Crop substitution and alternative crops for tobacco

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LIST OF ABBREVIATIONS

AFUBRA	Brazilian Tobacco Growers' Association
EurepGAP	European Good Agriculture Practices
FAO	Food and Agriculture Organization
WHO FCTC	Framework Convention on Tobacco Control
HACCP	Hazard Analysis and Critical Control Point
MOPAM	Multiple Objective Policy Analysis Matrix
NGO	Non-governmental Organization
PAM	Policy Analysis Matrix
TAZ	Tobacco Association of Zambia
VFC	Virginia flue-cured tobacco
WHO	World Health Organization

WEIGHTS AND MEASURES

1 hectare (ha)	=	2.417 acres (ac)
1 kilogram (kg)	=	2204 pounds (lbs)
1000 kilograms (kgs)	=	1 metric ton (mt)
1 kilometer (km)	=	0.62 miles

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I. INTRODUCTION

As tobacco control measures continue to gain momentum around the world, various stakeholders have expressed concern that these policies are likely to have serious negative consequences for the economies of tobacco-producing countries. Tobacco consumption is predicted to increase globally for at least the next 20 years, but the ultimate objective of the WHO Framework Convention on Tobacco Control (WHO FCTC) is clear and that is to curtail tobacco consumption to the greatest extent possible. For individuals and nations involved with tobacco production and marketing, this is regarded as a serious threat and has given rise to various calls for crop substitution and long-term diversification efforts. Equally, some advocating for tobacco control have gone further and called for reduced production on grounds that tobacco is not a good choice for smallholder farmers, rural economies or the environment.

Considering that hundreds of thousands of families, particularly in developing countries, are engaged in tobacco agriculture and that there is likely to be a reduction in demand for tobacco products over the medium to long-term future, a decision (FCTC/COP1(17)) was made at the first session of the Conference of the Parties to the WHO FCTC in Geneva to establish an ad hoc study group to identify viable crop alternatives to tobacco (1). Among other things, the Conference of the Parties called on the study group to summarize the uptake of existing economically viable alternatives for tobacco and to recommend cost-effective diversification initiatives.

This paper has been prepared in response to that mandate for presentation to a meeting of the study group on alternative crops held in Brasilia from 27–28 February 2007. The paper looks at farm-level production and marketing issues and seeks to draw comparisons between the costs and benefits of tobacco cultivation and opportunities to develop alternative agricultural enterprises.

A. Objectives

As set out in the terms of reference for this study, the paper's main objectives are to:

- Summarize existing studies that examine crop substitution and the profitability of tobacco and alternative agricultural crops;
- analyse the relative costs and profitability of agricultural crops with the existing data;
- discuss and outline the main issues that need to be considered as part of a crop diversification programme.

B. Approach and limitations

Structure of the paper

To achieve these objectives, the discussion is presented in four main sections including the present introduction. Following a few specific remarks about the approach and limitations of this study, Section 2 begins by setting out some important contextual issues that help elaborate the reasons why farmers grow tobacco and what is involved in developing competitive value chains for alternative products.

The main analysis is then presented in Section 3, which is built around a set of six country case studies. The first three case studies look at Indonesia, Zimbabwe and Malawi, where some very specific cost and profitability data for tobacco and other crops grown by large and small-scale farmers are available. The discussion of these countries again begins with some contextual information about the scale and importance of tobacco production and type of farmers involved in this commodity. The farm-level cost and profitability data are then compared to understand what may or may not be possible from a diversification perspective.

Taken together, these first three studies show that several crops can be more profitable than tobacco and may offer a possibility of better financial returns. Equally, however, the analysis also finds that the markets for these commodities are much smaller and more difficult to enter. The notion of developing one or two new products as complete substitutes for tobacco is not realistic at this point in time and no single crop is likely to play the same important and widespread role as tobacco does at the present. An important challenge for tobacco growing countries and communities therefore is to benefit as much as possible from tobacco production and to use that income to invest in new activities. This is particularly important for countries with a significant participation by smallholder farmers in tobacco agriculture, for whom the importance of including a high-value crop as part of the farm mix must be recognized.

The next case study looks at three diversification experiences in Brazil. Like Indonesia, Brazil ranks as a middle-income country and so has greater possibilities to develop high-value agriculture products for the domestic market than poorer countries like Malawi or Zimbabwe. The examples summarized here look at southern Brazil and cover vegetables sold in local outlets, bananas for national trade and organic vegetables being marketed through a supermarket chain. While these ventures have each been successful in their own way, all have limited outreach and several unique problems were encountered along the way that had to be addressed. Taken together, therefore, these cases each help to illustrate the point about attention to supply chain processes and the need for multiple value chains to emerge as viable alternatives to tobacco.

The next country considered in the analysis is China. China is by far the world's largest tobacco grower and currently accounts for around 42% of global production. In this case, however, the data required to draw meaningful comparisons with other farm commodities were not available. Nevertheless, the example of China is still worth highlighting especially with regard to future research on crop substitution. Because of China's dominant position and ability to subsidize production in the framework of a centrally planned tobacco policy, this country is likely to be an important competitor to other tobacco growing countries.

The final case study is again somewhat different and looks at the diversification experience in Canada as a developed country producer. More than 80% of tobacco is now grown in the developing world, but this example still helps to present an additional perspective on what is possible for crop substitution. Like the cases in Brazil, the analysis shows that Canadian farmers also had several ups and downs in developing new enterprises and were sometimes

reluctant to leave tobacco cultivation because of the high profitability and secure market structures for this crop. Over time, however, Canada has apparently been successful in striking a realistic balance between new enterprises and efficiency improvements in tobacco. The development of new commodities helped ease resistance to tobacco control measures and even allowed remaining tobacco farmers to increase their profitability by growing a higher percentage of their quota. The case of Canada also helps to illustrate the importance of non-farm opportunities as part of the dialogue on crop diversification. The paper concludes in Section 4 with a summary of main findings and areas for further analysis.

Approach and limitations

This paper was prepared from an agricultural economics point of view. Rather than focus explicitly on traditional health concerns that are usually at the forefront of discussions of tobacco policy, therefore, the overall approach is to be as straightforward about farm-level production and marketing issues as possible. Among other considerations, this approach leads to the conclusion that tobacco has many important and useful roles to play in national and rural economies that should not be overlooked. As the discussion shows, this is certainly not meant to imply that tobacco is indispensable in the long term or to be dismissive of the very well-documented arguments against tobacco consumption and importance of working for a reduction of this crop. Instead, the approach begins with a recognition that the long-term future of tobacco is uncertain and likely to decline. As provisions of the WHO FCTC begin to take effect, it is important to have an idea of what farm products could begin to substitute for tobacco and what type of support is required to develop these commodities.

By approaching this discussion from an agricultural economics perspective, it is therefore helpful to put aside some of the main arguments between pro- and anti-tobacco groups that sometimes distract attention from farm-level issues. Agricultural production and marketing begins with the decisions farmers make rather than consumer health concerns, and it is important to have a clear understanding of how tobacco compares with other farm enterprises and economic opportunities available to primary producers. The analysis cannot possibly address all of the issues that need to be considered in preparing a diversification plan, but hopefully serves as a starting point for improved dialogue by the study group on alternative crops and other stakeholders in the tobacco debate. Much more discussion is needed at many levels in individual countries to decide how best to cope with the threat of shrinking tobacco markets, but this can only be done from a clear and rational perspective that includes an understanding of farm decision-making.

Equally, while this paper seeks to highlight the most important issues that need to be considered at the farm level, the scope of this study is also very limited and several constraints need to be recognized. In the first place, the analysis is built around readily available literature only. An Internet search was carried out to identify key reports, but this was a fairly limited exercise and should only be seen as a starting point for further analysis and review. Beyond the topics covered here, for example, many other issues must all be figured together when considering a country's diversification opportunities. These include macroeconomic management, investments in rural roads and communications infrastructure, the rule of law and enforceability of contracts, import duties and tax structures, investments in education and the success of programmes that address other public health risks, like malaria and HIV/AIDS, which impact worker productivity. By highlighting some of the main issues from an agricultural perspective, it is hoped this paper will help facilitate improved

understanding of important farm-level incentives and constraints for the development of alternative crops.

Finally, it should be emphasized that this paper was prepared by an independent consultant and must not be read in any way whatsoever as a statement of policy or specific recommendations endorsed by the Parties to the WHO FCTC. The case studies cover Party and non-Party states and there is certainly no pretence of making any formal policy recommendations. Instead, the paper merely seeks to provide background information and analysis that may be useful for work by the study group on alternative crops. Most Parties to the Convention, in fact, derive a smaller share of total income from tobacco than many of the countries covered here. This helps to alleviate pressure from the search for viable alternatives and may make the transition to new crops easier to achieve.

II. CONTEXT OF THE DISCUSSION

A. Arguments for and against tobacco

There is no doubt that tobacco consumption has many important costs to society and is a significant drain on national health budgets, worker productivity and household income to mention just a few areas of negative impact.[1] The arguments against tobacco consumption however are very different from saying that the crop is not an attractive option for farmers or that production should be reduced from a primary producer's point of view. Numerous arguments have been made against tobacco farming, including the risks of green tobacco sickness and exposure to pesticides, farmer indebtedness and deforestation, but many other lines of work also involve occupational hazards and discussion of these businesses usually revolves around how to manage the risks effectively. Tobacco is a unique case because of its addictive properties and high costs to society, but this does not necessarily mean that farmers should (or will) stop growing the crop as long as it is still in demand, is profitable and compares favourably with other agricultural possibilities.

Equally, while many of the arguments against tobacco are concerned with the dangers of the crop and unequal trading relations that sometimes exist between farmers and tobacco companies, proponents of tobacco have tried to claim that the crop is the only commodity able to provide a high income and is absolutely indispensable for rural employment creation, foreign exchange earnings and government revenue.[2] These arguments have been used quite effectively to slow the implementation of tobacco control measures around the world (5). Countries like Zimbabwe and Malawi that derive a large share of income from tobacco have been especially vocal in raising concerns about the potential negative effects of tobacco control measures. A summary of some major arguments for and against tobacco production from an agriculture perspective is given below.

Table 1: Some pros and cons of growing tobacco from an agricultural sector perspective

Pros	Cons
• Tobacco is a major contributor to local economies. • Tobacco is profitable and has brought development to rural areas. • Without tobacco, farmers could not earn as much income. • Tobacco supports food production. • Tobacco creates more employment per	• Tobacco does not provide a relatively good income. • Farmers are caught in unequal trading relations. • Tobacco farming has trapped poor growers into a never-ending debt cycle. • Tobacco production exposes farmers to serious health risks.

[1] These costs were well described in the World Bank publication *Curbing the Epidemic* (2) and have been thoroughly documented in other sources as well.

[2] See, for example: ITGA (3) and Forces, International (4).

hectare than other enterprises. • Demand for tobacco products continues to grow.	• Tobacco contributes to rural poverty and food insecurity. • Tobacco contributes to deforestation and environmental degradation.

Perspective on the debate

There are clearly strong claims on both sides of the debate. This short paper cannot possibly answer all of the arguments for and against tobacco from the agricultural perspective, but several themes regarding costs and profitability, labour requirements, safe handling of agricultural inputs and rural credit recovery do recur throughout the discussion and are important to bear in mind when examining the case studies that follow.

Most of all, it should be kept in mind that the choice is not simply between growing tobacco and not growing tobacco. This greatly oversimplifies the issue and detracts attention from the real challenge, which is to develop viable, high-value alternatives alongside tobacco that are internationally competitive and offer farmers a realistic choice of how to allocate their resources. Merely to argue that tobacco has many dangers and that farmers should stop growing the crop, or that tobacco control measures will somehow bring about the downfall of tobacco economies overnight, completely misses the point of what is required for long-term agricultural competitiveness. Because of the uncertainty over future tobacco markets, now is most definitely a good time to look for sustainable alternatives and to consider what is needed to help these products emerge, but this is not the same as saying that the policy objective should be to curtail tobacco production because of the prospect of some reduction in global demand 25 or 30 years in the future.

On this basis, one important finding of the case studies is that tobacco profits do, more often than not, compare very favourably with alternative enterprises, at least in the countries covered here. This is true in absolute terms per hectare and on a daily basis measured by returns to labour. While this is not the same as saying that tobacco is always (or even sometimes) an optimal choice from a farm management point of view, the high profitability of the crop is a major challenge that must to be taken seriously by any diversification effort. Moreover, while several alternative farm products are shown to rival and sometimes surpass tobacco for potential gross and net incomes, the markets for these commodities are usually much smaller and more difficult to enter. The fact that tomatoes can be more profitable than tobacco in Malawi, for example, is not a sufficient reason to recommend that farmers switch to tomato production or even to conclude that tomatoes could ever substitute for even a small loss of tobacco revenue if the right marketing channels are not in place. Similarly, it has sometimes been claimed that sugar is a good diversification option for Malawi, but in this case, the crop is grown in a different climatic zone by large estates rather than smallholders who are the ones primarily involved with tobacco production.

Equally, it must be kept in mind that most "tobacco farmers" are already quite well diversified. One valid criticism of tobacco is that the crop is very harsh on the soil, but for this exact reason, tobacco is almost always grown in a carefully planned rotation even by small-scale farmers. Moreover, there is considerable evidence to show that tobacco can (and did) help to fuel the process of crop diversification. In Zimbabwe, for example, the case study finds that large commercial farmers were actively using tobacco revenue to develop new

enterprises specifically to lessen their dependence on tobacco. As persuasive as some arguments against tobacco production may be, any strategy that ignores the benefits of this crop as part of a farmer's overall enterprise system will be incomplete at best and may have a risk of failure.

Another consideration is the cost of tobacco cultivation. Compared with many other farm enterprises, there is no doubt that tobacco ranks as an expensive enterprise and this presents many important challenges for large and small-scale farmers alike. At the same time, of course, this problem is not unique to tobacco and another important finding discussed in the case studies is that most alternative crops that could rival tobacco for net profits and attractive rates of return are also expensive to grow. Long-term indebtedness, the need for pre-season finance and problems with unscrupulous moneylenders are not unique to tobacco and these issues will also have to be addressed for other commodities to develop sustainable alternatives.

From a farmer safety point of view, it is clear that tobacco does pose many serious risks in terms of growers coming in contact with dangerous pesticides and the potential for green tobacco sickness from handling unprocessed leaves. This latter problem is unique to tobacco, but the issue of pesticides is not. Notwithstanding the potential for niche marketing of organic products, mainstream cotton, paprika and fruit and vegetable crops all require many of the same chemicals as tobacco. Safe handling of these products is important, but the arguments against tobacco need to be put in the right context, since a majority of attractive substitutes again face the same type of challenges.

Finally, from the environmental perspective, one major argument against tobacco is the large demand for firewood or coal for curing the crop. Like much of the discussion around tobacco growing, however, the deforestation issue again needs to be put in perspective since it is mainly Virginia flue-cured (VFC) tobacco and some other minor varieties that demand a high, steady temperature for curing. There is no doubt that VFC tobacco is the most widely grown type of tobacco and that there is an important environmental threat associated with this crop. At the same time, however, other major varieties like burley (which accounts for over 90% of total production in Malawi) are either air or sun cured and so do not involve a major deforestation risk. Many other factors like high population densities, small farm sizes and the use of charcoal for cooking, of course, also contribute to deforestation and can be made worse when farmers do not have adequate income. Similarly, many other crops like soybeans and cattle (which have expanded rapidly in Brazil) also contribute to deforestation. Many of these alternatives in fact provide only a fraction of the income per hectare compared to tobacco, and so may even pose a greater environmental threat because of the need to clear additional land to earn the same amount.[1]

Another environmental argument against tobacco is the damage it does to the soil. As noted already, this is a very genuine concern since tobacco is quite harsh. Equally, however, this risk can be managed by following an appropriate rotation. Farmers are almost always well aware of this and specifically include leguminous crops as a part of their crop mix to restore soil fertility. Sometimes, this system can come under pressure when farmers only have access to very small plots, but even in these cases, farmers are unlikely to grow tobacco to their own

[1] Unfortunately, time and data limitations prevented specific calculations being made, but it would be interesting to show how the total income from VFC tobacco on an extended parcel, including the area required for fuel wood, compares with the income from other crops grown over the same area.

long-term detriment. No doubt some examples can be found, but no overall pattern of farmland being ruined and left abandoned because of tobacco was discovered during the course of this study.[1]

B. Market prospects for tobacco

While there may be many persuasive reasons to look for crop substitutes, it cannot be overlooked that global demand for tobacco is still increasing. As a way of reducing consumption, supply-side measures are widely acknowledged to be ineffective[2], but there is still a reluctance to endorse or even accept tobacco as a potentially viable part of current and future farm strategies. Until such time as there is no longer any demand for the crop, farmers somewhere will be involved in tobacco production and the need to switch to new enterprises will not happen overnight. The true competitiveness of tobacco compared with other enterprises, must therefore be seen in the wider context of trends in market demand and market prospects for alternative commodities.

Demand trends

While is not too early to discuss crop alternatives, worldwide demand for tobacco continues to grow. This is particularly true in developing countries, which now account for 70% of world consumption, with China alone accounting for 44%. In developed countries, there has been a marked decline in per capita and even absolute consumption, but world demand is still expected to grow by 2.3% per annum until 2010, including 3.2% annual growth in developing countries.[3] In the longer term, the number of smokers is expected to increase to 1.7 billion by 2025, from 1.1 billion at the turn of the century (9).

As in the recent past, growth in demand is expected to be fueled significantly by population and income growth. Importantly for crop substitution, the trends for total consumption are likely to overwhelm the demand-depressing effects of increased taxes and other non-financial programmes such as advertising bans and establishment of smoke-free areas called for by the WHO FCTC. In the latter part of the 1990s, there was some slowdown in the growth of developing country tobacco demand. This was almost certainly due to the economic crisis in parts of south-east Asia, but may also reflect some degree of effectiveness in country campaigns to increase awareness about the health effects of tobacco use (8).

Production trends

[1] The case of deforestation in Malawi is probably the best example of long-term environmental degradation from tobacco, but again, deforestation is mainly associated with VFC tobacco (an important crop in the past) rather than burley tobacco, which is the main crop now. As an extremely poor country with very high population densities, many other factors have also contributed to deforestation and will continue to pose a threat with or without tobacco. See Geist (6) for a more detailed discussion of the environmental risks associated with tobacco production.

[2] In a detailed analysis of supply side measures, Jacobs, et al. (7, p 330) conclude that "efforts driven by a desire to move production toward crops with less negative health implications are not likely to be effective as a means of controlling tobacco use. A basic observation in markets is that if one supplier of a commodity is prevented from operating, another will quickly emerge to take its place as long as there is an incentive to do so."

[3] Mergos, 2001 quoted in Jaffee (8) who notes that this projection should probably be regarded as the upper limit on expected growth in word demand. According to Jaffee, "Mergos' projections appear to be extrapolated from trends in demand, prices, population, growth, and income growth over the 1980 to 2000 period."

During the period from 1980 to 2005, world production of unmanufactured tobacco leaf increased from 5.26 million tons to 6.6 million tons, or about 1% per annum on average. Most of this growth occurred during the 1980s and early 1990s. There was a slowdown thereafter, partly because of the excessive unsold stocks in several countries, including China, India and Turkey. World production grew at 1.95% per annum during the 1980s, then declined by 0.69% per annum over the 1990 to 2001 period (8); it has again been on the increase since 2003 (see Appendix 1).

Importantly for diversification programmes, the expansion in production since 1980 has been entirely accounted for by developing countries. Tobacco production in developed countries, including the United States, European Union and Japan declined from 1.99 million tons to 1.29 million tons from 1980 to 2001. In sharp contrast, tobacco production in developing countries increased from 3.26 million tons in 1980 to 5.68 million tons in 2001. Developing country share of global production thus rose from 62% to 81%, but again this total growth only occurred during the 1980s and was stagnant during the 1990s. These global figures, however, cloud a more detailed trend in which production in China leveled off or even declined in some years, while output continued to expand in countries such as Brazil, India, Zimbabwe (until 2001), Zambia and Malawi. According to an analysis in 2003 (8), major factors underpinning these divergent trends have included:

- shifts in locus of demand from developed to developing countries;
- declining political and taxpayer support to tobacco in developed countries;
- cost competitiveness of developing country tobacco and relatively high profitability compared with main other crops in these countries;
- direct technical and financial support for tobacco cultivation in several developing countries;
- investments by international companies in the promotion of tobacco production and cigarette manufacturing in selected developing countries.

C. Alternative competitiveness opportunities

The market prospects for tobacco are far more complicated and subtle than described above, but these basic facts about global supply and demand do at least show that the switch to alternative crops does not have to happen overnight. It is widely accepted that reductions in demand will be gradual at best, meaning that tobacco will still be an important part of some rural and national economies for many years to come. This simple fact does not mean that countries can afford to be complacent in promoting alternatives, or that individual farmers might not be better off growing something else, but it does at least mean that time is on the tobacco grower's side while investments in new production and processing systems for alternative commodities are being made.

Before proceeding with the discussion of individual country experiences it is therefore helpful to review a few basic concepts of what is required for competitive agricultural development. In developed countries, where most tobacco was produced until the late 1960s, diversification away from tobacco has been facilitated by quota buy-outs and other generally favourable economic conditions that naturally attracted workers away from tobacco to other

areas of agriculture and non-farm employment. These opportunities do not exist to the same extent in most places where tobacco is grown today. The development of crop substitutes is likely to be a far more complex business in the developing world that demands attention to a great many things, by farmers and other private investors as well as by governments and donors alike.

In beginning to understand this challenge, the concepts of value chain and supply chain development are worth bringing to the fore. Although many definitions are applied, value chains essentially represent enterprises in which different producers and marketing companies work within their respective businesses to pursue one or more end-markets. Value chain participants sometimes cooperate to improve the overall competitiveness of the final product, but may also be completely unaware of the linkages between their operation and other upstream or downstream participants. Value chains themselves encompass all of the factors of production including land, labour, capital, technology and inputs, as well as all economic activities including input supply, production, transformation, handling, transport, marketing and distribution necessary to create, sell and deliver a product to a certain destination (10).

Supply chain development, on the other hand, is a complementary concept applied to a network of companies across a given industry. Whereas value chain analysis looks at the upstream accumulation of value as a determinant of international competitiveness, supply chain analysis is a downstream concept that looks at the flow of goods from the supplier to consumer. Both concepts are concerned with the organization of value-adding activities while competing in a particular industry, but the key analytical distinction comes in the flow of value between the supplier and consumer.

Value chain and supply chain concepts are also concerned with product differentiation and timeliness of delivery. These factors are major determinants of a commodity's final market price and the total value that can be divided between participants in the production and marketing system. Seasonality is an especially important factor in agriculture since the prices of most farm commodities are cyclical depending on world production and patterns in consumer demand. Quality differences are likewise an important source of competitive advantage as is the ability of a country to supply guaranteed minimum quantities according to a specific time schedule.

Beginning at the farm level, therefore, climatic suitability and grower profitability are merely the first (and most obvious) considerations in developing a diversification programme. The viability of any new enterprise also depends on the acquisition of specialized skills, the efficiency of input supply and availability of credit. Depending on the commodity, investments in irrigation and greenhouse construction or plastic tunnels may also be required. Perennial tree crops like tea, coffee and macadamia nuts likewise demand special attention to cash flow requirements before the crop produces its first revenue.

Beyond the farm level, many other aspects of competitive value chain development must also be addressed. These include access to post-harvest handling facilities, efficiency of transportation networks, ability to amass sufficient quantities to attract buyer interest and adherence to international standards for horticulture and livestock products in particular. The scope for competitive development is also determined by competition with other producers of the same product, both at the international and domestic levels.

Taken together, these challenges mean that developing new agriculture value chains as an alternative to tobacco is unlikely to be easy or fast. One of the most successful examples from the case studies below is the story of banana production in Schroeder, Brazil where farmers were able to make a complete transition from tobacco. By joining forces with each other and enlisting government institutions and private traders, the farm community was able to develop a competitive value chain for this commodity. At the same time, however, tobacco was never a major crop in Schroeder and much of the infrastructure required for bananas was already in place to serve other growers (11).

III. COUNTRY-LEVEL ISSUES AND ANALYSIS

Having set out some contextual issues around the analysis of crop alternatives, this section now looks in closer detail at the diversification opportunities and experiences with new crops in selected countries. Diversification opportunities vary greatly between countries and regions depending on local growing conditions, market infrastructure, availability of land per capita and many other factors described above. The purpose of these case studies therefore is not to provide a comprehensive roadmap or policy prescriptions for developing alternative crops, but rather to sketch out some practical issues and lessons from past experience that can help to evaluate current opportunities.

The countries covered here are Indonesia, Zimbabwe, Malawi and Brazil, which together produced around 1.2 million tons of tobacco in 2005 or about 19% of the world total. A brief discussion of China, which is by far the world's largest tobacco grower, is also included, but this analysis is more narrow because of the limited availability of data. Finally, the section concludes with a description of the diversification experience in Canada and lessons for other countries in promoting crop substitutes and other economic alternatives to tobacco.

A. Indonesia

The first case study is drawn from a supply-side analysis of Central Java.[1] This work considered how the financial costs and returns for tobacco compare with a range of crops that either complement tobacco or offer substitution potential. Although Indonesia's economy is incredibly diverse already, tobacco is a dominant crop in some locations and contributed around $274.9 million in gross export earnings in 2001. Roughly 175,000 hectares were planted with tobacco in 2002. Other than Central Java, tobacco is also important in East Java, Lombok and North Sumatra.

Tobacco production

There are two main types of tobacco produced in Central Java including a type of sun-cured Virginia tobacco grown mostly in upland areas with a mild climate and a second type of tobacco grown mainly in the lowlands where the climate is hot and tropical. More than 98% of Virginia tobacco is used domestically to manufacture *kretek* cigarettes, in which the crop is blended with cloves and other aromatic ingredients. Local consumers are the largest market for Indonesian *kretek* cigarettes, but the product still accounts for around 4% of total agriculture exports. Lowland tobacco, on the other hand, is more than 98% for export and is mainly sold on a pre-negotiated basis to manufacture cigars.

One particularly important characteristic of Central Java agriculture is that most farm sizes are extremely small, with only about 0.25 to 0.5 hectares total farmland available to individual households. Landholdings are perhaps slightly larger in upland areas compared with the lowlands, but a clear challenge for all farmers in Central Java is to seek the maximum income from a very small parcel. This factor is important to keep in mind since no matter how attractive the rates of return are from an alternative investment, there is still a need for a high-income crop to be included as part of the rotation. Tobacco has traditionally

[1] This case study is based on work by Keyser and Juita (12).

played this anchor role in many densely populated areas and any successful diversification strategy will need to ensure at least as much farmer income over the long term.

Upland farming systems

It is also important to note that tobacco in Central Java is only one part of a complex rotation of different crops. In the upland tobacco areas, Virginia *kretek* tobacco may be considered the foundation crop around which most other agriculture activity revolves, but is still grown during just one of three crop rotations per year and many other farm and non-farm enterprises are also important to each household's livelihood. There are many variations to the basic pattern, but a typical practice is to follow tobacco almost immediately with corn, soybeans or some other relay crop that grows well before the start of the heavy rains. Then, when that crop (or crops) is harvested, a second rotation of mixed intercrops such as garlic, green beans, cabbage or onion is planted depending on the length of maturity for each product and the time available before the next tobacco cycle must begin, either on the same land or on another part of the farm holding (see Box 1).

Box 1: Integrated Tobacco Farming in Upland Regions of Central Java.

Photo 1: Upland tobacco field with garlic, green beans and cabbage being grown as relay crops. Coffee trees (dark green) are also being established. Note from the spacing that the farmer has allowed room for tobacco and other crops to grow even after the coffee is mature.

Photo 2: A terraced field in Temanggung Regency with a small tobacco nursery (under shelter) and green beans and cabbage nearly ready for harvest. After harvest, the area will be given to tobacco. Basic grains and oilseeds will follow before replanting again with vegetables as the rotation repeats.

Photo 3: Tobacco seedling established under cabbage almost ready for harvest.

Source: Keyser, 2003.

Less traditional crops are also being introduced in upland areas, including potatoes and perennial crops like oranges, coffee and nilam, which can be grown either as a permanent intercrop or pure stand on existing tobacco land.[1] Because Virginia tobacco is mainly

[1] Nilam is an herbaceous plant that produces patchouli oil used by the cosmetics industry.

produced on volcanic mountains with a rough topography, irrigation is not normally possible in upland areas, which does impose some restrictions on crop opportunities. Conditions also vary greatly with elevation in that more elevated areas generally produce a better quality tobacco and are more suitable for certain rotation crops than others. Most upland tobacco is grown by independent smallholder farmers rather than by a large estate.

Lowland farming systems

In the lowland areas where a type of wide-leaf tobacco is grown to manufacture cigars, a completely different production system is in effect. In this case, tobacco is essentially the reserve of a large parastatal company known as PTPN-X.[1] Importantly, this company does not actually own any of its own land for tobacco and instead manages a system established by the Dutch colonial administration in which it leases land from individual smallholders on a rotating basis. According to the terms of these agreements, the company assumes full responsibility for all aspects of crop production, including the procurement of inputs, construction of temporary irrigation canals and pumping stations and mobilization of hired labour. The company then buys the tobacco from each landowner for an agreed price (with minimum yield and quality guarantees) and pays an allowance to the landowner to recover their fields when the system is moved to another location.[2]

Implicit to this system of rotation farming, small landowners in lowland areas only have the opportunity of leasing their land for tobacco production once every three to four years (equivalent to some nine or twelve crop cycles). Depending on the farmer's access to irrigation, typical crops grown in lowland areas at other times include rice, soybeans, groundnuts and chili. Farmers sometimes also give small areas to nilam, oranges and other high-value perennials as a way to supplement their income and provide more diverse earnings. A study of rice farmers in Klaten Regency, for example, found that roughly one third of total household income comes from rice (including cash sales and household retentions), one third from other agricultural crops and one third from family remittances and non-farm sources (13).

Financial analysis

The analysis of farm-level substitution opportunities for tobacco is built around a set of 24 original per hectare crop budgets estimated to reflect actual costs and returns to the best extent possible. These indicative models are based on 2003 prices and cover Virginia *kretek* tobacco and seven other crops that either complement tobacco or are considered to offer substitution potential. To provide the broadest possible indication of relative costs and profitability, several production levels were analyzed for each commodity.[3] The financial budgets were used to calculate a wide variety of indicators—covering production costs, farmer income, returns on expenditure, labour requirements and returns on labour—from multiple perspectives of interest to individual farmers and development planners alike.

[1] *Perseroan Terbatas Perkebunan Nusantara X*, or Estate Plantation X, Ltd.

[2] During the rainy season, lowland tobacco must be grown under cloth shelters with supplemental irrigation. Appropriately, this crop is known as t*embakau bawah naungan*, or TBN, meaning "tobacco under shelter". In the dry season, protective shelters are not needed and the crop can be grown in the open. This crop is known as *na oogst* and is less expensive to produce, but yields a lower-quality leaf.

[3] For Indonesia, these management levels were termed "low", "medium" and "high".

Because fluctuations in yield and price are of direct importance to farmer profitability for all crops, the break-even points for each enterprise variation was also determined.[1]

Key indicators for medium input management are summarized below in Table 2. Complete results covering all three management levels are provided in Appendix 2, which presents a strong review of the results of this study without turning to the primary source. While the financial data alone do not show which crops a farmer would choose if tobacco were no longer an option, they do point to a number of important trade-offs that are useful to consider in discussing substitution possibilities.

Table 2: Indonesia financial indicators for smallholder farmers, Central Java (US$/ha, medium input)

	Total Cost	Net Profit	Return to Total Cost	Total Labor (days)	Net Profit per Day
Upland Crops					
Potato	1,228	1,604	1.31	172	9.32
VA-Kretek Tobacco	**1,300**	**983**	**0.76**	**693**	**1.42**
Carrots	203	134	0.66	166	0.81
Garlic	897	89	0.10	360	0.25
Upland & Lowland Crops					
Chili	1,604	1,542	0.96	582	2.65
Nilam (yr 2)	674	787	1.17	440	1.79
Groundnuts	277	330	1.19	136	2.42
Corn	240	248	1.04	95	2.61
Lowland Crops					
TBN/Na Oogst Tobacco*	**n/a**	**944**			
Dry Season Rice**					
Technical Irrigation		679		207	3.28
Semi-Technical Irrigation		628		169	3.71
Simple Irrigation		523		165	3.18
Rain fed		424		144	2.95
Wet Season Rice**					
Technical Irrigation		563		144	3.93
Semi-Technical Irrigation		513		142	3.61
Simple Irrigation		459		146	3.15
Rain fed		361		105	3.44

* TBN/Na Oogst tobacco is produced by a parastatal company using leased land; the profit shown here is the guaranteed minimum (including payment for land recovery). All costs are covered by the parastatal; there is no financial outlay by the landowner.
** Due to the use of a secondary source, cost data were not available for rice.
Source: Keyser (12). All variations assume medium-input management.

With respect to crop substitution, the data are encouraging and suggest that many alternatives are likely to offer a potential for similar (or better) net profits and rates of return than tobacco. The results for chili, potatoes, nilam and oranges are particularly encouraging. In terms of total costs, the data also show that tobacco is relatively expensive to grow, both in cash and labour terms.[2] Compared with other enterprises, only chili and high-input garlic require more cash before sale than Virginia *kretek* tobacco.

[1] These calculations were made using a goal seek routine holding all other variables constant.

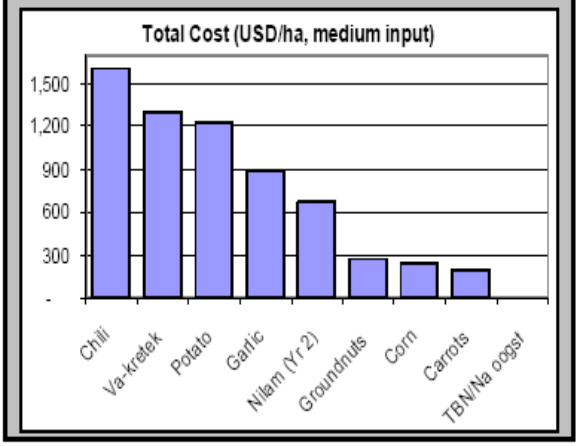
[2] The labor estimates for Virginia *kretek* tobacco, in fact, need to be reviewed. Due to a specific methodological consideration working with the local team, the total labor estimate for tobacco includes labor used for land

(…continued)

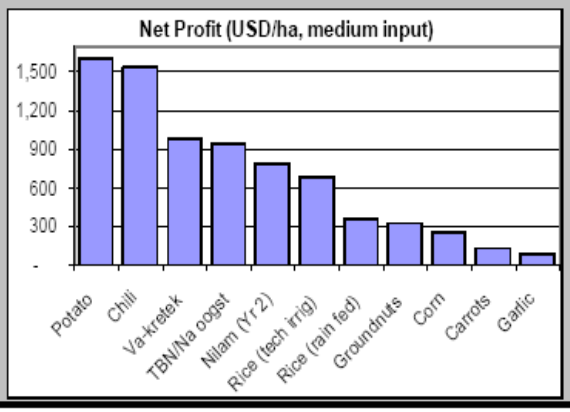
Just because other crops can be more profitable than tobacco however does mean that these alternatives are necessarily a better choice. In the first place, the data show that high-value alternatives are also expensive to grow and sometimes more costly than tobacco. Newer crops can also be difficult to market since the same type of trading networks do not exist. Total market demand for each alternative is also much smaller compared with tobacco, so that no one enterprise could ever be expected to substitute completely. For this reason, farmers may want to scale back on tobacco as efforts to reduce smoking take effect, but are likely to find it difficult to give up producing the crop entirely.

From these data, the original report concluded that agricultural planners would do well to focus on developing the specialized support services and private trading networks smallholders need to succeed with new enterprises. Especially in the case of perennial crops with a long maturity period, any shift from tobacco can be difficult and risky in terms of high establishment costs and limited access to long-term credit. From the farmer's perspective, substitute crops can easily appear to have less certain cost structures, unknown market outlets and possibly even a less certain future compared with tobacco. Considerable efforts are therefore required to develop new markets and support services, but this must be done only on the basis of true underlying competitiveness rather than just for the sake of promoting an alternative to tobacco.

Indonesia Total Costs. With respect to total production costs, the data show that tobacco is relatively expensive to produce and demands large cash expenditure before sale at each management level. Compared with other enterprises, only chili and high input garlic require more cash before sale than Virginia-kretek tobacco. A particular advantage of TBN/Na oogst tobacco for the landowners is that the company takes over all aspects of the management and simply makes a final payment at the end of the season without risk or outlay to the smallholder.



Indonesia Net Profit. From the income side, the data show that tobacco offers some of the best potential for high producer profits compared with most other activities. Although the estimated profits for tobacco rank somewhere near the middle of all other enterprise variations with low-input management, the total income more than doubles at the medium and high-input levels where only potatoes and chili seem likely to offer a potential for greater income. Because the costs of production for tobacco are also much higher at these more profitable management levels, however, many households may have little choice but to produce at the least profitable low-input level.



Other than tobacco, the study divides alternative crops into three broad categories including staple crops (rice, corn and groundnuts), horticultural crops (chili, potatoes, carrots and garlic), and perennial crops (nilam and oranges). First,

preparation that benefits other crops in the rotation. A better approach would have been to pro-rate this cost among other enterprises that also benefit from the labor used for tobacco.

with respect to staple commodities, the data show this group of products only provides about 28–37% as much total income compared with upland and lowland tobacco. For this reason, it is unrealistic to expect such commodities could ever substitute for tobacco in terms of total cash income. Any loss of tobacco revenue from shrinking tobacco markets simply must be made up for by some higher-value commodity. Rice, groundnuts and corn, together with other staple rotation crops like soybeans, certainly do play important roles in terms of their contribution to household food security and maintenance of soil fertility, but are not enough on their own to compensate for any real loss of revenue from tobacco.

Of the horticultural crops, the four commodities covered by the analysis include some of the highest and lowest value products. At specific management levels, for example, chili and potatoes far surpass tobacco in terms of the potential for total income and attractive returns to cash costs and family labour. On the other hand, the financial indicators for carrots and garlic are some of the poorest results compared with all other enterprises and show that these specific products yield very little profit and poor rates of return at most management levels.

With respect to perennial crops, the data suggest that nilam and oranges have good potential to surpass tobacco in terms of total farmer income and attractive rates of return. Success with a perennial enterprise however depends on being able to afford the initial establishment costs before the crop comes into production. Intercropping with tobacco, rice and/or other seasonal commodities can help smooth the cash flow requirement, but farmers must still weigh the potential returns in an uncertain market against the immediate need for cash from a known crop like tobacco. Unlike staple and horticultural crops, which are normally grown in rotation with tobacco, any land given to a perennial enterprise automatically takes away from the total space available for tobacco rotations, although intercropping on a diminished scale is still possible.

Finally, in terms of protection from shrinking tobacco markets, the data suggest that average farm gate prices for upland tobacco could fall by some 46–76% from the assumed levels before the crop would return a financial loss. Although Indonesia's ability to compete in world tobacco markets also depends on the costs of production compared with other tobacco growing countries, this finding is important and suggest that tobacco is likely to remain an attractive crop under progressively difficult market conditions for some time to come. This is not to suggest that Indonesia can afford to be complacent in promoting new enterprises, but the relatively robust results for tobacco do suggest that time may be on the farmer's side as the country begins to develop new production and market alternatives.

B. Zimbabwe

The second case study was completed in 2001 and considers the financial costs and returns for tobacco and twelve other important crops grown by commercial and smallholder farmers in Zimbabwe.[1] Like the analysis of Indonesia, this study is based on a set of original production budgets designed to reflect actual costs and returns to farm production in tobacco growing areas to the best extent possible. These budgets cover Virginia flue-cured tobacco (VFC), burley tobacco and 12 other crops that either complement tobacco or offer substitution potential, including traditional field crops, high-value alternatives and horticultural exports. As in Indonesia, three levels of progressively intensive management were considered.

[1] This case study is mainly drawn from Keyser (14).

Importance of tobacco

Zimbabwe has long been one of the world's leading producers of VFC tobacco. Historically, the crop generated around US$ 400 million to 600 million in foreign revenue annually, equal to almost 10% of GDP and 30% of total exports. More recently, of course, Zimbabwe's economy has undergone extreme decline and is still in a virtual tailspin. In 2001–02, the Government designated over 5300 landholdings for compulsory acquisition and resettlement. Since then, total tobacco production decreased from around 200 million kg of VFC tobacco during most of the 1990s, to only 75 million kg in 2005 and just 55 million kg in 2006. The 2004–05 crop was worth only US$ 118 million in total exports (15).

The analysis described here took place before the impact of these events on agricultural production (and tobacco in particular) was evident. Although this means that the cropping systems that were modeled by and large no longer exist in Zimbabwe, the analysis is still relevant to the discussion of crop alternatives. Before the crisis, for example, Zimbabwe had one of the best developed agriculture sectors in southern Africa and other countries of the region can certainly use these data to help assess what is possible with good management and investment. This is particularly true for Zambia and Malawi which enjoy similar climatic conditions. As discussed in the next case study, Malawi is severely constrained by a shortage of land per capita and so faces many specific challenges related to its population density, but this is not a problem for Zambia.

Additionally, from a regional perspective, it is apparent that neighboring countries have paid a high price for the economic instability in Zimbabwe, but are also benefiting from the inflow of commercial farmers. Tobacco output in Zambia, for example, has grown by over 360% in just the past few years largely due to investment by former Zimbabwean producers (see Box 2). Parts of Manica Province in Mozambique near the Zimbabwean border have also seen an increase in tobacco production together with other traditional field crops like maize and soybeans.

Box 2: The boom in Zambia's tobacco exports

Zambia's tobacco exports rose to nearly 52 million kg in 2005, up from 14.3 million kg the year before. At the start of the marketing season, tobacco was expected to earn US$ 83 million, up from US$ 26.7 million in 2004. Around half of the 2005 crop was VFC tobacco grown by commercial farmers and the other half burley grown by smallholders.

Zambia's burgeoning tobacco industry has expanded quickly; in 2000, production was at just 3.4 million kg. According to Tobacco Association of Zambia (TAZ) executive director, Jewette Masinja, "fresh investments by farmers, mainly from Zimbabwe, and the introduction of good agriculture practices by Zambian farmers learning from the newcomers had led to the rise in tobacco production." For the past few seasons, there have also been reports of smallholder cotton farmers switching to burley tobacco, which has become more profitable.

In a related development, Masinja also noted that "a weak US dollar and a strong South African rand meant the [2005] tobacco crop would not be very competitive on the international arena…Zambia tobacco farmers are paid in U.S. dollars while they import most of their pesticides and other farming inputs from South Africa, paying in rand". The Kwacha exchange rate has since normalized, but as Masinja explains, "these pressures have continuously increased the overall cost of production in the last three years. Increased finance charges, transport costs, marketing, exchange rates, and taxes all have a serious effect on growers." – Based on update of original article: Reuters 9 March 2005 (16).

In reading the Zimbabwe case study, therefore, one important feature of the data is that the numbers may, at least to a certain extent, be interpreted as rough proxies for conditions in neighboring countries. The absolute price levels will of course be different than shown, but a similar relation between costs and profits has been found to exist in Zambia and Malawi, at least at certain points in time.[1] In Mozambique, Zimbabwean tobacco growers have generally had a harder go with tobacco because of unexpectedly adverse growing conditions and a poorer business environment. For these reasons, the data are probably not a good indication of what can be achieved there and the special circumstances for Malawi are also discussed below.

Zimbabwe's tobacco farm systems

In geographic terms, tobacco in Zimbabwe was (and still is) grown almost exclusively in high-potential farm areas of Natural Region II in north-eastern and central regions. This zone accounts for less than 15% of Zimbabwe's total land area, but is ideally suited to intensive farming, with a more or less reliable 750 to 1000 mm of rainfall coming in the summer months from late October until mid-March. Before the land redistribution, large-scale commercial farmers occupied almost 63% of this high potential farmland. Although there were fewer than 2000 commercial tobacco growers, they accounted for about 87% of area planted to tobacco and 95% of the total crop, equal to some 180 to 240 million kg of flue-cured tobacco annually.

[1] See Keyser, Grey and Scott (17), Keyser and Lungu (18) and Keyser (14), (19) and (20) for data from Malawi, Zambia and Zimbabwe. Also see Mataya and Tsonga (21) for data from Malawi.

Another important characteristic of Zimbabwe tobacco production is that most growers already had diversified sources of income. Tobacco was indeed the backbone of commercial agriculture in many locations, but other important crops for large-scale farmers included wheat, soybeans, maize and groundnuts, which were typically grown with tobacco on a 5-year rotation, as well as livestock. Moreover, throughout the 1990s, many commercial tobacco farmers introduced high-value crops like export roses, supermarket vegetables, paprika and coffee specifically to lessen their dependence on tobacco. More than 80% of all horticultural exports, for example, were grown on tobacco farms and were first developed using tobacco revenue. Farmers met during this study all said the reason for introducing horticulture was to lessen their dependence on tobacco.

Smallholder farmers, by comparison, were (and still are) only marginally involved in the direct production of tobacco. At the start of the Zimbabwe crisis, there were roughly eight times as many smallholder tobacco growers (about 16,000 in total for burley and flue-cured tobacco) compared with large commercial farmers, but these accounted for less than 1.5% of all smallholder households and just 7% of those in suitable agro-ecological zones. In this respect, the greatest threat from shrinking tobacco markets for smallholder agriculture was rightly identified in 2001 not so much as the potential loss of direct farm income, but the loss of remittances sent by family members employed by large-scale commercial producers. Because of how events in Zimbabwe unfolded, there was a loss of income from tobacco, but which had absolutely nothing to do with tobacco control measures.

Financial analysis

Putting aside political and economic developments, the analysis is once again encouraging from a crop substitution point of view and shows that several commodities other than tobacco offer an opportunity for high producer profits and attractive rates of return with the right kind of investment and planning. Other crops that rival or surpass tobacco for potential net profit include roses, paprika, coffee and supermarket vegetables for large-scale commercial farmers, and paprika, coffee and cotton for smallholder growers. On the other hand, these alternatives were also found to be relatively expensive and, with high-input management, sometimes more costly than tobacco. This is particularly true for high-value horticultural crops like roses, which is a completely different type of investment from extensive agricultural crops and can only be grown over a few hectares at most by highly skilled specialists. A summary of the financial indicators for commercial and smallholder farmers is given in Tables 3 and 4 below; the full set of indicators is presented in Appendix 3.

Table 3: Zimbabwe financial indicators for large commercial farmers (US$/ha, high-input)

	Total costs	Net profit	Return to total costs	Total labor (days)	Net profit per day
Irrigated Crops					
Paprika - long season	3,439	4,765	1.39	310	15.4
Tobacco, flue-cured	**3,473**	**2,827**	**0.81**	**497**	**5.7**
Coffee (USD 2,000mt)	2,954	2,046	0.69	375	5.5
Paprika - short season	2,560	1,542	0.60	270	5.7
Export veg - mange tout	1,435	765	0.53	295	2.6
Export veg - baby carrots	1,396	504	0.36	275	1.8
Wheat	1,115	385	0.35	21	18.3
Cotton	1,205	286	0.24	278	1.0
Groundnuts	1,228	286	0.23	135	2.1
Marigold	1,223	261	0.21	136	1.9
Export veg - baby corn	872	31	0.04	190	0.2
Soybeans	780	(8)	(0.01)	24	(0.3)
Maize	927	(89)	(0.10)	50	(1.8)
ROSES - auction sales					
Roses (long stem)	212,815	50,228	0.24	9,360	5.4
Roses (medium stem)	226,542	32,154	0.14	9,360	3.4
Roses (short stem)	222,166	16,964	0.08	9,360	1.8
Dryland Crops					
Tobacco, flue-cured	**2,930**	**2,082**	**0.71**	**437**	**4.8**
Groundnuts	737	110	0.15	83	1.3
Soybeans	561	30	0.05	14	2.1
Maize	610	(34)	(0.06)	27	(1.3)

Source: Keyser (14).

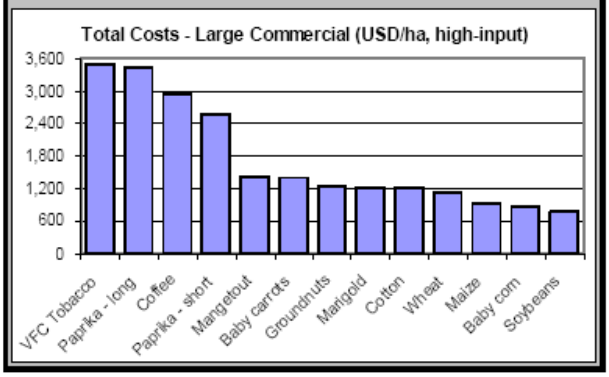
Table 4: Zimbabwe financial indicators for medium and high-input smallholder farmers (US$/ha)

Activity	Total costs	Net profit	Return to total costs	Family labor (days)	Total labor (days)	Net Profit per day family labor	Net profit per day total labor
Communal and Resettlement Farmers (medium input)							
Paprika	340	715	2.10	150	260	4.76	2.75
Coffee (USD 2,000mt)	234	666	2.85	150	210	4.44	3.17
Tobacco, flue-cured	**637**	**571**	**0.90**	**150**	**320**	**3.81**	**1.78**
Tobacco, burley	**542**	**408**	**0.75**	**150**	**315**	**2.72**	**1.29**
Cotton	173	259	1.50	115	145	2.25	1.79
Groundnuts	106	144	1.35	90	90	1.60	1.60
Soybeans	107	105	0.98	60	60	1.76	1.76
Maize	116	15	0.13	72	72	0.21	0.21
Small-scale Commercial Farmers (high input)							
Tobacco, flue-cured	**1,514**	**1,582**	**1.04**	**150**	**480**	**10.55**	**3.30**
Paprika	872	1,255	1.44	150	300	8.37	4.18
Coffee (USD 2,000mt)	567	1,033	1.82	150	310	6.89	3.33
Tobacco, burley	**994**	**536**	**0.54**	**150**	**390**	**3.57**	**1.37**
Cotton	295	278	0.94	120	170	2.32	1.64
Groundnuts	157	176	1.12	120	120	1.47	1.47
Soybeans	153	123	0.81	70	70	1.76	1.76
Maize	310	99	0.32	100	125	0.99	0.79

Source: Keyser (14).

For large commercial farmers, the data show that many traditional agricultural crops, including wheat, soybeans, groundnuts and maize, had become marginal activities at the time of the 2001 study and, in some cases, even returned a net loss and failed to cover long-term depreciation of fixed assets. On the other hand, these traditional crops were also found to provide a positive gross margin and could therefore be important in terms of helping to finance other more profitable and expensive crops like tobacco, paprika and coffee from a cash flow perspective. In turn, the very good profits from these high-value enterprises help to offset the net losses from traditional field crops and the analysis clearly shows that tobacco and other high-value crops work best when grown as part of a mixed farm system.

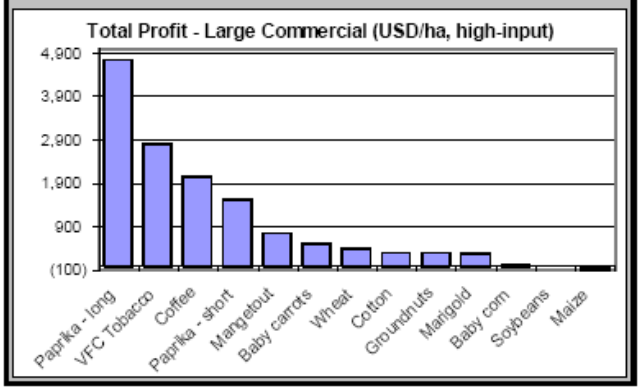
Zimbabwe Total Costs. The analysis from Zimbabwe shows that VFC tobacco is one of the most expensive crops to grow on a per hectare basis. Roses are far more expensive, but are a completely different type of enterprise. Speciality vegetable crops like mangetout peas, baby carrots, and baby corn are about 1/3 as expensive as tobacco on a per hectare basis, but are usually grown on three crop rotations per year. Traditional field crops like wheat, maize, and soybeans are the most affordable enterprises.



For smallholder farmers, the opportunities to earn high profits from crops other than tobacco are more limited. Paprika, coffee and cotton do, at certain management levels, offer a potential for more income compared with burley tobacco and flue-cured tobacco, but these crops each have their own limitations. In the case of paprika, which is the most profitable smallholder alternative, yields are highly dependent on rainfall and can easily be wiped out by adverse growing conditions. Whereas large-scale farmers are able to protect themselves

from this risk through irrigation, smallholder farmers in southern Africa rarely have this capacity and paprika is typically regarded as a risky enterprise for this sector. Coffee is likewise an attractive possibility that could provide a net income that rivals many tobacco scenarios, but is a relatively new crop and would require a substantial investment in farmer training and pulping and processing facilities before it can be widely promoted. With respect to cotton, this enterprise generally provides a much lower income that tobacco (except compared with some levels of burley management), but does offer an excellent rate of return to cash and total production costs. At the national level, cotton is the most widely grown smallholder cash crop.

Zimbabwe Net Profit. In terms of total profit, the analysis shows that some enterprises like long-season paprika, coffee, and some horticulture crops can provide as much or more total income than tobacco. The markets for these other crops, however, are mostly much smaller or more difficult to enter than the market for tobacco and one conclusion from the analysis is that new investments are certainly required to develop alternative enterprises.



For all categories of farmer, the analysis reveals that the most profitable crops and management systems also require specialized infrastructure. This is especially true with respect to roses and supermarket vegetables like baby corn, baby carrots and mangetout peas, which can be very profitable, but are also expensive to grow and highly skill intensive. In addition to field costs, value chain development for these enterprises requires large capital investments in processing and packing facilities, special irrigation equipment and other infrastructure including greenhouses and insulated trucks for roses and EurepGAP and Hazardous Analysis and Critical Control Point (HACCP) accreditation for vegetables.[1] Some large vegetable exporters were working with smallholder farmers near Harare to provide inputs and develop a network of collection points for baby corn and mangetout peas, but these programmes were generally expensive to establish and still relatively small, with only limited farmer participation, when the original study was prepared.

Marketing constraints are therefore clearly one of the main obstacles to success with many high-value crops that could compete with tobacco for profitability and export earnings. Again, this is most obvious in the case of roses and export vegetables, which must be grown to exacting standards and delivered in fresh condition according to tight schedules. Paprika is generally more forgiving and can be sold to local export agents and processors on forward contract. This helps to minimize many important production and marketing risks, but total world demand is only around 120 000 tons annually and paprika could never come close to substituting for tobacco on its own.

In terms of labour requirements, the data show that tobacco generates more employment opportunities per hectare than nearly every other enterprise analysed. This is one factor often

[1] These certifications are required by European supermarket chains, if not necessarily for formal EU market entry. By contrast, United States law requires a full pest risk assessment (PRA) be carried out for all new vegetable products.

noted by proponents of tobacco to illustrate the overall importance of the crop to the national economy, and calculations carried out for the Zimbabwe study revealed that the total annual wage bill for commercial tobacco was likely to be around US$ 47.1 million.[1] As noted, a large share of that income was sent as remittances to family members in communal areas, thereby giving tobacco an important role in helping to finance food and non-tobacco cash crops on smallholder farms. From the smallholder's perspective, it should also be noted that the income from tobacco is far greater than the value of any food crop that could be grown on the same parcel of land (see Box 3).

[1] Estimate based on average per hectare wage bill for large-scale commercial VFC tobacco of ZW$ 34 053 (US$ 619.14) multiplied total area planted in 2000 (76 110 hectares).

Box 3: Returns to labor and the trade-offs of tobacco production

An argument that is often made in the literature about opportunities for reducing tobacco cultivation is that tobacco's very high labour requirement distorts a farmer's perceptions of income and net profitability. A work in progress on Bangladesh (22), for example, notes that contrary to popular notions about tobacco being a lucrative crop, studies have found that farmers rarely count family labour and tobacco would lose much of its profit margin if this were take into account. An earlier published article on Kenya by Kweyuh (23) argues much the same case by quoting a farmer who says that he stopped growing tobacco on his two-acre plot when he realized that he was left with minimal profits once the cost of extended family labor was taken into account.

The estimation of an accurate opportunity cost for family labour for a smallholder enterprise can indeed be a tricky business. According to the standard economic definition, this value is equal to the foregone income that could have been earned if labour had been used to grow in the next most profitable crop. Perhaps more clearly, this means that if a farmer decides to grow tobacco instead of beans, the cost of his labour should be measured by the daily returns from bean production.

On this basis, one specific and very easy way to look at the returns to labor in crop budget analysis is to hold the value of that input equal to zero for all enterprises and reinterpret crop profits as the returns to labor. Since family labor does not get charged in any budget, comparisons between enterprises can be made directly by looking at the daily returns to family labor (net profit/days worked). The calculations by Keyser for Indonesia, Zimbabwe and Malawi all follow this methodology. Taken together, these data show that tobacco does not always provide the best daily return compared with other enterprises, but neither does it provide the worst or anything like a net loss as some of those writing against tobacco have claimed.

Arguments have also been put forward by Kweyuh and others that the high labour demand for tobacco takes away from time that could otherwise be spent on food production, and, by extension, that tobacco production actually contributes to food insecurity.

While the decision to cultivate any cash crop compared to a subsistence commodity naturally involves some risk for a small farmer if the yield or price should fall, the allocation of labor to any cash enterprise is not inherently a bad thing. To argue that a farmer is left with only a small profit misses the point about what can be done with the income and profit that is earned. If, for example, the income from tobacco can be used to purchase more food than could have been grown on the same area, or if labor had been used for some other enterprise, then the farmer has made a rational economic choice.

While this may not always be the case for tobacco, the data summarized in this paper show that tobacco is likely to provide enough income to purchase more food than could have been grown on the same parcel. This is illustrated in the table below using data from Zimbabwe in which the profits from tobacco are converted to volume equivalents of maize at three different price and yield levels.

	INCOME FROM TOBACCO				Maize Yield at Same Mgt. Level (tons/ha)
	Net Profit ($/ha)	Equivalent value in maize (tons/ha)			
		$120/mt	$150/mt	$200/mt	
Flue-cured tobacco					
High	835	6.96	5.57	4.18	2.00
Medium	571	4.76	3.81	2.86	1.25
Low	433	3.61	2.89	2.17	0.83
Burley tobacco					
High	543	4.53	3.62	2.72	2.00
Medium	408	3.40	2.72	2.04	1.25
Low	190	1.58	1.27	0.95	0.83

Finally, with respect to vulnerability to variations in price and yield, the results from Zimbabwe are similar to those from Indonesia and show that tobacco is one of the most robust crop options available and can provide good financial returns even after a large drop in yield or price. This does not take away from the importance of developing long-term crop alternatives, but it does again suggest that time is on the tobacco grower's side while investments in alternative enterprises are being made. The data in Table 5 help to illustrate this point by showing how much yield or price could decrease from the assumed levels before each enterprise would return a net profit equal to zero.

Table 5: Zimbabwe sensitivity indicators for yield and price (medium management, dryland unless indicated)

	% change in yield to net profit = 0	% change in price to net profit = 0
Large-scale commercial		
Flue-cured tobacco (irrigated)	-48%	-42%
Flue-cured tobacco	-45%	-39%
Paprika (irrigated)	-41%	-38%
Coffee (irrigated)	-34%	-31%
Cotton	-6%	-5%
Soybeans	+16%	+15%
Maize	+24%	+20%
Communal farmers		
Flue-cured tobacco	-58%	-50%
Burley tobacco	-50%	-45%
Paprika	-70%	-68%
Coffee	-84%	-81%
Cotton	-64%	-60%
Maize	-14%	-11%

Source: Keyser (14).

C. Malawi

The next case study looks at Malawi, which is one of the most heavily tobacco-dependent economies in the world.[1] The importance of tobacco to the Malawi economy is actually quite difficult to exaggerate. The crop currently accounts for some 60% of Malawi's total export earnings, 23% of its tax base and 13% of GDP. Or, as one report in 2003 vividly put it, "many of Malawi's cities have been built by tobacco wealth and most of the few signs of 'prosperity' one sees in the rural areas (such as tin roofs, bicycles, and radios) have been paid for by tobacco-related incomes."[2] Earlier this decade, Malawi surpassed United States and became the world's largest exporter of burley tobacco.

For these and other reasons, Malawi is regarded as one of the most vulnerable countries to the threat of shrinking tobacco markets. Unlike Zimbabwe, where fewer than 2,000 large commercial farmers (and their workers) were involved in tobacco production, the situation is quite different in Malawi where an estimated 315 000 to 330 000 smallholder households grow tobacco on plots ranging in size from 0.1 to 0.3 hectares. Small-scale producers now account for 70% of Malawi's total tobacco output and, nationally, one in five Malawian households derive a substantial share of their cash income directly from tobacco. In 2002, Malawi officially recorded 138.2 million kilos total tobacco production, including 125.4 million kg of burley tobacco (91%), 11.2 million kg of flue-cured tobacco (8%) and 1.6 million kg of dark western types (1%).[3]

Historic context

Until the late 1970s, tobacco production was restricted in Malawi to an elite group of large-scale growers who owned or leased estate land. These farmers were permitted to sell their tobacco directly to international buyers at officially recognized auctions. Smallholder farmers, on the other hand, were limited in the varieties of tobacco they could grow and were mostly required to sell to government agencies at prices below prevailing market levels. During the 1980s, the situation began to change when a class of medium-scale entrepreneurs was allowed to acquire leases on customary land to establish "estates" (typically 10-20 ha) to grow burley or flue-cured tobacco and to sell their tobacco directly through auction rather than a government agency. The situation eased further in 1993 with the introduction of tobacco sales quotas to groups of smallholder farmers, who were organized into "clubs" and allowed to sell through a programme of intermediate buyers meant to facilitate the logistics of bringing the smallholder crop into the auction (8).

Smallholder farmers responded quickly to the policy reforms with up to 200 000 smallholders taking up tobacco cultivation by 1996 and over 300 000 households involved in tobacco cultivation today. Research during the early liberalization period revealed the relatively high profitability of tobacco cultivation compared with most other cash and food crops, but also pointed to problems with the estate sub-sectors and suggested that a number of these enterprises might not remain viable should tobacco prices fall significantly. Burley tobacco has for a long-time dominated Malawi's tobacco sector and grew from 68% of total production in the early 1990s to more than 90% of total production today. The burley crop is

[1] This section is based heavily on work by Jaffee (8). It also draws on Mataya and Tsonga (21), FAO (24) and Keyser (18).

[2] (8, p. 3-4).

[3] (8, citing production figures credited to the Tobacco Control Commission).

physically well suited to smallholder production and has the advantage of being air cured and so does not require firewood, charcoal or coal for post-harvest treatment.

As burley production grew during the 1990s, flue-cured tobacco decreased from 27.3 million kg at the start of the 1990s to just 11.2 million kg in 2002. Whereas burley tobacco is mostly a smallholder crop, flue-cured tobacco is primarily grown by medium and large-scale estates. As the earlier research warned, sharply reduced prices in the late 1990s rendered many of these farms unprofitable and several long-standing commercial producers either ceased production of flue-cured tobacco altogether or greatly reduced their plantings.

Current situation

During the last few years, many of the concerns about the viability of burley estates and smallholder profitability also seem to have come to fruition. Many estates have simply ceased burley tobacco production, having experienced problems of labour abandonment and the sale of their tobacco by farm tenants and/or estate managers to intermediate buyers or others. While no hard statistics are available, Jaffee (8) estimates that some 40–50% of estates that had been producing tobacco in the early 1990s have since given up production or scaled back their operations.

In the smallholder sector, farmers likewise seem to have been affected by declining profitability for reasons related to price, productivity and quality. Financial analysis of smallholder tobacco systems in 1990s found that profitability and rates of return from tobacco can improve several times over with better on-farm management compared to average practices. Marketing is also an important constraint in that smallholder growers still have only indirect access to the auction. Intermediate buyer systems are much less profitable compared with direct auction sales and the challenge of linking farmers more closely to the market is still an important issue (18). In early 2006 proposals were introduced to establish a network of rural commodity exchanges that would allow farmers to sell their tobacco directly, but it was later concluded this would be impractical.

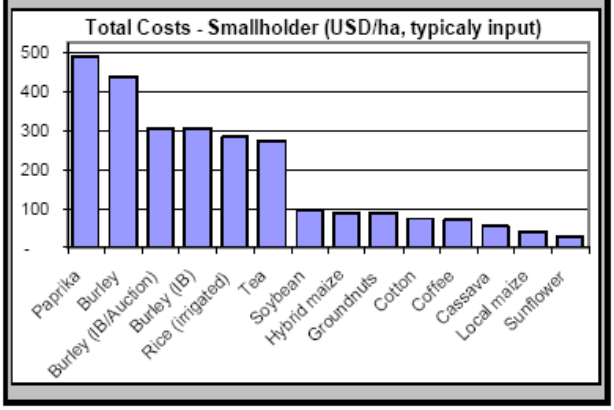
From a policy and business environment perspective, many other factors behind the diminishing profitability of tobacco can also be identified (8). These include:

- exchange rate movements, which have sometimes fluctuated to the detriment of farmers;
- rising costs associated with transport, handling and auctioning;
- high international transport costs for exports, which are particularly significant for Malawi as a landlocked country;
- very high auction fees, at 3.95% of gross revenue (compared to 2.4% in Zimbabwe);
- a variety of institutional cesses charged by state and industry bodies that amount to some 3.58% of gross revenue.

Alternative enterprises

It is clear that the profitability and competitiveness of Malawian tobacco are important to the viability of Malawi's economy. Equally, however, it is also important to look at longer term crop alternatives that could begin to substitute for some of the household income and export revenue currently accounted for by tobacco. As set out in the other case studies, one of the best ways to do this is to compare the underlying costs and profitability of existing and potential enterprises. This type of analysis does not show how farmers could best allocate resources between enterprises or what type of competitiveness constraints need to be overcome for successful development, but does help identify areas where new growth could be most likely to emerge.

Malawi Smallholder Costs. Total costs per hectare for smallholder farmers are ranked in the chart below. As shown, tobacco, paprika, rice and tea are the most expensive enterprises analyzed for this sector while cotton, coffee, local maize, and sunflower are the least expensive with low-input management. Some costs savings is possible for tobacco by selling to an intermediate buyer, but this is advantage is more than offset by lower farm gate price.



In Malawi, a number of studies have gone beyond simple financial calculations and looked at underlying economic efficiency using the Policy Analysis Matrix (PAM)-based shadow prices and scarcity values. Nakhumwa (25), Jansen and Hayes (26) and Keyser (18) all used the PAM and other methodological tools to look at the costs and returns to tobacco and many other commodities. Each of these reports has been summarized in good detail by Mataya and Tsonga (21) which is one of the best reports to look at for a broad overview of Malawi's crop alternatives. The partial data set from Keyser's analysis is presented in Appendix 4 and key results are highlighted in the accompanying text boxes.

In the study by Nakhumwa, maize (local and hybrid), groundnuts, burley tobacco, cotton, sorghum and soybeans were evaluated with respect to their domestic and international prospects and comparative advantage at three technological levels: smallholder, low-input and high-input estates. Findings in this study indicate that paprika, tobacco, groundnuts and soybeans can all be produced very efficiently and enjoy strong economic comparative advantage. Results also show that Malawi has no comparative advantage in the production of maize for export, but can grow the crop efficiently as an import substitute.[1]

Jansen and Hayes (26) took the PAM methodology a step further and developed a Multiple Objective Policy Analysis Matrix (MOPAM) that attempted to rank different enterprises from a variety of perspectives. In addition to economic efficiency, the criteria applied for this analysis included drought tolerance, price variability, income generation, food security, employment creation and diversification potential. Each factor was assigned a weight, depending on the importance of that factor for the commodity under consideration. This analysis was carried out for 28 commodities and ranked macadamia, estate coffee, cassava, Irish potato, smallholder tobacco, estate flue-cured tobacco, dark fire tobacco and paprika at the top of the list in that order. At the bottom of the list, the least attractive crop options were identified as green pepper, local maize, cabbage, onion, cotton, rape (Chinese cabbage),

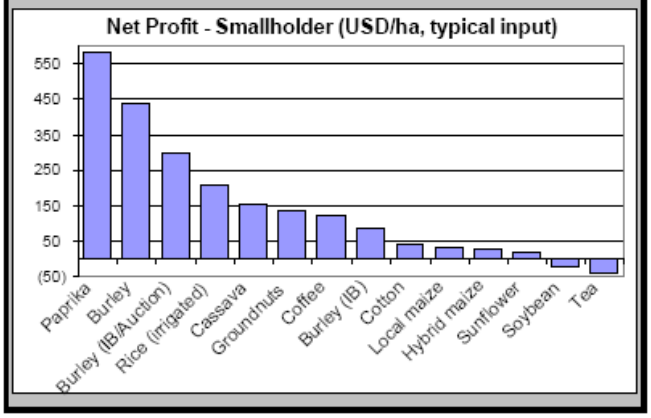
[1] Results reported in Mataya and Tsonga (21).

sunflower and soybeans. Smallholder burley tobacco ranked 17 on the list of 28 commodities. (21)

Keyser's analysis of Malawi (18) covers 26 crops and livestock products. This study used the PAM to calculate various measures of social efficiency and policy transfer, and ordinary crop budgets to estimate private returns, rates of return and returns to labour. Again this study found that Malawi is very efficient in the production of many agricultural commodities, but this was mainly due to high transportation costs and the natural protection Malawi enjoys as a landlocked country from competition with imports. Most import substitutes were found to be far more efficient than exports.

Even more important from a poverty alleviating point of view, the analysis found that most crops in the smallholder sector provide extremely poor financial profits. For example, only eight of 20 different enterprises were found to return more than US$ 65/ per hectare with average management, and just five activities provide more than US$ 327. These poor results were attributed in Keyser's study (18), in part, to high input prices following market liberalization that had an adverse effect on input use, yield and profitability.

Malawi Smallholder Profits. With respect to net profits, the data show most enterprises provide smallholder farmers very little income. This is particularly true for cotton, sunflower, soybeans and tea. Maize would be more profitable if valued home consumption, but many households are not able to grow enough food on the land available to them and so must include a higher value cash crop as part of the farm mix. With these kinds of options, there are clearly many good reasons why tobacco plays a dominant role. In terms of marketing, the data show the profitability of tobacco improves several times over by selling directly on the auction.



The low income-earning potential of most smallholder crops is further exacerbated by the small size of area cultivated, which in most cases is less than one hectare. This is true with respect to burley tobacco, even though the crop was shown to yield substantial returns relative to other enterprises. From a diversification perspective, therefore, it is essential for any new enterprise to provide a very high income per hectare and, of course, that enterprise must be suited to the same climatic conditions as tobacco. Although cassava was identified by the MOPAM as a good alternative, for example, this crop only yields approximately US$ 150 per hectare compared with US$ 300 and up for most tobacco options. Sugar has likewise been identified as an option for the large estate sector, but is grown in a very different climatic zone than tobacco and must be produced within about 50 km of a processing plant. Similarly, macadamia nuts can be very profitable, but are probably not a good choice for smallholders since the crop needs to be grown over a large area.

Another interesting result from the analysis is that the profitability of tobacco (and relative standing of tobacco compared with other enterprises) depends significantly on the type of marketing arrangement smallholder farmers have access to. For smallholders with direct access to the auction, Keyser found paprika and tomato were the only crops to provide a higher net income compared to typical management tobacco. For farmers who must sell through an intermediate buyer, however, several other enterprises appear to provide more

income including rice, cassava, groundnuts and smallholder coffee. In addition to underscoring the importance of looking for long-term diversification options, these results point to an immediate need to improve tobacco marketing channels as one of the most direct routes to increased farm profitability, rural income growth and agriculture competitiveness.

D. Brazil

The next case study looks at three different attempts to introduce alternative agriculture crops in the main tobacco growing areas in southern Brazil.[1] In sharp contrast to Malawi and Zimbabwe, Brazil's economy is already extremely diverse and tobacco accounts for less than 1.5% of total merchandise exports. Even at this level, however, Brazil is now second largest tobacco grower in the world and largest tobacco exporter. At least in the areas where tobacco is grown, the importance of the crop should not be underestimated. In 2003, total production of all tobacco varieties amounted to 648.5 million kg, of which 70% was exported for earnings of approximately US$ 1.16 billion in gross foreign revenues (11).

Three states in southern Brazil now account for almost 90% of the land devoted to tobacco and 93% of total production. Most of the remaining production comes from northern states that mainly supply dark tobacco used for cigars. In order of importance, the main tobacco producing states in the south are Rio Gande do Sul, Santa Catarina and Paraná. About 78% of total production in the south is flue-cured Virginia tobacco, the balance is air-cured burley (11). According to the Brazilian Tobacco Growers Association (AFUBRA), more than 600 localities and some 170 000 to 190 000 growers, mainly small landowners, are involved in growing tobacco in the south.[2] For these families, tobacco is the primary source of cash income. According the Food and Agriculture Organization of the United Nations (FAO), tobacco has played a significant role in slowing the pace of rural-urban migration, which is one of the main socioeconomic problems now facing Brazil (24).

Individual landholdings where tobacco is grown have an average area of 16.8 ha, with 2.6 ha planted to tobacco, 9.4 ha under other crops and the remainder being pasture, virgin or replanted forests, dams and fallow areas. About a quarter of the family farms in southern tobacco growing areas rent land or have sharecropping arrangements with landowners—contractual arrangements for renting land requiring all those farmers either to grow tobacco or to leave the farms (25).

Although small by Brazilian standards compared with other crops, the plot sizes of 2.6 ha for tobacco stand in sharp contrast to the situation in Malawi and Indonesia where tobacco plots are rarely larger than 0.3 ha. Detailed information needed to describe optimal cropping patterns from an agronomic and financial point of view for Brazilian (and other) farmers was not available, but the fact that the average landholding is considerably larger than in other countries does at least provide more scope to introduce new crops and diversified cropping patterns. The same issue of needing to provide enough income from the total farm area, of course, still holds true, but as the farm size increases so too do the opportunities to cultivate lower-value crops on a more extensive basis.

Obstacles to diversification

[1] This case study draws extensively from Vargas and Campos (11).

[2] Figures quoted by Vargas and Campos (11).

Notwithstanding major concerns that have been raised over the expansion of tobacco farming in Brazil (see Box 4), Vargas and Campos identify three main barriers to the adoption of alternative livelihoods in tobacco-producing regions. These include the role of the so-called "integrated system" in keeping farmers financially dependent on tobacco companies, the role of local and state governments in supporting and subsidizing tobacco growing and processing and the high financial returns from tobacco, particularly compared with traditional food crops.

First, with respect to the integrated system, it is argued that these systems have made farmers dependent on tobacco, giving them no choice but to produce the crop according the terms dictated by international buyers. Viewed another way, however, the agreement to supply the farmer with seed, fertilizer and approved chemicals required for tobacco in exchange for a promise to buy the harvest for a guaranteed price after subtracting the cost of inputs can be an effective way of linking poor households to the market. Apart from tobacco, this type of outgrower arrangement has been used very successfully in other countries for many crops including cotton, paprika and supermarket vegetables, which are also expensive to grow and have been described as substitution possibilities for tobacco. The integrated framework system in Brazil may indeed have many serious problems, but as a priority for long-term crop substitution, the focus of the debate should be on how to improve this system (possibly as a model for other crops) rather than to criticize the arrangements as an inherently negative feature of tobacco.

Second, with regard to public policies, Vargas and Campos observe that the political weight of tobacco in the regional economy impedes implementation of local public policies aimed at fostering crop substitution. In the Rio Pardo Valley, for example, it is said that "public policies reveal more concern for expanding tobacco production than for reducing the crop".[1] Apart from an apparent need for better rules to govern the safe handling of chemicals and more competitive price-setting mechanisms, however, creating the conditions for expanded agricultural production is exactly what governments normally should do, rather than curtail some profitable activity. As illustrated by the diversification experiences below, numerous state and private organizations are working with farmer groups already to introduce new commodities. Whether these efforts are sufficient, let alone how they compare with policies in the tobacco sector, is a question well beyond the scope of this limited discussion.

[1] (11, p. 9).

Box 4: Corporate and social responsibility for tobacco and other crops

Tobacco production systems in Brazil have come under sharp criticism, most notably in the 2002 exposé, ***Hooked on tobacco*** by Christian Aid (27). Looking at the case of Souza Cruz in southern Brazil, this report raised many serious concerns related to the health and safety of family farmers as a result of tobacco production. A follow-up report, ***Behind the mask*** (28), looked in similar terms at Kenya and found many of the same risks in 2004.

Written as a critique of the activities of international tobacco firms, the reports make a number of solid points that have added fuel to the calls for crop substitution. The main arguments relate to the health risks resulting from inappropriate use of pesticides, the employment of child labour associated with the extensive use of family labour in tobacco growing and the pattern of dependence on the tobacco company for inputs, input loans and markets. It is also claimed that farmers could make more money growing food crops and that tobacco production contributes directly to increased poverty, early death and even suicide within devastated households.

However, some of the arguments are debatable. Christian Aid offers little comparison of tobacco with other crops and overlooks the importance of input loans in helping to finance production. Equally, arguments about poor returns to labour are poorly substantiated. Although tobacco is certainly a demanding enterprise, the evidence from Indonesia, Zimbabwe and Malawi discussed here shows that the daily returns from tobacco actually compare very favorably with many other crops. Unfortunately, Christian Aid offers no similar data for Brazil or Kenya and relies on anecdotal farmer quotes instead. By contrast, Vargas and Campos report that 93% of small farmers in southern Brazil regard tobacco as the most profitable crop and more than 77% believe that other crops would not give the same financial return for the same allocation of land.

The articles are effective in raising awareness of several important issues. One of the most obvious problems relates to safe handling of pesticides and inappropriate types of protective clothing being sold by the tobacco companies in Kenya and Brazil. Non-transparency in price setting and grading of tobacco are also serious issues. Especially when a farmer has little or no choice regarding where to sell their crop, some protection must usually be afforded by the state from abusive practices associated with monopsony conditions. Greater flexibility with input packages, an understanding of cash flow and labour requirements for other crops and a farmer's ability to pay off long-term debt are all areas identified by Christian Aid in which the tobacco industry could and should do a much better job. Farmers cannot stop growing tobacco overnight, and it is important to have a productive dialogue on these and other important issues to improve conditions for current growers to the greatest extent possible. Only in a more open environment will farmers truly be able to decide what crops are best and how to allocate farm resources in the most productive way.

Towards this end, an interesting example of industry practice comes from the horticulture sector, which also uses dangerous pesticides and sometimes involves closed market linkages between growers and contract buyers. Switching to fruit and vegetable crops therefore would not necessarily spare small farmers many of the risks that Christian Aid highlights with regards to tobacco, except that most international value chains for these commodities demand adherence to industry standards like EurepGAP, Nature's Choice and Field-to-Fork, which is not the case with the tobacco industry.

Third, on crop profitability, Vargas and Campos draw attention to the same issue identified in other countries whereby tobacco offers far greater gross and net profits than other basic commodities. To illustrate this point, the authors use the data reported in Table 6, which compares the profitability of VFC and burley tobacco with corn and beans. Depending on seasonal price cycles, subsistence crops saved for home consumption could be more profitable than shown if valued in imputed terms against the price of purchasing an equivalent amount of food when local stocks are scarce. However, even on this basis, the data show that tobacco is far more profitable (and expensive) compared with staple commodities. This is true when measured in gross and net terms and by the daily returns to labour. Without debating the costs and benefits of cash and food crop production, therefore, it is at least clear that the search for viable alternatives to tobacco means looking at high-value commodities rather than basic foods.

Table 6: Costs and returns for selected crops in Brazil (US$/ha)

	Virginia tobacco	Burley tobacco	Corn	Beans
Costs				
Variable costs	1,738	1,344	335	248
Fixed costs	171	171	57	57
Total costs	1,909	1,515	392	305
Profits				
Gross margin	2,370	1,879	396	264
Net profit	455	361	1.51	(42.11)
Labour				
Total days worked	149	134	22	26
Return per day	3.05	2.69	0.07	(1.62)

Source: Tobacco Growers Association data quoted by Vargas and Campos (11, p.11).

Note: The methodology behind the figures is not clear. The difference between gross and net profit should be equal to total fixed costs, but this is not the case. More detailed (independent) calculations of total farm costs covering a far wider variety of enterprises (including other high-value cash crops) is needed to draw firm conclusions about the relative profitability of tobacco.

However one views the challenges and opportunities for crop diversification, it is clear that the issue cannot be discussed in isolation from the current costs and benefits of tobacco and will require concerted efforts by the private sector, government and individual farmers and

farmers' associations to succeed. The development of new value chains with similar (or indeed better) support systems to those currently available for tobacco is a major challenge for Brazil and other countries. Against this context, Vargas and Campos offer three examples of diversification initiatives from which several lessons may be drawn.

Agroecological crops in Santa Cruz do Sul

The first diversification experience comes from the Rio Pardo Valley in Santa Cruz do Sul. In terms of volume, corn, sugar-cane and cassava, together with tobacco, are the agricultural mainstays in this municipality. Tobacco production peaked in 1999 at 15.5 million kg, equal to about 2.5% of Brazil's total production, and has remained fairly stable around this level in recent years.

Beginning in the late 1980s the search for an alternative model led to the establishment of various "agroecological" endeavors based on the principles of organic farming. The primary aim of this system is to use no pesticides and to minimize the use of all other inorganic inputs. The first efforts to support agroecological production were undertaken by various NGOs through technical assistance to family farmers. Since then, efforts to consolidate the model as an alternative to tobacco have grown, gradually bringing in new diverse local partners including farmers' associations, church organizations, municipal governments, more NGOs and the public extension agency of the state. These efforts eventually gave rise to a regional cooperative of ecologically-based family farmers known as ECOVALE. Farmer products, including a wide variety of horticultural crops, erva-mate (Brazilian tea), peaches, oranges, beans and corn, are sold in fairs and to regional and local supermarkets and restaurants.

According to Vargas and Campos, estimates of the revenues for small farmers in ECOVALE show these crops provide feasible alternatives to tobacco in terms of profitability, marketing and production finance. Citing data from the Center for Small Family Farmers, for example, an average household is said to earn annual income of $1,560 from agroecological crops compared with only $937 to $1,182 from burley and Virginia tobacco respectively, based on an average 2.6 ha plot. Annual incomes from agroecological crops are said to range from $312 to $4,686, but these estimates are acknowledged to include income from other sources (whereas the estimates for tobacco are exclusive for that crop).[1]

While very encouraging from a diversification perspective, several limitations must also be noted that are important to consider in thinking about the potential for agroecological crops and other substitutes more generally. In the first place, the financial returns that are reported for agroecological enterprises are vague at best and the estimates do not show how these enterprises compare with respect to variable costs, labour requirements, investment needs, returns to capital and other matters of private and social importance that farmers think about in deciding what crops to grow. Agroecological crops may very well do better than tobacco on several of these scores, but there are still likely to be a number of good reasons for including tobacco as part of the farm mix as well. Without more detailed cost and profit information, it is difficult to draw firm conclusions on how these crops truly compare.

In the second place, Vargas and Campos report there are 330 families involved in agroecological products in the Rio Pardo Valley, which is an exceptionally small number

[1] (11, p. 16-17).

compared with the total number of tobacco growers. Without doubt, the hard work by farmer groups and other associations involved with ECOVALE is highly commendable, but the experience so far does not really suggest these crops could ever substitute for tobacco on a large scale. For widespread farmer participation, market linkages clearly need to be extended beyond local fairs and restaurants and will therefore involve completely different cost and price structures than the ones encountered so far. Horticulture production and marketing is, in fact, one of the most demanding areas of agriculture and requires specialized infrastructure as noted above. Whether anything like the ECOVALE programme can be built up to this level is the true challenge for developing an alternative crop as a competitive substitute for tobacco.

Banana farming in Schroeder

The next example of alternative crop production described by Vargas and Campos is of banana farming in the municipality of Schroeder in northeastern Santa Catarina state. This is a highly urbanized region in which rice, cassava, sugar-cane, corn and bananas have always been the agricultural mainstays compared with tobacco, which only ever accounted for less than 3% of total agricultural production value. Throughout the 1990s, bananas remained the main agricultural product, contributing about 60% of total agricultural production value.

At the end of the 1970s, dissatisfied tobacco growers created a group in the agriculture department of the local Industrial, Commercial and Agricultural Association, which became the current Banana Producers Association of Santa Catarina. Motivated and helped by the creation of the Association, participating farmers were able to achieve gains in banana productivity throughout the 1980s and 1990s and to adapt to the quality standards required for trade in wider state and national markets. In 2000, the state research agency began working in partnership with the Association on a pilot monitoring project aimed at controlling critical banana diseases. In 2005, there were 92 associated members farming bananas over a combined area of 937.5 ha. Tobacco is no longer grown in Schroeder. While farmers have been able to covert completely from tobacco, this was never an especially important crop to begin with and much of the infrastructure needed for banana production and marketing was in place already.

In terms of farmer profit, the net income for a small banana producer works out at around US$ 811 per hectare, which is roughly double the per hectare estimates for tobacco cited above. Vargas and Campos do not provide data showing the costs of production for bananas or how the rates of return to capital and labour compare with tobacco and other enterprises. This example does however illustrate that other enterprises can be developed to replace tobacco, but this is likely to require good coordination, group work and the involvement of state and other local institutions to succeed.

Organic food crops and value chain development in Santa Rosa de Lima

The third example of crop substitution is similar to the first in terms of the introduction of organic food crops. In this case, Vargas and Campos describe a three-stage process beginning in late 1996 with the formation by 12 families of a farmers' association to produce organic crops at the invitation of a local supermarket owner. The association grew rapidly and established a board of directors to build new market links and synchronize production of its members.

In the second stage, from mid-1998 to 2000, the number of members jumped from 200 to nearly 500 members including some from other municipalities. Several value-adding activities were also included using external grants and support. At the end of this phase, however, the original (and most important) supermarket buyer declared bankruptcy causing a serious setback for the association. Other constraints on competitiveness became apparent as a result of this loss and the association was forced to scale down considerably due to competition from lower-cost producers closer to the main urban markets, difficulty in transporting fresh produce long distances, financial losses due to spoilage and overwhelming (and apparently uncontrolled) volume increases in production by new members. In the third stage of development, the focus switched to agro-processing. In this phase, a total 27 agro-industrial units were established that are now producing a wide range of products ranging from salami, honey, brown sugar and its byproducts, pickled vegetables and fruit preserves, processed milk and vegetables. The main outlet now seems to be local fairs rather than long-distance supermarket chains.

In terms of the original focus on organics, only around 35–45 families remained associated and working with these crops in 2005, but not necessarily as their main revenue source. Other families that were once a part of the association returned to tobacco production or to other activities connected with conventional agriculture. Due to the nature of their study, Vargas and Campos do not provide information on how the organic food crops, processed products, or longer-distance supermarket vegetables compare in terms of farmer cost and profitability.

As an example of what is required to develop and coordinate competitive value chains, however, this example is very informative. In the first place, market coordination became a significant challenge to the members who quickly encountered several practical problems. This case study also exposes the weakness of relying on one or two main market outlets, as well as the importance of controlling farmer participation in order to achieve the required quality standards for fresh horticultural products. Almost naturally, the association has evolved to focus on a range of fairly basic processed products for which timeliness of delivery is less of an issue and not so complicated to manage.

Conclusions

Taken together, these experiences from Brazil are each encouraging and help to illuminate some of the practical challenges with developing new production and marketing chains. From a diversification perspective, each group was able to succeed in their own right, but sometimes on a more limited basis than participants might have hoped for and with numerous ups and downs along the way. As commented already, competitive value chain development is neither easy nor automatic. Far more effort will be needed to build on these types of experiences if alternative crops are truly to become a viable alternative for the hundreds of thousands of tobacco growers in Brazil (and other countries). Niche products like organic vegetables, for example, certainly can be an alternative, but this is only a limited market and many other competitive products will also need to develop alongside tobacco if the majority of tobacco growers are really going to have a practical choice of what to grow.

E. China

China is by far the world's largest tobacco grower and currently accounts for around 42% of global production. China is also the largest consumer of cigarettes, with approximately one quarter of the world's smokers. With a centrally planned tobacco policy, the Chinese

government plays an important role in tobacco and cigarette production through its national monopolies, the State Tobacco Monopoly Administration and the China National Tobacco Company. Cigarette production is an important source of central government revenue, accounting for about 10% of total revenue equal to 10.5 billion yuan (or approximately US$ 1.27 billion) to central government revenue in 2001. In 2000, some 1.27 million hectares were devoted to this crop (29).

With such a dominant position in the global tobacco economy, some consideration of diversification opportunities and cost structures for tobacco and alternative crops in China is clearly in order. Unfortunately, reliable data seem to be extremely limited. One recent study led by Teh-wei Hu and a team of researchers from Chengdu and Shangahi Universities, for example, provides only scant information on real production trends and comparative costs (29).

The central argument put forward by Hu and his team about tobacco compared with other enterprises is that the crop provides lower returns than alternative crops including grains, oilseeds, beans and fruit. He also observes that government uses various incentives to promote tobacco because of the importance to tax revenue. The methodology used for these calculations, however, including the types of tobacco and production systems being modeled, is not clear. Moreover, rate of return calculations only illustrate one aspect of cost and profitability and are almost meaningless without information on what those costs and profits actually are. Particularly for farmers with only a small parcel of land, there may be no choice but to accept a commodity that provides a low rate of return if that is the only (viable) enterprise that provides a large enough cash income to last throughout the year. Another weakness is that yield and price differences (which vary greatly by quality) are not accounted for by Hu, making the data even more difficult to interpret.

Because of the global importance of China as a tobacco producer, some further analysis of the underlying economics of this crop and alternative commodities would be very useful to the discussion of diversification possibilities. In the face of possible long-term reductions in global demand, China is likely to be the main country that other producers have to compete with. More comprehensive analysis of Chinese tobacco may be available somewhere, and additional research on specific costs and profits would be very useful for the larger dialogue on alternative crops.

F. Canada

While the focus of this paper is primarily on developing countries, some additional insight to the issue of crop substitution can be gained by looking briefly at experiences in the developed world as well. As noted earlier, these countries are in a much stronger position to promote alternative enterprises, both in terms of the ability to afford farmer quota buy-outs and greater opportunities for farm and non-farm diversification. A summary article on Canada's diversification experience by Cunningham for the International Development Research Centre helps to illustrate these points as well as a number of similarities in terms of the challenges of competitive value chain development.[1]

Tobacco production

[1] This case study is taken from the IDRC web site which provides a summary of the book by Cunningham (30) on Canadian tobacco.

As Cunningham's article begins, Canada's success in controlling smoking is all the more notable given the large quantity of tobacco leaf grown in the country. Tobacco is both a significant cash crop and an important agricultural export. In the mid-1990s, Canada ranked as the world's sixth largest producer of flue-cured tobacco and among the top 20 producers including all types of tobacco. About 90% of the tobacco grown in Canada is produced in a highly concentrated area in southwestern Ontario near the north shore of Lake Erie.

Historically, tobacco companies in Canada have encouraged and helped farmers to begin growing tobacco and, even today, tobacco continues to make a huge contribution to the local economies of four Ontario counties. In fact, tobacco farmers are shown to do very well financially. In 1990s, according to Statistics Canada, tobacco farmers earned an average income of CA$ 79 000 (US$ 67 000), compared to an average for all farmers of CA$ 47 500 (US$ 40 000). In 1990, the income of the average tobacco farm exceeded the income of about two thirds of Ontario families.[1]

Although the federal government of Canada also has a long history of supporting tobacco farming tracing back to the early 1900s, Canada has more recently taken some of the most aggressive steps in the world to reduce tobacco production. Between 1987 and 1993, more than CA$ 50 million (US$ 42.4 million) was paid by federal and provincial governments to farmers who stopped growing tobacco. A further CA$ 13 million (US$ 11 million) was spent on projects helping to find alternative crops. As Cunningham notes, these initiatives have had three obvious practical and political benefits, including the following:

- they assisted affected farmers;
- they reduced the number of people with a vested economic interest in opposing tobacco-control measures;
- they gave governments a handy response when faced with farmer complaints about efforts to reduce smoking.

Diversification efforts

More specifically, Cunningham explains that Canada's Tobacco Diversification Plan, announced in 1987, had two components including the Tobacco Transition Adjustment Initiative (commonly known as Redux) and the Alternative Enterprise Initiative. Redux provided compensation to farmers who had left tobacco and financial incentives for other farmers to cease tobacco production. Farmers who retired 50% of their quota and sold the remaining 50% on the open market could get up to CA$ 65 000 (US$ 55 000) compensation. By all accounts, the programme helped with an orderly downsizing of tobacco farming. Remaining farmers were also in a better position because they were able to grow a higher percentage of their quota.

By 1990, Redux had helped about one third of tobacco growers across Canada exit from tobacco production. Of the Ontario farmers who exited, half said they would have exited had there been no programme, and a third said the programme prompted them to discontinue farming. Many farmers eligible for Redux did not take advantage of the programme because they were better off continuing to grow tobacco. Of the Ontario and Quebec farmers who did

[1] These patterns are not dissimilar from the situation in developing countries.

leave, about 40% were still involved afterwards in tobacco growing, typically as employees of other farmers.

The Alternative Enterprise Initiative provided financial support for the development of new crops, or the marketing and processing of existing non-tobacco crops unless this disrupted crop production by other farmers. However, Cunningham explains that the programme was not very successful. In the first place, some of the funds were not used because farmers were reluctant to leave a high-income crop (tobacco) for a riskier low-income activity. Large amounts of money were also given to ventures that failed. A peanut cooperative, for example, went bankrupt and the Southern Ontario Tomato Cooperative was declared "a very controversial, problem-ridden project" by a government report. After being given money to run a tomato-processing facility, the venture ultimately failed, primarily because farmers did not have the necessary knowledge base or marketing skills to jump suddenly into new big projects.[1]

Despite these difficulties (which, after all, are not atypical of large-scale government-funded programmes), Cunningham explains that since the early 1980s, many farmers who once grew tobacco have used their land to produce alternative crops, including ginseng, baby carrots, rhubarb, Spanish onions, zucchini, coriander, garlic, melons, early and sweet potatoes, buckwheat and hay. Government programmes he says have contributed to this diversification, but the biggest factor has been the free market. As the demand for Canadian tobacco fell in the 1980s, farmers realized they could make more money by reducing this crop and growing something else, either instead of or alongside tobacco. By the late 1980s, tobacco farming had stabilized and the number of farmers exiting tobacco slowed to a trickle.

Finally, Cunningham concludes that remaining tobacco farmers will probably be secure and continue to make good money in the short term. Moreover, he notes that current farmers are getting older, with many approaching retirement. Farmers' children are much less interested in taking over the family farm than would have been the case two or three decades ago, and many in the newer generation have moved into other businesses completely outside of agriculture.

Conclusions

With respect to other countries looking to build a diversification programme, the Canadian experience, much like the other case studies, illustrates that alternative crops can substitute for some of the income earned from tobacco, but that programmes designed to promote diversification crops simply for the sake of promoting diversification crops are likely to face an uphill battle. Grand ideas like the development of tomato processing facilities and the establishment of peanut cooperatives may sound good in principle, but must still be competitive and well managed. If these facilities have not developed already on their own accord, there may be some very good fundamental reasons other than the dominance of tobacco to explain this. Developing countries with fewer resources than Canada will need to be even more prudent in deciding the best way to help new activities emerge alongside tobacco.

Indeed, while the Canadian experience is informative, it is clearly very different from what most developing countries can expect. Donor funding for something like a tobacco buy-out

[1] Similar problems were identified by Vargas and Campos in their study of diversification in Brazil (11).

programme is perhaps not inconceivable, but it is abundantly clear that Canadian farmers benefited from many favourable economic conditions that most developing countries cannot offer. The same principles of adherence to market forces and risk of diversification for the sake of diversification still hold true, but the development of new enterprises will likely be more complicated and slow in developing countries without a large consumer base for alternative products and other opportunities for non-farm employment.

IV. CONCLUSIONS

This paper was prepared to provide an improved basis for discussion of the opportunities for crop substitution and issues that need to be considered in promoting alternative commodities to tobacco. Rather than look at the question of tobacco from a traditional health perspective, the paper began with recognition that agricultural production and marketing begins with the decisions farmers make and proceeded to look at the topic from an agricultural economics point of view. As provisions of the WHO FCTC take effect, it is important to have an idea of what farm products could begin to substitute for tobacco and what type of support is required to help these commodities emerge. The paper did not seek to make any specific policy recommendations and is merely offered as a starting point for discussion of crop substitution by the study group on alternative crops.

Towards this end, the analytical discussion began in Section 2 with an overview of important issues that shape a country's diversification choices and reasons to pursue alternative crops. Although the markets for tobacco are still expanding, there are many good reasons to consider diversification opportunities. Not least of these is that new commodity systems are likely to take considerable time to develop and emerge as competitive alternatives to tobacco. Although time does still appear to be on the side of farmers and policy-makers, it is important to understand what products might emerge as viable substitutes and what steps are required to support these enterprises.

Next, in Section 3, the paper looked in closer detail at specific crop options and development experiences in six countries. Among other things, the analysis helped to illustrate the type of analytical approaches other countries may want to pursue in thinking about their own substitution possibilities. The analyses of Indonesia, Zimbabwe and Malawi, for example, were based on a very specific examination of farm level costs and returns. Given the many strong arguments being made for and against tobacco, it is essential to have a clear understanding of how the underlying costs and profitability of tobacco compare with other commodities. The situation in other countries could be very different from the results presented here, and other countries involved in tobacco production may do well to include this type of financial and economic assessment as part of their own strategic planning process. Crop budget analysis cannot be used to predict optimal farm plans, but does help to anticipate areas of growth and focus attention on the types of investment needed for competitive products to emerge.

Summary points

With the general approach and limitations of this study in mind, several important conclusions stand out that are useful to summarize as follow.

- Several crops rival and sometimes surpass tobacco for total net profit and rates of return.

- Tobacco is expensive to grow, but so too are most high-value alternatives that rival tobacco for potential income.

- Consideration of alternative crops demands attention to climatic suitability, market linkages and long-term price trends.

- The markets for most high-value alternatives are generally much smaller than for tobacco and more difficult to penetrate.

- Countries should not expect to develop just one or two substitute commodities, but need to focus on helping multiple products emerge alongside tobacco.

- The development of new enterprises requires investment in specific supply-chain processes beginning at the farm level and extending through to crop assembly, processing and distribution.

- Tobacco is never grown as a monocrop and most "tobacco farmers" already have diversified sources of income.

- Tobacco income can help fuel the introduction of alternative crops as a long-term response to the threat of shrinking markets.

Costs and profitability

One common myth about tobacco is that it is the most profitable crop a farmer can grow. This is far from true and the analysis clearly shows that many other commodities have the potential to rival and even surpass tobacco in terms of gross and net profits, returns to cash and returns to family labour. In Indonesia, potato, chili, nilam and oranges were all found to return higher profits than tobacco depending on farm management. In Zimbabwe, the analysis likewise shows that paprika, coffee and specialty horticulture crops offer greater profits than tobacco, and in Malawi, tomato, paprika, rice, confectionery groundnuts and coffee all provide higher incomes for smallholder farmers depending on market arrangements. Tobacco certainly can be very profitable, especially compared with staple foods, but there is little evidence to show that the cultivating the crop is the most profitable or only profitable activity a farmer can do.

In looking at substitution possibilities the analysis also shows that tobacco is an expensive crop to grow, but so too are most high-value alternatives. Together with the need for careful quality controls, the high costs for tobacco has often led the introduction of various input supply programmes managed by the tobacco companies. In Brazil and elsewhere, these programmes have sometimes come under heavy criticism as a way of trapping farmers into tobacco production. The problem of affording the inputs for tobacco is indeed a serious constraint, but a move away from tobacco will not eliminate the need for pre-season finance and technical support systems. Instead, there is a very specific development challenge of building new (and hopefully better) support systems for other crops as part of a diversification programme. It will take time for these systems to emerge and any successful transition from tobacco will almost certainly be a gradual process.

Marketing and value chain development

Another important consideration is that the markets for most high-value products that could substitute for a loss of tobacco revenue are much smaller and more difficult to penetrate. Paprika, for example, can be highly profitable, but total world demand is only about 120,000 tons annually and any new production by tobacco growers would come into immediate competition with already established paprika growers. Pre-packed supermarket vegetables are sometimes also described as a good alternative, but these markets are also limited by international competition and require strict adherence to specific quality control guidelines. Horticulture production and marketing is, in fact, one the most demanding areas of agriculture and, if anything, the value chains for fresh vegetables are even more demanding than tobacco in terms of buyers dictating what inputs can and cannot be used, what prices will be paid and what crops must be grown.

In this respect, the challenge of developing new supply chains for alternative products may appear daunting, but this does not mean that new products cannot, or will not, emerge over time to replace tobacco. As the markets for tobacco begin to shrink, it is natural to expect that other commodities will become relatively more attractive and gradually emerge alongside tobacco. Global supply and demand conditions for alternative high-value commodities 25 or even 50 years into the future are difficult to predict, but with the right type of financial incentives and policy environment for private businesses to flourish, the free market is more than capable of sending the right signals that producers and other value chain participants need in order to discover what works best.

In this respect, another important future role for tobacco can also be to help fuel the process of diversification itself. Specific policy incentives that encourage tobacco growers to use their income to invest in other farm activities may very well be worth exploring. Before the economic crisis in Zimbabwe, for example, more than 80% of horticulture exports were grown on tobacco farms and were first developed using tobacco revenue. Other countries may do well to encourage similar ways of harvesting tobacco revenue as a driver of new investments in other areas. At least for the foreseeable medium term, the opportunities to utilize tobacco income and to get the greatest possible benefit from the crop (while also seeking to reduce consumption and minimize public health costs) should not be overlooked.

Future research

No matter how the findings from this paper are interpreted, one final conclusion that stands out very clearly from the evaluation is that effective agricultural policy-making requires careful analysis. Without an understanding of how tobacco and other commodities compare in terms of farmer costs and profitability, investment requirements, marketing systems, labour needs and other matters of private and social importance, sector planning can easily become an exercise in guesswork based on presuppositions about which crops and farm systems are best. This is particularly true in the case of tobacco, where the costs and benefits of growing the crop are often discussed from other perspectives than agriculture and farm economics. The analyses of Indonesia, Zimbabwe and Malawi were all based on very specific, practical methodologies that help compare different products and farm systems from a variety of perspectives. Only with a common ground for dialogue and understanding, can private investors, policy-makers and donors alike begin to talk sensibly about true agricultural sector priorities and how best to cope with the likelihood of shrinking tobacco markets.

It is hoped that other countries will want to build on the type of research presented here and begin to make use of the methodologies underlying the analysis. In addition to a focus on

specific farm-level costs and profits, other tools have recently been developed to quantify value chain processes and price build-up from stage to stage as indicators of countries' actual and potential competitiveness for new and existing products (10). Applied to the question of crop substitution for tobacco, these methods could be used as powerful tools to help policy-makers to make sense of the competing arguments and priorities associated with the tobacco debate.

Finally, it should be emphasized that many other conclusions besides those noted above can be drawn from the detailed case studies and other information presented in this report. Agricultural administrators, public health officials, farmers, agribusiness firms, tobacco companies and others are all likely to interpret the discussion differently, with an increased emphasis on their particular interests and areas of concern. As a starting point for discussion, however, it is hoped that this paper has at least helped to raise awareness of the importance of understanding how tobacco truly compares with other enterprises from a farm management and agricultural economics point of view. Without an understanding of these important production-level issues, wider efforts to promote tobacco control are likely to face an uphill battle.

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APPENDIX 1: Tobacco Production in Selected Countries (tons unmanufactured)

Sorted by 2005 volume.

	1961	1971	1981	1991	2001	2002	2003	2004	2005
China	395,854	801,808	1,519,718	3,051,686	2,358,842	2,454,105	2,262,658	2,411,490	2,688,500
Brazil	167,839	244,172	365,738	413,831	568,505	670,309	656,200	921,281	878,651
India	307,000	361,900	480,800	555,900	340,000	550,000	490,000	598,000	598,000
United States of America	935,000	773,322	936,030	754,950	449,760	398,520	364,080	400,060	290,170
Argentina	48,400	61,700	50,889	94,504	98,110	125,431	117,779	118,000	163,528
Indonesia	85,800	57,352	109,646	140,283	201,900	194,500	210,300	141,000	141,000
Turkey	101,407	173,861	168,024	240,881	144,786	152,856	160,252	157,000	140,716
Greece	74,245	88,162	130,900	161,900	142,000	133,000	136,000	133,936	123,729
Italy	24,974	79,274	130,970	193,296	130,487	122,231	124,985	117,882	110,000
Thailand	29,000	49,000	75,230	85,400	64,000	78,000	66,000	68,000	70,000
Malawi	12,202	26,438	51,031	113,374	82,544	69,401	69,500	69,500	69,500
Zimbabwe	99,890	65,181	71,812	178,595	195,905	178,408	102,683	62,320	65,000
Zambia	7,273	6,297	2,984	5,500	3,400*	4,800	4,800	14,300**	52,000**
Tanzania, United Rep of	2,701	14,154	17,200	23,322	24,270	28,000	28,000	34,000	47,000
Canada	95,127	102,040	112,369	78,704	58,606	54,550	46,338	42,430	43,000
Macedonia, The Fmr Yug Rp				26,502	23,200	22,044	21,592	21,140	27,691
Kenya	448	161	3,701	10,000	19,500	20,000	20,000	20,000	20,000
Uzbekistan				8,800	19,000	19,000	19,000	19,000	20,000
Kazakhstan				2,088	14,700	15,830	15,898	14,314	14,000
Kyrgyzstan				43,200	24,036	6,154	8,690	12,988	13,396
Dominican Republic	29,393	22,818	40,223	23,700	16,800	12,700	11,500	11,560	12,000
Moldova, Republic of				42,382	16,058	11,806	6,692	7,900	6,000
Japan	126,900	149,600	137,700	69,897	60,600	58,200	50,662	52,659	n/a

Africa	203,815	218,519	243,187	434,880	470,566	453,736	378,347	334,050	346,904
Europe	363,955	563,611	741,855	691,587	537,954	527,521	509,515	516,257	482,615
Asia	1,517,233	2,355,098	3,245,776	4,892,387	3,758,933	4,055,264	3,770,700	3,954,292	4,226,556
World	3,576,965	4,571,831	5,988,825	7,563,343	6,146,428	6,468,958	6,020,704	6,466,987	6,603,571

FAOSTAT (31) 03 February 2007

1992 data

*** 2000 TAZ data updated from Reuters.**

**** TAZ data updated from Reuters.**

Appendix 2: Indonesia Financial Indicators for Tobacco and Other Crops

INDONESIA: Per Hectare Financial Indicators

2003 data sorted by management level and ranked by net profit.

TBN/NO tobacco not included since farmed on contract arrangement (different terms apply) - average payment to farmer around $945/ha.

* Analysis of rice based on CASER/USAID study where distinction between management levels is based on irrigation technology; because of different data source, missing financial indicators could not be calculated.

** Labour estimates for tobacco include land preparation that benefits other crops (all production is heavily intercropped).

					Production Costs (USD/ha)			Farmer Income (USD/ha)				Labour					Sensitivity Indicators		
Crop	Primary Region	Region Covered by Model	Yield (kg/ha)	Gross Revenue (USD/ha)	Total variable costs	Annual capital recovery cost	Total production costs	Gross profit (gross revenue - var costs)	Net profit (gross revenue - total cost)	Return to var costs	Return to total costs	Hired labor (days)	Family labor (days)	Total labor (days)**	Net profit per day family labor (USD/day)	Net profit per day total labor (USD/day)	% change in yield to gross profit = 0	% change in yield to net profit = 0	% change in price to net profit = 0
LOW INPUT																			
Chili	All	Midland	6,800	2,674.2	1,169.6	17.0	1,186.5	1,504.6	1,487.6	1.29	1.25	365	122	487	12.2	3.1	-55%	-54%	-52%
Potato	Upland	Upland	6,000	1,887.6	941.0	13.5	954.5	946.7	933.2	1.01	0.98	75	67	142	13.9	6.6	-51%	-50%	-79%
Nilam (yr 2)	All	Lowland	19,000	1,067.4	401.6	20.2	421.7	665.8	645.7	1.66	1.53	271	51	322	12.7	2.0	-74%	-72%	-60%
VA-Kretek Tobacco	**Upland**	**Upland**	**600**	**1,479.8**	**944.2**	**70.3**	**1,014.5**	**535.5**	**465.3**	**0.57**	**0.46**	**316**	**205**	**521**	**2.3**	**0.9**	**-38%**	**-33%**	**-46%**
Groundnuts	All	Lowland	750	505.6	178.6	13.5	192.0	327.1	313.6	1.83	1.63	39	67	106	4.7	3.0	-65%	-62%	-78%
Corn	All	Lowland	2,250	391.9	145.5	13.5	159.0	246.3	232.9	1.69	1.46	46	40	86	5.8	2.7	-63%	-59%	-60%
Carrots	Upland	Midland	3,750	252.8	127.3	13.5	140.8	125.5	112.0	0.99	0.80	92	51	143	2.2	0.8	-50%	-44%	-44%
Garlic	Upland	Upland	1,050	530.9	505.7	13.5	519.2	25.2	11.7	0.05	0.02	195	81	276	0.1	0.0	-5%	-2%	-2%
MEDIUM INPUT																			
Potato	Upland	Upland	9,000	2,831.5	1,214.3	13.5	1,227.8	1,617.1	1,603.6	1.33	1.31	99	73	172	22.0	9.3	-58%	-57%	-57%
Chili	All	Midland	8,000	3,146.1	1,586.6	17.0	1,603.6	1,559.4	1,542.5	0.98	0.96	433	149	582	10.4	2.7	-48%	-47%	-45%
VA-Kretek Tobacco	**Upland**	**Upland**	**950**	**2,282.7**	**1,218.5**	**81.7**	**1,300.1**	**1,064.2**	**982.5**	**0.87**	**0.76**	**430**	**263**	**693**	**3.7**	**1.4**	**-46%**	**-42%**	**-76%**
Nilam (yr 2)	All	Lowland	26,000	1,460.7	643.6	30.2	673.8	817.0	786.8	1.27	1.17	372	68	440	11.6	1.8	-67%	-64%	-54%
Groundnuts	All	Lowland	900	606.7	263.5	13.5	277.0	343.2	329.7	1.30	1.19	68	68	136	4.8	2.4	-57%	-54%	-54%
Corn	All	Lowland	2,800	487.6	226.1	13.5	239.6	261.6	248.1	1.16	1.04	55	40	95	6.2	2.6	-54%	-51%	-51%
Carrots	Upland	Midland	5,000	337.1	189.7	13.5	203.2	147.4	133.9	0.78	0.66	119	47	166	2.8	0.8	-46%	-41%	-40%
Garlic	Upland	Upland	1,950	986.0	883.7	13.5	897.2	102.2	88.7	0.12	0.10	305	55	360	1.6	0.2	-10%	-9%	-9%
HIGH INPUT																			
Potato	Upland	Upland	13,000	4,089.9	1,552.0	13.5	1,565.5	2,537.9	2,524.4	1.64	1.61	129	84	213	30.1	11.9	-63%	-62%	-62%
Chili	All	Midland	9,000	3,539.3	1,853.9	17.0	1,870.9	1,685.4	1,668.4	0.91	0.89	507	173	680	9.6	2.5	-46%	-45%	-44%
VA-Kretek Tobacco	**Upland**	**Upland**	**1,200**	**2,807.2**	**1,591.2**	**84.2**	**1,675.4**	**1,216.0**	**1,131.8**	**0.76**	**0.68**	**568**	**350**	**918**	**3.2**	**1.2**	**-44%**	**-40%**	**-68%**
Nilam (yr 2)	All	Lowland	31,000	1,741.6	847.0	50.7	897.6	894.6	843.9	1.06	0.94	452	81	533	10.4	1.6	-61%	-58%	-48%
Groundnuts	All	Lowland	1,025	691.0	322.6	13.5	336.1	368.4	354.9	1.14	1.06	80	81	161	4.4	2.2	-53%	-51%	-51%
Corn	All	Lowland	3,100	539.9	265.9	13.5	279.4	274.0	260.5	1.03	0.93	65	45	110	5.8	2.4	-51%	-48%	-49%
Garlic	Upland	Upland	2,550	1,432.6	1,173.9	13.5	1,187.4	258.7	245.2	0.22	0.21	348	62	410	3.9	0.6	-18%	-17%	-17%
Carrots	Upland	Midland	6,000	404.5	232.9	13.5	246.4	171.6	158.1	0.74	0.64	137	52	189	3.0	0.8	-44%	-41%	-39%
RICE - dry season*																			
Technical Irrigation	Lowland	Lowland	6,360	678.9	-	-	-	678.9	678.9	-	-	183	24	207	28.1	3.3	-58%	0%	0%
Semi-technical irrigation	Lowland	Lowland	5,880	627.6	-	-	-	627.6	627.6	-	-	147	22	169	28.1	3.7	-61%	0%	0%
Simple irrigation	Lowland	Lowland	4,900	523.0	-	-	-	523.0	523.0	-	-	116	48	165	10.8	3.2	-51%	0%	0%
Rain fed	Lowland	Lowland	3,970	423.8	-	-	-	423.8	423.8	-	-	90	54	144	7.8	2.9	-63%	0%	0%
RICE - wet season*																			
Technical Irrigation	Lowland	Lowland	5,900	563.5	-	-	-	563.5	563.5	-	-	108	36	144	15.8	3.9	-63%	0%	0%
Semi-technical irrigation	Lowland	Lowland	5,370	512.9	-	-	-	512.9	512.9	-	-	106	36	142	14.3	3.6	-62%	0%	0%
Simple irrigation	Lowland	Lowland	4,810	459.4	-	-	-	459.4	459.4	-	-	110	36	146	12.8	3.2	-63%	0%	0%
Rain fed	Lowland	Lowland	3,780	361.0	-	-	-	361.0	361.0	-	-	91	14	105	25.7	3.4	-61%	0%	0%

SOURCE: Keyser (12)

Appendix 3: Zimbabwe Financial Indicators for Tobacco and Other Crops

ZIMBABWE: Per Hectare Financial Indicators for Large Commercial Farmers

2001 data sorted by irrigation use and management level and ranked by net profit.

For roses, yield and price are per 1,000 stems

					Production Costs (USD/ha)			Farmer Income (USD/ha)				Labour		Sensitivity Indicators		
Activity	Irrigation	Yield (kg/ha)	Farm gate Price (USD/kg)	Gross Revenue (USD/ha)	Total variable costs	Annual investment cost	Total costs (excl family labor)	Gross profit (gr revenue - var costs)	Net profit (gr revenue - total cost)	Return to var costs	Return to total costs	Total labor (days/ha)	Net profit per day total labor (USD/ha)	% change in yield to gross profit = 0	% change in yield to net profit = 0	% change in price to net profit = 0
IRRIGATED CROPS																
LOW INPUT																
Tobacco, flue-cured	**overhead**	**2,800**	**1.70**	**4,760.0**	**2,867.2**	**303.5**	**3,170.7**	**1,892.8**	**1,589.3**	**0.66**	**0.50**	**462**	**3.4**	**-48%**	**-41%**	**-35%**
Wheat	overhead	5,500	0.20	1,100.0	752.2	188.1	940.3	347.8	159.7	0.46	0.17	19	8.4	-35%	-16%	-15%
Cotton	overhead	2,500	0.43	1,065.5	873.6	188.1	1,061.7	191.8	3.7	0.22	0.00	212	0.0	-23%	0%	0%
Groundnuts	overhead	3,000	0.30	908.2	880.9	188.1	1,069.1	27.2	(160.9)	0.03	(0.15)	90	(1.8)	-4%	21%	18%
Soybeans	overhead	2,400	0.23	545.5	528.9	188.1	717.0	16.6	(171.5)	0.03	(0.24)	22	(7.8)	-3%	35%	32%
Maize	overhead	6,000	0.10	628.4	620.8	188.1	808.9	7.6	(180.5)	0.01	(0.22)	30	(6.0)	-1%	35%	29%
MEDIUM INPUT																
Tobacco, flue-cured	**overhead**	**3,100**	**1.77**	**5,487.0**	**3,007.8**	**303.5**	**3,311.3**	**2,479.2**	**2,175.7**	**0.82**	**0.66**	**482**	**4.5**	**-55%**	**-48%**	**-42%**
Coffee (USD 2,000mt)	drip line	2,000	2.00	4,000.0	2,227.2	514.5	2,741.7	1,772.8	1,258.3	0.80	0.46	321	3.9	-48%	-34%	-31%
Wheat	overhead	6,500	0.20	1,300.0	816.0	188.1	1,004.1	484.0	295.9	0.59	0.29	20	14.8	-41%	-25%	-23%
Coffee (USD 1,500mt)	drip line	2,000	1.50	3,000.0	2,227.2	514.5	2,741.7	772.8	258.3	0.35	0.09	321	0.8	-28%	-9%	-9%
Cotton	overhead	3,000	0.43	1,278.5	931.5	188.1	1,119.6	347.1	159.0	0.37	0.14	245	0.6	-34%	-14%	-11%
Groundnuts	overhead	4,000	0.30	1,210.9	961.7	188.1	1,149.8	249.2	61.1	0.26	0.05	110	0.6	-25%	-6%	-5%
Coffee (USD 1,360mt)	drip line	2,000	1.36	2,720.0	2,227.2	514.5	2,741.7	492.8	(21.7)	0.22	(0.01)	321	(0.1)	-20%	1%	1%
Soybeans	overhead	2,900	0.23	659.1	566.2	188.1	754.3	92.9	(95.3)	0.16	(0.13)	23	(4.1)	-16%	16%	15%
Maize	overhead	7,000	0.10	733.1	687.6	188.1	875.7	45.5	(142.6)	0.07	(0.16)	45	(3.2)	-8%	24%	20%
HIGH INPUT																
Tobacco, flue-cured	**overhead**	**3,500**	**1.80**	**6,300.0**	**3,169.4**	**303.5**	**3,472.9**	**3,130.6**	**2,827.1**	**0.99**	**0.81**	**497**	**5.7**	**-60%**	**-54%**	**-47%**
Coffee (USD 2,000mt)	drip line	2,500	2.00	5,000.0	2,439.1	514.5	2,953.6	2,560.9	2,046.4	1.05	0.69	375	5.5	-55%	-44%	-41%
Coffee (USD 1,500mt)	drip line	2,500	1.50	3,750.0	2,439.1	514.5	2,953.6	1,310.9	796.4	0.54	0.27	375	2.1	-38%	-23%	-21%
Export veg - mange tout	drip line	4,000	0.55	2,200.0	1,248.0	186.8	1,434.8	952.0	765.2	0.76	0.53	295	2.6	-43%	-35%	-35%
Export veg - baby carrots	drip line	3,800	0.50	1,900.0	1,209.1	186.8	1,395.9	690.9	504.1	0.57	0.36	275	1.8	-36%	-27%	-27%
Coffee (USD 1,360mt)	drip line	2,500	1.36	3,400.0	2,439.1	514.5	2,953.6	960.9	446.4	0.39	0.15	375	1.2	-31%	-15%	-13%
Wheat	overhead	7,500	0.20	1,500.0	927.1	188.1	1,115.2	572.9	384.8	0.62	0.35	21	18.3	-43%	-29%	-26%
Cotton	overhead	3,500	0.43	1,491.6	1,017.2	188.1	1,205.3	474.5	286.4	0.47	0.24	278	1.0	-41%	-25%	-20%
Groundnuts	overhead	5,000	0.30	1,513.6	1,039.9	188.1	1,228.0	473.7	285.6	0.46	0.23	135	2.1	-38%	-23%	-19%
Marigold	overhead	14,000	0.11	1,484.0	1,035.2	188.1	1,223.3	448.8	260.7	0.43	0.21	136	1.9	-34%	-20%	-18%
Export veg - baby corn	drip line	950	0.95	902.5	685.0	186.8	871.8	217.5	30.7	0.32	0.04	190	0.2	-24%	-3%	-3%
Soybeans	overhead	3,400	0.23	772.7	592.1	188.1	780.2	180.6	(7.5)	0.31	(0.01)	24	(0.3)	-26%	1%	1%
Maize	overhead	8,000	0.10	837.8	738.6	188.1	926.7	99.2	(88.9)	0.13	(0.10)	50	(1.8)	-14%	13%	11%
PAPRIKA																
Paprika - long season	overhead	6,000	1.37	8,203.6	3,135.6	303.5	3,439.1	5,068.0	4,764.5	1.62	1.39	310	15.4	-66%	-62%	-58%
Paprika - short season	overhead	3,000	1.37	4,101.8	2,256.8	303.5	2,560.3	1,845.0	1,541.5	0.82	0.60	270	5.7	-49%	-41%	-38%
ROSES - auction sales																
Roses (long stem)	drip line	1,100	239.13	263,043.5	184,355.5	28,459.8	212,815.3	78,688.0	50,228.1	0.43	0.24	9,360	5.4	-56%	-36%	-24%
Roses (medium stem)	drip line	1,750	147.83	258,695.7	198,082.1	28,459.8	226,541.9	60,613.6	32,153.8	0.31	0.14	9,360	3.4	-50%	-26%	-15%
Roses (short stem)	drip line	2,750	86.96	239,130.4	193,706.3	28,459.8	222,166.2	45,424.1	16,964.3	0.23	0.08	9,360	1.8	-43%	-16%	-10%
DRYLAND CROPS																
LOW INPUT																
Tobacco, flue-cured	**no**	**2,200**	**1.69**	**3,718.0**	**2,375.7**	**221.6**	**2,597.3**	**1,342.3**	**1,120.7**	**0.57**	**0.43**	**382**	**2.9**	**-44%**	**-37%**	**-32%**
Cotton	no	1,500	0.40	606.3	555.3	106.2	661.5	51.0	(55.2)	0.09	(0.08)	145	(0.4)	-11%	12%	9%
Groundnuts	no	1,800	0.30	544.9	499.1	106.2	605.3	45.8	(60.4)	0.09	(0.10)	57	(1.1)	-10%	13%	11%
Maize	no	3,500	0.10	366.5	381.7	106.2	487.9	(15.2)	(121.4)	(0.04)	(0.25)	19	(6.4)	5%	43%	34%
Soybeans	no	1,600	0.23	363.6	391.9	106.2	498.1	(28.3)	(134.5)	(0.07)	(0.27)	12	(11.2)	9%	41%	37%
MEDIUM INPUT																
Tobacco, flue-cured	**no**	**2,500**	**1.76**	**4,400.0**	**2,546.1**	**221.6**	**2,767.7**	**1,853.9**	**1,632.3**	**0.73**	**0.59**	**415**	**3.9**	**-51%**	**-45%**	**-39%**
Cotton	no	2,300	0.40	929.6	707.3	106.2	813.5	222.3	116.1	0.31	0.14	198	0.6	-31%	-16%	-13%
Cotton	no	1,900	0.40	767.9	624.2	106.2	730.4	143.8	37.6	0.23	0.05	172	0.2	-25%	-6%	-5%
Groundnuts	no	2,300	0.30	696.3	573.1	106.2	679.3	123.2	17.0	0.21	0.02	68	0.2	-21%	-3%	-2%
Soybeans	no	2,100	0.23	477.3	429.3	106.2	535.5	48.0	(58.2)	0.11	(0.11)	13	(4.5)	-11%	13%	12%
Maize	no	4,500	0.10	471.3	431.3	106.2	537.5	40.0	(66.2)	0.09	(0.12)	23	(2.9)	-11%	18%	14%
HIGH INPUT																
Tobacco, flue-cured	**no**	**2,800**	**1.79**	**5,012.0**	**2,708.7**	**221.6**	**2,930.3**	**2,303.3**	**2,081.7**	**0.85**	**0.71**	**437**	**4.8**	**-55%**	**-50%**	**-44%**
Groundnuts	no	2,800	0.30	847.6	631.1	106.2	737.3	216.5	110.3	0.34	0.15	83	1.3	-31%	-16%	-13%
Soybeans	no	2,600	0.23	590.9	455.2	106.2	561.4	135.7	29.5	0.30	0.05	14	2.1	-25%	-6%	-5%
Maize	no	5,500	0.10	576.0	503.9	106.2	610.1	72.1	(34.1)	0.14	(0.06)	27	(1.3)	-16%	8%	6%

SOURCE: Keyser (14)

Appendix 3: Zimbabwe Financial Indicators for Tobacco and Other Crops

ZIMBABWE: Per Hectare Financial Indicators for Communal and Small-Scale Commercial Farmers

2001 data sorted by management level and ranked by net profit.

				Production Costs (USD/ha)			Farmer Income (USD/ha)				Labour				Sensitivity Indicators		
Activity	**Yield (kg/ha)**	**Farm gate Price (USD/kg)**	**Gross Revenue (USD/ha)**	Total variable costs	Annual investment cost	Total costs (excl family labor)	Gross profit (gr revenue - cash costs)	Net profit (gr revenue - total cost)	Return to cash costs	Return to total costs	Total labor (days/ha)	Family labor (days/ha)	Hired labor (days/ha)	Net profit per day total labor (USD/ha)	% change in yield to gross profit = 0	% change in yield to net profit = 0	% change in price to net profit = 0
COMMUNAL & RESETTLEMENT FARMERS																	
LOW INPUT																	
Paprika	800	1.05	844	252.0	8.5	260.5	591.6	583.1	2.35	2.24	220	150	70	2.69	-73%	-71%	-69%
Tobacco, flue-cured	**650**	**1.45**	**943**	**437.8**	**71.7**	**509.5**	**504.7**	**433.0**	**1.15**	**0.85**	**260**	**150**	**110**	**1.94**	**-66%**	**-56%**	**-48%**
Coffee (USD 2,000mt)	150	2.00	300	37.6	19.9	57.5	262.4	242.5	6.97	4.21	135	110	25	1.94	-91%	-84%	-81%
Tobacco, burley	**650**	**0.85**	**553**	**318.5**	**44.5**	**363.0**	**234.0**	**189.5**	**0.73**	**0.52**	**225**	**150**	**75**	**1.04**	**-50%**	**-41%**	**-36%**
Coffee (USD 1,500mt)	150	1.50	225	37.6	19.9	57.5	187.4	167.5	4.98	2.91	135	110	25	1.39	-87%	-78%	-74%
Cotton	700	0.36	252	76.7	8.5	85.2	175.4	166.9	2.29	1.96	102	102	-	1.72	-74%	-70%	-66%
Coffee (USD 1,360mt)	150	1.36	204	37.6	19.9	57.5	166.4	146.5	4.42	2.55	135	110	25	1.23	-86%	-75%	-72%
Groundnuts	550	0.30	167	74.3	8.5	82.8	92.2	83.7	1.24	1.01	75	75	-	1.23	-59%	-53%	-50%
Soybeans	700	0.21	149	79.8	8.5	88.3	69.1	60.6	0.87	0.69	50	50	-	1.38	-50%	-44%	-41%
Maize	825	0.10	86	40.5	8.5	49.0	45.9	37.4	1.13	0.76	54	54	-	0.85	-64%	-52%	-43%
MEDIUM INPUT																	
Paprika	1,000	1.05	1,055	331.3	8.5	339.8	723.2	714.7	2.18	2.10	260	150	110	2.78	-71%	-70%	-68%
Coffee (USD 2,000mt)	450	2.00	900	213.8	19.9	233.7	686.2	666.3	3.21	2.85	210	150	60	3.27	-79%	-77%	-74%
Tobacco, flue-cured	**800**	**1.51**	**1,208**	**565.2**	**71.7**	**637.0**	**642.8**	**571.0**	**1.14**	**0.90**	**320**	**150**	**170**	**2.01**	**-65%**	**-58%**	**-50%**
Coffee (USD 1,500mt)	450	1.50	675	213.8	19.9	233.7	461.2	441.3	2.16	1.89	210	150	60	2.20	-72%	-68%	-65%
Tobacco, burley	**1,000**	**0.95**	**950**	**497.7**	**44.5**	**542.2**	**452.3**	**407.8**	**0.91**	**0.75**	**315**	**150**	**165**	**1.44**	**-56%**	**-50%**	**-45%**
Coffee (USD 1,360mt)	450	1.36	612	213.8	19.9	233.7	398.2	378.3	1.86	1.62	210	150	60	1.90	-68%	-65%	-62%
Cotton	1,200	0.36	432	164.6	8.5	173.1	267.6	259.1	1.63	1.50	145	115	30	1.85	-66%	-64%	-60%
Groundnuts	825	0.30	250	97.6	8.5	106.1	152.1	143.6	1.56	1.35	90	90	-	1.69	-65%	-61%	-58%
Soybeans	1,000	0.21	213	98.9	8.5	107.4	113.8	105.3	1.15	0.98	60	60	-	1.90	-58%	-54%	-49%
Maize	1,250	0.10	131	107.5	8.5	116.0	23.4	14.9	0.22	0.13	72	72	-	0.32	-21%	-14%	-11%
HIGH INPUT																	
Tobacco, flue-cured	**1,050**	**1.55**	**1,628**	**720.9**	**71.7**	**792.6**	**906.6**	**834.9**	**1.26**	**1.05**	**365**	**150**	**215**	**2.48**	**-68%**	**-62%**	**-54%**
Tobacco, burley	**1,250**	**0.98**	**1,225**	**637.7**	**44.5**	**682.1**	**587.3**	**542.9**	**0.92**	**0.80**	**350**	**150**	**200**	**1.68**	**-56%**	**-52%**	**-47%**
Maize	2,000	0.10	209	157.5	8.5	166.0	52.0	43.5	0.33	0.26	86	86	-	0.60	-30%	-25%	-21%
SMALL-SCALE COMMERCIAL FARMERS																	
LOW INPUT																	
Tobacco, flue-cured	**1,100**	**1.58**	**1,738**	**870.5**	**87.8**	**958.4**	**867.5**	**779.6**	**1.00**	**0.81**	**375**	**150**	**225**	**2.31**	**-60%**	**-54%**	**-47%**
Tobacco, burley	**1,100**	**0.89**	**979**	**519.4**	**51.2**	**570.6**	**459.6**	**408.4**	**0.88**	**0.72**	**330**	**150**	**180**	**1.39**	**-55%**	**-49%**	**-44%**
Maize	1,700	0.10	178	134.6	15.2	149.8	43.4	28.2	0.32	0.19	80	80	-	0.54	-29%	-19%	-16%
MEDIUM INPUT																	
Tobacco, flue-cured	**1,500**	**1.68**	**2,520**	**1,201.3**	**87.8**	**1,289.1**	**1,318.7**	**1,230.9**	**1.10**	**0.95**	**445**	**150**	**295**	**2.96**	**-63%**	**-58%**	**-51%**
Tobacco, burley	**1,300**	**0.98**	**1,274**	**651.6**	**51.2**	**702.8**	**622.4**	**571.2**	**0.96**	**0.81**	**360**	**150**	**210**	**1.73**	**-57%**	**-52%**	**-47%**
Maize	2,550	0.10	267	188.6	15.2	203.8	78.5	63.3	0.42	0.31	95	95	-	0.83	-35%	-28%	-24%
HIGH INPUT																	
Tobacco, flue-cured	**1,800**	**1.72**	**3,096**	**1,426.2**	**87.8**	**1,514.0**	**1,669.8**	**1,582.0**	**1.17**	**1.04**	**480**	**150**	**330**	**3.48**	**-64%**	**-61%**	**-54%**
Paprika	1,800	1.18	2,127	784.4	87.8	872.2	1,342.9	1,255.1	1.71	1.44	300	150	150	4.48	-68%	-63%	-59%
Coffee (USD 2,000mt)	800	2.00	1,600	540.4	26.6	567.0	1,059.6	1,033.0	1.96	1.82	310	150	160	3.42	-69%	-67%	-65%
Coffee (USD 1,500mt)	800	1.50	1,200	540.4	26.6	567.0	659.6	633.0	1.22	1.12	310	150	160	2.13	-58%	-56%	-53%
Tobacco, burley	**1,500**	**1.02**	**1,530**	**943.3**	**51.2**	**994.5**	**586.7**	**535.5**	**0.62**	**0.54**	**390**	**150**	**240**	**1.50**	**-44%**	**-41%**	**-37%**
Coffee (USD 1,360mt)	800	1.36	1,088	540.4	26.6	567.0	547.6	521.0	1.01	0.92	310	150	160	1.77	-53%	-51%	-48%
Cotton	1,500	0.38	573	279.7	15.2	294.9	293.6	278.4	1.05	0.94	170	120	50	1.73	-55%	-52%	-49%
Groundnuts	1,100	0.30	333	141.5	15.2	156.7	191.5	176.3	1.35	1.12	120	120	-	1.60	-62%	-57%	-54%
Soybeans	1,300	0.21	277	137.9	15.2	153.1	138.7	123.5	1.01	0.81	70	70	-	1.98	-55%	-49%	-45%
Maize	3,900	0.10	408	294.7	15.2	309.9	113.7	98.5	0.39	0.32	125	100	25	0.91	-33%	-29%	-24%

SOURCE: Keyser (14).

Appendix 4: Malawi Financial Indicators for Tobacco and Other Crops

MALAWI: Per Hectare Financial Indicators for Smallholder Farmers

1995-96 data sorted by management level and ranked by net profit.

					Production Costs (USD/ha)			Farmer Income (USD/ha)				Labour		
Activity	**Region**	**Yield (kg/ha)**	**Farm Gate Price (USD/kg)**	**Gross Revenue (USD/ha)**	Total variable costs	Annual investment cost	Total costs (excl family labor)	Gross profit (gr revenue - var costs)	Net profit (gr revenue - total cost)	Return to var costs	Return to total costs	Total labor (days/ha)	Net profit per day total labor (USD/ha)	Pct Chg in Yield & Price to Gross Margin = 0
LOW INPUT														
Tomato	North	48,000	0.16	7,843.1	500.0	-	500.0	7,343.1	7,343.1	14.69	14.69	788	9.32	-94%
Dairy	South	5,840	0.32	1,889.4	1,002.8	158	1,161.3	886.6	728.1	0.88	0.63	970	0.75	-47%
Burley Tobacco	**North**	**650**	**1.62**	**1,052.7**	**453.5**	**13**	**466.6**	**599.2**	**586.2**	**1.32**	**1.26**	**245**	**2.39**	**-60%**
Paprika	Central	800	1.34	1,071.9	490.7	-	490.7	581.2	581.2	1.18	1.18	287	2.02	-60%
Burley Tobacco	**Central**	**550**	**1.59**	**874.6**	**423.7**	**13**	**436.7**	**450.9**	**437.9**	**1.06**	**1.00**	**225**	**1.95**	**-54%**
Burley Tobacco	**South**	**600**	**1.45**	**870.2**	**427.7**	**13**	**440.8**	**442.5**	**429.4**	**1.03**	**0.97**	**235**	**1.83**	**-54%**
Burley Tobacco (IB/Auction)	**North**	**650**	**0.98**	**637.7**	**301.5**	**13**	**314.6**	**336.2**	**323.1**	**1.11**	**1.03**	**245**	**1.32**	**-53%**
Burley Tobacco (IB/Auction)	**Central**	**550**	**1.10**	**605.7**	**293.0**	**13**	**306.1**	**312.7**	**299.6**	**1.07**	**0.98**	**225**	**1.33**	**-52%**
Burley Tobacco (IB/Auction)	**South**	**600**	**0.92**	**551.4**	**297.3**	**13**	**310.3**	**254.1**	**241.0**	**0.85**	**0.78**	**235**	**1.03**	**-46%**
IET Rice (irrig)	Central	3,000	0.16	490.2	283.1	-	283.1	207.1	207.1	0.73	0.73	185	1.12	-42%
Burley Tobacco (IB)	**North**	**650**	**0.78**	**509.8**	**301.5**	**13**	**314.6**	**208.3**	**195.2**	**0.69**	**0.62**	**245**	**0.80**	**-41%**
Cassava	Central	2,500	0.08	212.4	54.3	-	54.3	158.1	158.1	2.91	2.91	109	1.45	-74%
G'Nuts - Chalimbana	Central	400	0.56	222.2	86.6	-	86.6	135.6	135.6	1.57	1.57	107	1.27	-61%
Coffee	North	1,000	0.20	196.1	59.8	12	71.4	136.3	124.7	2.28	1.75	130	0.96	-70%
Faya Rice (irrig)	Central	1,500	0.23	338.2	214.4	-	214.4	123.9	123.9	0.58	0.58	168	0.74	-37%
Burley Tobacco (IB)	**Central**	**550**	**0.72**	**395.4**	**293.0**	**13**	**306.1**	**102.4**	**89.3**	**0.35**	**0.29**	**225**	**0.40**	**-26%**
Burley Tobacco (IB)	**South**	**600**	**0.65**	**392.2**	**297.3**	**13**	**310.3**	**94.9**	**81.8**	**0.32**	**0.26**	**235**	**0.35**	**-24%**
Faya Rice (rain-fed)	Central	800	0.21	169.9	103.3	-	103.3	66.6	66.6	0.64	0.64	109	0.61	-39%
Beans/L-Mz	Central	930	0.13	123.6	64.6	-	64.6	58.9	58.9	0.91	0.91	85	0.69	-48%
G'Nuts - oil expressing	Central	400	0.29	117.6	63.8	-	63.8	53.9	53.9	0.85	0.85	107	0.50	-46%
Cotton	Central	350	0.33	114.4	72.9	-	72.9	41.5	41.5	0.57	0.57	96	0.43	-36%
Local maize	Central	800	0.09	70.6	37.8	-	37.8	32.8	32.8	0.87	0.87	74	0.44	-46%
Pigeon Pea/L-Mz	South	750	0.10	75.1	43.2	-	43.2	32.0	32.0	0.74	0.74	83	0.39	-43%
Hybrid maize	Central	1,300	0.09	114.7	88.5	-	88.5	26.2	26.2	0.30	0.30	88	0.30	-23%
Sunflower	Central	400	0.12	47.1	28.3	-	28.3	18.8	18.8	0.66	0.66	59	0.32	-40%
Local Sorghum	Central	450	0.11	51.5	40.1	-	40.1	11.4	11.4	0.28	0.28	95	0.12	-22%
Local maize	South	500	0.08	39.2	36.4	-	36.4	2.8	2.8	0.08	0.08	70	0.04	-7%
Hybrid maize	South	1,000	0.08	78.4	87.2	-	87.2	(8.8)	(8.8)	(0.10)	(0.10)	85	(0.10)	11%
Soybean	Central	450	0.16	73.5	95.9	-	95.9	(22.3)	(22.3)	(0.23)	(0.23)	64	(0.35)	30%
Tea	South	3,000	0.08	235.3	274.1	-	274.1	(38.8)	(38.8)	(0.14)	(0.14)	372	(0.10)	16%
HIGH INPUT														
Tomato	North	80,000	0.16	13,071.9	3,172.8	-	3,172.8	9,899.1	9,899.1	3.12	3.12	960	10.31	-76%
Burley Tobacco	**North**	**1,400**	**1.75**	**2,450.5**	**1,279.5**	**20**	**1,299.1**	**1,171.0**	**1,151.4**	**0.92**	**0.89**	**428**	**2.69**	**-50%**
Burley Tobacco	**Central**	**1,300**	**1.72**	**2,236.3**	**1,236.1**	**20**	**1,255.7**	**1,000.2**	**980.6**	**0.81**	**0.78**	**408**	**2.40**	**-47%**
Burley Tobacco	**South**	**1,350**	**1.58**	**2,132.6**	**1,247.6**	**20**	**1,267.2**	**885.0**	**865.4**	**0.71**	**0.68**	**418**	**2.07**	**-44%**
Coffee	North	6,000	0.20	1,176.5	440.0	12	451.6	736.4	724.9	1.67	1.61	450	1.61	-63%
Cotton	Central	1,000	0.33	326.8	166.2	-	166.2	160.6	160.6	0.97	0.97	187	0.86	-49%
Tea	South	5,800	0.08	454.9	357.3	-	357.3	97.6	97.6	0.27	0.27	443	0.22	-21%
Beans/H-Mz	Central	2,320	0.12	278.2	182.1	-	182.1	96.1	96.1	0.53	0.53	123	0.78	-35%
Soybean	Central	1,100	0.16	179.7	103.6	-	103.6	76.1	76.1	0.73	0.73	78	0.98	-42%
Sunflower (hybrid)	Central	1,200	0.12	141.2	99.9	-	99.9	41.3	41.3	0.41	0.41	83	0.50	-29%
Pigeon Pea/H-Mz	South	2,000	0.09	181.4	154.7	-	154.7	26.8	26.8	0.17	0.17	115	0.23	-15%
Hybrid maize	Central	3,100	0.09	273.5	250.9	-	250.9	22.6	22.6	0.09	0.09	127	0.18	-8%
Local maize	Central	1,300	0.09	114.7	97.0	-	97.0	17.7	17.7	0.18	0.18	92	0.19	-15%
Local maize	South	1,000	0.08	78.4	95.6	-	95.6	(17.2)	(17.2)	(0.18)	(0.18)	88	(0.20)	22%
Hybrid maize	South	2,800	0.08	219.6	247.5	-	247.5	(27.9)	(27.9)	(0.11)	(0.11)	119	(0.23)	13%

SOURCE: Keyser (18)

Appendix 4: Malawi Financial Indicators for Tobacco and Other Crops

MALAWI: Per Hectare Financial Indicators for Estates

1995-96 data sorted by farm size and ranked by net profit.

						Production Costs (USD/ha)			Farmer Income (USD/ha)				Labor		
Activity	**Production Level**	**Region**	**Yield (kg/ha)**	**Farm gate Price (USD/kg)**	**Gross Revenue (USD/ha)**	Total variable costs	Annual investment cost	Total costs (excl family labor)	Gross profit (gr revenue - var costs)	Net profit (gr revenue - total cost)	Return to var costs	Return to total costs	Total labor (days/ha)	Net profit per day total labor (USD/ha)	Pct Chg in Yield & Price to Gross Margin = 0
LARGE ESTATE															
Clonal Tea	Direct	South	2,888	1.10	3,177	2,558	(13)	2,544	619.0	632	0.24	0.25	424	1.49	-38%
Sugar (SUCOMA)	Direct	Central	92,851	0.04	3,423	3,001	-	3,001	421.4	421	0.14	0.14	315	1.34	-27%
Flue Tobacco	**Direct**	**Central**	**1,647**	**2.40**	**3,950**	**2,911**	**633**	**3,545**	**1,038.6**	**405**	**0.36**	**0.11**	**421**	**0.96**	**-38%**
Paprika	Direct	Central	1,387	1.88	2,610	1,816	401	2,217	794.0	393	0.44	0.18	326	1.21	-43%
Coffee	Direct	South	2,714	2.00	5,427	4,203	842	5,046	1,223.9	382	0.29	0.08	700	0.55	-30%
Macademia Nuts	Direct	South	975	1.25	1,219	776	89	865	442.8	354	0.57	0.41	223	1.59	-56%
Sugar (DWANGWA)	Direct	South	92,840	0.04	3,289	3,002	-	3,002	287.2	287	0.10	0.10	281	1.02	-22%
Burley Tobacco	**Direct**	**Central**	**1,672**	**1.85**	**3,092**	**2,467**	**467**	**2,934**	**625.3**	**158**	**0.25**	**0.05**	**471**	**0.34**	**-27%**
Burley Tobacco	**Tenant**	**Central**	**1,385**	**1.69**	**2,340**	**1,743**	**467**	**2,210**	**597.0**	**130**	**0.34**	**0.06**	**384**	**0.34**	**-71%**
Burley Tobacco	**Direct (5% loss)**	**Central**	**1,726**	**1.85**	**3,192**	**2,633**	**467**	**3,100**	**558.7**	**92**	**0.21**	**0.03**	**471**	**0.19**	**-23%**
Burley Tobacco	**Tenant (15% loss)**	**Central**	**1,450**	**1.69**	**2,451**	**1,928**	**467**	**2,395**	**523.1**	**56**	**0.27**	**0.02**	**384**	**0.15**	**-65%**
Hybrid maize	Direct	Central	6,728	0.13	879	721	309	1,030	158.7	(151)	0.22	(0.15)	66	(2.28)	10%
Indian Tea	Direct	South	2,294	0.86	1,980	1,812	337	2,150	168.1	(169)	0.09	(0.08)	304	(0.56)	5%
MEDIUM ESTATE															
Burley Tobacco	**Improved Tenant**	**Central**	**1,235**	**1.69**	**2,088**	**1,658**	**244**	**1,902**	**429.5**	**186**	**0.26**	**0.10**	**384**	**0.48**	**-68%**
Burley Tobacco	**Impv Tenant (15% loss)**	**Central**	**1,303**	**1.69**	**2,202**	**1,849**	**244**	**2,093**	**353.4**	**109**	**0.19**	**0.05**	**384**	**0.28**	**-60%**
Burley Tobacco	**Avg. Tenant**	**Central**	**1,096**	**1.55**	**1,699**	**1,348**	**244**	**1,592**	**351.2**	**107**	**0.26**	**0.07**	**444**	**0.24**	**-63%**
Burley Tobacco	**Avg Tenant (15% loss)**	**Central**	**1,154**	**1.55**	**1,788**	**1,497**	**244**	**1,741**	**291.4**	**47**	**0.19**	**0.03**	**444**	**0.11**	**-55%**
Hybrid maize	Tenant	Central	4,014	0.13	525	401	221	622	124.0	(97)	0.31	(0.16)	104	(0.93)	27%
Hybrid maize	Tenant	Central	4,014	0.13	525	401	221	622	124.0	(97)	0.31	(0.16)	104	(0.93)	27%
Hybrid maize	Tenant (15% loss)	Central	4,080	0.13	533	415	221	636	118.3	(103)	0.29	(0.16)	104	(0.99)	55%
Paprika	Tenant	Central	1,123	1.50	1,688	1,332	178	1,510	355.4	178	0.27	0.12	279	0.64	-62%
SMALL ESTATE															
Burley Tobacco	**Tenant**	**Central**	**1,119**	**1.60**	**1,790**	**1,540**	**57**	**1,597**	**250.4**	**193**	**0.16**	**0.12**	**456**	**0.42**	**-64%**
Burley Tobacco	**Tenant (15% loss)**	**Central**	**1,183**	**1.60**	**1,893**	**1,711**	**57**	**1,769**	**181.7**	**125**	**0.11**	**0.07**	**456**	**0.27**	**-54%**
Soybean	Tenant	Central	1,010	0.16	165	143	23	166	21.8	(1)	0.15	(0.01)	114	(0.01)	-46%
Soybean	Tenant	Central	1,010	0.16	165	143	23	166	21.8	(1)	0.15	(0.01)	114	(0.01)	-46%
Hybrid maize	Tenant	Central	2,845	0.13	372	353	23	376	19.0	(4)	0.05	(0.01)	137	(0.03)	-17%
Hybrid maize	Tenant (15% loss)	Central	2,892	0.13	378	363	23	386	14.9	(8)	0.04	(0.02)	137	(0.06)	-4%
Hybrid maize	Tenant	Central	2,905	0.13	380	366	23	389	13.8	(9)	0.04	(0.02)	137	(0.07)	0%

SOURCE: Keyser (18)