

From Tobacco to Food Production: Assessing Constraints and Transition Strategies in Bangladesh

Submitted by



U B I N I G

(Policy Research for Development Alternative)

In collaboration with
Carleton University, Ottawa, Canada

FINAL TECHNICAL REPORT

August, 2008

IDRC Project Number: 103435 – 001

Project Title: From Tobacco to Food Production: Assessing Constraints and
Transition Strategies in Bangladesh

Country: Bangladesh

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Abstract

Anti-tobacco legislation in Bangladesh establishes the principle of support to tobacco farmers wanting to shift out of tobacco production. How to do so remains a key challenge. No detailed research has been undertaken on the constraints farmers face or practical ways to make the transition to alternative cropping systems. Using participatory and conventional research methods, this project developed a better understanding of the constraints farmers face and promising directions for helping farmers shift out of tobacco into socially and economically sustainable and ecological forms of agriculture following Nayakrishi biodiversity-based farming practices. The findings point to the need for public investment in the rehabilitation of soils degraded by years of tobacco production, urgent action to halt the expansion of tobacco into new and fragile environments, the critical role of farmer-based seed systems in facilitating a transition out of tobacco cultivation, and the need for public investment in marketing infrastructure for food and other economic products. By the end of the project, more than 350 participating farmers had made a permanent shift out of tobacco production and local capacities were established to support ongoing experimentation with new cropping systems. In addition, the project helped raise awareness among government departments and non-governmental organizations of policy-relevant findings from the research.

Keywords: Tobacco, Transition Strategies, Bangladesh, Community-based Research, SAS2, Ecological Agriculture, Deforestation, Soil Degradation, Farmer-based Seed Systems

Contents

ABSTRACT	2
RESEARCH OBJECTIVES	6
RESEARCH METHODS AND ACTIVITIES	7
PROJECT OUTPUTS AND OUTCOMES	9
Policy-relevant Research Findings	9
Displacement of agriculture	9
Deforestation	9
Mining of soils and forests	10
Long-term land and water degradation	11
Transition Strategies, Not Substitution Strategies	11
The Decline of Seed Systems and Diversified Markets	12
The Debt Trap	13
Factors affecting Economic Performance.....	13
Water Management	14
Adoption and Capacity Building	15
Adoption of Viable Transition Strategies.....	15
Establishment of independent research capabilities	15
Gender Impacts	16
OVERALL ASSESSMENT AND RECOMMENDATIONS.....	17
REFERENCES	19

The Research Problem

The Government of Bangladesh acted in 2005 on its obligations under the World Health Organization Framework Convention on Tobacco Control (WHO-FCTC) by establishing the 'Smoking and Tobacco Product Usage (Control) Bill, 2005'. The Bill focuses on discouraging tobacco consumption in public places and restricts the promotion and advertising of tobacco products. It also establishes a program offering subsidies for tobacco farmers to shift to other crops and limits the entry of new tobacco companies into Bangladesh (BATA, 2005).

The impetus for the bill came from national social movements raising awareness about the impacts of the tobacco epidemic (Efroymsen and Saifuddin, 2005). As early as the 1970s the Gonoshasthaya Kendra (People's Health Centre) launched discussions in Bangladesh about the health impacts of tobacco consumption. It also argued that it would be impossible to curb tobacco use and tobacco production so long as economic policies allowed foreign investment in activities with known health and environmental hazards. More recently, urban groups and campaigners against tobacco consumption triggered national debates on the issue and pressed for speedy implementation of the WHO-FCTC (Ajker Kagoj, 2005; Bangladesh Today, 2005; Daily Ittefaq, 2005; Islam, N, 2005; Efroymsen and Saifuddin, 2005).

Research on tobacco control in Bangladesh has focused mainly on consumption patterns and the cost of tobacco-related illnesses (Efroymsen, 2000; Yunus, 2001; Efroymsen et al., 2001; WHO, 2005b). Several studies have also questioned the profitability of tobacco production for farmers, and noted that many tobacco farmers are interested in shifting to other crops (Deb and Sujon, 2003; Naher and Chowdhury, 2003). No detailed research has been undertaken, however, on the constraints farmers face or practical ways to make the transition to alternative cropping systems. While the Tobacco Bill establishes the principle of support for tobacco farmers wanting to shift out of tobacco cultivation, how to do so remains a key challenge. In particular,

- There is a need to develop a **tobacco transition strategy** comprised of appropriate plant species, plant varieties and farming practices that can restore soil health in areas degraded by tobacco production. To be successful, the strategy will need to be situated in the broader context of mobilising

farmers to shift from conventional chemical-based monocropping towards practices that are ecological, biodiversity-based, and socially and economically sustainable, exemplified by farming movements such as the Nayakrishi Andolon.

- There is a need to develop production systems and rural institutions that enhance the **capacity** of farming households **to participate in the market**. As tobacco is essentially a 'cash crop' and consequently a key element in the livelihood of tobacco farmers, transition strategies must find ways of replacing tobacco without bringing severe economic hardship on farmers and their communities.
- There is a need for a range of policies capable of confronting the legacy of **dependency** and **environmental degradation** created by the tobacco industry. Tobacco companies, tobacco traders and money lenders have developed an integrated system of loans, supply of inputs and purchase of product that tightly ties large, middle and small farmers to the tobacco production cycle. Land tenure, water management and forestry are also affected by the practices of the tobacco industry.

The project undertook original research on these problems in tobacco farming communities in three regions of Bangladesh.

Research Objectives

The overall research objectives of the project specified in the Memorandum of Understanding were to:

- Assess the economic performance of tobacco production;
- Identify significant constraints faced by tobacco farmers trying to shift out of tobacco production and;
- Develop viable transition strategies.

The specific objectives were to collect detailed information on the impact of tobacco production on natural resources in the study areas, develop criteria and indicators relevant to farmers and economists regarding the economic performance of tobacco in relation to alternative cropping systems, identify key social and institutional constraints faced by farmers trying to shift out of tobacco production, provide training to farmers in transition, and engage with policy makers and activists fighting for a tobacco-free Bangladesh.

The project achieved these research objectives to a significant extent (80%). More time and resources were needed to complete research on the impacts of tobacco production with respect to livestock, water and aquatic resources, to consolidate analysis of the economic performance of alternatives over the medium term, and to formulate more detailed policy-relevant recommendations. A second phase would seek to address these and other research objectives emerging from this phase of the project.

Research Methods and Activities

The research involved a sustained and systematic process of data collection and stakeholder engagement, between May, 2006 and June, 2008. Research was undertaken in Kushtia, one of two major tobacco-growing regions in Bangladesh (along with Rangpur), and in Cox's Bazaar and Bandarban in the Chittigong Hill Tracts region of southern Bangladesh where tobacco production has expanded in recent years. In the first year 8 villages were engaged directly in the research, increasing in the second year to 17 villages and more than 350 farming households (Table 1).

The research design and methods drew on SAS² (Social Analysis Systems), an action-research methodology developed by Jacques Chevalier and Daniel Buckles at Carleton University (www.sas2.net). This involved numerous collaborative inquiries into questions of interest to farmers and the research team including the problems of tobacco production, the reasons why farmers continue to grow tobacco, the economic performance of tobacco compared to other crops, and the kinds of strategies needed to address technical, economic and institutional constraints. The assessments were organized in a way that allowed farmer participants to identify various aspects of the problem in their own words, and weigh the pros and cons of proposed actions. They reflected on what they had done in the past to shift out of tobacco and why these responses failed. They also identified new actions and organized themselves to act on decisions they made. The data and analysis was often segregated by gender, to ensure appropriate participation by women.

SAS²-based collaborative inquiry was combined with research based on conventional social and agricultural science research methods. Activities included the collection of government records, review of published information on tobacco issues in Bangladesh and interviews with government officials, representatives from tobacco companies, village leaders, and other stakeholders. Crop calendars were developed with and by farmers in every village, and more than 100 agricultural field experiments with alternatives to tobacco designed and implemented over a span of two years in collaboration with tobacco farmers. Seed to support the experiments, and training in the principles and practices of ecological agriculture, was provided by the Nayakrishii Andolon, an ecological farmers movements associated with UBINIG.

A formal survey of the households involved in the experiments and conventional tobacco farmers was conducted each year to assess the comparative economic performance of tobacco and alternatives. Farmers, wage workers and other local stakeholders were also engaged in the development of criteria and indicators for assessing economic performance, and in the identification of key constraints on the proposed transition strategies. An initial review of the health impacts of tobacco was also conducted, including interviews and health checkups by a qualified medical doctor.

The facts and conclusions emerging from these various activities were shared over the course of the project with the farmers, local governments, civil society organizations, and various government agencies responsible for health, agriculture, environment and finance in the country. Dissemination included the publication of reports, the production of videos, the organization of public meetings and several campaigns and rallies associated with No Tobacco Day (May 31) and Environment Day (June 5) celebrations in Bangladesh. Farmers also composed songs and held dramas to disseminate their messages. A paper was presented at the "Second Meeting of the WHO FCTC Study Group on Economically Sustainable Alternatives to Tobacco Growing", held in Mexico City.

Together, these various activities reflect a significant effort to mobilize evidence and engage tobacco farmers in telling their own story, developing their own alternatives and advocating their own interests.

Table 1: Communities Engaged in the Research

District	Upazila	Union	Village	
			Year 1	Year 2
1. Cox'sbazar	1. Chakaria	1. Kakara	1. Maijkakara	1. Maijkakara
			-	2. Lotoni
			-	3. Proper kakara
		2. Surajpur-Manikpur	2. Manikpur	4. Manikpur
			-	5. Uttar para
			-	6. Maddhyam para
2. Bandarban (CHT)	2. Lama	3. Lama Sadar	3. Sabekbilchari	7. Sabekbilchari
			-	8. Line jhiri
			-	9. Sylheti para
			-	10. Chagal khaya
			4. Dardari	11. Dardari
			-	12. Mong su pru para
		4. Rupashi para	-	13. Barua para
			-	
3. Kushtia	3. Daulatpur	5. Rafaetpur	5. Bheramara	
		6. Daulatpur	6. Chuamallik para	
			14. Bheramara	
			15. Chuamallik para	

	4. Mirpur	7. Chatian	7. Chatian	16. Chatian
		8. Fulbaria	8. Kachuadaha	17. Kachuadaha
3 Districts	4 Upazillas	8 Unions	8 Villages	17 Villages

Project Outputs and Outcomes

The main outputs of the project include detailed reports on various specific research questions (see Appendix), more than 350 trained and organized farmers able to experiment in an ongoing way with alternatives to tobacco, and campaign materials (video, photographs, songs, dramas, posters and pamphlets) used during numerous meetings and rallies organized by the project. The specific achievements of the project in terms of policy-relevant research findings, adoption of viable transition strategies by farmers in the study area and capacity building are highlighted below.

Policy-relevant Research Findings

Displacement of agriculture

Tobacco production competes directly with agriculture, and is responsible for displacing food and other economic crops from prime lands in areas where it is introduced. Kushtia, the second largest tobacco-producing district in the country, was at one time a food surplus region with very fertile agricultural lands. Tobacco is now occupying the best lands available in the district, displacing crops such as pulses, sugar cane, jute and vegetables. Tobacco production is increasing in the districts of the Chittagong Hill Tracts, displacing the traditional culture of rice and vegetables (SEMP, 2005; BBS, 2008). This fact challenges the notion that tobacco is simply an agricultural product among many alternative agricultural crops. Tobacco production displaces agriculture, and should be treated by policies as a raw material for a consumer product (cigarettes, bidis) now widely recognized as unnecessary and destructive of human health. Such a perspective would bring together the initiatives of various government ministries concerned with the economic, health, environmental and social development of the country, possibly under the leadership of the Ministry of Planning.

Deforestation

Tobacco is known as a "forest killer" (Suvarna and Thomas, 2003). Geist (1998) found that tobacco growing accounts for over 30% of annual deforestation in

Bangladesh. This places Bangladesh as number three internationally in terms of the severity of tobacco-driven deforestation (Geist, 1998; Deb and Sujon, 2003). Our research shows that at least 15 kg of fuel wood is required to produce 1 kg of cured tobacco leaves (see Appendix). The Chittagong Hill Tracts, home to indigenous populations and an ecologically and politically important watershed (the Mathahmuri River), is currently facing the brunt of the deforestation caused by tobacco production. Our research shows that in one village alone (Dardari) some 99,840 medium sized trees are consumed in a single tobacco season. Most of this fuel comes from illegal logging of government forests. Even in areas such as Kushtia where original forests have already been cleared, the fuel needed to cure the tobacco leaves uses up valuable fuel, fodder and food sources including wood from fruit trees and rice straw that could otherwise be used as cooking fuel and fodder for milking cows.

Mining of soils and forests

Naher and Chowdhury suggest that at the macro level, “tobacco cultivation appears to have reached a plateau and is now gradually dwindling” (2003:22). Our analysis suggests, however, that tobacco production is not dwindling but rather simply shifting from one area to another as it mines the soils and forest resources needed to produce cheaply.

Evidence to support this argument can be seen in two major production shifts of the last 15 years. First, while Rangpur remains the largest producer of tobacco in Bangladesh, it has shifted production from higher quality, kiln dried leaves to the production of lower quality, sun-dried leaves for local bidi factories. This is due to both a decline in the fertility of soils in the district and to the loss of ready sources of fuel wood for tobacco kilns. Ownership of the industry in Rangpur has also shifted from international companies such as the British American Tobacco Company (BATC) to many smaller national companies producing bidi for national markets. The bidi factories account for the largest number of jobs for poor people created by the industry, and where the only source of public opposition to the tobacco bill when it was passed by Parliament (Daily Ittefaq. 2005). Second, the production of higher quality kiln-dried leaf has increased steadily on the fertile banks of the Matamuhuri River in the Chittagong Hill Tracts (Bandarban and Chittagong). During this period, the BATC has shifted its

attention from Rangpur, and to some extent from Kushtia, to this relatively isolated, fertile and heavily forested region, leaving much degraded areas to weaker, national segments of the industry. The policy implication of this analysis is that efforts to break the cycle of mining soils and forests by international tobacco interests should focus first on areas such as the Chittagong Hill Tracts where tobacco production is expanding.

Long-term land and water degradation

Tobacco is grown as a large-scale monocrop. It requires six times more fertilizer per acre than any other crop widely grown in Bangladesh (Naher and Chowdhury, 2003; Sarkar and Haque, 2001). It also depends on heavy applications of herbicides to keep down persistent weeds. Most tobacco fields, especially in Kushtia, are plagued by a persistent weed commonly known as "Mula". The chemicals used to control this weed are toxic, polluting the water, killing fish and destroying the soil organisms needed to maintain soil health. These problems are compounded by a production system that returns nothing to the soil. The plant residue from tobacco (stalks) has virtually no ecological or economic value to farmers: the leftover biomass is not a good manure, it cannot be eaten by animals and provides no value as a fuel. Farmers note the loss of livestock and poultry in their households due to a lack of fodder and feed and the loss of animal manure essential to maintain soil health. These two production factors (heavy application of chemicals and the absence of beneficial plant residues) inevitably lead to long-term soil and water degradation.

The project has determined that lands under tobacco production for many years require concerted efforts to recover soil health, before they can be converted to food and other economic crops. This situation has significant implications for transition strategies and policies that must deal not only with the substitution of tobacco with other plants but also investments in the recovery of lands suffering from long-term degradation.

Transition Strategies, Not Substitution Strategies

Findings regarding the impact of tobacco production on soil health, combined with a participatory analysis of agricultural systems, contributed to a reorientation of project thinking regarding what might comprise a viable transition strategy. What emerged was

a focus on beginning the transition out of tobacco in the season **before** tobacco is grown, rather than simply substituting tobacco with another monocrop. This allows for gradual and steady improvements in soil quality, a better stream of financial benefits throughout the year, and a more holistic approach to the development of sustainable and economically viable agricultural systems. A policy implication of this finding is that subsidies to support the transition out of tobacco production need to begin with access to resources during the pre-tobacco transition period (June to November). Efforts that focus exclusively on crops to substitute for tobacco during the tobacco season will not be able to address the severe soil problems encountered in tobacco fields or provide the stream of financial benefits needed to replace income from tobacco. Our research also indicates that transition strategies should be situated in the broader context of mobilising farmers to shift from conventional chemical-based monocropping towards practices that are ecological, biodiversity-based, and socially and economically sustainable. In the Bangladesh context, these improved practices are exemplified by ecological farming movements such as the Nayakrishi Andolon.

The Decline of Seed Systems and Diversified Markets

Farmers trying to shift out of tobacco production are constrained by specific changes in agricultural infrastructure. In Kushtia, many years of tobacco production combined with broader changes in the agricultural systems of the region (especially the development of commercial monocrops) have dramatically narrowed the base of plant genetic resources available to farmers. Access to appropriate seed for alternative cropping systems is highly constrained, and farmer-based seed systems have virtually disappeared. In Cox's Bazaar and Bandarban, traditional seed systems are more robust but they too suffer from a limited range of species and varieties. In all three regions tobacco production has led to the development of a closed market system controlled and managed by the buyers, particularly the large companies such as BATC. This has had a dampening effect on the ongoing development other local and regional markets. Our research suggests that in specific localities where tobacco is dominant other markets wither as buyers of vegetables, jute, rice and other economic crops go elsewhere for their supply. Poor access to diverse plant genetic resources (seed) and the decline of local markets are consequently significant constraints on the transition to

other cropping systems. Policies that seek to support the transition out of tobacco production will need to invest in developing farmer-based seed systems and market infrastructure if they are to create enabling conditions for farmers willing and able to shift to other crops.

The Debt Trap

An increasing number of tobacco farmers say they want to stop growing tobacco but feel they can't. They believe they are trapped because they are indebted to the tobacco companies and money-lenders through loans for inputs and advances on income. Farmers in this contractual relationship are known as "card holders" because of the card issued to them by the BATC when signing a contract.

The relationship of indebtedness among card holders is typically reinforced by intermediaries in leasing arrangements between landowners and tenant farmers. Intermediaries lease-in land from owners for extended periods of time and lease-out land and agricultural inputs to land-poor farmers. Many intermediaries are also card holders that sell agricultural inputs and buy tobacco products from smaller farmers for resale to the BATC. This set of relationships ties small, medium and large farmers together in direct and indirect contracts with tobacco companies. The contracts in turn severely limit the extent to which farmers at any scale can make independent land-use decisions or negotiate on prices for inputs and products. Social tensions and conflicts due to this dependency are particularly severe in indigenous communities where land use decisions have traditionally been made collectively through community leaders. Further research is needed to determine how to break the cycle of indebtedness and mobilize the leadership potential of card holders and leaders in indigenous communities. It seems likely that strong sanctions against tobacco production at the national level will be needed to provide a counterbalance to the interests of local actors in the tobacco industry.

Factors affecting Economic Performance

A comprehensive survey of costs and benefits associated with the crop combinations, and comparisons with tobacco systems, showed that labor costs (including household labor) are on average 37% lower than for tobacco production.

Overall, the cost-benefit analysis showed that all crop combinations are more profitable than tobacco in terms of returns to labor and similar in terms of returns to land. This is particularly important to farmers with little capital to invest and younger families with few household members to draw on for field tasks and curing of tobacco.

These findings are consistent with economic assessments of tobacco production undertaken by other researchers, particularly with respect to the use of and tendency to under value household labor (Panchamukhi, 2000; Suvarna and Thomas, 2003; Naher and Chowdhury, 2003). Our research adds to these prior findings a more nuanced and policy-relevant understanding of the factors affecting economic performance. Assessment of economic performance using criteria and indicators developed by farmers, shows that the alternative crop combinations perform very well on four criteria considered important by farmers (food stock, market potential, providing for multiple uses, and labor). Access to seed and the management of soil fertility, other important criteria, remain challenges for farmers that would otherwise receive these inputs from tobacco buyers and traders. This points to the importance of strong local seed systems to the transition and to the long term nature of efforts needed to improve soils damaged by tobacco production. Both are key factors affecting economic performance, and should be considered in any policy development aimed at facilitating the transition out of tobacco production.

Water Management

Another factor affecting the economic performance of alternative strategies that emerged late in the study is that there is a conflict of interests over the use of water during the Rabi (winter) season between tobacco producers and farmers growing food and other economic crops. Both systems require water, but the strategies for managing water are at odds. Tobacco production requires frequent irrigation for 4 hours at a time, compared to shorter and discontinuous periods needed for Boro rice (1-2 hours) and vegetables (1 hour). The appetite of tobacco production for large amounts of water has led to the diversion of surface water from rivers into large storage areas for irrigation. This dries up the rivers and is costly compared to the more decentralized management of ditches, canals and ponds that can be used to irrigate less demanding plants. This dynamic has led to corruption and conflict involving the government managers in charge

of water schemes and is particularly worrisome in the Chittagong Hill Tracts region where tobacco production is severely affecting the health of the Matamuhuri River.

Adoption and Capacity Building

Adoption of Viable Transition Strategies

Farmers were engaged intensively in development, testing and assessment of various specific transition strategies. As a result of this process, some 351 farmers in the unions and villages where the project was active have now successfully shifted from tobacco into alternative systems of production (Table 2). This represents about 22% of the tobacco farmers in the study communities. During this same period the area under tobacco production declined by 141 acres, and significant quantities of food stuffs were produced in place of tobacco. All farmers participating in the process in year one continued their efforts to shift out of tobacco in year two, suggesting that adoption rates are stable.

Table 2. Farmer shifts out of tobacco production in three districts

Changes	Cox'sbazar	Bandarban	Kushtia	Total
Number of tobacco farmers that shifted out of tobacco production	77	61	213	351
Decline in area under tobacco production	26.78 acre.	21.22 acre	93.73 acre.	141.73 acre
Quantity of food produced through the alternative systems of production	Potato = 126.66mt French Bean = 10.05mt Felon = 6.42mt	Potato = 100.34mt French Bean = 7.96mt Felon = 5.08mt	Potato = 105.26mt Maize = 33.32mt Wheat = 13.05mt Garlic = 13.98mt Lentil = 7.79mt Rice = 58.39mt Grass pea = 0.36mt	Potato = 332.26mt French Bean = 7.96mt Felon = 5.08mt Maize = 33.32mt Wheat = 13.05mt Garlic = 13.98mt Lentil = 7.79mt Rice = 58.39mt Grass pea = 0.36mt

Establishment of independent research capabilities

The participatory approach to agricultural research adopted by the project left in place enhanced capacities among farmers to continue to explore options independently and do full-cost accounting when reviewing economic performance. It also cemented the relationship between farmers in tobacco areas and the broader farmers-movement Nayakhrishi Andolon. These enhanced skills and relationships are now actively shared with other farmers, providing for a scaling-up effect not only for specific transition strategies but also the capacity to experiment and share learning on an ongoing basis.

For example, ten farmers in two unions where the project is active established nurseries of their own to raise seedlings of trees for timber, fruit and medicines. These farmers have raised 50,000 saplings so far, thereby providing access to important homestead forestry resources in support of the transition out of tobacco. Farmer seed exchanges across districts and the establishment of village seed huts have provided farmers in the study areas with access to plant species and markets needed to support ongoing experimentation with alternatives to tobacco.

Gender Impacts

The fifty-five training events organized by the project engaged a significant number of women in the project process, thereby ensuring that gender perspectives were explored and taken into consideration at all stages of the project (Table 3). For example, women’s engagement was very critical when establishing seed huts in the tobacco research villages, and provided a space for women to discuss their priorities and plan future activities. The seed huts also underlined for men the importance of women’s seed knowledge and its strategic contribution to the transition out of tobacco production, thereby enhancing the status of women in their own households and communities. The shift from tobacco production to alternative systems achieved by 351 households in the study areas has also meant that women have been freed from exposure to smoke and other health risks associated with curing of tobacco leaves.

Table 3. Participation of men and women in research, field experiments, evaluation dissemination and rallies in three districts¹

Activities	Cox’sbazar		Bandarban		Kushtia		Total		%	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Farmer Researchers	2	2	2	2	4	4	8	8	50	50
Experiment Group	49	28	42	19	138	75	229	122	65	35
Imagination Group	39	28	40	19	85	65	164	112	59	41
Dissemination Meetings	42	16	23	7	87	35	152	58	72	28
Rallies	450	300	120	40	590	370	1160	710	62	38

¹ The Experiment Group was comprised of farmers actively engaged in field experiments. The Imagination Group was comprised of farmers, wage workers, and other community members affected by tobacco production engaged in planning and evaluation of field experiments from their various perspectives.

Overall Assessment and Recommendations

The project generated policy-relevant findings vital to the broader challenge of creating and implementing policies and programs to stop the production of tobacco and tobacco products in Bangladesh. Significant constraints faced by farmers trying to shift out of tobacco production were identified, the economic performance of tobacco production and alternatives assessed and viable transition strategies developed. Other concrete outcomes include farmer adoption of transition strategies in the study areas, and the development of capacities for ongoing, independent experimentation sensitive to gender perspectives. We can confidently conclude that there is now much more optimism about the possibility of shifting out of tobacco production among farmers in the study areas. This is an encouraging situation. Considering the short duration of the project (24 months), floods during the first year that disrupted field experiments, and difficulties created by political instability throughout the study period, it is our view that the project has been worth the investment of time, effort and funding. The contribution of Canadian partners to the development of field methods has also been very useful.

Many questions remain, however. Tobacco production in Bangladesh continues as tobacco companies intensify their efforts to allure farmers and extend their influence into fragile regions such as the Chittagong Hill Tracts. Urgent action is needed to block the destructive pattern of mining soil and forest resources and address the constraints farmers face when trying to shift out of tobacco production. While some actions are within the control of farmers, others require collective action and policy support either at the community or national level. Government and non-governmental organizations involved in the fight against the tobacco industry must be engaged.

To support this process we recommend IDRC fund a second phase of the project to address the following questions. First, the technical and economic feasibility of promising crop combinations needs to be confirmed before significant investments are considered by farmers and governments promoting widespread adoption. As noted by farmers, questions of access to seed and strategies to improve degraded soils with the selected crops remain challenges. Greater diversity in the cropping systems is also needed to ensure multiple uses and markets for outputs, links to livestock production and a steady flow of income. Further agricultural research in the current study villages

and in other community settings is needed to strengthen the alternatives, enhance the level of evidence underlying the results and broaden scientific consensus around the way ahead. Given the seasonal nature of farming, technically sound recommendations appropriate to farming communities require careful assessment over multiple years, to reduce the risk of errors that could be catastrophic for farmers and policy makers alike.

Second, while the occupational health impacts of growing tobacco are experienced directly by farmers and their families, documentation of these impacts is needed to bolster resolve in the face of the tobacco lobby. Framing the transition as an occupational health issue would greatly enhance public support for government action.

Third, research on tobacco production in Bangladesh should be combined with a broader strategy to engage government and non-governmental organizations involved in the fight against the tobacco industry in debate and advocacy of specific policy and program initiatives. Dissemination strategies are needed at two levels. On the one hand, appropriate messages and guidelines are needed to help farmers through the complex process of deciding what crops to grow, how to grow them and what benefits and costs they can expect. As different farmers in different regions have different kinds of resources, constraints and cultural perspectives (labor, land, capital, knowledge, land tenure systems, etc), dissemination strategies also need to be adjusted to address their collective and individual concerns. On the other hand, a communication strategy and related educational materials are needed to support a process of policy formulation involving the general public, scientists, government officials and civil society organizations. While the research project identified a number of policy-relevant findings, further efforts are needed to take these recommendations into the policy arena.

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