA AGRICULTURAL CENSUS REPORT. (1993). Ministry of Agriculture.

CLEAVER, K.M. (1993). A strategy to develop agriculture in sub-Saharan Africa and a focus for the World Bank. World Bank, Washington.

DE JANVRY, A. (1981). The agrarian question and reformism in Latin America. The John Hopkins University Press, Baltimore.

EICHER, C. & RUKINI, M. (1996). Reflections on agrarian reform and capacity building in South Africa. Michigan State University.

INTEGRATION OF SUSTAINABLE AGRICULTURE AND RURAL DEVELOPMENT. (1995). Issues in agricultural policy. FAO, Rome.

REPORT OF THE COMMISSION OF INQUIRY INTO APPROPRIATE AGRICULTURAL LAND TENURE SYSTEMS. (1994). Republic of Zimbabwe, Harare.

ROBERT, M. (1993). Strategy pure and simple : how winning CEOs outthink their competitive competition. McGraw-Hill, New York.

SIGWELE, H. (1993). Food self-sufficiency versus food security : Which way forward. Ministry of Agriculture, Gaborone.

SIGWELE, H.K. & KHUPE, C. (1996). Implications of the world trade organisation to Botswana's livestock sector. Ministry of Agriculture, Gaborone.

STATISTICAL BULLETIN. (1995). Central statistics Office. Ministry of Finance and Development Planning, Gaborone, Botswana.

VAN ROOYEN, J. (1996). Food security a vital issue. Farmers' Weekly. August 30.

WORLD BANK. (1994). South African Agriculture : Structure, performance and options for the future. World Bank, Washington.

YANXI ZHANG. (1996). Agricultural science and technology in China : Its development and outlook. Peoples' Republic of China.