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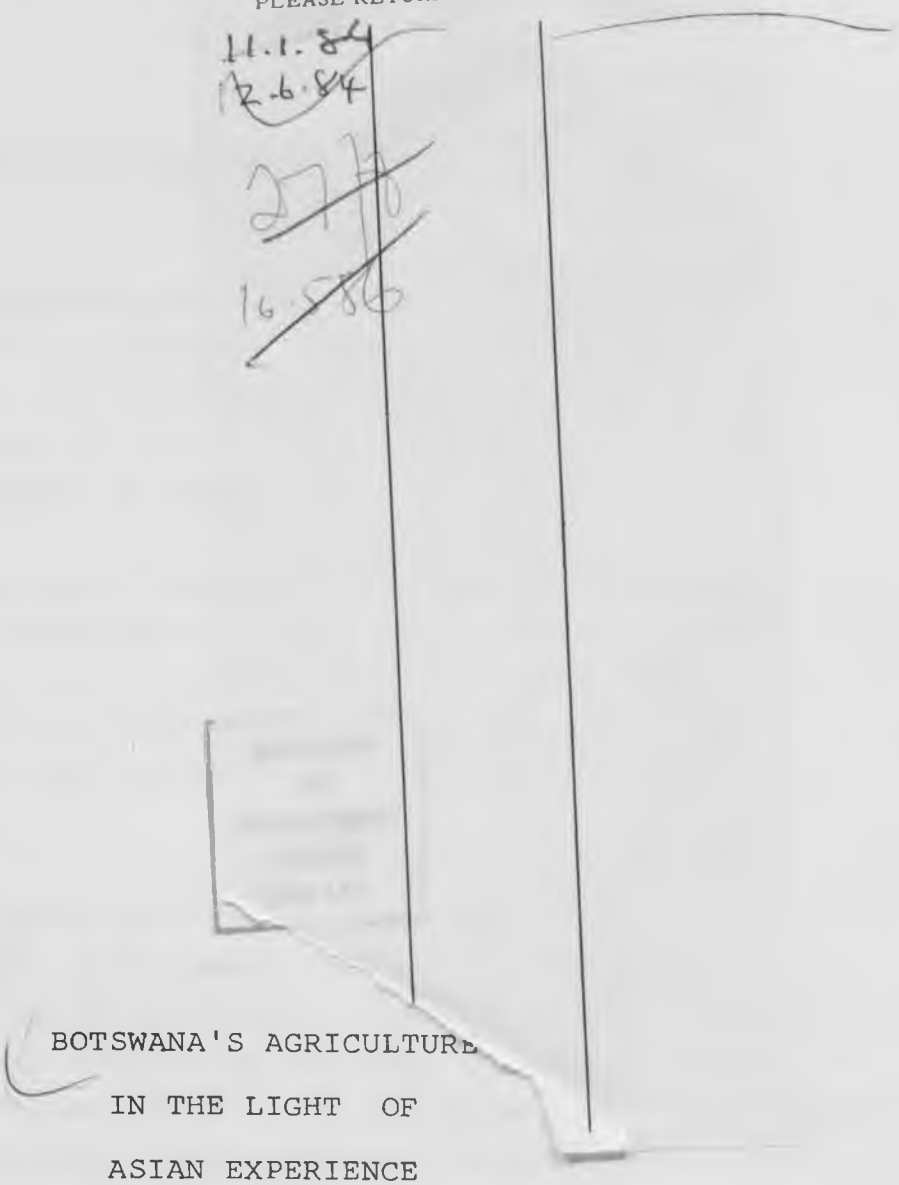
IN THE LIGHT OF
ASIAN EXPERIENCE

Michael Lipton

IDM PUBLIC LECTURE

MAY 3, 1978

Botswana
Lesotho
Swaziland



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(IDM PUBLIC LECTURES)

1977 - 1978

F O R E W O R D

This second IDM evening Public Lecture Series which ran from October 1977 to November 1978 was organized under my predecessor, Dr. George Haythorne. As with the first Series, each of the five lectures deals with an important aspect of development.

Since there are inevitably delays in acquiring and printing a full set of five lectures and since the topics will have interest to different groups it was felt that more timely pulbication of individual lectures would better serve the purpose of communicating the contents of these lectures to a wider audience.

Professor Michael Lipton is a well known author and consultant on economic development issues. He is on the staff of The Institute of Development Studies, Sussex. At the time of his public lecture at the IDM, Professor Lipton was the Special Employment Adviser to the Government of Botswana. His address on development issues facing Botswana agriculture are thoughtful and stimulating to further study and policy development.

F. Schindeler
Director

May 3, 1978

BOTSWANA'S AGRICULTURE IN THE LIGHT OF ASIAN EXPERIENCE*

Michael Lipton

A. Learning from agricultures with scarce land.

Professor Tinbergen once said that all specialists in development studies ought to have to sign a pledge that we would not claim to be expert on any country unless we had at least overflown it by daylight. Overflying a country in the daylight does suggest a number of things; but some of those things are very misleading. Daylight overflying shows Botswana as it shows much of Africa: as an area of vast open spaces. You can fly hundreds of miles and see little sign of human habitation.

Now these vast open spaces can lead us to false conclusions. We can jump to the conclusion that farm land is plentiful, and should therefore be farmed in ways that save labour but spread out land use: extensively and in large units. We might also think that, if there is so much land, the yield of land cannot matter very much, and that one has to go in for extensive agriculture, concentrating on high output per man-hour and high output per unit of capital equipment, but rather neglecting the question of yield. If there's plenty of land, why bother to get a high yield per acre? This is the style of a lot of African agricultural development.

This style is related to the output mix - to the concentration of policy-makers upon cattle, and indeed upon cattle independently of crops. Cattle use much more land and less labour, per unit of output, than crops. The "African" output-mix from cattle sharpens

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*This is the only footnote. I have tried to preserve the informal style of a lecture, but have (a) edited out some repetitions and unclarities, (b) tried to take account of some points raised in the discussion, (c) inserted a few indicators of relevant published evidence.

this effect. Cattle are not used mainly as a source of draught power, or of dung for fertilizing crops - they are used primarily as a source of meat (and if we are lucky, as milk and dairy products). And cattle are usually grazed on unimproved rangelands. Supplementary feeding and even pasture crops, play a much smaller role than in other developing areas.

The concentration on extensive rather than on intensive agriculture has led to a stress on rain-fed farming, and to substantial neglect, certainly by Asian standards, of irrigated farming. And it has led, above all, to what one could call a widespread belief in widely-spread farming: large units spreading their labour and their capital thinly over many acres.

These things - the concentration on cattle (which need a lot of cash to acquire) and the widespread belief in large-scale farming - are probably increasing rural inequality. This is particularly unfortunate in an African context, because in this continent we start with relatively <u>low</u> levels of rural inequality. If one compares Africa with either Asia or Latin America we find that the main source of inequality in Africa is not within the rural areas, but between city and country and within the cities. We do not find the enormous inequalities within the rural sector that one finds between the hacienda owner and the peon in Latin America, or even between the landless labourer and the large landlord in much of Asia. So one starts with relatively low rural inequality (not very low, but relatively low by world standards) in Africa. Policies that encourage big holdings and extensive farming, based on beliefs that land is plentiful, dissipate this advantage.

Yet the widespread belief that land is not scarce in African agriculture, and specifically in Botswana agriculture, is in general wrong. The case for small-scale, intensive, crop-based, and in many cases irrigated, farming is strong and getting stronger all the time. Asian experience is therefore crucially relevant in two areas of fact and four areas of policy, which I shall outline.

The two facts which we can carry over from Asian agriculture are these. First, the small farmer is a more efficient user of scarce land than the large farmer, because the small farmer saturates each hectare with more human and family labour, so there is more labour-per-acre and generally more output-per-acre on small farm units than on large farm units. Second, the small farmer is highly responsive to incentives: to changes in price, to crops offering a better chance to make money, and to opportunities for low-risk innovation. These two key facts about small farming - its relative efficiency and its price-responsiveness - carry over, in my view, from African experience to Asian experience.

The four implications which I shall look into are the implications for the output-mix, especially as between crops and cattle; the need for a small farm-specific form of technology and research; the form of interaction required between agriculture and industry; and the implications, perhaps most controversially, for land tenure and land reform. In each of these areas I believe that Botswana is ready for, and has indeed already embarked on, a change of course. This change of course is towards a set of policies more orientated towards production and employment, and tending to benefit efficiency and equity alike; because if the small farmer is a more efficient operator than the large farmer, then concentrating scarce resources upon the small farmer will not only advance social justice, but will also tend to increase output by improving the efficiency of resource use.

B. Is agricultural land scarce in Botswana?

Obviously it is scarce in some areas, perhaps the area around Francistown being the extreme case. Such obvious scarcities are being intensified in some areas, and spread to others by several factors: by population growth, including the over-grazing and net reduction in emigration from Botswana; by loss of farmland due to urbanisation; and by the failure of growth in the modern sector to absorb the rising labour force. (Of the latter, mining is an extreme case; Botswana's diamond boom cannot create much employment directly on any conceivable technology in diamond mining.) Hence the labour pressure on each acre of farmed land goes up.

But even where there is no obvious pressure of this sort, land is effectively scarce, I would argue, in most of Botswana, even in what seem to be wide open spaces. It is effectively scarce, first, because to bring new land either under the plough or into grazing requires large investments of capital, capital requires saving and saving in any poor country is scarce. Land is effectively scarce, second, because it has to be cultivated not in conjunction with some nice, smooth commodity called "labour" which is available all the year round, and which seems to be unemployed for a lot of the year, but in conjunction with particular inputs of scarce labour at certain times of the year; even when there is plenty of labour overall there won't necessarily be plenty of male labour at ploughing time.

Above all, there is a high and rising unit cost of bringing new land into use. Bringing new land into ploughable or hoeable condition by de-stumping is an expensive operation directly, and involves indirect costs also - wild animal control, loss of grazing land, and also that new lands areas require new housing, drinking water, sometimes even whole new settlements are required with schools and roads.

Yesterday I was in Kagai, in Kalahari District, a settlement where some 90 Basarwa are being provided with lands areas and encouraged to farm them. It is, I think, a very successful settlement (especially as an example), but a settlement involving an enormous fixed investment, both in developing the land and in providing infrastructure for quite a small number of people. Even when there seems to be land freely available, the cost of settling people on it and providing them with the necessary infrastructure is high - and rising, because the best and 'easiest' land is settled first. Even when land is not obviously scarce, the cost of expanding the arable area may prove increasingly prohibitive.

Now, what about grazeable land? In many parts of Botswana there is already severe over-grazing. In large areas of Ngamiland, camelthorn and similar useless crops have taken over and would be very expensive to replace by usable grass. Many pans, especially in the West, look like white deserts.

Will the Tribal Grazing Lands Programme help solve the problem of over-grazing? Initially, it will reduce the extreme scarcity of common grazing land near the villages, as some of the larger farmers take some of their herds off the commons onto the new Tribal Grazing Lands Programme ranches; that indeed is the main intention. But it is an intention achieved at very high capital cost indeed. A Ncojane farmer, to get his 6,400 hectares, has to pay interest on about P.27,000 to cover the investment cost, and the cost of new developments of the Tribal Grazing Lands Programme is higher still. So the cost of bringing new effectively grazeable land into use also seems on a per hectare basis to be high, and indeed rising, as the better grazing land is used up.

More seriously, most of the farmers taking TGLP ranches say that their main motive is to increase the size of their herds, and having done so to move the extra animals back onto the commons. Thus once again the common land will be degraded. We may, if we are not careful, in a few years be back where we were before. All this suggests that new grazing land, like new ploughable land, is effectively scarce, because it is costly to bring it into use.

Another hidden reason why land may be scarce is that draught-power is a critical constraint on using it. If draught-power is scarce, then that means that there are enormous gains from raising output, not via more over-extension of draught on an even wider land area, but by using the same ploughed acreage for much more output by intensive crop-farming. If land has to be ploughed to be brought under crops, and we are short of draught power (whether donkeys, cattle or tractors), then clearly we are going to have a very much better chance of a long-run sustainable increase in output if we do not further over-stretch our short capacities of draught power by bringing new land into cultivation. Each new hectare of allegedly "plentiful" land, brought under the plough, has a hidden, external cost (as compared with the devotion of the same resources to intensification of farming on existing land): the cost due to lost output on other land, as scarce draught is spread more thinly, and (inevitably) with worse timing..

This is not to deny that we can look for ways of using draught power more intensively. For example, one might use smaller spans: in Ngamiland the span with only two oxen is quite common. There is land which is not very different from the land in Ngamiland, in Eastern Botswana, being ploughed with spans of six and even eight oxen. This may be because of ploughing methods; it may be that the mouldboard plough is being used in areas where simple chisel-ploughing or minimum tillage in some other form might be adequate. One could go further: in several areas in Botswana, hoe-ploughing is used, so that one again drastically economises on draught power

by doing without cattle or donkeys at all. Of course, to justify the labour-costs of such "draught-saving" methods as hoeing - or the capital-costs of tractors - much higher yields, and/or better crop prices, than those common in much of Botswana, are needed.

There are other methods, perhaps a bit less obvious, of economising draught power. Shorter-duration crops or varieties could be selected, so that, instead of everybody having to claim the scarce oxen to plough their land ready for planting at more or less the same time, the ploughing season gets extended; timing would remain, however, somewhat dependent on the first rains. More important, the long distances between many cattleposts and the lands areas, and the concentration of many herds upon meat production, reduces the availability of draught animals.

However, improvements in these matters imply more labour-intensive use being made of the existing land and draught-power. What we are trying to do is find ways, effectively, of replacing scarce cattle by plentiful labour at times when it really is plentiful, not at the seasonal peaks, which are the present very short-term ploughing peaks. So really, if one suggests raising farm output by saving draught-power rather than by intensifying other inputs, one is not thereby altering the case for small farming. It is small farms that are more labour-intensive. They have not only more workers per acre, but also more workers per unit of cattle as well. Thus, if one is concerned to increase ouput by saturating draught-power with more labour, one has exactly the same implication, viz. the small farm, as if one is concerned with increasing output by saturating land with more labour. The extreme case is stall-feeding, where one is using as small an area of land as possible to support as large as possible a number of cattle by collecting the grazing material and feeding it to the animals, rather than allowing cattle to graze extensively. This also involves replacing land by labour, this time in use of draught animals.

There is of course also an effective capital shortage militating against the expansion of cattle area. Hence the reluctance to fence of many people who have, or are about to get, TGLP ranches; the failure to finance supplementary feeding of cattle because farmers say they cannot borrow the money or that it is too expensive to do so; and the greater cost of transport, as cattle posts get further and further away from the point of sale and slaughter, and as new and more distant cattle posts - and the Ncojane farmers have very distant cattle posts - have to be provided. All these things are aspects of the principle of diminishing returns, that as more and more land is brought into use the effective cost of extensive farming at the margin - whether of cattle or of crops - goes up and up.

Apart from capital shortages there are critical shortages of specific forms of labour - shortages of a type that favour intensification, and argue strongly against expanding areas farmed. Male ploughmen in the ploughing season are often scarce. People to scare birds are "scarce" in the sense that not enough are forthcoming at the terribly low wages (25-40 t/day) offered, and that yields are too low to make it attractive for farmers to offer higher rates; hence major damage, particularly quelea damage to sorghum, is caused by the lack of bird-scarers. And if one is short of bird-scarers then it is folly to try to develop farming by expanding one's sorghum over a larger and larger area and spreading one's bird-scaring labour thinner and thinner. So being short of specific sorts of labour at specific times of year - even if labour overall is plentiful and unemployed, specific sorts of labour at specific times and places, and at wages (or, in the family, returns) that make employment pay, are scarce - makes a strong case for concentrating that labour on small areas of land.

The vast amounts of time that are spent by both people and beasts in travel from place to place in the process of farming - something that comes out very clearly in the UNDP Shoshong Survey - are another example of this. There may be an awful lot of labour around, but at critical times when it is scarce, for ploughing, for bird-scaring, for weeding, for harvesting, it has to spend an enormous amount of time simply getting round the vast, extensive, desperately low-yielding bits of land which constitute Botswana's present mode of crop production. Intensive farming, by concentrating workers on more compact pieces of land, saves travel time - it improves the use of labour over <u>space</u>. This indirectly eases the seasonal peaks, and improves the use of labour over <u>times</u> of year. This should lead to fuller employment in the slack seasons; ease the ploughing peak, and there can be more work to do later on. Peak constraints on weeding and bird-scaring labour, too, now reduce available work in harvesting - and cut back yields. Intensification helps solve these problems especially in a family farm household, which can time some of its "consumption peaks" (weddings, house repair, etc.) to fall into slack production periods, leaving more labour time for the "production peaks".

Suppose then, that <u>effectively cultivable</u> land is scarce, and getting scarcer in Botswana. Although there is an apparent abundance, the rising costs of bringing land into use - plus spatial and/or seasonal constraints on draught or labour, which (given the technology and organisation) are used in more-or-less fixed proportions to land - mean that there is an effective scarcity. Therefore it is important to pull up the yields per acre of agriculture in Botswana - yields which, in terms of caloric matter per acre, crop or animal, or in terms of net value added per acre, are among the lowest in the world. Even if this is so, why do I make a case for small farm units as against large farm units? And how is Asian experience relevant?

C. Efficiency of small scale where land is scarce.

Two key facts emerge from research into Asian agriculture, and are being increasingly confirmed by research into African agriculture. First, where land is scarce, it is almost always (some crops constitute exceptions) the small family farmers who get highest yields at a given technology, and who tend to use low-cost yield-raising technologies. A good example is row-planting. I do not refer to the use of factory-produced row planters or of Makgonatshotle, which requires quite costly equipment, but to simple row-planting, which only requires an extra labourer. This is likelier to be undertaken by the small family farm, where the family worker keeps the whole product of his effort and requires little supervision, than by the big commercial farmer. This is true of rice in Sri Lanka, where the incidence of transplanting is greater on small farms. It is also, I suggest, true of sorghum in Ngamiland; the small farmer sows behind the plough in every third furrow, thus getting effectively something nearly as good as formal row-planting but not much worse. In larger units, in Ngamiland and elsewhere, broadcasting is often used to save on hired workers, for each member of the family.

This tendency, to put in more labour-per-hectare on small farms, usually means not only better planting but also more manuring, weeding, and water-control (given the level of access to capital). There is therefore a mass of evidence, based on systematic work from Asia (mainly on the Indian Farm Management studies), that increasing farm size goes alongside falling yield per acre, in a particular crop, in each cropping season; a lower propensity to double-crop; and a lower propensity to grow high-value, labour-intensive crops such as vegetables.

It is true that, when a new technology comes into play, such relationships can be briefly camouflaged. This is because the big farmer can more easily acquire scarce (often subsidised) capital, and is readier to adopt the new, subjectively risky technology. He can afford to take the risk. But then the small farmer catches up, and in a few years you are back to where you were before. Both big and small farmers are using more or less the same, relatively efficient, technology, but the small farmer is putting more labour into it, because he has more family labour per acre. Not only are there more people, more man-hours available per acre, also the supervision cost is less, because they are all pulling together and they feel that they get the full product of their labour for the family. On the other hand, a hired worker, who is not supervised, has no real motivation to do more than the minimum that he can get away with, except at harvest time when he can be "paid by results"; moreover, if big commercial farms try to operate more labour-intensively, they bid up local wage-rates and may erode their profitability.

So the small family farm is a high-yielding farm, almost universally, in Asian agriculture. Apart from the Indian Farm Management studies, the Censuses of Agriculture (e.g. in the Philippines and Sri Lanka) and abundant other evidence - summarised in Dorner's book, Land Reform and Economic Development, confirm this conclusion. African evidence also suggests greater efficiency and higher yeild, with a given technology, on a small farm, particularly from Kenya. It works over time as well: there was a dramatic rise in productivity of land in Taiwan following the major redistributive land reforms of the 1950's, and preliminary evidence suggests the same conclusion for Ethiopia, despite the massive difficulties there.

Most of this is about crops, but what about cattle? There is not all that much work on the efficiency of cattle management in large and small units. But a recent study by Moore, comparing villages in India, shows that villages with smaller units of cattle management have typically higher output of milk and higher output of meat, both per acre and per unit of cattle, than villages where the units of cattle management are larger and more dispersed. That is not really surprising; a factor of production that economists often omit when they are talking about cattle, is what cattle farmers - in Britain anyway - call "TLC", which stands for Tender Loving Care. TLC is not easy to give if there is one man trying to look after five or six hundred cattle, particularly if the one man is in Gaborone and he is trying to do it through someone who is politely called a "manager" but is usually an illiterate herdsman five or six hundred miles away. This is not the way to a large amount of Tender Loving Care, or even a large amount of informed knowledge in the process of cattle management. So there is some reason to believe that the greater efficiency of the small unit, caused by the greater labour input (greater efficiency in terms of yield per unit of land, and of yield per unit of capital) applies to cattle farming as well as to crop farming.

Small units also find seasonal adaptation easier. Per acre, there is a large amount of family labour. This is fairly flexible as between the timing of farmwork and of domestic chores. The UNDP's Shoshong study (1971/2) shows how this works. In the peak season, family farm-labour expands and the amount of time the family spends on domestic and social activities contracts. In the slack season, domestic activities and social activities - repairing the house, going to one's brother's wedding - pick up. Family farming is a

finely adjusted life-style, in which the production and consumption aspects of life of the same unit fit together over time. You can't really manage a hired, employed large-scale farm workforce in anything like such a flexible way. That is one reason why, in the Asian studies, cropping intensity - seasons used per year - increases as farm size falls.

One further fact tends to make the small farm higher-yielding with a given technology. This is that extra output is worth more to poor people than it is to rich people, especially if that extra output saves purchases, rather than merely permitting sales. If I were a deficit farmer, and I had to buy my mealies in the shop if I didn't produce them, then I'm making much more money by producing extra mealies than if I were a surplus farmer and I just had to sell my extra mealies at the market price. That is, because the purchase price (which includes transport costs and traders' profit) is a good deal more than the sale price. (This difference is especially large in Botswana, where mills are often remote from farms, and where the poor often "mill" by hand.) Hence it pays the small deficit farmer better to expand output for extra subsistence use, than it pays the large surplus farmer to do so for sale.

Also especially important for Botswana, the small, "concentrated" farmer needs to travel less, both among workplaces and between work and home. Treks around different bits of land characterise extensive farming in Botswana, particularly the long treks between village, lands and cattle posts. These use an enormous amount of time, energy, thought and planning which could better be used in the direct process of farming. Such waste can be avoided in the small, intensive, integrated farm unit, where cattle and crop are treated as complementary parts of a single farm enterprise, and not solely as competitors for scarce time.

A further important factor favouring small intensive farming is that family farmers see themselves getting the whole product of their labour, and don't see themselves in any sort of conflict situation with a farm employer. Sometimes a farm employer may have some racial or tribal distrust of the people he is employing: that is common in agricultures all over the world, for usually the social origin of the farm labourer is different from the group or social origin of the yeoman farmer, so that there is some hostility between these two groups. It surfaces in all sorts of obvious ways in Botswana, but it surfaces in Britain too, where it leads to a feeling on the part of the agricultural labourer that maybe he won't do very much more work than he can get away with; after all, why should he work any harder for the Squire, or even for the large tenant farmer, who is a richer man from an advantaged social background?

D. Peasant responsiveness

The second key fact that we learn from Asian experience, but which is applicable also in Africa, is that the small family farmer is highly responsive to incentive and to the prospects of innovation. A classic study by Raj Krishna (Economic Journal, 1963) showed that, when wheat prices rise, Punjabi farmers are much readier to switch their land into wheat than are the "developed" farmers of Kansas in the USA. The small farmers of India are more price-responsive than their "big" counterparts in the USA. That might surprise those people who still believe in the myth of the conservative and unresponsive tenant. But should it? After all, farmers in the Punjab are much poorer, income matters much more to them. If there is a chance, at fairly low risk, to make extra money, naturally they will be keen to take it.

As for innovation, consider the diffusion of high-yielding varieties in the 1960's. An analysis by Hayami and Ruttan (Agricultural Development: an International Perspective, 1971) showed that high-yielding varieties of wheat and rice diffused more quickly in Asia in the 1960's than did hybrid varieties of maize in the United States in the 1930's and the 1950's. Though the initial Punjabi HYV-growers were medium-sized farmers, increasingly the spread of HYV has been due to the small man, seeing the chance for extra risk-free money, putting family labour intensively into the cultivation of these crops. (I should add that rice and wheat are rather different in that wheat is usually a much lower-risk crop than rice. High-yielding varieties of tropical and sub-tropical wheat tend to be grown under water-controlled "winter" conditions, so that the small farmer can rapidly follow the example set by the medium farmer. Then, when everyone has adopted the new technology, we begin to see re-asserting themselves, once again, the advantages of the small farmer in having more family labour per acre than the large farmer has, and once again his yields become higher. Rice is rather different, most of it is grown in the rainy season, and, unless water control is excellent, rice can be extremely risky. Often small farmers, having initially followed the innovating medium farmers, then give up, because they find it is not possible for them to cope with the risks and difficulties of intensive HYV rice-farming. This is a short-run problem, and can be overcome by appropriate rice HYV's (see Roumasset, Rice and Risk, North-Holland, 1976, for an example from the Philippines).

But in general, these two simple facts about the Asian small farmer - his responsiveness to price incentives and to promising innovations - are amply confirmed in Africa too. One of the first pieces of evidence was for tobacco smallholders in Malawi (Edwin Dean, 1960). More recently, Helleiner has summarised the African evidence (in L. Reynolds, Agriculture in Economic Development, Yale, 1975). Exeter's work for

Kenya again shows that small farmers use land most effectively (V. Amann, Agricultural Employment and Labour Migration in East Africa, Makerere 1974). Hence, if in African agriculture, and particularly in Botswana, land is becoming scarcer and the case for intensive farming is becoming stronger, then that implies that the case for small farming also would become stronger. For it is the small farmer who makes more labour-intensive use of scarce resources of land and cattle.

All these things have four main implications for policy towards agriculture in Africa in general but in Botswana in particular. These are the implications for the output-mix for the choice of technology, for land reform and land tenure policy and for the balance of resource use between agricultural and non-agricultural activities.

E. Implications for the output-mix

(1) Cattle:

Within cattle farming, if we are going to concentrate on the small, labour-intensive forms of activity, we should pay more attention to the non-meat products of cattle. It is these sorts of cattle products that require more intensive labour-input, more intensive managerial input, and less use of land, per unit of output. Incentives, extension and inputs should then shift towards draught; towards cattle cultivation for hides for tanning; towards cattle cultivation for milk and dairy products; and to some extent away from extensive meat-ranching. Cattle farming in Botswana does now mean mainly meat farming. It is really striking how, even in remote areas of Ghanzi, Kgalagadi and Ngamiland districts, one finds shops full of Steri-milk and Ultra-milk imported from South Africa. In spite of an enormous transport barrier of hundreds of miles of bad roads about which everybody justly complains, in come the Steri-milk and the Ultra-milk, and the milking possibilities of local herds are grossly underused. Certainly many poor cattle-herders drink

some of this milk, but some of the milk is wasted. Partly that is because of certain beliefs about how much milk is required for the calf, but mainly it is because too little attention within cattle production has been given to milk and dairy, as compared to the enormous amount of attention and thought that has been given to meat production.

Hides for tanning is another area where there is often sheer waste. I have seen large numbers, not only of cattle hides but also of goat skins, rotting on the ground because the capacity to tan them was not there. On the whole, people are not stupid; if these skins are being wasted that is because it does not, at present, pay people to tan them, or because it is too risky, or because credit is not readily available. But whatever the reasons, if we seek a more labour-intensive use of cattle and of cattle products, certainly tanning, and particularly somewhat improved forms of on-the-spot bush-tanning, is one of the areas on which one ought to concentrate.

Alongside such changes in the output-mix from cattle, Asian experience suggests that Botswana ought to be asking if the time is ripe to turn away from open grazing: not only towards more formal herding and paddocking - as intended under TGLP - but also towards supplementary feeding and even stall-grazing. It is interesting, for an economist, to be confronted by a range ecologist with the concept of the carrying capacity of a particular area of land. Such "carrying capacity" is defined as the number of beasts that a piece of land, given some sort of farm management which is not usually

specified, can go on carrying for ever. But an economist asks: what is the most socially profitable use of that land? If labour is plentiful and land is getting scarcer, can we look for a more labour-intensive way for land to carry cattle? This would replace land by labour, for instance, through gathering food for feeding or by supplementary feeding. Thus carrying capacity can actually be raised by substituting labour for land.

(2) Crops:

Vegetables, tobacco, etc., are obviously labour-intensive forms of land use, if water control is available and if suitable forms of cultivation are adopted. One word of warning: it is easy suddenly to overshoot local demand for vegetables. Often, in Asia, one sees an area that does not feed itself; it encourages vegetable production, and suddenly there are far more vegetables produced than the local market can take, and great difficulty in getting them out to other markets. Near a border, or where one is considering, for example, using vegetables for seed cultivation, that particular risk need not arise, but it needs to be watched. However, most of Botswana is quite a long way from self-sufficiency in vegetable, or indeed, fruit production.

As regards rice, anyone who in 1978 saw the flooded molapos of Ngamiland must be impressed and depressed by how marvellous this land could be for cultivation. Of course rice in paddies, rice with controlled water supply, would be ideal, but if there is land where people feel they just can't control the water - it is too risky, sometimes there are floods, sometimes there is very little water - even there there are amazing varieties of floating rice, which elongate as the flood comes. They can survive in up to nine metres of water. These are seldom high-yielding, but they are a way of making productive use of otherwise terribly risky land.

More systematically and over larger areas, near surface water in Ngamiland, there are possibilities of low-lift irrigation, in the style that has brought such very high-yielding rice production to Bangladesh. One can get the water up by pump - perhaps animal or manual pumps, perhaps in some cases power-driven pumps if these can be reliably maintained - up to higher flood-free land, and can cultivate reliable crops of rice with water control there, perhaps in some cases taking two crops of rice a year. Rice is known to be acceptable to consumers, and - while sorghum should undoubtedly remain the focus of cereal research - represents an attractive prospect of "labour-intensifying" the crop-mix in Botswana.

Varietal shifts also require much more attention. We tend to think of high-yielding varieties of cereals as things which increase risk. IR8 rice and Mexican 8156 wheat produce enormous yields when farmed by marginal farmers; but, if farmed by a small farmer, without much extension, capital or knowledge, can be terribly risky. That is not true of most of the newer HYV's, of rice, wheat, sorghum, millet or maize. For many environments, HYV's have been developed which not only increase the expected value of yield, but also reduce its variability. Plant geneticists have bred in resistance to moisture-stress, and to most of the major insects and fungal pests. Consequently the high-yielding varieties of cereals are no longer "too risky" for the small farmer.

Indeed he has two great advantages over the large farmer in cultivating HYV's. First, they are often "inferior goods": lower-income consumers are more likely to choose them than richer people. In effect, a lot of caloric value, a lot of food, not very high cooking (or tastiness) qualities together mean a price discount per calorie. For the farmer who eats most of what he grows, if he and his

family need extra food, there is a special advantage in these HYV's: they don't merely earn their (often unattractive) price from a grain buyer, but instead save the family the considerably higher cost of purchasing costlier calories from "superior" traditional varieties.

The second way in which the small farmer has an advantage in cultivating HYV's is that many of them benefit from enormously intensified inputs of labour, to which (per acre) he has readier access than a large farmer. A HYV, even if it isn't fertilized or weeded properly, usually performs better than a traditional variety farmed with the same "bad" practices. But the returns to fertilizer, to weeding properly, to controlling water supply properly, become enormously greater when a HYV is used. Consequently, the advantages of having a lot of family labour available per hectare are much greater if HYV - which rewards intensive labour management and labour use - is grown.

There is, therefore, a case for shifting the crop output-mix towards intensification: towards vegetables in some parts of Botswana; in Ngamiland, towards rice; and within cereals as a whole towards higher-yielding varieties.

(3) Cattle and crops:

If one sees smaller farm units as the route, at once to greater equity and a more employment-intensive use of scarce resources, this makes a case for a shift from cattle towards crop farming. Crop farming is much more labour-intensive per acre than cattle farming;

and it ties up less capital, which poor people often cannot afford. In caloric terms, one gets anything from three to seven times as many calories per acre of land if the land is used for crops than if the land is used for cattle.

There does exist in Botswana some land that has no economic use except extensive grazing. For this, and much other land, there is little prospect of economic crop production. However, there is quite a large amount of land, more than most people think, that is marginal between arable uses and cattle uses. Improvements in crop farming (HYV's) and reconsideration of de facto subsidies to beef farming, will push more land into this category. The case for using such land for arable farming as land becomes scarcer and agricultural populations grow is strong. And such populations will continue to grow. The population in Botswana is doubling each generation; the absorptive capacity of the urban sector is limited; hence the agricultural labour force will continue to grow fast. The cost-per-job in cattle farming - which needs a lot of capital (cattle) and land per Pula of value added - is much more than in crop farming. The capacity to expand cattle use is limited anyway by the danger of over-grazing. Cattle can of course be farmed more labour-intensively, especially by integrating their use more with crop cultivation (kraal manure, use of stubble, etc.). However, the case for shifting towards a crop-orientated, smaller farm economy in Botswana's agriculture remains strong, and gets stronger as growing populations - human and bovine - press upon limited land.

F. Appropriate technologies, intensification and extensions.

In crop agriculture in Botswana today, the big freehold farmers are using more "advanced" technologies. A very large share of maize output especially, comes from a small share of land. Yet the yield per acre is generally larger, with a given technology, on a small farm (see above). So why have mainly the larger farmers gone into the more "advanced" technology - fertilizers, SR52 maize?

It is mainly because the big freehold farmer has privileged access to these things. He can get extension; he can get cheap credit; he can sometimes get into his aeroplane and fly to South Africa or Rhodesia to buy the seeds; he can borrow cheaply to put in pumps. He has all sorts of advantages which at present the small farmer is denied. Little - despite encouraging experiments at Pelotshetla and at the Palapye Brigade - is done for small-scale farming.

That may seem surprising, because there is a lot of extension in Botswana. Botswana has, I suspect, one of the highest ratios of agricultural demonstrators to farmers in Africa. And while the poor extension worker gets a lot of stick, he is perhaps unduly maligned, I have seen agricultural extension in many countries, and Botswana is not bad at all by comparison with most developing agricultures. But agricultural extension, as it affects the small farmer, should be seen as a pipe which is conducting to small farmers two sorts of possible fuel. One possible fuel is information about what other farmers do; the other is information about the upshot of agricultural research that is clearly safe and profitable for the small farmer. In Botswana, the agricultural extension "pipe" has been sadly short of both sorts of fuel.

The lessons of what other farmers are doing, even within Botswana, are seldom learned. For example, outside Ngamiland, few people know what Ngamiland's farmers are doing: to reduce the size of the span of oxen; to profit from hoe-ploughing in suitable areas; to sow behind the plough, so as to simulate row-planting cheaply; and so on. Yet non-Ngami officials have scant respect for Ngami farmers (largely because they often do not destump - probably because it does not pay). Hence the possible lessons from Ngami farmers are not communicated elsewhere.

Again, many experts seem to think that efficient crop farming is almost impossible in Ghanzi and Kalahari. Yet, even there, farmers have promising techniques which are unfamiliar elsewhere in Botswana. Garforth has drawn attention to the wholly unreasearched practice of foot-ploughing. Or again: only this morning I was standing in a field of sorghum (near Kang), which the farmer had managed to sow remarkably evenly broadcast. He showed me a trick of wristwork that he used to get even sowing while broadcasting. I can't reproduce the trick - nor, clearly, can most farmers outside Kang. But the fact is that some farmers seem to know how to do this; and not only do no AD's come to learn from them, but actually no AD's come to Kalahari at all at present (although I believe that that is going to change) because the Ministry of Agriculture has considered the district unsuitable for crop farming.

The general point is that agricultural demonstrators don't come to farmers to learn from them, and where appropriate to communicate what farmers know to one another. The wisdom of farmers is not, on the whole, communicated by the extension service to other farmers. In one area of Ngamiland (to name it could unjustly distress an otherwise very able AD) a 10-hectare farmer had a field of maize in which he had taken a small square, put on some kraal manure, and ploughed it in. There was an enormous difference between the yield on these tall mealies and the rather pathetic yield on the mealies elsewhere in the fields. You could see the

size of the cob, and the number of cobs; there was a complete transformation. The AD and I did some sums with the farmer and found out that he was getting much more value-added per acre on the land where he had applied the manure - amply sufficient to pay for the cost of bringing the manure to the land. But the agricultural demonstrator wasn't terribly interested. He said, "I haven't taught this farmer to do that, he is doing it on his own account"! In other words, his guiding principle is that the extension service and the research service supplies information to the farmer, but that the channel doesn't work the other way round. Thus one of the two things which ought to be going into the pipe marked "agricultural extension" is not in fact going in nearly to the extent it should. Information (carefully checked for profitability and safety in different circumstances) is seldom being transferred, even where appropriate, by AD's from one farmer to another.

I have said that the "pipe" was also far from full of its other main potential for the small farmer - something that the large farmer can buy, and for want of which the small farmer doesn't develop in Botswana. This other potential component of the pipeline is the output of agricultural research. You may be shocked when I say that there is practically no output of agricultural research which the small farmer in Botswana can use, and you may think this is unfairly critical of a very careful and thoughtful research operation. That is not my aim. This research operation is now (it wasn't always) doing well what it is trying to do: to conduct certain purely agronomic and technical tests on the technical feasibility of certain farm procedures.

What the research system in Botswana is not as yet producing on a significant scale is recommendations which anybody can reliably give to the small farmer and say: "This will pay you and reduce your risks. It is worth your while to do this". Can we say that with row-planting? Do we know that, if he buys a row-planter (let alone a Makgonatsothle), it will give him a reliable rate of return which covers the rate of interest on the money he borrows? Few agricultural extension officers even know that rate of interest. So they can't assess the profitability of the things which they are advising him to do. And naturally the farmer isn't going to do these things unless they pay him. We lack, as far as I can see, careful economic assessment of many practices now being recommended. Perhaps that is why the recommendations, particularly with respect to early planting, vary from year to year and from teacher to teacher. Under these circumstances the small farmer can have very little confidence in such agricultural research findings as do reach him.

I am trying to explain a mystery: a good research system, a good extension system, intelligent farmers, yet negligible agricultural progress and almost nothing being communicated. It isn't the fault of particular "people" - of some stupid man making silly mistakes at a research station or in the extension office or on the farm. Not at all. It is the fault of a system which has not been geared to ask: "How can we generate a research output which will pay the small farmer? How can we introduce economic and commercial assessments of rates of return and of riskiness into the research output which we are presenting the small farmer"?

Asian agricultural research was in this situation fifteen years ago. Extension officers were sometimes going out and telling farmers to do things that were actually

physically unfeasible. For instance, farmers couldn't control the water in the ways that the extension officer advised because at the critical time they were busy doing something much more important with the previous crop. In many parts of India, extension officers were going into the field, confidently telling farmers to dig deep compost pits, make careful composts and then put them onto their "tall" grain varieties; these then got very tall, and often fell over because of the heavy heads of grains they had to carry. In Asia then, and in Botswana now, a good system of research and often good extension workers, were giving advice which was either technically unfeasible or, more seriously and frequently, which had been shown to raise yields on research farms (with controlled water and inputs and with no need to make profits), but which in many places lost money for the farmer, or caused him to incur unacceptable levels of risk.

So we have been here before. This is not an error which is unique to us in African research-extension-farming systems. It is an error which was made, no doubt, by European farming systems, and certainly has been made recently by Asian ones. But the appropriate technology for the small farmer has to be developed and communicated, and it has to be appropriate technology that makes sense to him in terms of profitability and risk reduction. Implements have to be developed - or selected from other people's stock - that suit poor people.

For example, consider irrigation. Complex, costly and capital-intensive systems have got irrigation an unjustly bad reputation in Botswana. Hand-operated pumps suggest themselves, because poor households usually contain plenty of hands and plenty of feet willing to work. Sometimes they can get hold of animals to turn simple irrigation equipment such as animal-operated wheels, which lever water up in buckets; as the animals go round the wheel goes round, there is a rope

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G. Getting resources to the efficient rural poor.

In Botswana a large proportion of land, and a larger proportion of gross output of animal products and maize, is in the hands of the large freehold farmer. He is not necessarily more socially efficient. Certainly he is efficient on his own terms, but because he makes an enormously greater use of purchased inputs - fertilizers, tractors, etc. - with one or other form of subsidy. In particular, the huge subsidies which, perhaps rightly, go to cattle farming in Botswana are used much more by the freehold farmer (and by the large cattleholder on tribal land) than by the small farmer. So the big farmer's high levels of output are due mainly to high levels of input of working capital - inputs often financed, in part, by public subsidy. If a farmer with a small amount of land, but a lot of labour to saturate it, uses an appropriate technology - and gets no more and no less subsidy (including concealed subsidy via the credit system and the extension system) than does the big farmer using his appropriate technology - then that small farmer will do better, in terms of crop or animal output per acre or per unit of capital, than the large farmer. For want of instruction, for want of credit, for want of direction of such subsidised inputs as are available, the small farmer is not at present able to do his job.

There is then a possible case in Botswana for some degree of redistribution of large landholdings, if, and only if, combined with appropriate policies for credit, technology and extension for small farmers. Such a case would seem strong on efficiency grounds as well as on equity grounds. One has to argue here in terms of what is politically acceptable and possible, but at least for a start one might regard squatting as a normal practice rather than a practice to be fought, at least when land has been abandoned or has gone out of use for many years. One might perhaps apply something equivalent to the Agriculture Act which Sri Lanka has, or indeed which the UK has had since 1948 which allows people to be ejected from land which has been abandoned and is not being used.

going down to the bottom of the well, the buckets go round and round and out they come at the top of the well and they pour into the furrows and irrigate the land. Such simple irrigation systems have been known in many parts of Asia and in many parts of Africa for thousands of years. Why aren't they known in Botswana? In part it is because Botswana has not until recently experienced acute land shortage. Botswana is moving into an era of acute land shortage, and it is time that appropriate implements for irrigation were applied.

Appropriate, animal-drawn ploughing implements are indeed being researched to some extent at Sebele. However, in my view, far simpler, cheaper, animal-drawn implements, which can be made locally by village carpenters are needed. How does one plant in rows? Does one have to buy a Makgonatsotlhe and spend hundreds of Pula? Or can village carpenters - and there are many in Botswana, usually totally uninstructed, not touched by vocational education - profitably do something to help the farmer? They can learn from the millet and sorghum farmers of semi-arid Western India to make a seed-drill, drawn by animals. This looks like a fork into the top of which are poured the seeds. They go through a seedbox and come out through the hollow prongs of the "fork", making three or four rows of seeds, so that the farmers can plant in straight rows and then can get in between and weed. The distance can be adjusted if a new seed drill is made, and this way the farmer is able to plant his rows without incurring the large expense of modern iron implements. So appropriate implements need to be, and can be, developed for small farmers. Scanning the toolsheds of Asia - critically of course - is the obvious first step.

Second, when a freehold farm comes up for sale, particularly in an area where land is desperately scarce, one might adopt the policy of breaking that land up into small, labour-intensive units of production, rather than - as is now done - forbidding the breaking-up and encouraging (indeed permitting only) the take-over and cultivation of land by large farmers. One understands all the large-farm pressures against this. Politics work through pressures. But compensation is a serious possibility, if one is satisfied that there is a real efficiency gain from land reform. Resources in diamond-producing countries are unlikely to be so desperately scarce as to forbid this.

Anyway, pressures can be put on for a variety of purposes, and from different sources. The sorts of political concern which are going to be facing politicians and civil servants in, let us say, North-Eastern District in five or ten years, are not going to be alleviated if, every time a freehold farm comes on the market, it is automatically given to another freehold farmer of the same size. Pressures will be easier to manage if such farms are split up into efficient, labour-intensive, family-size units, properly serviced with inputs, extension and credit. Similar arguments will increasingly apply in other parts of Botswana. Even where land seems plentiful, the draught to plough it will long remain scarce - and the case for intensive, i.e. small-farm, use of both land and draught will remain powerful.

What of the balance between agricultural and non-agricultural activities? Can Botswana render rural economic life - agricultural production and manufacturing together - profitable to the less well-off, as compared with urban economic life? If one goes for a large-farming, capital-intensive rural solution, then neither agriculture nor industry will be able to absorb the growing pressures of rural population. We know the urban sector can't absorb those pressures; it will not long remain possible for very large numbers of people to be absorbed in mining in South Africa. Nobody knows how long Botswana will want to do this,

and nobody knows how long South Africa will permit it. An independent South Africa under majority rule might be more concerned even than the present racist government in South Africa to give jobs to all "their own" people. So there is no reason to rely on the expansion of mining opportunities for work abroad, and with domestic mining and urban manufacturing absorbing extra people only at a very slow rate, there is going to come quite possibly a time of crisis for Botswana as regards employment.

Only the rural sector has sufficient, and efficient, possibilities of labour-intensity to provide that work, and then only if agricultural and small manufacturing in the rural sector advance together. A growing rural small-farm sector requires the services of carpenters; of builders who will produce better granaries; of blacksmiths who will produce more and better hoes for weeding (and also, in some areas, planting); and so on. We are talking of an interacting development in which rural small-scale manufacturing and agriculture advance together. The small-scale manufacturing sector supplies the inputs for agricultural development, and helps to process its outputs (e.g. in milling, tanning and dairy production). Farming and manufacturing - in Botswana as in the Punjab or Jaffna or Taiwan - <u>can</u> advance labour-intensively together, based on small scale rural units.

There is, as I see it, in the context of the small farm policy no conflict between agriculture and industry, but there could be a conflict between the rural sector and the urban sector. If agriculture and small industry march together and develop together they are in conflict with enormous over-centralisation of the capital city, and with contractors and inputs which come from the towns (or indeed from South Africa).

At present - if we forget about the accretion of cattle herds, which is not something that people do by invested effort, and look at only the investment that comprises embodied saving, either monetised or via direct family labour - less than 10 per cent of all investment in Botswana is in agriculture and industry. The remainder goes into roads and into health centres, into schools into office buildings, into housing, into hotels - things which are certainly important - and, of course, into mining which is extremely important. But none of these things, even mining because the life of a mine is finite, can in the long run provide income and employment for the mass of Batswana. These things have to come from agriculture and industry - sectors which between them employ 85 per cent of Botswana's workforce, sectors which between them get less than 10 per cent fixed investment in Botswana at the moment.

Small-farm-based agricultural development, combined with a small-unit-based development of rural manufacturing industry, is not some sort of Utopian myth. In several parts of Asia - from Japan to Jaffna, from Korea to Koala - it is proving to be, amid the tangle of dead ends, a path to reduce poverty and to achieve growth.

Of course Asia and Africa alike are dominated by "the paradox of poverty" - by growth which, because concentrated on a few large urban concerns, does not "trickle down". But Asia's efficient and equitable exceptions can form a model for Botswana's rural development. They show that small units, both in agriculture and some forms of rural industry, are highly responsive to incentive and innovation and thus make efficient use of scarce resources of capital and of land.

The development of technologies, tenure systems, and investment allocations that favour small rural concerns is thus practicable as an equitable alternative to the further accretion of wealth in the hands of a very small number of owners of cattle and cropland: a path that will not be acceptable indefinitely either to the present rulers of Botswana or to those who vote for them.