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# India

## Revitalizing Punjab's Agriculture

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The World Bank



## Currency

Currency Unit = Indian Rupee (Rs.)  
US\$ 1 = Rs. 46.1

## Years

Fiscal Year : April 1–March 31  
Agricultural Year: July 1 – June 30  
Marketing Year: October 1-September 30 for *kharif* crops; April 1- March 31 for *rabi* crops

## Unit Measurements

ha: hectare  
qtl: quintal (100 kg)

kg: kilogram  
hp: horse power

kwh: kilo watt hour  
mmt: million metric tons

|                   |                   |
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## INDIA

## REVITALIZING PUNJAB'S AGRICULTURE

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## Acronyms

|       |  |
|-------|--|
| APMC  | Agricultural Produce Markets Committee         |
| ATMA  | Agriculture Technology Management Agency       |
| CACP  | Commission for Agriculture Costs and Prices    |
| CF    | Contract Farming                               |
| CMIE  | Centre for Monitoring Indian Economy           |
| COC   | Cost of Cultivation                            |
| CPIAL | Consumer Price Index for Agricultural Labor    |
| CSO   | Central Statistical Organization               |
| DES   | Department of Economics and Sociology          |
| EB    | Enterprise Budget                              |
| ECA   | Essential Commodities Act                      |
| ESO   | Economic and Statistical Organization          |
| FCI   | Food Corporation of India                      |
| FHP   | Farm Harvest Price                             |
| FYM   | Farmyard Manure                                |
| GCF   | Gross Capital Formation                        |
| GOI   | Government of India                            |
| GOP   | Government of Punjab                           |
| HSEB  | Haryana State Electricity Board                |
| HYVs  | High Yielding Varieties                        |
| ICAR  | Indian Council of Agricultural Research        |
| ICTs  | Information and Communications Technologies    |
| IFPRI | International Food Policy Research Institute   |
| IPM   | Integrated Pest Management                     |
| KVK   | Krishi Vigyan Kendra                           |
| MSP   | Minimum Support Price                          |
| NATP  | National Agricultural Technology Project       |
| NPC   | Nominal Protection Coefficient                 |
| NSS   | National Sample Survey                         |
| O&M   | Operation and Maintenance                      |
| PAFC  | Punjab Agro Foodgrains Corporation             |
| PAU   | Punjab Agricultural University                 |
| PDS   | Public Distribution System                     |
| PSEB  | Punjab State Electricity Board                 |
| PSERC | Punjab State Electricity Regulatory Commission |
| RDF   | Rural Development Fund                         |
| SDP   | State Domestic Product                         |
| TFP   | Total Factor Productivity                      |
| WTO   | World Trade Organization                       |

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## **Executive Summary**

### **Outcomes**

1. The pioneering role played by Punjab in Indian agriculture is well known. The 'green revolution' technology was ushered into the country in Punjab in the mid-1960s, initially in wheat and subsequently in rice, and the rice-wheat cropping system rapidly came to dominate the state's agriculture. With about 3% of India's net sown area and 1.5% of its farming population, Punjab today produces about 10% of the country's rice and 20% of its wheat. The 1970s and 1980s were the heydays for the state's agriculture as productivity of both crops increased rapidly, farm incomes rose, poverty declined, and the state led the Indian agriculture scene.
2. In the 1990s, however, difficulties emerged. Two sets of outcome indicators confirm this. The first is the pace and composition of agricultural growth. The second is environmental sustainability of current agricultural patterns and practices followed in the state.
3. From 5.0% per annum in the 1980s, agricultural growth in Punjab slowed to 2.6% per annum in the 1990s (the corresponding national average was 3.2% per annum in the 1990s). This deceleration was because of a dramatic slowdown in the crop sector, from 4.8% per annum in the 1980s to 1.3% per annum in the 1990s, as productivity gains in the rice-wheat cropping system slowed. Rice yields did not show any trend growth during the 1990s and wheat yields grew at a more moderate pace than before. Yield growth of cotton, the third most important crop in the state, was negative as a result of severe pest attacks in the late-1990s. Overall, total factor productivity in the crop sector stagnated in the 1990s. The one silver lining was continued strong performance of the livestock sector, which grew at 5.3% per annum in the 1990s, and presently accounts for about one-third of the gross state domestic product (GSDP) from agriculture.
4. Of the main agricultural states, Punjab has the largest proportion of irrigated area, highest cropping intensity, and the most intensive use of chemical fertilizers and pesticides. These input intensive practices have led to a number of adverse environmental impacts, chief among which is the over-exploitation of groundwater resources. Among all Indian states, Punjab now has the highest percentage (98%) of groundwater exploitation (defined as groundwater extracted to annual recharge) in the country. The situation is particularly bad in the fertile central region of the state which covers about half of the state's cropped area, where average groundwater exploitation is 141% and over 80% of blocks are now classified as 'overexploited', that is, extraction is more than recharge. Water quality too has deteriorated as extensive use of nitrogenous fertilizers and pesticides has led to increasing nitrate concentration and accumulation of pesticide residues.
5. Rice cultivation, in particular, because of its stagnant yields, water intensive nature, problems of high agro-chemical use, and pollution caused by burning straw, is a particular culprit in adding to pressures on the state's natural resources. It has been estimated that shifting one million hectares out of the rice-wheat system (of a total net sown area of about 4 million hectares), mainly from the Central region, would balance water use and its replenishment, and this is the scale of diversification the state has set for itself.

### **Policies and Their Consequences**

6. Within the current incentive structure, shifting a million hectares out of the rice-wheat cropping system is easier said than done. Both crops have for long enjoyed GOI price support,

and have also benefited from large subsidies on electric power (for groundwater irrigation), fertilizers, and canal water irrigation. Publicly funded agricultural research, extension, irrigation and marketing services have also tended to focus primarily on this cropping system. The net result is that cultivation of rice in the *kharif* season and wheat in the *rabi* season is generally more profitable, and less risky, than other crops.

7. **Price support.** Presently, more than 90% of market arrivals of rice and wheat in Punjab are procured by the Government of India (GOI) at administratively determined minimum support prices (MSP). Unlike many other states, Punjab enjoys an extensive network of government purchase centers, and farmers in the state are assured of being able to sell their produce at the MSP. From being a 'support price' meant to provide insurance to farmers, substantial increases in MSPs of rice and wheat, particularly from around the mid-1990s, have made it the 'best price' for farmers. Rice and wheat MSPs have increased disproportionate to production costs, international prices, prices received by farmers for rice and wheat in states where government procurement is limited, prices of other crops within Punjab, and general inflation. This divergence of real MSPs from other relevant costs and prices has led to at least three undesirable outcomes. First, it has accentuated incentives for growing rice and wheat, even as other factors like falling water tables and stagnant rice yields, point to a need for diversification. Second, because of relatively low market prices and insufficient offtake from the Public Distribution System, GOI stocks of foodgrains have increased well beyond stated norms with a consequent increase in storage costs and food subsidy (which, at the national level, is now about 0.8% of GDP). Third, the high MSPs have driven the private sector out of the grain trade business in Punjab, where it used to be fairly active when MSPs were not so out of line with market prices.

8. **Input subsidies.** In 2001/02, subsidies on power, fertilizer and canal water averaged about 10.5% of Punjab's agricultural GSDP. The subsidy on fertilizers is financed by GOI, while power and canal water subsidies, equivalent to 6.8% of the agricultural GSDP, are funded by GOP. Benefits of these subsidies have tended to favor rice and wheat more than other crops since both use significant doses of fertilizers and, in addition, rice is also very water intensive. Apart from the fiscal outflow on account of such large subsidies, of particular concern is the design of the power subsidy, which does not provide any incentive for water conservation in a water deficit state. Power for agricultural pumpsets is charged not according to actual consumption but on a 'flat rate' basis – currently Rs. 60/hp/month. In practice, this method of charging means that once the user pays the charges due as per pumpset capacity, the marginal cost of electric power is zero, and hence there is no incentive for energy, and by implication groundwater, conservation.

9. The benefits of input subsidies are also skewed towards larger farmers. Small and marginal farmers constitute 36% of the farmers in the state and cultivate 9% of the land, but they receive only 6% of the power subsidy, 7% of the fertilizer subsidy and 5% of the canal water subsidy. Although not unexpected, since these subsidies are universal and not targeted by design, this result is a serious indictment of the subsidy regime. Politically, continuation of these subsidies is often justified on the inability of small and marginal farmers to pay higher user charges, but it is really the larger farmers who are obtaining most of the benefits.

10. **Other public expenditures.** Apart from subsidies, during the triennium ending 2000/01, GOP also spent 1.9% of agriculture GSDP on capital formation and 2.7% of agriculture GSDP on current expenditures in the sector. Compared to other states, both of these expenditure levels are low, particularly the latter which are, by far, the lowest in the country. The low level of capital spending is worrying since it is a precursor to future growth. Current expenditures have acquired a pejorative meaning of being non-productive, but they are needed to meet critical development needs such as O&M in irrigation and research and extension. Without adequate resources to meet

these needs, lives of existing assets get shortened and technology generation and adoption, essential to improve productivity, is compromised. Reducing input subsidies to free resources for meeting capital and recurrent needs, particularly the non-wage needs, is a priority for the state.

### **Provision of Public Services**

11. Punjab has a large public sector serving agriculture, including the Punjab Agricultural University (PAU) for agricultural research, education and extension, and various departments of the state government (agriculture, horticulture, animal husbandry, dairy development, fisheries and irrigation) that provide front line extension and other inputs and regulatory services. These public agencies have suffered an erosion of support in recent years as salaries have consumed an increasing proportion of their outlays. On average, more than 80% of departmental expenditures are on salaries, leaving little for operational expenses.

12. Perhaps the most visible deterioration has occurred in the *canal irrigation* system that in 2001/02 irrigated 0.99 million hectares compared to 1.67 million hectares in 1990/91. About 85% of the O&M budget for irrigation goes to meet wages and salaries, with consequent neglect of actual works. Unlike many other states, participatory O&M with beneficiary involvement, is a little known or practiced concept in Punjab. To make up for the neglect of the canal irrigation system, farmers have had to increasingly rely on groundwater, exacerbating the depletion of groundwater resources in the state.

13. *Research and extension* expenditures and priorities have traditionally emphasized production and have been slow to respond to new demands of post-harvest management, quality improvement, marketing, policy, and integrated pest and nutrient management. There continues to be an excessive reliance on the public sector for funding and delivery of services with private sector presence limited to a few contract farming initiatives and hybrid seed development. The public research and extension system suffers from a proliferation of thinly funded schemes, and is unable to effectively utilize available staff due to limited operating budgets. Modern tools of information and technology are insufficiently used. Despite water being a critical input for future of agriculture in the state, a comprehensive research strategy for addressing various aspects of water management has also been lacking.

14. Punjab has a large network of regulated *wholesale markets* (also known as *mandis*) which have played an important historical role in providing market access to farmers across the state. They are also a source of considerable revenue, providing the state government with revenues equivalent to 4.7% of agriculture GSDP in 2001/02 through a variety of market fees and taxes. However, the current market system is increasingly characterized by congestion, poor sanitary conditions and lack of transparency. Services like grading, standardization, and market information systems have suffered and modern market infrastructure, particularly for perishables like fruits and vegetables, is lacking. As per existing regulations, the state government has a monopoly on establishment and management of *mandis*. There is also a regulation that all produce sold wholesale, has to be sold through the *mandis*. These two features, in particular, are holding back development of a modern and competitive market infrastructure that is needed to support agricultural diversification in the state. At the GOI level there is recognition that reform of existing market regulations is necessary to facilitate a more private sector led approach to agricultural wholesale marketing, and states are being exhorted to adopt such reforms – Punjab would do well to heed this call.

## Reform Options

15. Three key challenges face Punjab agriculture – restoring growth, promoting sustainable use of natural resources, and rationalizing fiscal outlays on the sector. Two broad groups of policy and institutional options are available for moving forward on these three fronts. The first group relates to price policies and public expenditures and the second group deal with reform of key institutions serving the agricultural sector – research, extension, irrigation and regulated markets. An important feature of policies in the sector is that while some, like MSP and fertilizer subsidy, are funded and controlled by GOI, others are financed and determined by GOP. This division of responsibilities complicates enormously the strategic choices and actions that GOP can take by itself. To resolve existing problems, GOP has to act in concert with parallel reforms by the Central government, and even lead the national effort to reform GOI policies where necessary.

16. The first priority is to *reform the price support and subsidy regime*. Output subsidies through the MSP, and subsidies on power, fertilizer and water have led to inefficient use of resources and distorted the distribution of farm incomes toward larger farmers who receive the bulk of these subsidies. Over time, these subsidies have also been capitalized into land values as land costs have grown faster than variable costs. These subsidies have to be contained, and over the long run, eliminated. Getting prices right is necessary to provide an appropriate incentive structure for diversification, and also to free resources for key public investments needed to facilitate diversification.

17. Reform of the MSP system is in the GOI domain. The high level of GOI foodgrain stocks, which are likely to mount further following the good monsoon in 2003, provide GOI with a good reason to limit grain procurement. Given the political sensibilities, the appropriate transitional arrangement may be to freeze MSPs of rice and wheat in nominal terms until the desired correction in relative prices and GOI stocks is achieved. In addition, some sort of an agreement between GOI and GOP whereby compensation is paid to Punjab in exchange for a cap on grain procurement from the state is apparently being considered. It is important that such any such agreement be speedily reached, one hurdle to which may be objections from other states to the proposed cash compensation to Punjab, otherwise the situation, both in terms of excess stocks with GOI and environmental degradation in Punjab, will worsen.

18. With regard to input subsidies, in terms of both fiscal drain and efficient use of groundwater, the removal of the power subsidy is the priority, and is an action within the GOP ambit. A planned and gradual withdrawal may be more acceptable, but must be sustained over time. To be effective, however, agricultural power has to be charged according to consumption, and hence metering of all pumpsets has to be considered a priority in sequencing the reforms.

19. Price and subsidy reforms are likely to adversely affect farmer incomes, at least in the short run. Although large farmers will suffer absolutely and relatively more, small farmers will also feel the pain. One ‘sweetener’ that has been used in a number of countries (EU, USA, Mexico, Turkey) to reduce price distorting subsidies have been lump sum annual income support payments made directly to farmers based on their crop area prior to phasing out price support for these programs. These payments are less distortionary as they decouple payments from production decisions and facilitate a transition to a price regime that allows resources to be allocated more efficiently. To date, however, these experiences have been rated as a mixed success. Some lessons have emerged for effective implementation, but it is probably still too early to judge the long term impact of these programs. It is also not clear whether such a program would be politically acceptable by confining it to Punjab, or even whether the necessary pre-conditions can be met to efficiently and equitably implement it.

20. Another option is to provide matching grants to farmers, communities and agri-business to facilitate transition to other enterprises. These one-time grants could support a variety of activities including technical support, training, business development services, and market infrastructure development, depending on need and demand. They are often best administered in a decentralized manner, and have the advantage of being tied to specific diversification initiatives decided on by farmers and agri-business. As one time grants there is also less expectation of them becoming a permanent subsidy. However, they require many of the same checks as an income support scheme, such as clear eligibility rules, transparent administration and an independent monitoring system.

21. While ‘getting prices right’ is necessary to create an appropriate incentive structure for diversification, it also appears that price and subsidy reform by itself will not be enough. Rough estimates suggest that while removing input subsidies and price support improves profitability of a number of crops relative to rice and wheat, it may not be enough to overcome the low risk associated with these two crops and usher in vast area substitution. Reversing the decline in agricultural public investment in R&D, rural infrastructure and human resource development (which, in turn, needs reduction in subsidies to release resources for these purposes), and institutional reforms in the research, extension, irrigation and marketing systems are equally, if not more, important to create an environment where public services can work more closely with the private sector to respond nimbly to changing farmer and market demands.

22. The importance of managing Punjab’s water resources in a more efficient and sustainable manner can hardly be overemphasized. Unless this is done, groundwater tables will continue to recede rapidly. Rehabilitation of the *canal irrigation* system and its distributaries, minors, and surface drains is a priority to reduce the dependence on groundwater. To raise resources to enable this, an increase in water tariffs has to be considered. Punjab’s current water rates recover only about 43% of O&M expenditures – these should be revised to at least cover full O&M costs. The institutional arrangements for O&M also need revisiting. Beneficiary involvement is weak. Experience from other states suggests that organized beneficiary participation brings down unit costs, and beneficiary groups can take on maintenance responsibilities, starting with field channels and minors and gradually working up to distributaries and main canals as the groups mature and federate. For this to happen, though, political support is required and also legislation, as in other states, that formalizes the role and responsibilities of water user groups and other stakeholders. To help with group mobilization, assistance from NGOs and other social intermediaries will be necessary. These are still relatively little known concepts in Punjab.

23. Options to arrest the depleting *groundwater* table include:

- Delay paddy transplantation to June. Early transplanting in May, practiced by some farmers, adds significantly to evapotranspiration losses. Delayed transplanting would be facilitated by: (i) ensuring GOI does not begin procurement operations for paddy/rice before October 1 (already in effect); (ii) metering of agricultural power connections, and introduction of higher tariff for the month of May.
- Encourage use of sprinklers/drip systems, through matching grants, to improve water use efficiency in high value crops. Note that this would work effectively only when electricity is metered and adequately priced, otherwise the incentive to shift to alternative (relatively expensive) systems like drip etc., is weak.
- Approve the Punjab Groundwater Control and Regulation Act, which aims to regulate groundwater extraction, and has been in draft since 1998.

24. GOP is currently revising its State Water Policy of 1997. This exercise provides an opportunity to take a holistic and futuristic look at water availability and demands across different sectors. Issues related to water entitlements (for surface water) and water rights (for groundwater), and social, environmental, technical and institutional arrangements should be critically examined to ensure sustainable development in the future.

25. Revamping of the *agricultural research and extension* system to enhance its overall efficiency and effectiveness has to be an important element of a strategy to renew agricultural growth in the Punjab. Reform of these systems can also contribute to environmental sustainability (e.g., through development and dissemination of management practices to conserve water), and fiscal sustainability (e.g., privatization of selected services). Options in this regard include:

- Redefine public-private roles in the list of extension services currently being provided, and privatize as appropriate. For instance, input-related services, such as planting materials, fish fingerlings, and veterinary services should be privatized. With sophisticated farmers and a commercialized agriculture, there is little reason for the public sector to remain engaged in these activities, beyond regulatory oversight.
- Explore private delivery of publicly funded services. With farmer co-financing, this is often a more efficient option, especially for new skills, such as marketing, that are not available in the existing system.
- Promote public-private partnerships for R&D through competitive research funding. Competitive funding has been shown to be one mechanism for promoting partnerships, and drawing other potential participants into the research system.
- Promote rural producer organizations and greater decentralization in decision making. Farmer organizations appear to be weak in Punjab, and GOP should formulate a policy for strengthening and mobilizing them, and involving them more directly in technology generation and dissemination activities. Demand for services can be greatly enhanced through strong farmer organizations who have the capacity to formulate priorities, express demands, contract and co-finance services, and link farmers to markets.
- Enhance aggregate level of public funding for agricultural research and extension, with a rigorous priority setting exercise to ensure that resources are allocated to drive the future agricultural growth and diversification agenda. Monitoring, evaluation and impact assessment mechanisms for research and extension also need to be strengthened and institutionalized.
- Develop strong linkages with advanced research organizations both within India and abroad, to ensure access to modern biotechnology tools and products, as well as upgrade capacities to utilize and regulate these technologies, especially in intellectual property rights and bio-safety.
- Promote modern information and communication technologies to enhance efficiency of farmer information and extension services. Punjab's extension departments require a major upgrade to exploit this technology.

26. Modernization of the *marketing* system will require regulatory reforms as well as other facilitating actions and investments. The priority is amendment of the Punjab Agricultural Produce Markets Act to allow private sector entry in establishment and management of wholesale markets. To promote agri-business and high value agriculture, the mandatory requirement that all produce sold wholesale has to be sold through regulated markets needs to be reconsidered. To improve farm profitability and also attract private trade back to the state, GOP should reduce the various market fees and cesses, which at the moment are the highest in the country. An

amendment of the Essential Commodities Act (ECA) has to be also considered by GOI/GOP to permanently remove trade restrictions related to storage and movement of agricultural produce.

27. There is a need to develop and enforce a grades and standards system that better reflects market requirements. In doing so it is important that private companies, millers and other private players take a leading role in the development of these standards with GOP role that of facilitation and enforcement of an agreed system. Public-private partnerships in development of market information systems is another area where Punjab could build on experiences of other states. Information on sanitary and phytosanitary standards in different countries/commodities is an area where information flows need particular strengthening. GOP should also consider taking the lead in introducing a system whereby private warehouses can issue negotiable warehouse receipts. This requires amendment of the GOI warehousing laws, a warehouse certification process that allows certification of quantity and quality of produce, and acceptance by banks of the warehouse receipt as collateral. Finally awareness and use of market based risk management instruments such as futures trading need to be promoted, among extension staff as well as farmers.

28. In the last year Punjab's diversification agenda has become closely associated with the concept of *contract farming*, whereby farmers enter into an agreement with processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at pre-determined prices. Given the political difficulties with changing price policies, contract farming is increasingly being seen by GOP as an instrument to wean farmers away from the rice-wheat system. A public sector corporation, Punjab Agro Foodgrains Corporation (PAFC), has been assigned the task of promoting contract farming in the state, for which it has developed a five-year plan that aims to shift one million hectares out of rice-wheat cultivation to a variety of other crops.

29. PAFC sees its approach to be that of a facilitator, tying up farmers with agribusinesses which will supply quality seeds and technical assistance, and buy back the crop. Various models are being tried out, but it is still too early to judge their effectiveness. There is little doubt, though, that contract farming has a place in the development of Punjab's agriculture. The physical and social environment is suitable – highly productive with assured irrigation, widespread mechanization, all villages connected by roads, good telecommunications, and average farm size more than twice the India average. Moreover, PAFC's venture into this field embodies a more market-oriented approach to agricultural development and a significant shift away from the state's traditional focus on production as an end in itself. To be successful, however, attention will have to be paid to a number of aspects

- Without significant reforms in other areas (e.g., price support, marketing, research and extension) to correct the presently distorted incentive structure that favors rice and wheat, there is little to suggest that the target of one million hectares will be attained by 2007.
- International experience suggests that contract farming tends to succeed only in certain types of crops/activities such as perishable products, or those where exacting market specifications have to be met. Basic field crops like standard rice, wheat, maize, oilseeds, pulses do not normally figure highly in contract farming programs and there is also a high risk of 'side selling' i.e., farmer will sell output to another buyer. In the PAFC plans, maize and oilseeds figure prominently.
- The absence of a quick and effective contract enforcement and dispute resolution system in Punjab (and India) magnifies the risk of farmers 'side selling' if market prices at time of harvest significantly exceed the contracted price, or conversely the risk of buyer default if market prices are well below the contract price. To address this, GOP needs to facilitate initiatives by agribusiness and farmers organizations wishing to develop speedy dispute-

resolution systems. This might lead to a system for registration of contracts. The government's facilitative role needs to be stressed, since, to be successful, such measures are best designed by the interested parties.

- Direct commercial involvement of the state should be minimal. In some of the models being adopted this is not the case as PAFC is exposing itself to a high degree of risk by contracting to buy output from farmers in case the buyer backs out.

## **Conclusion**

30. After leading Indian agriculture in the 1970s and 1980s, the decade of the 1990s was a difficult one for Punjab agriculture. Revamping growth in an environmentally and fiscally sustainable manner is the main challenge confronting the state today. This study has identified a number of priorities for moving ahead. Given political realities, the reform process will need to be accelerated by a program of public awareness, education and informed debate. Wide stakeholder participation, particularly from amongst the farming community, is necessary to realize reforms that may run counter to established interests in the status quo. There is a mismatch in the state between the high level of technical accomplishment in agriculture and an underdeveloped debate on policy issues facing the sector. While the State Government is aware of the critical policy issues discussed in this study, it is constrained by prevailing public opinion. GOP should itself work to raise public awareness, being as frank as possible about the problem, and cautious about claims of what can be achieved through measures such as contract farming in the absence of more fundamental reforms. With the right leadership and commitment there is no reason to believe that Punjab agriculture cannot regain its past glory.

# Chapter 1

## Introduction

1.1 In 1966 high yielding varieties (HYVs) of wheat imported from Mexico were first planted in Punjab, sowing the seeds for a transformation of the state's agriculture in particular, and Indian agriculture in general. The 'green revolution' technology, comprising largely of high yielding varieties of seeds (initially of wheat and subsequently of rice), chemical fertilizers and assured irrigation, spread rapidly through the state. Aided by public investments in supporting infrastructure (irrigation, roads, markets, research and extension) and price incentives that encouraged wheat and rice production, remarkably high growth rates of production followed in the 1970s and 1980s. Punjab soon emerged as the dominant 'foodgrain surplus' state in the country, contributing significantly to meeting national food security goals. With about 3% of India's net sown area and 1.5% of its farming population, Punjab today produces about 10% of the country's rice, 20% of its wheat, and about 45% of all rice and wheat procured by the government.<sup>1</sup> Among the major Indian states, Punjab currently has the highest rice and wheat yields, the lowest poverty ratio (6% in 1999/2000), and ranks a close second to Maharashtra in per capita income.

1.2 Despite, or perhaps because of, these achievements serious concerns are now emerging about future prospects for the agricultural sector in the state. Agricultural growth slowed substantially in the 1990s – state domestic product from agriculture grew at a trend rate of 2.6% per annum in the 1990s compared to the all India figure of 3.2% per annum, and relative to a growth rate of 5% per annum in Punjab in the 1980s. The rice-wheat production system, which served the state so well in the past and helped establish it as the leading agricultural state in the country, is under threat. Productivity of rice appears to be plateauing and there is growing realization that current cropping patterns are adversely affecting land and water resources of the state. Rice cultivation in particular appears to be causing a number of environmental problems because of its water-intensive nature in an increasingly water-deficit state. While these supply-side sustainability concerns have been raised by observers in the past, a more immediate threat has emerged from the demand side. Over 90% of the rice and wheat that is marketed in Punjab is procured by Government of India (GOI) at an administratively determined minimum support price (MSP) for subsidized distribution through the Public Distribution System (PDS). Steady increases in MSP and a widespread infrastructure for government procurement in Punjab meant that the rice-wheat cropping system provided a relatively risk free environment that was more profitable than competing crops. However, during the past few years, national PDS offtake has lagged procurement, resulting in a buildup of GOI stocks of foodgrains. This in turn entails a large fiscal cost that is increasingly being questioned. At the national level, pressure is building for reform of the MSP and the GOI procurement system, which inevitably will have consequences for rice and wheat production and marketing in Punjab.

1.3 Punjab agriculture is today at a crossroad. The sector continues to be very important in the state's economy, accounting for about 40% of the state domestic product and providing employment to an equal proportion of the total labor force. However, the input intensive technologies of the green revolution are no longer giving the same marginal returns as before. The status quo is an increasingly unsustainable option, and there is growing realization among GOP policy makers that urgent action is needed to encourage agricultural diversification.

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<sup>1</sup> Rice and wheat account for over 60% of the weight in India's index of agricultural production. In Punjab, rice and wheat are the two main crops grown on about 75% of the total gross cropped area of 8.1 million hectares.

However, existing input subsidies for power, water and fertilizer, and price support policies distort the incentive structure for diversification and sustainable use of natural resources, and their removal, as everywhere, is fraught with complex political economy considerations. Agricultural research and extension, marketing arrangements and information systems have been slow to respond to new demands for a diversified agriculture. On the plus side, Punjab has a history of successful agricultural entrepreneurship, reasonably literate farmers with average farm sizes more than twice the India average, widespread mechanization and rural connectivity, all of which are factors that, with a facilitating policy environment, can help achieve a second agricultural transformation.

1.4 Against the above background this study identifies three key challenges facing the state's agricultural sector -- revamping growth, promoting sustainable use of natural resources, and rationalizing fiscal outlays on the sector. Chapter 2 reviews recent agricultural performance in Punjab with a focus on the pre-dominant agricultural production system (rice-wheat). Chapter 3 analyzes the impact of key sectoral policies and public expenditures, with the underlying aim of identifying the main constraints to more rapid, diversified and sustainable agricultural growth. Chapter 4 explores options for reform, drawing on relevant international experience, and keeping political economy considerations in view.

## Chapter 2

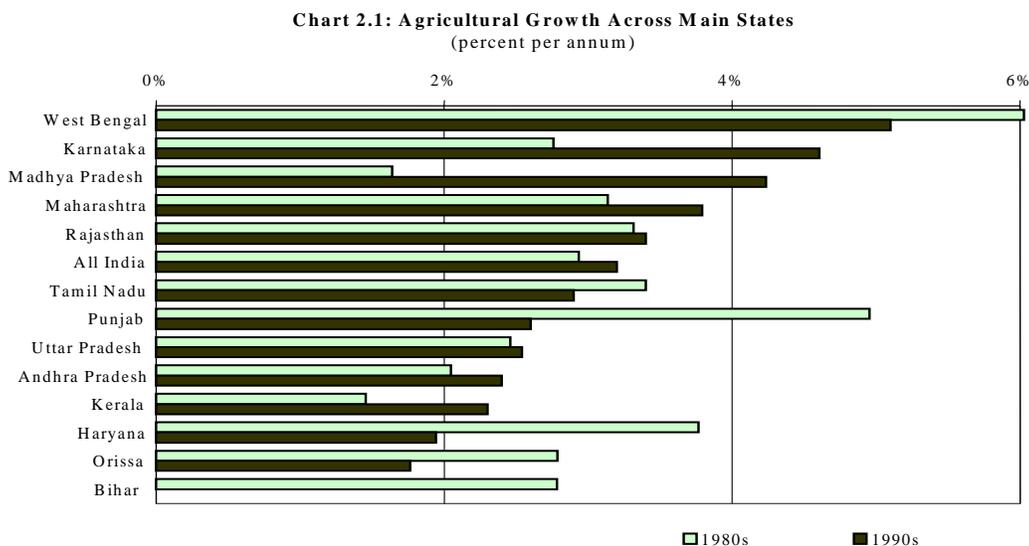
### Developments and Outcomes

2.1 Two sets of outcome indicators can be used to evaluate recent agricultural performance in Punjab. The first is the pace and composition of agricultural growth. The second is environmental sustainability of current agricultural patterns and practices followed in the state. As shown in this chapter, there are serious concerns emerging on both counts.

2.2 Another set of developments explored in this chapter are recent and emerging trends outside of Punjab, in the national and international arena, that have a bearing on agricultural prospects of the state. Punjab is a food surplus state, so external developments are particularly important and need to be kept in view when designing any appropriate state agricultural strategy.

#### A. Agricultural Growth – Pace and Composition

2.3 *Substantial deceleration in agricultural growth in the 1990s.* Following the introduction of the ‘green revolution’ technology, Punjab experienced substantial agricultural growth in the 1970s and 1980s.<sup>1</sup> The trend rate of growth of state domestic product (SDP) from agriculture was 4.0% per annum in the 1970s and 5.0% per annum in the 1980s, which was more than twice the corresponding national averages.<sup>2</sup> During the 1990s, however, growth decelerated significantly in the state to 2.6% per annum, compared to a corresponding national average of 3.2 % per annum (Chart 2.1).



Notes: (i) Growth is in SDP from agriculture and allied sectors; (ii) 1980s covers the period 1980/81 to 1989/90 and 1990s covers 1990/91-1999/00; (iii) Agricultural growth in Bihar during the 1990s was -0.1 percent per annum.

Source: Central Statistical Organization, National Accounts Statistics; GoP, Statistical Abstract of Punjab, 2002

<sup>1</sup> In this report, unless otherwise stated, agriculture is referred to in its wide sense, i.e., what in the Indian national accounts is called the agriculture and allied sector. It includes the crop sector, the livestock sector, forestry and fishing. When considering public expenditure issues, agriculture includes irrigation.

<sup>2</sup> All growth rates in this report, unless otherwise mentioned, are trend rates calculated using the semi-log regression method.

2.4 The 1990s slowdown has meant that Punjab's agriculture economy is no longer among the fastest growing in the country, having been overtaken by a number of other states including Karnataka, Madhya Pradesh, Maharashtra and Rajasthan, apart from West Bengal which was already growing faster than Punjab in the 1980s.

2.5 **Deceleration in agricultural growth is because of a sharp slowdown in the crop sector.** The crop sector accounts for about two-thirds of agricultural SDP in Punjab, and it is this segment which is responsible for the overall slowdown. Average growth in the crop sector fell dramatically from 4.8% per annum in the 1980s to 1.3% per annum in the 1990s (Table 2.1). Livestock continued to grow at over 5% per annum in the 1990s and helped steady overall agricultural performance. Forestry and fishing are minor sectors in the state, although it is worth noting that the latter grew at an accelerated pace in the 1990s, albeit from a very low base.

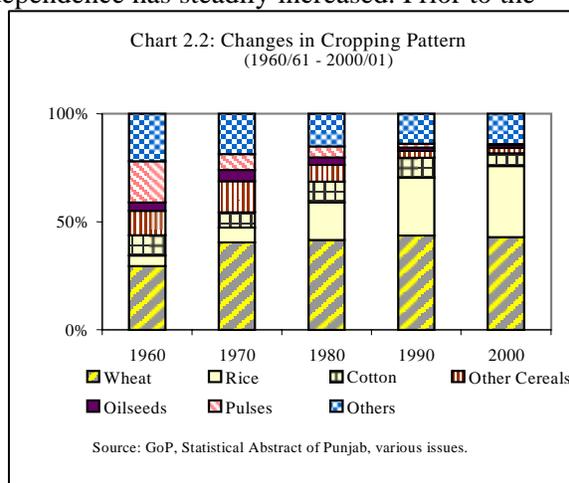
**Table 2.1: Sub-Sectoral Agricultural Growth in Punjab**

| Sectors     | Share in Agriculture SDP (percent) | Growth Rate (percent per annum) |       |       |       |
|-------------|------------------------------------|---------------------------------|-------|-------|-------|
|             |                                    | 1980s                           | 1990s | 00/01 | 01/02 |
| Agriculture | 100                                | 5.0                             | 2.6   | 3.0   | 0.8   |
| Crop Sector | 66.8                               | 4.8                             | 1.3   | 3.4   | 0.1   |
| Livestock   | 32.0                               | 5.6                             | 5.3   | 1.7   | 1.9   |
| Fisheries   | 0.9                                | 12.8                            | 18.0  | 10.2  | 11.6  |
| Forestry    | 0.3                                | -0.1                            | 2.8   | 9.0   | 12.8  |

Note: 1980s: 1980/81-1989/90 and 1990s: 1990/91-1999/00

Sources: Estimated – Data from CSO, National Accounts Statistics; GoP, Statistical Abstract of Punjab (several issues); Economic and Statistical Organization, Government of Punjab

2.6 **Crop sector is dominated by rice and wheat.** The two crops together account for over 75% of the gross cropped area in the state. This dependence has steadily increased. Prior to the green revolution, rice was virtually absent (excepting for traditional basmati varieties in some pockets) and wheat accounted for about 30% of cropped area. This changed quickly with the introduction of green revolution technologies. In pace with technological innovations and their adoption, and a supportive policy environment, first wheat and then rice flourished (Chart 2.2). The 1970s and 1980s were the prime years for the two crops with rapid area expansion, largely at the expense of other cereals and pulses, and rapid yield growth. In the 1990s, though, the pace slowed considerably (Table 2.2).



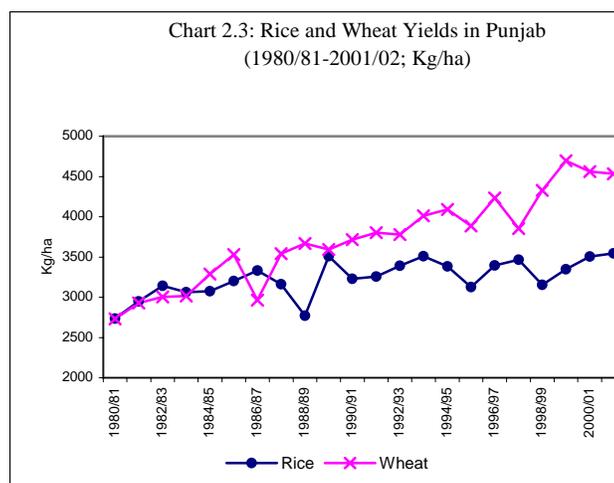
2.7 A decomposition of the 1990s production growth of rice and wheat into standard area-yield components shows that in wheat, increased yields accounted for over 90% of the production growth, but in rice, there was no growth in yields and area expansion was solely responsible for the production growth that took place.

**Table 2.2: Growth in Main Crops, Punjab**

| Crop         | Share in area (%)<br>(1998-2000) | Production Growth<br>(percent per annum) |       | Yield Growth<br>(percent per annum) |       |
|--------------|----------------------------------|--|-------|-------------------------------------|-------|
|              |                                  | 1980s                                    | 1990s | 1980s                               | 1990s |
| Wheat        | 42.5                             | 4.3                                      | 2.2   | 3.0                                 | 2.0   |
| Rice         | 32.6                             | 6.7                                      | 2.5   | 1.3                                 | 0.0   |
| Fodder Crops | 9.5                              | -1.4                                     | 0.3   | -1.2                                | 0.4   |
| Cotton       | 6.4                              | 9.6                                      | -11.2 | 9.0                                 | -9.3  |
| Maize        | 2.0                              | -6.6                                     | 0.6   | -1.3                                | 2.6   |
| Vegetables   | 1.7                              | na                                       | 4.0   | na                                  | -1.3  |
| Sugarcane    | 1.4                              | 2.9                                      | 2.1   | 0.7                                 | -0.2  |
| Rapeseed     | 0.8                              | 6.4                                      | -2.0  | 6.0                                 | 0.4   |
| Fruits       | 0.7                              | na                                       | -0.5  | na                                  | 2.3   |
| Gram         | 0.1                              | -10.8                                    | -20.3 | 3.8                                 | 2.8   |
| Groundnut    | 0.1                              | -17.1                                    | -7.4  | -0.2                                | 0.4   |

Source: Estimated from data in CMIE, Agriculture, December 2002; GoP, Statistical Abstract of Punjab (several issues)

**2.8 Are yields of rice and wheat plateauing?** Per hectare average yields of rice and wheat in Punjab are the highest in the country. A question often asked is whether these yields have plateaued. The available evidence -- zero trend growth in rice yields in 1990s -- suggests that average yields in rice may indeed have plateaued at around 3500 kg/ha with the available technology.<sup>3</sup> In wheat, moderate gains (2% per annum yield growth in the 1990s) are still occurring largely due to the continuous release of higher yielding varieties. In both crops, though, average state yields are about 80% of yields realized by scientists in demonstration plots using the best available technology, a very low yield gap by even developed country standards.<sup>4</sup>



Source: GOP, Statistical Abstract of Punjab, various issues

**2.9 Other crops.** Apart from rice and wheat, the other crops with any significant presence (>5% of gross cropped area) in the state are cotton and fodder crops. Cotton performed poorly in the 1990s as yields *declined* at 9.3% per annum after increasing at 9% per annum in the 1980s. Pest attacks were a main underlying reason with average yields falling sharply from 440 kg/ha (in terms of lint) in 1996/97 to 180 kg/ha in 1998/99. Since 1998/99, though, cotton yields have stabilized and were 430 kg/ha in 2000/01, holding promise for the future. Fodder crops, too, hold promise given the strong performance of the livestock sector in the state.

<sup>3</sup> Statistical tests confirm a significant break in trend of rice yields in the 1990s from the 1970s and 1980s.

<sup>4</sup> According to the Punjab Agricultural University (PAU), the potential yield from existing varieties of rice is about 4500 kg/ha and of wheat 5500 kg/ha. Against this the state average rice yield was 3466 kg/ha (77% of potential) and average wheat yield was 4597 kg/ha (84% of potential) for the years 99/00-01/02.

2.10 **Total factor productivity in the crop sector is slowing.** While per hectare yield is a standard measure of productivity in agriculture, it is a partial measure since it only accounts for changes in land productivity. A more comprehensive measure that accounts for productivity of all (measurable) inputs is total factor productivity (TFP). Overall, TFP growth in the Punjab has averaged around 2% annually since the Green Revolution, although lowest (1.4%) for the rice-wheat area of central Punjab (Murgai, Ali and Byerlee, 2001). This is close to global standards for commercialized agriculture. However, a number of recent studies have pointed to a sharp decrease in TFP growth since 1990, when TFP growth stagnated for the Punjab as a whole (Table 2.3). TFP growth in the southwest region was negative, because of the problems in cotton. But even for the main rice-wheat tract of central Punjab, TFP growth slowed to 0.67% per annum, mainly due to negative TFP growth in rice (Singh and Hossain, 2002). Since in a developed agriculture like the Punjab, TFP growth should account for most of the output growth, these recent trends are worrying, especially so since they do not take account of the growing problems of resource depletion and environmental externalities in the state (see Section B below).<sup>5</sup>

**Table 2.3: TFP Growth in Punjab Crop Sector, 1981-96**  
(percent per annum)

| Region       | Period 1981-1989 |      | Period 1990-96 |       |
|--------------|------------------|------|----------------|-------|
|              | Output           | TFP  | Output         | TFP   |
| Northeast    | 2.63             | 0.01 | 2.81           | 2.05  |
| Central      | 4.23             | 1.62 | 1.50           | 0.67  |
| Southwest    | 4.96             | 2.02 | -2.66          | -2.04 |
| Punjab State | 4.29             | 1.55 | 0.39           | 0.05  |

Note: Northeast includes districts of Rupnagar, Gurdaspur, Nawanshahar, and Hoshiarpur; Central region includes: Amritsar, Kapurthala, Jalandhar, Ludhiana, Patiala, Fatehgarh and Sangrur; Southwest includes: Faridkot, Muktsar, Moga, Bhatinda, Mansa, and Ferozepur.  
Source: Kumar (2002); regional rates have been computed by the author on request, personal communication

2.11 **Livestock has performed well.** While crop sector growth has decelerated sharply, the livestock sector, which includes animal husbandry, dairy and poultry, continues to perform well. From less than 25% of agriculture SDP in 1980/81 the share of the livestock sector had grown to 32% by 2000. Milk, meat and eggs are the main products, and buoyed by increasing domestic demand, their production increased at 4-5% per annum during the 1990s. This sector will have to continue to play a major role in agricultural diversification in the state in the foreseeable future.

## B. Environmental Sustainability

2.12 Among the main agricultural states, Punjab practices the most input intensive agriculture. It has the largest proportion of irrigated area, highest cropping intensity, and the most intensive use of fertilizers, tractors, and pesticides (Table 2.4). Much has been written about the impact of these input intensive agricultural practices on the quality and quantity of the state's land and water resources (for instance, PAU, 1998; Sidhu and Johl, 2002). A range of indicators suggest that this is a real concern.

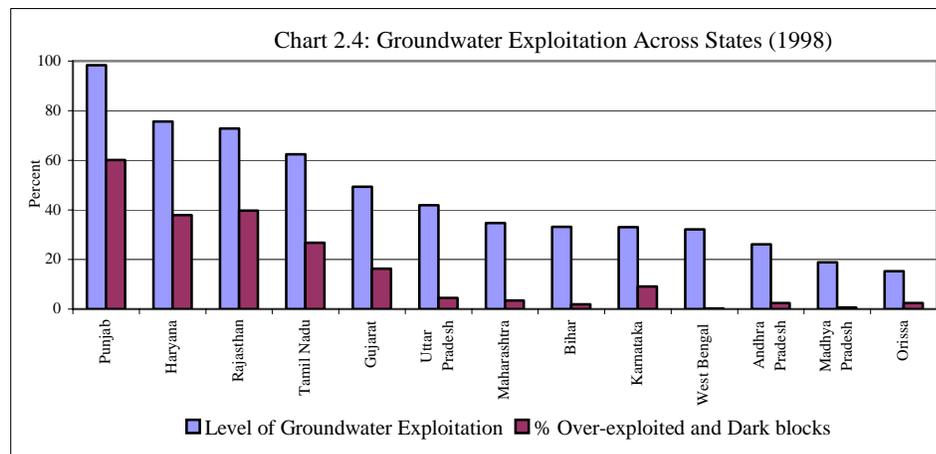
<sup>5</sup> There are both theoretical and empirical difficulties in accounting for environmental costs in TFP measures (Byerlee and Murgai, 2001). One approach, if data are available, is to use a cost or production function approach to decompose productivity growth into positive factors, such as technology, and negative factors, such as resource degradation.

**Table 2.4: Input Use in Agriculture**

|                                      | <i>Punjab</i> | <i>Next Highest State</i> | <i>All India</i> |
|--------------------------------------|---------------|---------------------------|------------------|
| Cropping Intensity (%)               | 192           | 174 (Haryana)             | 135              |
| Percent Area Irrigated               | 95            | 78 (Haryana)              | 40               |
| Number of Tractors per '000 hectares | 98            | 63 (Haryana)              | 17               |
| Fertiliser Use (Kg/ha)               | 167           | 160 (Andhra Pradesh)      | 86               |
| Pesticides Use (Kg/ha)               | 0.83          | 0.80 (Haryana)            | 0.26             |

Source: CMIE, Energy, May 2003; CMIE, Agriculture, December 2002; GoP, Statistical Abstract of Punjab, 2002; Fertilizer Statistics 2001-02; GoI, Indian Chemical Statistics 2000-01.

2.13 **Water availability.** Of greatest concern is the over-exploitation of groundwater resources of the state. In 2000/01, groundwater irrigated 76% of net irrigated area in the state compared to 57% in 1990/91. Among all the major Indian states, Punjab now has the highest percentage of groundwater exploitation in the country, and also the largest percentage of overexploited and dark blocks (Chart 2.4).<sup>6</sup>



Source: Central Groundwater Board, personal communication.

2.14 The state average of groundwater exploitation conceals considerable regional variation. Traditionally Punjab has been divided into three agro-climatic regions: (a) the northeast region (Kandi area) which covers 19% of the geographical area of the state, with relatively high rainfall (950 mm) and low levels of groundwater; (b) the central region covering 47% area with 650 mm rainfall and a depleting groundwater regime; and (c) the southwest region covering 34% area with 400 mm rainfall and faced with problems of rising groundwater levels and water logging. Of the three regions, the central region is the most fertile, but is also the region where the groundwater situation is most acute with average groundwater exploitation of 141% and where 83% of the 69 blocks are classified as overexploited (Table 2.5).

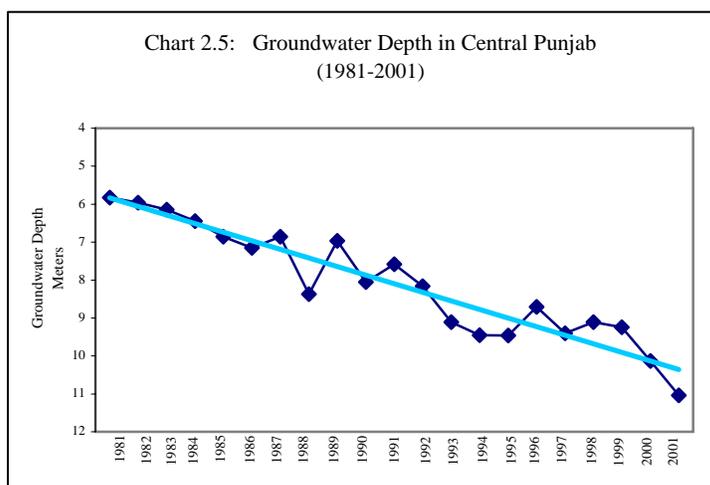
<sup>6</sup> Groundwater exploitation is groundwater extracted as a percentage of annual recharge. Overexploited blocks are blocks where groundwater extraction is more than 100% of recharge; dark blocks are where extraction is between 85-100% of annual recharge.

**Table 2.5: Groundwater Status Across Regions in Punjab**

| Exploitation (%)    | Blocks (as percentage of total number of blocks) |              |                 |        |
|---------------------|--|--------------|-----------------|--------|
|                     | North East Zone                                  | Central Zone | South West Zone | Punjab |
| <100                | 78   | 17           | 76              | 47     |
| 100-150             | 19   | 33           | 12              | 25     |
| 150-200             | 3  | 30           | 0               | 16     |
| 200-250             | 0  | 9            | 6               | 6      |
| 250-300             | 0  | 6            | 0               | 3      |
| 300-350             | 0  | 3            | 3               | 2      |
| 350-400             | 0  | 0            | 0               | 0      |
| >400                | 0  | 2            | 3               | 1      |
| Total no. of blocks | 36   | 69           | 33              | 138    |

Source: GOP, Water Resources and Environment Directorate.

2.15 Over the last two decades the groundwater table has fallen at about 23 cm/year in the Central region; there are also signs that the rate of depletion may be becoming more pronounced in recent years (Chart 2.5).<sup>7</sup> The large area under rice cultivation (during the *kharif* season over 75% of the cropped area in Central Punjab is under rice), and its early transplanting, are cited as the primary reasons for the declining groundwater tables (GOP, 2002). Rice has

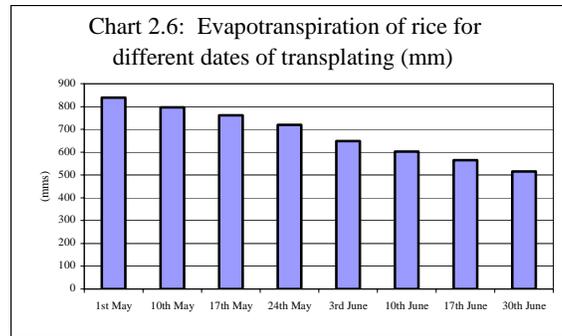


Source: Estimated using data from GoP, Ground Water Cell, Directorate of Agriculture

a high water requirement with normal evapotranspiration (ET) of 73 cms as compared to 45-50 cms for traditional *kharif* crops like maize, groundnut and pulses that it has replaced.<sup>8</sup> Also, the ET needs of rice vary considerably depending on date of transplantation (Chart 2.6). Compared to the Punjab Agriculture University (PAU) recommended transplanting date of June 10, on average, about 20% of rice area is transplanted in May which increases water use considerably (Singh and Kalra, 2002). Early transplanting appears to be happening primarily because of labor shortages and adoption of a long duration variety (Pusa 44) by some farmers (Hira and Khera, 2000)

<sup>7</sup> Although too short a period to make a conclusive judgement, it is worth noting that the water table in Central Punjab fell by 40cms/year between 1997-2001; and by 90 cms each year in 2000 and 2001.

<sup>8</sup> Evapotranspiration is a process through which water escapes to the atmosphere through the crop foliage (transpiration) and the soil surface (evaporation). It varies according to the temperature, humidity, wind speed, sun-shine hours, type of crop, and amount of water that is supplied for crop development.



Source: GOP, 2002.

2.16 While Central Punjab faces rapidly receding water tables, parts of the Southwest region where canal irrigation is widespread, face waterlogging and salinity problems. Proper lining of canals and drainage are the major challenges in these areas.

2.17 **Water quality.** Groundwater in most parts of the Southwest districts is saline, and considered marginally fit to unfit for irrigation (Hira and Khera, 2000). Excessive residual sodium carbonate has been found in about 30% of groundwater samples in Ludhiana and Sangrur districts of Central Punjab.<sup>9</sup> Extensive use of nitrogenous fertilizers and pesticides has also led to increasing nitrate concentration and accumulation of pesticide residues in water (Singh, Sadana and Arora, 1991; Thind and Kansal, 2002).

2.18 **Air.** About 16 million tons of rice straw is burnt every year resulting in loss of carbon, nitrogen and sulphur to the atmosphere. It also results in air pollution creating suffocating smoggy conditions in many parts of the state at the time of rice harvest. Efforts to popularize eco-friendly soil incorporation of rice straw (Beri, Sidhu and Saini, 1999) have not succeeded due to lack of appropriate machinery, additional costs and the delay it causes in sowing of wheat. Conservation tillage could help avoid burning of rice straw.

2.19 **Adverse impacts of high agrochemical use.** Punjab uses almost 7000 tons of technical grade pesticides annually, 55% of which are used on cotton, 20% on rice and 9% on fruits and vegetables. Weedicide use on rice and wheat has increased from 12 tons in 1971/72 to 3550 tons in 1999/2000. High pesticides use has led to accumulation of pesticide residues in soil, water, food, feed and other agricultural produce often above tolerance limits. Some pests of cotton (American bollworm, whitefly) have developed resistance to pesticides resulting in crop failures. Similarly *phalaris minor*, the most common weed of wheat, has developed resistance to isoproturon (Walia, Brar and Dhaliwal, 1997), necessitating use of more potent (and costly) weedicides for its effective control. Indiscriminate use of pesticides has killed the natural enemies of harmful insects making integrated pest management (IPM) in crops like cotton increasingly difficult. Although large area IPM demonstrations on cotton, sugarcane and rice have been organized, adoption rates by farmers are low.

2.20 **Spread of rice cultivation has contributed to many of the environmental problems.** Rice cultivation, in particular, because of its stagnant yields, water intensive nature, and problems such as high agrochemical use, and pollution caused by burning straw, is a particular culprit in adding to environmental pressures on the state's land and water resources. There is a widely held view among agricultural scientists in Punjab that reducing area under the rice-wheat system by about a million hectares (of a total net sown area of about 4 million hectares),

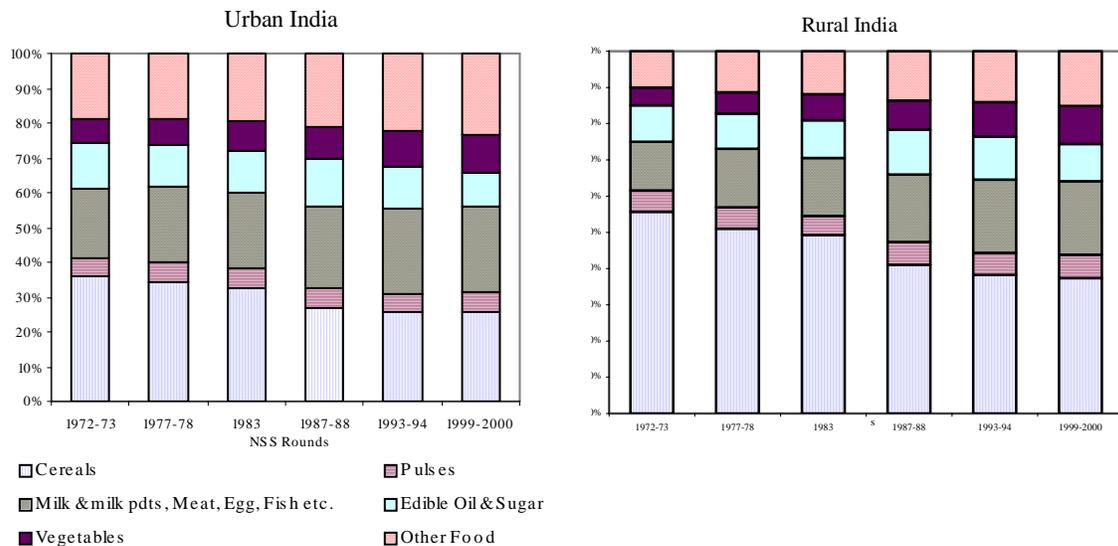
<sup>9</sup> Dr. J.S. Brar, PAU, personal communication.

mainly from the Central region, would balance water use and its replenishment.<sup>10</sup> This scale of diversification away from rice is the immediate challenge the state has set for itself.<sup>11</sup>

### C. External Developments

2.21 **Changing composition of the food basket in India.** An important development for a state like Punjab which has specialized in cereals production, is the change in the composition of the food consumption basket in India. As would be expected with rising prosperity, the share of cereals has decreased while consumption of milk and milk products, meat, poultry, fruits and vegetables, edible oils and sugar has increased (Chart 2.7). These trends are likely to continue in the future as incomes rise – the income elasticity for cereals is much less than for higher value products.

Chart 2.7: Changes in National Consumption Pattern



Source: GoI, 2001, "Level and Pattern of Consumer Expenditure in India-1999-2000" NSS 55<sup>th</sup> Round (July 1999- June 2000).

2.22 There is considerable debate in the literature on likely future domestic demand for rice and wheat in view of changing consumption patterns. Estimates differ, particularly with respect to elasticity estimates and feed demand. The recent Sen Committee report carries a summary of this literature.<sup>12</sup> The committee, although unable to fully resolve data limitations and likely future demands, is nevertheless quite emphatic that Punjab's future agricultural strategy should increasingly focus on diversification away from rice and wheat, and future demand for cereals should increasingly be met from the eastern and central-eastern regions of the country, which have the water resources available to grow water-intensive crops like rice.

<sup>10</sup> The implicit calculation behind this view appears to be the following: Saving of 23 cms of water by substituting paddy (ET=73 cms) by an alternative *kharif* crop (ET=50 cms) over one million hectares will result in, assuming a specific yield of groundwater of 20%, a rise in 23 cms of groundwater table across five million hectares area of Punjab.

<sup>11</sup> Moving 1 million hectares out of the rice-wheat system is the goal of the Johl Committee report (GOP, 2002). This is also the medium term target set by Punjab Agro Foodgrains Corporation in its contract farming plan (PAFC, Note on Contract Farming, 2003).

<sup>12</sup> GOI, Report of the High Level Committee on Grain Policy, 2002, Appendix 2.

In summary, for Punjab, not only do supply side factors like stagnant yields and overexploited groundwater resources call for diversification away from rice, but changing demand patterns also suggest that non-cereal products are most likely to present the best growth opportunities in the future. The key to Punjab's future agricultural success will depend on how nimbly the state is able to respond to these changing market demands.

2.23 *International trade issues.* Concerns are often voiced about the probable impact of WTO and other international trade related changes on India's (and Punjab's) agriculture (Ghuman, 2002; Chand, 2002). Two sets of concerns, in particular, are notable:

- Trade liberalization and increased integration with the global economy would lead to a deluge of cheap (often subsidized) imports, which would wipe out the production base of a large section of domestic agriculture.
- The WTO requirements on 'Aggregate Measure of Support' would lead to elimination of price and subsidy support to Indian agriculture.

2.24 An ongoing Bank study is examining WTO issues in relation to Indian agriculture in depth and hence these aspects are only flagged here. On the basis of a recent paper (Gulati, Pursell and Mullen, 2003), though, it appears that these fears may largely be misplaced. There is a wide gap between bound and applied import tariffs in India, and also between applied tariffs and rates actually needed to protect domestic production. Indian agriculture is reasonably competitive on an import substitution basis and producer support estimates calculated under the importable hypothesis (i.e., India as a net importer of major commodities) suggest the sector was 'net taxed' in the 1990s. Under the exportable hypothesis, due to the extremely low international prices, the sector was 'net subsidized' in 2000. The subsequent upturn in international prices may well have reversed this trend again.

2.25 For Punjab, future agricultural strategy should reflect on how the sector can best respond to international market demand for improved quality of produce. Future export market access may be hindered by rising sanitary and phyto-sanitary (SPS) standards and increasing technical requirements (labeling, identity preservation, etc.) in importing countries. In domestic upper-income urban markets too, food safety and standards are likely to be increasingly rewarded. To meet these challenges adequate arrangements need to be established in Punjab as soon as possible.

## Chapter 3

### Policies, Public Expenditures and Provision of Public Services

3.1 Price support and input subsidies are at the core of agricultural policies in Punjab. Some, like the policy of minimum support prices (MSP), government procurement, and subsidy on fertilizers, are controlled and funded by GOI. Others, like the subsidies on power and water for irrigation, are funded by GOP. This division of responsibilities complicates enormously the strategic choices and actions that GOP by itself can take to influence reform in the sector.

3.2 A second set of issues explored in this chapter relate to expenditure decisions and delivery of government services that are within the GOP ambit. These include decisions on creation of new infrastructure assets, operation and maintenance (O&M) of existing ones, and delivery of research, extension, irrigation, and marketing services. The summary conclusion is that institutions and policies which were established, and well suited, to the demand for increased cereal production now need substantial restructuring and change of approach to be able to respond to market demands of competitive, high value agriculture.

3.3 Finally, this chapter looks at farm profitability of different crops, and explores the probable impact on profitability of eliminating power and fertilizer subsidies, and of aligning domestic output prices with international prices.

#### A. Price Support

3.4 *Price support has been a core element of India's rice and wheat strategy.* GOI minimum support prices have been an integral part of national policy to support rice and wheat production since the advent of the green revolution.<sup>1</sup> To support the MSP, GOI through the Food Corporation of India (FCI), follows an open-ended procurement policy and buys whatever is offered for sale at MSP (provided it meets defined quality specifications). Under this system, wheat and paddy are procured directly from farmers through wholesale markets, while rice is procured by a system of levies whereby rice mills are obligated to sell a certain percentage (known as 'levy percentage' which differs across states) of their milled rice to GOI at the MSP.

3.5 *Punjab has been a major beneficiary from GOI price support operations.* In principle while MSP is a national price, in practice it operates effectively only in a handful of states where the supporting physical apparatus for extensive government procurement exists. Consequently Punjab and Andhra Pradesh are the major rice procuring states, while Punjab, Haryana and Uttar Pradesh account for the bulk of wheat procurement (Table 3.1). In Punjab, more than 75% of the state's rice production and 55% of wheat production is procured by GOI. As a proportion of market arrivals the figures are much higher -- over 90% of market arrivals of rice and wheat in Punjab are currently procured by GOI at the MSP. These figures are the highest among all states and underline the comparatively risk free market environment faced by the average wheat/rice growing Punjabi farmer compared to counterparts in other states.

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<sup>1</sup> As stated in the GOI Economic Survey, 2002/03 the objectives of the MSP policy are: (i) provide remunerative prices to farmers, and (ii) meet food security needs and ensure adequate supplies for the Public Distribution System and various other welfare schemes. GOI announces MSPs for 24 crops every year including wheat, rice, copra, cotton, jute, sugarcane, tobacco, and a number of coarse cereals, oilseeds and pulses. Of these, MSPs are effective mainly for rice, wheat and sugarcane where extensive procurement arrangements exist to support the MSP.

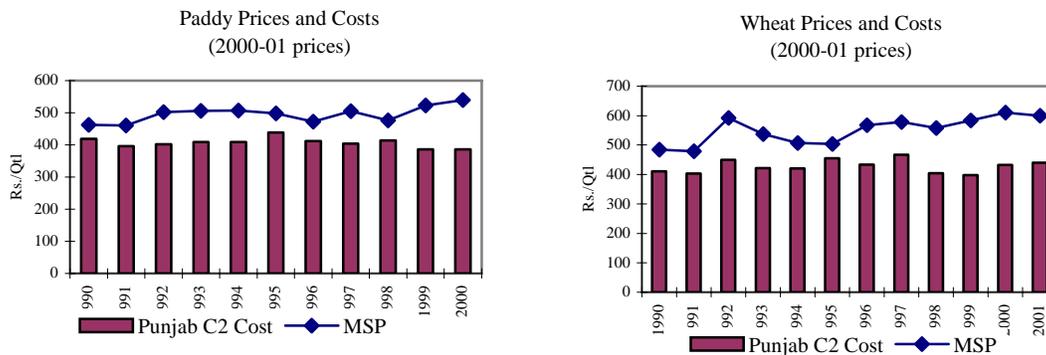
**Table 3.1: Rice and Wheat Procurement Across Main States**  
(average 1999/00-2000/01)

| <i>Rice</i>    | Percentage Share in All-India |            | Procurement as Percentage of |                 |
|----------------|-------------------------------|------------|------------------------------|-----------------|
|                | Procurement                   | Production | Production                   | Market Arrivals |
| Andhra Pradesh | 32                            | 13         | 55                           | 87              |
| Bihar          | 0                             | 7          | neg                          | neg             |
| Haryana        | 6                             | 3          | 47                           | 54              |
| Karnataka      | 1                             | 4          | 5                            | 9               |
| Orissa         | 5                             | 6          | 19                           | na              |
| Punjab         | 35                            | 10         | 77                           | 90              |
| Tamil Nadu     | 7                             | 9          | 18                           | 40              |
| Uttar Pradesh  | 7                             | 14         | 10                           | 33              |
| West Bengal    | 2                             | 15         | 3                            | 35              |
| All India      | 100                           | 100        | 23                           | 53              |
| <i>Wheat</i>   |                               |            |                              |                 |
| Bihar          | 0                             | 6          | neg                          | neg             |
| Haryana        | 27                            | 13         | 46                           | 97              |
| Madhya Pradesh | 3                             | 9          | 5                            | 25              |
| Punjab         | 57                            | 22         | 57                           | 99              |
| Rajasthan      | 4                             | 8          | 9                            | 38              |
| Uttar Pradesh  | 9                             | 35         | 6                            | 29              |
| All India      | 100                           | 100        | 21                           | 56              |

Source: Estimated. Data from GOI, Bulletin of Food Statistics, various issues; CMIE, Agriculture, various issues.

3.6 *Support prices of rice and wheat have increasingly diverged from market prices, production costs and international prices.* From being a ‘support price’ meant to provide insurance to agricultural producers against any sharp fall in farm prices, MSPs for wheat and rice have become the ‘best price’ for farmers, particularly from around the mid-1990s.<sup>2</sup> Since 1996/97, MSPs for the two crops have been increased substantially, disproportionate to trends in production costs, international prices, market prices, prices of other crops, or to general inflation.

**Chart 3.1: Paddy and Wheat Prices and Costs in Punjab**

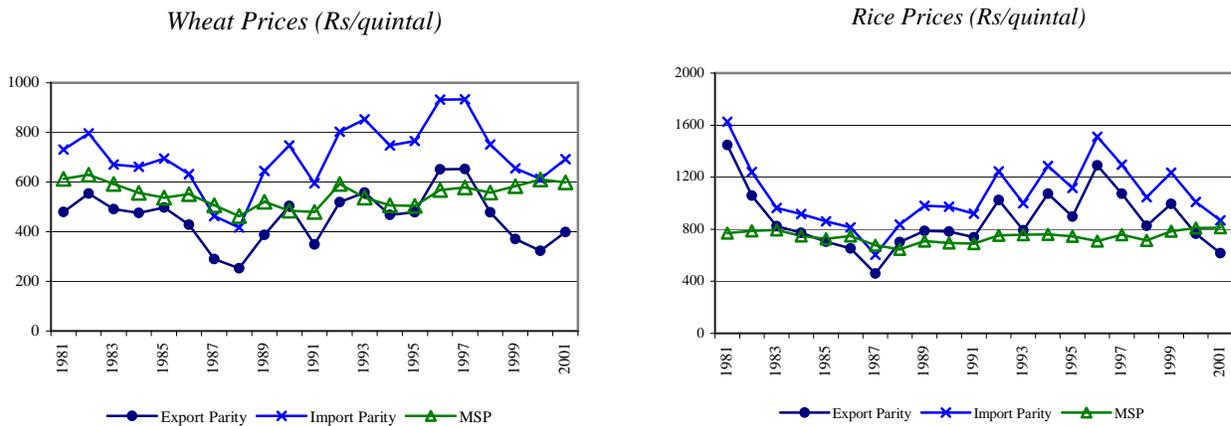


Notes: All costs and prices have been deflated using Punjab's CPIAL. Paddy MSP is for fine variety, which is the dominant variety procured in Punjab.  
Source: GOI, Commission for Agricultural Costs and Prices.

<sup>2</sup> MSPs are announced after taking account of recommendations of the Commission for Agricultural Costs and Prices (CACPC). In recommending MSPs, CACPC considers various factors including cost of production, input/output price trends, and international prices. Of these the cost of production is the most significant. An important cost concept used by CACPC is C2 cost which includes all actual expenses in cash and kind including rent paid for leased land, rental value of owned land, imputed value of family labor, and interest on value of owned capital. C2 is a comprehensive cost akin to full cost.

3.7 MSP and production costs. In 2001/02, weighted average full cost (C2 cost in CACP terminology) of eight wheat producing states was Rs. 483 per quintal (of which Punjab's was Rs. 456 per quintal) against the MSP of Rs. 620 per quintal (GOI, Economic Survey, 2002/03), providing an attractive return to those farmers who were able to access the government procurement system. Punjab, with the highest density of government purchase centers in the country, provides such ready access to virtually every farmer in the state. A significant development during the 1990s, particularly since the mid-1990s, has been the faster rate of increase of MSPs as compared to costs of production (Chart 3.1). For Punjab, during 1981-89, the average difference between MSP and C2 cost was 20% for wheat and 14% for paddy. In the 1990-95 period, this widened to 21% for wheat and 19% for paddy, and during 1996-2000 widened even further to 36% and 26% respectively, further accentuating incentives for producing rice and wheat.

**Chart 3.2: International Rice and Wheat Prices vis-a-vis MSPs**  
(2001/02 Prices)



Notes: All prices have been deflated using Punjab's CPIAL; International prices are for Thai 15% broken (rice) and US Hard Red Winter Number 2 (wheat).

Sources : Estimated using the database of the study by Gulati, Pursell and Mullen (2003); GOI, Bulletin on Food Statistics, various issues.

3.8 MSP and international prices. In recent years, real MSPs have increasingly diverged from international prices of rice and wheat (Chart 3.2).<sup>3</sup> Steady increases in MSP, particularly after the mid-1990s when international prices experienced a downturn, has meant that Punjab rice and wheat is no longer export competitive (although they are still efficient import substitutes). It is interesting to note that a downward trend in real international prices in the 1981-87 period elicited a downward response in real MSPs, but the downturn in international prices since the mid-1990s has not been reflected in MSPs which have continued to increase in real terms (particularly for wheat). This could partly be a reflection of increased political intervention in the setting of MSPs -- till the mid-1990s MSPs recommended by the CACP were by and large accepted, but in the late-1990s GOI started announcing substantially higher prices than those recommended by CACP. For instance, in 1996/97 against a CACP recommended price of Rs.

<sup>3</sup> International prices are adjusted for transport, handling charges, etc. and are calculated for Punjab treating the commodities both as exportables and importables. If domestic price is less than the exportable international price (i.e.  $NPC < 1$  on exportable hypothesis) the commodity is export competitive; if domestic price is less than the international importable price (i.e.  $NPC < 1$  on importable hypothesis) the commodity is an efficient import substitute.

405 per quintal for wheat, GOI announced a MSP of Rs. 475 per quintal -- a 25% jump from the previous year's MSP of Rs. 380 per quintal.<sup>4</sup>

3.9 MSP and farm prices in other states. In Punjab, where over 90% of the rice and wheat that is marketed is bought by GOI, the MSP is the representative price received by farmers. However, in some of the other major producing states like Bihar, Orissa, eastern Uttar Pradesh, Karnataka, and West Bengal for rice or Bihar, Madhya Pradesh and Rajasthan for wheat, government

procurement is limited – around 5-10% of production (Table 3.1). In these states the representative price is the farm harvest price (FHP), data on which is collected by the Ministry of Agriculture. Table 3.2 shows trends in real FHPs and real MSP during the 1990s. The notable feature is that while FHPs declined in real terms in a number of states, in Punjab they increased, and this trend was accentuated in the second half of the 1990s.

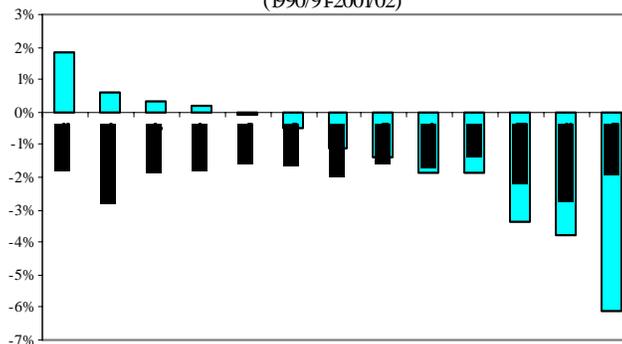
**Table 3.2: Growth in Farm Harvest Prices**  
(1990/91-2000/01; percent per annum)

|                      | Paddy Prices |                | Wheat Prices |
|----------------------|--------------|----------------|--------------|
| Andhra Pradesh       | -0.49        | Bihar          | -1.77        |
| Bihar                | -1.09        | Haryana        | 0.43         |
| Karnataka            | -0.06        | Madhya Pradesh | -0.31        |
| Orissa               | -2.08        | Punjab         | 1.71         |
| Punjab               | 0.01         | Rajasthan      | -0.52        |
| Tamil Nadu           | -0.17        | Uttar Pradesh  | -0.11        |
| Uttar Pradesh        | -0.55        | MSP            | 1.86         |
| West Bengal          | 1.06         |                |              |
| MSP (fine variety)   | 0.96         |                |              |
| MSP (coarse variety) | 0.78         |                |              |

Notes: All prices are expressed in real terms (2000-01 prices) using state-specific CPIALs as deflators; Due to data unavailability growth of paddy prices in Orissa is for the period 1996/97 to 2000/01.  
Sources: Estimated; Data from GOI, 2002; GoP Statistical Abstract of Punjab, various issues

3.10 *Benefits of MSP accrue mainly to larger farmers.* A recent exercise using 1998 National Sample Survey (NSS) data shows that small and marginal farmers, who constituted about 54% of farmers growing rice and wheat in Punjab, obtained only about 21% of the financial benefits from MSPs for rice and wheat (Sur and Umali-Deiningner, 2003).<sup>5</sup> This distribution of benefits is roughly in line with the 22% of rice and wheat area that was cultivated by small and marginal farmers.

Chart 3.3: Average Annual Growth in Real Farm Harvest Prices across Agricultural Commodities in Punjab (1990/91-2001/02)

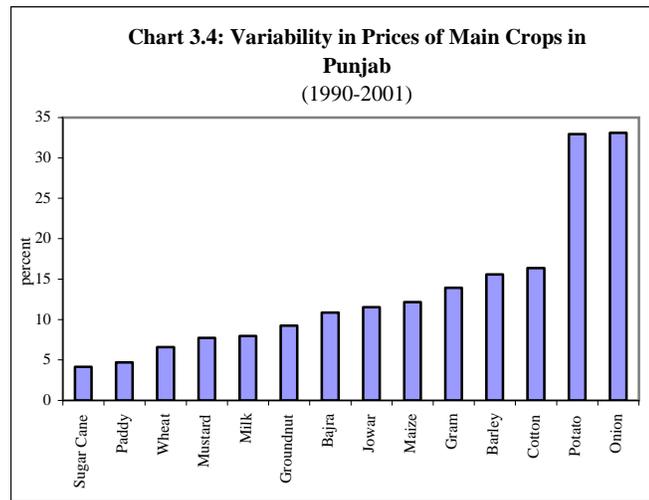


Source: Estimated using data from GOP, Statistical Abstract of Punjab, various issues

<sup>4</sup> GOI, Economic Survey, 2002/03 and Bhatia (2002) also allude to increased political intervention in setting of MSPs.

<sup>5</sup> Benefits are calculated as the difference between MSP and C2 cost of production.

3.11 **Consequences of the increase in MSPs.** The disproportionate increase in rice and wheat MSPs has led to at least three undesirable outcomes. First, prices of rice and wheat have increased more than of other crops in Punjab (Chart 3.3). Together with the relatively low price variability (Chart 3.4) and low yield variability (Chart 3.6, below) of rice and wheat, this has made rice-wheat cultivation even more attractive and worsened incentives for diversification away from this cropping system. Second, GOI stocks of foodgrains have increased well beyond stated norms with a consequent increase in storage costs and the food subsidy (Box 3.1). Finally, the high MSPs have forced the private sector, which used to be a major grain buyer in the state when MSPs acted as a minimum price, out of the grain trade business in Punjab – over 95% of rice and wheat marketed in Punjab in the last 3-4 years has been bought by GOI, with private presence limited mainly to high value basmati rice.



Note: Variability computed using the Cuddy La Valle Index.  
Source: Estimated. Data from GOP, Statistical Abstract of Punjab, various issues

### Box 3.1 Minimum Support Prices, Food Subsidy and GOI Foodgrain Stocks

Large increases in the minimum support prices (MSP) of rice and wheat since 1996/97 have increased public procurement sharply. Annual national procurement of rice and wheat which averaged 21.9 mmt in the 1991-97 period, increased to an average of 32.2 mmt in the 1998-2001 period. However, because of relatively low market prices, offtake from public foodgrain stocks did not match the increased procurement and public stocks increased rapidly. Against a national buffer stock norm of 15.4 mmt on January 1, stocks on this date were 18.3 mmt in 1998 and increased steadily to an unprecedented 58 mmt in 2002. Since then efforts to liquidate surplus stocks including open-market sales at prices much below FCI's economic cost, reduction of PDS prices and increasing PDS allocations, and increased export incentives have met with some success and grain stocks as of January 1, 2003 were down to 48.2 mmt. However, even this level of stocks is very high -- almost three times the current buffer stock norm of 16.8 mmt.

High MSPs and large public stocks have led to a sharp increase in the food subsidy in recent years -- from about 0.5% of GDP in the mid-1990s to over 0.8% of GDP in 2002/03. In particular, the storage component of the food subsidy has increased dramatically, from 13% of the food subsidy in 1997/98 to 42% in 2001/02, and this fiscal cost of carrying excessive grain is increasingly being questioned (GOI, Economic Survey, 2001/02). With growing realization among policy makers that the existing MSP and procurement system was becoming unsustainable, a High Level Committee on Long Term Grain Policy was constituted in November 2000 which submitted its report in June 2002. The committee has identified high MSPs fixed in the 1990s as the central problem and recommended immediate reduction of MSP to average C2 cost, and also that future MSPs be strictly linked to C2 costs. To make the transition palatable, the committee has also recommended a compensation package for state governments, and further suggested that state governments offer this compensation to farmers through a combination of direct per hectare transfers, subsidized insurance premiums, specific crop diversification schemes or credit/input linked schemes to offset costs. GOI is deliberating on these recommendations and action has yet to be taken on any of these proposals.

## B. Input Subsidies

3.12 Apart from output price support, subsidized inputs, particularly irrigation and chemical fertilizers, have been an important feature of pricing policies in the agricultural sector. Fertilizers are subsidized by GOI, while irrigation – both canal water as well as groundwater through subsidized electric power is subsidized by the state government. The fertilizer subsidy is explicitly shown in the GOI budget, while the power and water subsidies are estimated as difference between costs and user charges.<sup>6</sup> It is also important to note that from 1997-2002 Punjab provided free electric power and canal water for agriculture; user charges were reintroduced in October-November 2002.

### 3.13 *Size and trends.*

During 1997/98 - 2001/02, subsidies on fertilizer, power and water averaged about 4.5% of Punjab's SDP or 10.9% of its agriculture SDP (Table 3.3)<sup>7</sup>. Of these, the power subsidy was the largest,<sup>8</sup> followed by fertilizers, with the canal water subsidy a distant

third.<sup>9</sup> Over time, these subsidies have grown, particularly during the 1980s (input subsidies were less than 1% of SDP prior to the 1980s), plateaued for a few years in the early 1990s due mainly to a decrease in fertilizer subsidy following decontrol of phosphatic and potassic fertilizer prices, and then accelerated again in the late 1990s.

**Table 3.3: Input Subsidies in Agriculture in Punjab**  
1990/91 to 2001/02 (Billion Rupees, Current Prices)

|         | Subsidy in Rs. Billion |       |            |       | Total Subsidy as Percentage |     |
|---------|------------------------|-------|------------|-------|-----------------------------|-----|
|         | Irrigation             | Power | Fertilizer | Total | Agr. SDP                    | SDP |
| 1990-91 | 0.24                   | 3.85  | 4.27       | 8.36  | 10.1                        | 4.4 |
| 1991-92 | 0.27                   | 4.21  | 4.76       | 9.24  | 8.8                         | 4.0 |
| 1992-93 | 0.31                   | 5.93  | 6.05       | 12.29 | 10.1                        | 4.7 |
| 1993-94 | 0.32                   | 7.10  | 4.60       | 12.02 | 8.6                         | 4.0 |
| 1994-95 | 0.25                   | 6.72  | 5.47       | 12.44 | 8.1                         | 3.6 |
| 1995-96 | 0.36                   | 6.93  | 5.67       | 12.96 | 7.8                         | 3.4 |
| 1996-97 | 0.49                   | 8.99  | 6.40       | 15.88 | 8.2                         | 3.6 |
| 1997-98 | 0.78                   | 11.89 | 8.05       | 20.72 | 10.1                        | 4.3 |
| 1998-99 | 0.86                   | 14.45 | 9.32       | 24.63 | 11.0                        | 4.4 |
| 1999-00 | 1.25                   | 19.39 | 10.61      | 31.25 | 12.3                        | 5.1 |
| 2000-01 | 1.18                   | 16.59 | 10.86      | 28.63 | 10.6                        | 4.3 |
| 2001-02 | 1.39                   | 17.77 | 10.28      | 29.44 | 10.5                        | 4.2 |

Sources: Irrigation Department, Punjab; PSEB; Fertilizer Statistics 2001-02; Statistical Abstract of Punjab. See also Annex 1.

<sup>6</sup> Following the establishment of the Punjab State Electricity Regulatory Commission (PSERC) in 2001/02, the agricultural power subsidy is being explicitly indicated in the state budget.

<sup>7</sup> Annex 1 contains a methodological note on the estimation of size and incidence of input subsidies.

<sup>8</sup> Power subsidy to agriculture is calculated as the difference between cost of supply and revenue collected from the sector. The cost of supply is estimated by multiplying Punjab State Electricity Board (PSEB) data on agricultural consumption by the average per unit cost of supply. This methodology tends to overestimate the subsidy to agriculture as PSEB agricultural consumption figures are not actually measured consumption (since there are no meters) but are derived as a residual – they overestimate agricultural consumption by the extent to which distribution losses and pilferage are shown as agricultural consumption. Data on actual agricultural consumption are not available, but a Bank study in neighboring Haryana suggested that actual consumption in agriculture was only about two-thirds of what HSEB showed as agriculture power consumption (World Bank, 2001).

<sup>9</sup> The irrigation subsidy calculated here is on O&M costs alone i.e., it is the difference between O&M expenditures and revenue collected from water charges. It does not include costs incurred on capital expenditures. Gulati and Narayanan (2003), using an alternative definition that includes a 1% cumulative capital cost at historical prices, estimate canal water irrigation subsidy in Punjab for the triennium ending 1999/00 to be Rs. 1750 million, compared to Rs. 960 million estimated here.

3.14 **Consequences of the subsidies.** Apart from the obvious fiscal consequences, such large subsidies distort the relative scarcity value of inputs and encourage misallocation of resources. Of great concern also is the design of the subsidies as it encourages wastage and indiscriminate exploitation of natural resources. Power and water are charged not according to actual consumption, but on a ‘flat rate’ basis. For instance, power for agricultural pumpsets is currently charged at Rs. 60/hp/month. In practice, this means that once the user pays the charges due as per pumpset capacity, the marginal cost of electricity for operating pumpsets is zero, and hence there is no incentive for energy (and by implication groundwater) conservation. Similarly, canal water is charged at Rs. 200/ha/year, although because of the *warabandi* system of irrigation (a rotational water entitlement system) that is practiced in the state, the amount of water consumed is rationed. Unmetered and subsidized power and water provide no incentive for water conservation in a water deficit state. Rapidly depleting water resources are a critical concern and prompt corrective action is necessary, not least on the pricing front. For fertilizers, the relative underpricing of nitrogenous fertilizers has led to their overuse, and contributed to contamination of water quality and increased pest and disease incidence in some crops. Also, part of the fertilizer subsidy has gone to support the fertilizer industry, keeping inefficient units in business.<sup>10</sup>

3.15 **Benefits from input subsidies accrue mainly to larger farmers.** Table 3.4 summarizes the distribution of benefits from power, water and fertilizer subsidies across different farm sizes<sup>11</sup>. Small and marginal farmers constitute 35.5% of the farmers in the state and cultivate 8.8% of the cropped area. But they receive only 5.9% of the power subsidy, 7.3% of the fertilizer subsidy and 5.0% of the canal water subsidy – a distribution which is more regressive than the land distribution. Although not unexpected, since these subsidies are universal by design and not targeted towards specific groups, this result is a serious indictment of the subsidy regime. Politically, continuation of these subsidies is often justified on the inability of small and marginal farmers to pay higher user charges. But as the results show, it is really the larger farmers who are obtaining most of the benefits.

**Table 3.4: Percentage Distribution of Benefits of Input Subsidies across Farm-sizes in Punjab (1995/96)**

|                             | Farm Sizes         |                   |                    |                 |
|-----------------------------|--------------------|-------------------|--------------------|-----------------|
|                             | Marginal<br>(<1ha) | Small<br>(1-2 ha) | Medium<br>(2-6 ha) | Large<br>(>6ha) |
| Percent Area Cultivated     | 3.0                | 5.8               | 41.1               | 50.2            |
| Percent Farms               | 18.7               | 16.8              | 46.2               | 18.4            |
| Percentage Distribution of: |                    |                   |                    |                 |
| Fertilizer Subsidy          | 2.5                | 4.8               | 40.5               | 52.2            |
| Power Subsidy               | 1.8                | 4.1               | 46.0               | 48.1            |
| Canal Water Subsidy         | 1.4                | 3.6               | 39.9               | 55.1            |

Source: Estimated. See also Annex 1

3.16 **Other subsidies.** Apart from fertilizer, power, and water, some government schemes also subsidize inputs and services like seeds, planting material, artificial insemination and training.

<sup>10</sup> Gulati and Narayanan (2003) compare prices farmers would have paid for fertilizer, had it all been imported, to prices actually paid. Using this methodology, they conclude that between 1981-2001 farmers received only about 67% of the fertilizer subsidy in India.

<sup>11</sup> In Table 3.4, marginal, small, medium and large farmers are those operating: less than 1ha, 1-2 ha, 2-6 ha and above 6 ha respectively. This is different from the classification sometimes adopted at the all – India level where farms more than 4 ha are referred to as large farms. In Punjab, however, where the average operational farm size is 3.6 ha as against 1.6 ha at the national level, it is more appropriate to categorize 2 to 6 ha as medium farms and above 6 ha as large farms.

Their accurate assessment is limited by unavailability of data on full costs of providing these services, but rough estimates suggest that the size of these subsidies is small (not more than Rs. 200-300 million annually) compared to the three main subsidies discussed above. However, although the fiscal costs of providing these subsidies may not be large, they do discourage a greater role for the private sector in provision of these goods and services. For instance, private delivery of artificial insemination services is increasingly being encouraged in other states by reducing government subsidies on them, and GOP would do well to consider such options seriously.<sup>12</sup>

### C. Public Expenditures and Capital Formation

3.17 *Agricultural public expenditures are smaller in Punjab compared to other states.* Apart from the GOP funded subsidies on power and water, which cost the state government 6.8% of the agriculture SDP in 2001/02, there are other public expenditures on agriculture. These include expenditures on capital formation and also expenditures incurred on providing various agricultural services through the government departments of irrigation, agriculture, horticulture, animal husbandry, dairy and fisheries, and the Punjab Agricultural University. As a percentage of agriculture SDP, these expenditures are lower in Punjab as compared to other agriculturally important states in the country (Table 3.5). For the triennium ending 2000/01, they average 4.7% of agriculture SDP, which is less than all states except West Bengal.

**Table 3.5: Public Expenditures in Agriculture across Main States, India**  
(Average for 1998/99 to 2000/01)

|                | Agriculture expenditure (Rs. Billion) | Agriculture expenditure to agriculture SDP (%) | Composition of agriculture expenditure     |  |
|----------------|---------------------------------------|--|--|--|
|                |                                       |  | Capital expenditure to agriculture SDP (%) | Current expenditure to agriculture SDP (%) |
| Andhra Pradesh | 30.5                                  | 8.1  | 2.7  | 5.4  |
| Bihar          | 13.9                                  | 5.9  | 2.1  | 3.7  |
| Haryana        | 9.6                                   | 6.0  | 1.9  | 4.1  |
| Karnataka      | 29.0                                  | 10.5   | 4.1  | 6.4  |
| Madhya Pradesh | 21.9                                  | 7.7  | 1.8  | 5.9  |
| Orissa         | 12.8                                  | 9.8  | 4.5  | 5.3  |
| <b>Punjab</b>  | <b>11.5</b>                           | <b>4.7</b>                                     | <b>1.9</b>                                 | <b>2.7</b>                                 |
| Rajasthan      | 17.9                                  | 7.8  | 2.5  | 5.3  |
| Tamil Nadu     | 24.2                                  | 11.0   | 1.9  | 9.1  |
| Uttar Pradesh  | 33.6                                  | 5.3  | 1.0  | 4.2  |
| West Bengal    | 16.0                                  | 4.1  | 0.6  | 3.5  |
| All States     | 357.4                                 | 7.8  | 2.2  | 5.6  |

Source: Estimated using data from RBI, State Finances, A Study of Budgets of 2000-01 and 2001-02; CSO, National Accounts Statistics

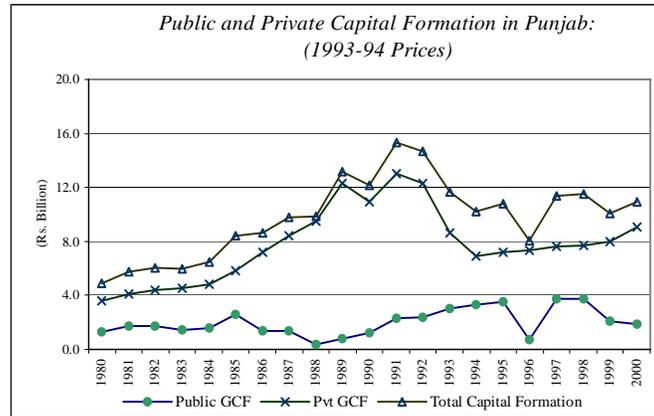
3.18 *Capital investments.* A decomposition of agricultural public expenditures into their capital/current components shows that for the triennium ending 2000/01, capital expenditures were only 1.9% of agriculture SDP, which is less than the 2.2% average across all states in the country.<sup>13</sup> This relatively low level of public investment is worrying since capital investments

<sup>12</sup> For instance, charges for artificial insemination services provided by government departments are Rs. 35 in Uttaranchal and Rs. 30 in Uttar Pradesh. In Punjab the charge is Rs. 7.

<sup>13</sup> Capital expenditures shown in the state accounts are primarily investments in irrigation and flood control. Two points should be noted. First, the capital expenditures series has been adjusted to exclude expenditures on food storage and warehousing which were negative for a number of years. These latter expenditures are primarily transfer payments to finance grain procurement operations carried out on behalf of FCI, and to the best of our knowledge, do not involve any capital formation. Closer examination also

are a precursor to future growth. Private capital formation, which is the dominant source of investment in the sector (four to six times public capital formation), decreased in real terms in the first half of the 1990s, but has stabilized since (Chart 3.5).

**Chart 3.5: Agricultural Capital Formation in Punjab**



Note: Series have been deflated using the Punjab's SDP (Agriculture) deflator.

Sources: Economic and Statistical Organization, Punjab; Statistical Abstract of Punjab 2000.

3.19 **Current expenditures.** The size and composition of current public expenditures (or revenue expenditures as they are called in the budget documents) in agriculture is of even greater concern than public capital spending. As a proportion of agriculture SDP, current expenditures in Punjab are, by far, the lowest among the main agricultural states (Table 3.5). Current expenditures have acquired a pejorative meaning of being non-productive, but they fulfill critical developmental needs, for instance, of O&M in irrigation and research and extension. Without adequate resources to meet these vital needs, lives of existing assets get shortened, and technology generation and adoption, essential to improving productivity, is compromised. Rationalizing fiscal outlays to free resources for meeting these needs, particularly their non-wage components, should be a priority for the state. This issue is further elaborated in the next section on provision of public services.

## D. Agricultural Services

### Research and Extension

3.20 Punjab has a large public sector serving agriculture, including the Punjab Agricultural University (PAU) for agricultural research, education and extension, and the various departments of the state government that provide front line extension, as well as a number of other input and regulatory services. Together these departments and units employ nearly 30,000 staff.

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revealed that the 'public capital formation in agriculture' series compiled separately by the Department of Economics and Statistics, GOP matches closely the 'capital expenditures excluding food storage and warehousing' in the budget documents further endorsing this inference. Second, adding 'off-budget' expenditures on rural roads, incurred by the State Mandi Board, which were an average Rs. 0.28 billion annually between 1998-2000 increases agricultural capital expenditures by this amount, but does not make any substantive difference to the overall picture.

3.21 **Research expenditures and priorities have been slow to respond to new demands.**

Agricultural research in the Punjab is largely supported by appropriations from the GOP budget (75%) and by various ICAR programs (17%), with small amounts from other sources. Overall, 0.42% of agriculture SDP is invested by the public sector in agricultural research and education in Punjab, which is the same as the all-India average, but low compared to the industrialized country average of 2.6% (for research alone, and excluding the large private sector R&D effort) and 0.6% for all developing countries. GOP itself has been a leader in investing in research in Punjab, providing over two-thirds of the total R&D investment in the state. However, after exceeding the average growth rate for all states in the 1970s and 1980s, the rate of growth of GOP investments in research fell to 2.4% per annum in the 1990s, compared to 3.8% for all states (Pal and Byerlee, 2003). Also an increasing share of this budget is spent on salaries, amounting to 83% in 2001, relative to 65% in 1980, the norm for effective research organizations. The budget is operated through a large number of schemes (e.g., there were 523 schemes in 2002/03) resulting in high transaction costs and hindering redeployment of manpower. PAU also pays pension to the retirees for which it does not receive any financial support from GOP. The pension payments for 2002/03 were about Rs. 184 million against an income of Rs. 60 million on the investments of Pension Corpus Fund. Clearly this pension system is not sustainable.

**Table 3.6: Allocation of Punjab Agricultural University's Research Budget**

| Year | Research Budget<br>(Rs. Million) | Percentage Research Budget to Field Crops |              |                    | Percentage Research Budget to |                       |                 |           |        |
|------|----------------------------------|---|--------------|--------------------|-------------------------------|-----------------------|-----------------|-----------|--------|
|      |                                  | All                                       | Wheat & Rice | Cotton & Sugarcane | Horticulture                  | Livestock & Fisheries | Post Harvesting | Marketing | Others |
| 1980 | 41.5                             | 43  | 16           | 15                 | 12                            | 16                    | 5               | 1.2       | 23     |
| 1990 | 144.1                            | 48  | 18           | 12                 | 13                            | 11                    | 3               | 0.5       | 24     |
| 2000 | 547.1                            | 41  | 19           | 10                 | 11                            | 12                    | 4               | 0.7       | 30     |
| 2001 | 608.5                            | 40  | 20           | 9                  | 12                            | 11                    | 5               | 0.7       | 31     |

Source: Punjab Agriculture University.

3.22 The allocation of research funds within PAU has been slow to respond to new demands for a diversified agriculture. Based on crop specific schemes, the share of rice and wheat (which is mainly used for productivity maximization) in the total research budget has actually increased over time, from 16% in 1980 to 20% in 2001, while the share of cotton, sugarcane, horticulture, livestock, and post-harvest has either stagnated or decreased slightly (Table 3.6). Research on marketing, policy, integrated pest and nutrient management, and organic farming has been especially weak. Although water has emerged as a critical input for future of agriculture in Punjab, a comprehensive research strategy for addressing various aspects of water management has been lacking. In sum, the research allocations are not only low, these are also not appropriately targeted. There is considerable potential for improving the effectiveness of these outlays by reordering the priorities to address the challenges of diversification and sustainable use of natural resources.

3.23 The private sector has increased its investment in R&D in Punjab, mostly associated with research on hybrid seeds of maize, cotton, and rapeseed. However, large private agribusiness investors in high-value agriculture in Punjab (e.g., tomatoes, potatoes, dairy, and mentha), have largely imported their technologies from elsewhere, and have depended little on PAU technologies.

3.24 **Extension expenditures are consumed by salaries.** Extension is carried out by a number of state agencies, such as the Departments of Agriculture, Horticulture, Dairy, Animal Husbandry, and Fisheries, which have an extensive network of extension specialists at the district,

block and village levels. More than 13,500 staff were employed in these departments in 2001, of which an average of 20% were technical staff (Table 3.7).

**Table 3.7: Public Expenditures on Provision of Agricultural Services in Punjab (2001/02)**

| Department                     | Total Expenditure<br>(Rs. Million) | Expenditure on Salaries<br>(Rs. Million) | Share of Salaries in Total Expenditure<br>(%) | Number of Employees |               |
|--------------------------------|------------------------------------|--|---|---------------------|---------------|
|                                |                                    |  |   | Technical           | Non-Technical |
| <b>Research</b>                |                                    |  |   |                     |               |
| Punjab Agricultural University | 1154                               | 959                                      | 83  | 1264                | 4050          |
| <b>Extension</b>               | 1904                               | 1575                                     | 83  | 2732                | 10828         |
| Agriculture (Crop Sector)      | 720                                | 545                                      | 76  | 1226                | 3566          |
| Horticulture                   | 124                                | 85                                       | 69  | 199                 | 988           |
| Animal Husbandry               | 954                                | 854                                      | 90  | 1081                | 5667          |
| Dairy Development              | 52                                 | 42                                       | 81  | 112                 | 238           |
| Fisheries                      | 54                                 | 49                                       | 90  | 114                 | 369           |
| <b>Irrigation (O&amp;M)</b>    | 1392                               | 1216                                     | 87  | 1147                | 8055          |
| <b>Total</b>                   | 4450                               | 3750                                     | 84  | 5143                | 22933         |

Sources: Concerned Departments of GOP and PAU, Punjab.

3.25 These public extension services have suffered an erosion of support in recent years, as salaries have consumed an increasing proportion of their outlays. For example, between 1990/91 and 2001/02, the share of salaries in the budget of the Department of Agriculture increased from 22% to 76%, while overall crop sector extension expenditures as a share of agriculture SDP decreased from 0.92% to 0.26%. The share of salaries in Department of Animal Husbandry and Department of Fisheries is now 90%.

### Box 3.2

#### Private Sector Extension in the Dairy Sector

Nestle, a Swiss multinational company, has been operating a milk plant in Moga since 1961. The company procures milk from 1025 villages, and through Nestle Agricultural Services (NAS), works closely with the dairy farmers of these villages providing extension advice, inputs and other services needed to obtain assured supply of quality raw milk. The focus of various activities is on sustained development of efficient dairy farming and clean milk production through direct and transparent contact. NAS has a staff of about 20 qualified veterinary and livestock specialists working as 'Route Officers', each covering about 50 villages. Farmers are advised about the latest developments in the dairy sector through organized field days, training camps, farmers' open days, milk yield competitions and exposure visits. Important messages are disseminated through payment envelopes, calendars, posters and newsletters. NAS also provides health cover to dairy animals, and supplies medicines, balanced feed and fodder seed. For genetic upgradation of dairy cattle, the company supplies pedigree bulls and has also set up 37 artificial insemination centers. All material inputs are supplied on cost recovery basis but costs are low as a result of bulk purchase by the company.

The number of milk suppliers has increased from 180 in 1961 to over 85,000 in 2002. Average milk procurement has increased from 4.6 kg/farmer/day in 1962 to 10.7 kg/farmer/day in 2002. In 2002 the average farmer received Rs. 25,500 from the sale of milk to supplement his income from crop production. A rigorous program for creating awareness about the benefits of clean milk production, and modernization of infrastructure have resulted in substantial improvement in milk quality in terms of reduction in bacterial count, antibiotics, pesticide residues, and aflatoxins.

3.26 In addition to agricultural extension services, these public agencies also continue to provide some inputs, especially planting materials, and animal and veterinary services. While prices for these services have been raised, they are still well below full cost of the service. Not only do low prices undermine fiscal sustainability, they also act as a disincentive for private investment in these services.

3.27 In recent years, private extension activity has increased. Much of this is associated with contract farming by large agribusiness entities, such as Pepsi and Nestle (Box 3.2). As part of the contract, these firms provide intensive extension advice to their farmer clients, sometimes charging a fee for the service.

3.28 *Assessment of research and extension.* The public sector agricultural research and extension system performed well in introducing and disseminating green revolution technologies from mid-1960s to 1980s, based on packages of technology for major crops, especially rice and wheat, and a linear system of passing those packages from research to extension to farmers. However, their relevance and effectiveness were increasingly compromised as a result of inability to adapt to changing needs. This system is ill suited to meet the needs of a market-driven and diversified agriculture. Major deficiencies include:

- An excessive reliance on the public sector for both funding and delivery of services;
- Proliferation of programs resulting in dispersal of available resources and lack of focus in areas of relevance, opportunity and strength;
- Insufficient use of modern tools of information and communication technology;
- A system compartmentalized by rigidity of disciplines, schemes and commodities, with a focus on rice and wheat relative to other commodities and enterprises;
- Emphasis on production, with weak capacity in post harvest and marketing services;
- An erosion of human resource capacity, with extensive inbreeding and intellectual isolation of research staff, lack of objective and transparent criteria for performance linked career advancement, lack of in-service training, and a high ratio of support staff to technical staff (average of about 5:1);
- Inability to effectively utilize available staff due to limited operating budgets and difficulties in redeploying staff in strategic and emerging areas; and
- A break down of effective linkages of research and extension, with erosion of capacity and budget support, and an increasing reliance on technical staff at PAU for direct extension advice.

## **Irrigation**

3.29 Punjab has an extensive canal irrigation network that in 2001/02 irrigated 0.99 million hectares of land. In 1990/91 the same network irrigated 1.67 million hectares (GOP, Statistical Abstract, 2002). This absolute decline is in some measure due to the changing crop mix as spread of water intensive crops like rice has changed water demand per hectare, but is largely a reflection of the state of disrepair of the surface irrigation system in the state. Carrying capacity of channels has decreased due to erosion of banks, silt deposits, breaches, etc., and, judging from annual data on actual area irrigated, this disrepair appears to have taken place largely during the 'free water' era of 1997-2002. The maintenance of the system is the responsibility of the Water Resources and Environment Organization (formerly the Irrigation department) but lack of operational funds has meant that O&M has been neglected, a situation common to most states of

the country. About 87% of the O&M budget goes to meet salaries (Table 3.7) leaving little for actual works.

3.30 Unlike many other states in the country, not much initiative has been taken in Punjab to undertake O&M by involving actual beneficiaries within a participatory irrigation management framework. There are no water user groups to speak of in Punjab and without active state support (political, legal, institutional) it is unlikely that they will emerge. This is despite the State Water Policy of 1997 calling for transfer of O&M responsibilities to beneficiary groups. Also little has been done to carry out a systematic assessment of available water resources and current and future demands from various sectors (drinking water, irrigation, industrial/thermal use). Numerous committees were constituted following the 1997 State Water Policy, but none of them are very active.<sup>14</sup>

3.31 To make up for the neglect of the canal irrigation system, farmers have increasingly relied on groundwater irrigation. Area irrigated by groundwater increased by 0.83 million hectares between 1990/91-2001/02 as against the 0.68 million hectares decline in canal water irrigated area. Apart from the substantial private investments this implied in pumpsets, it has also contributed to the rapid depletion of groundwater resources. There is also the danger that use of marginal quality tubewell water in the absence of canal irrigation will lead to development of sodic soils in central Punjab. Clearly, urgent corrective measures are necessary, not least of which should involve new institutional arrangements, such as beneficiary participation in the operation and maintenance of existing surface irrigation systems.

### **Marketing**

3.32 Punjab has a vast network of regulated wholesale markets (also known as '*mandis*') including 144 principal markets, 530 sub-yards and about 900 seasonal purchase centers for rice and wheat. These are regulated under the Agricultural Produce Markets Committee (APMC) Act, 1961 whose main objectives were to protect farmers from exploitation by middlemen and to provide facilities for auctioning of produce, and thus ensure farmers received competitive prices. In Punjab the *mandi* system has played a major role in development of the agriculture sector, providing easy market access to farmers all over the state. During the harvest season, farmers can typically find a purchase center within 8-10 kms of their village, which is by far the best market density in the country.

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<sup>14</sup> There is a State Water Resources Council with the Chief Minister as chairperson; a State Water Resources Committee with the Chief Secretary as chairperson; a State Water Resources Technical Advisory Committee with a Chief Engineer as chairperson; and a Regional Water Resources Technical Advisory Committee.

3.33 Two features of the Act are particularly noteworthy in the present context. First, the Act empowers the state government (as in other states), through the State Mandi Board, with a monopoly on establishing and managing these markets. Second, all notified agricultural commodities, currently numbering over 100 and including all important grains, pulses, oilseeds, cotton, fruits, vegetables, and spices, if sold wholesale, must be marketed through a regulated market. These provisions of the APMC Act are no longer compatible with the modern and competitive structure sought by government. They adversely affect farmers by restricting their marketing options in forcing them to sell only through *mandis*, and also hamper the development of wholesale markets by restricting their establishment to the public sector.

3.34 While there has been an increasing need for modern market infrastructure, the existing public monopoly has not kept pace with market needs. The current system is characterized by congestion in *mandis*, poor sanitary conditions, and lack of market transparency. The condition of fruit and vegetable markets is especially poor. Support services like grading, standardization, and market information systems have suffered, and quality improvements have been lacking. The marketing system is such that the farmer has no incentive to improve the quality and cleanliness of produce. Licensing requirements for traders and commission agents operating in the *mandis* have led to vested interests that prevent new entrants and oppose reforms in the system. Malpractice and fraud are widespread and were alluded to in a 1998 report by an expert committee that reviewed the agricultural marketing system in Punjab.<sup>15</sup> In a later report, Dhillon, Rangi and Gill (2002) estimate that farmers paid Rs.1.25 billion for paddy in a single season by way of malpractices at the *mandi* level.

3.35 Recent GOI committees have increasingly questioned the state monopoly and other restrictive provisions that apply under the APMC Acts.<sup>16</sup> The Ministry of Agriculture, GOI is currently drafting a fresh ‘Model APMC Act’ as a blueprint for all states to address ills identified in the system of regulated markets. However, since agricultural marketing is a State subject, GOI cannot directly enforce any amendments to the Act – these will have to be done by state governments. Punjab would do well to heed to this call.

**Table 3.8: Market Fees and Taxes in Punjab**

| Charges                | Rate Ad-Valorem | Paid by | Accrues to                 |
|------------------------|-----------------|---------|----------------------------|
| Market Fee             | 2%              | Buyer   | Mandi Board                |
| Rural Development Fund | 2%              | Buyer   | Rural Development Board    |
| Infrastructure Tax     | 1%              | Buyer   | Rural Infrastructure Board |
| Purchase Tax           | 4%              | Buyer   | State Treasury             |
| Commission             | 2.5%            | Buyer   | Commission Agent           |
| Total                  | 11.5%           |         |                            |

Source: Punjab Mandi Board (2002)

<sup>15</sup> Punjab State Agricultural Marketing Board, ‘Expert Committee on Possibility to Reduce the Number of Intermediaries in Agricultural Marketing System in the State of Punjab’, 1998. The committee composed of officials, academics and agribusiness referred to the following mal-practices by commission agents: evasion of market fee and other taxes, over-weighting of agricultural produce of the farmers, non-payment of incidentals due to labor, deduction of excessive charges, giving illegal gratifications to the procurement agencies and the marketing staff at the expense of farmers, charging illegal commissions, and charging higher commission rate on “illegal transactions” where market fee and other taxes were not paid.

<sup>16</sup> GOI, Report of the Expert Committee on Strengthening and Developing of Agricultural Markets, 2001 and GOI, Report of the Inter-Ministerial Task Force on Agricultural Marketing Reforms, 2002.

3.36 At the *mandis*, all produce has to be sold through commission agents. Various fees and taxes amount to at least 11.5% of the value of produce (Table 3.8) -- the highest in the country. In addition, commodity-specific charges are incurred on unloading, sieving, weighing, etc. which are paid by the seller – for wheat and paddy these currently add to another 1-2% of the value of produce. The fees and taxes generate considerable revenues which accrue to different parts of the public sector -- the Mandi Board, Rural Development Board, Rural Infrastructure Development Board, and the state treasury. In 2001/02 revenues of Rs. 13.3 billion were generated which was equivalent to 4.7% of agriculture SDP. This is a sizeable amount, equal to the total amount of public spending on capital formation and provision of public services in the agricultural sector. In addition, commission agents earned about Rs. 4 billion -- a considerable amount of money that makes them a powerful lobby. From the Punjab perspective the high levels of taxes and charges, particularly in recent years with FCI buying virtually all the rice and wheat sold in the state, are seen as an instrument of resource transfer from GOI, and the incentive to lower them is weak. However, to encourage private traders back to Punjab the disincentive arising from the high taxes has to be reduced, otherwise neighboring states with lower taxes will attract their business.<sup>17</sup>

### E. Financial and Economic Profitability

3.37 A combination of price support, subsidized inputs, and relatively low risk has made rice and wheat cultivation the most profitable amongst competing crops in Punjab. Before moving to an analysis of relative profitability, however, it is instructive to look at trends in costs and returns to rice and wheat. Rice is the dominant *kharif* season crop and wheat dominates the *rabi* season, and it is against these two that other crops are evaluated.

3.38 ***Fixed costs in rice and wheat have grown faster than variable costs, suggesting subsidies have been capitalized into land values.*** For Punjab, detailed cost of cultivation (COC) data from the Commission on Agricultural Costs and Prices (CACP), which is the most authoritative and widely used data source on production costs, is only available for rice, wheat and cotton. Fixed cost, more than 85% of which is rental value of land, increased faster than variable cost (Table 3.9). This suggests that the price increases dictated by the MSP have been capitalized into land values. Indeed the COC data may be underestimating this since it

**Table 3.9: Growth in Rice and Wheat Costs in Punjab**  
(1990/91-2000/01)

|       | <i>Trend Growth Rate (percent per annum)</i> |                       |                         |                            |
|-------|--|-----------------------|-------------------------|----------------------------|
|       | MSP<br>(Rs./qtl)                             | C-2 Cost<br>(Rs./qtl) | Fixed Cost<br>(Rs./qtl) | Variable Cost<br>(Rs./qtl) |
| Wheat | 1.9  | 0.1                   | 1.5                     | -1.3                       |
| Rice  | 1.0  | -0.4                  | 0.0                     | -0.8                       |

Source: Estimated: Data from CACP.

arbitrarily caps land rent at 33% of value of output; evidence from recent years indicates that actual land rents are significantly higher than COC values. This has two major implications. First, real returns to farmers may be less than indicated by COC data, so farmers feel squeezed, even though returns on variable costs have increased. Second, with subsidies capitalized into land values – which tends to happen in all subsidy programs – reduction of subsidies will affect land values and rents, and consequently face opposition from agricultural landowners who are a dominant interest group in the state.

3.39 ***Enterprise profitability to farmers.*** To evaluate profitability across a wider range of field crops, sample data in some years (e.g., Chand, 1999a), and PAU crop budget data were used to

<sup>17</sup> In the 2002 season, private traders in Punjab did not buy any Punjab wheat but bought about 500,000 tons from neighboring Uttaranchal and UP where they found advantages both in terms of market charges and the fact that market prices there were below MSP.

construct farm enterprise profitability in Table 3.10.<sup>18</sup> Irrespective of the data source used, what emerges clearly is the high gross profitability (defined here as the difference between gross revenues and variable costs) of rice and wheat relative to main competing crops. However, cotton has been more profitable than rice in some years, such as 1996/97, but has been severely affected by pests and diseases in recent years. Basmati rice is also generally competitive with standard rice.

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<sup>18</sup> Annex 1 contains a detailed note on the profitability analysis presented here.

**Table 3.10: Gross Profits Across Crops in Punjab (Rs/ha)**

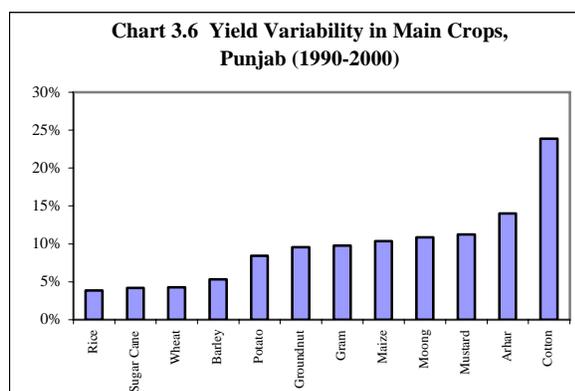
|                            | 1992-93 | 1996-97 | 2001-02 |
|----------------------------|---------|---------|---------|
| <b><i>Kharif Crops</i></b> |         |         |         |
| Rice                       | 10,103  | 5,334   | 12,872  |
| Basmati Rice               | na      | 7,705   | 13,195  |
| Maize                      | 1,440   | -2,327  | 1,410   |
| Cotton                     | 5,977   | 12,886  | 6,237   |
| Sugarcane                  | 17,365  | 8,905   | 18,630  |
| Green Gram (moong)         | 7,827   | 2,765   | 5,320   |
| Pigeon Pea (arhar)         | 5,550   | 1,578   | 2,132   |
| Groundnut                  | na      | 528     | 2,228   |
| Pearl Millet (bajra)       | na      | -4,390  | -2,325  |
| <b><i>Rabi Crops</i></b>   |         |         |         |
| Wheat                      | 11,857  | 8,859   | 18,351  |
| Barley                     | 8,970   | 5,828   | 9,015   |
| Gram                       | na      | 1,718   | 9,238   |
| Mustard                    | 6,945   | 6,374   | 4,362   |
| Sunflower                  | na      | 5,403   | 2,133   |

Notes: Gross Profit is the difference between gross revenue and variable cost of production;

Profits in case of sugarcane accrue over a year.

Sources: 1992-93 figures from Chand (1999a); 1996-97 and 2001-02 figures from PAU, Department of Economics and Sociology.

3.40 In addition, rice and wheat are much less risky. They enjoy relatively stable prices (Chart 3.4, above), and extremely low yield risk. Yield variability of other crops is higher, and in the cotton, yield risk is extreme (Chart 3.6).



Note: Variability is computed using the Cuddy La Valle Index.

Source: Estimated. Data from GOP, Statistical Abstract of Punjab, various issues.

3.41 Finally, the question arises whether the superior profitability of rice and wheat is due to the high priority to research and technology transfer programs for these crops. Average yields for rice and wheat are 75-85% of maximum potential yields from applying the full PAU package of recommendations and as measured in onfarm demonstration programs. However, other crops are only achieving 50-60% of maximum potential yields. To explore this question, returns from PAU enterprise budgets with the full package of technology are presented for a range of crops and for dairy in Table 3.11. In the *kharif* season, basmati rice is competitive, and especially cotton -- mainly through use of the complete package of recommended practices. In the *rabi* season, winter maize and gram also compete. Also and as expected, fruits and vegetables and dairy are generally very competitive. Note, however, these calculations do not take account of the lower price risk and yield risk of rice and wheat.

**Table 3.11: Agriculture Profitability in Punjab**  
(2001/02; as per the technology package recommended by PAU)

| Crop                                  | Yield<br>(Kgs/ha) | Gross<br>Revenue<br>(Rs./ha) | Variable Costs<br>(Rs./ha) | Gross Profits<br>(Rs./ ha) |
|---------------------------------------|-------------------|------------------------------|----------------------------|----------------------------|
| <b><i>Kharif Crops</i></b>            |                   |                              |                            |                            |
| Rice                                  | 4,333             | 36,400                       | 18,892                     | 17,508                     |
| Basmati Rice                          | 3,000             | 36,000                       | 17,579                     | 18,421                     |
| Summer Maize                          | 5,000             | 23,750                       | 14,574                     | 9,176                      |
| Cotton                                | 2,500             | 46,500                       | 18,072                     | 28,428                     |
| Sugarcane                             | 30,000            | 79,688                       | 45,994                     | 33,694                     |
| Green gram (moong)                    | 1,500             | 21,750                       | 12,019                     | 9,731                      |
| Pigeon pea (arhar)                    | 1,500             | 21,375                       | 9,746                      | 11,629                     |
| Groundnut                             | 2,250             | 27,625                       | 19,190                     | 8,435                      |
| <b><i>Rabi Crops</i></b>              |                   |                              |                            |                            |
| Wheat                                 | 5,250             | 37,025                       | 15,215                     | 21,810                     |
| Barley                                | 4,500             | 25,475                       | 10,635                     | 14,840                     |
| Winter Maize                          | 7,125             | 35,456                       | 12,848                     | 22,608                     |
| Gram                                  | 2,000             | 30,875                       | 11,467                     | 19,408                     |
| Rapeseed & Mustard                    | 2,000             | 24,700                       | 11,810                     | 12,890                     |
| Sunflower                             | 2,000             | 23,000                       | 13,722                     | 9,278                      |
| <b><i>Vegetables &amp; Spices</i></b> |                   |                              |                            |                            |
| Potato                                | 31,250            | 62,500                       | 38,517                     | 23,983                     |
| Tomato                                | 50,000            | 100,000                      | 66,388                     | 33,612                     |
| Mentha                                | 1,750             | 66,500                       | 40,126                     | 26,374                     |
| <b><i>Dairy</i></b>                   |                   |                              |                            |                            |
|                                       |                   | 184,104                      | 128,000                    | 56,104                     |

Notes: (i) Sugarcane and dairy returns are for a year; (ii) For the dairy sector, returns per hectare reflect returns from milk yields of 8 milch animals for a year.

Sources: PAU, Department of Economics and Sociology; GOP, 2002; Gill et.al (1995).

**3.42 Exploring economic profitability.** Enterprise profitability is of course, distorted by input subsidies and MSP policies, which generally favor rice and wheat, especially rice which consumes an estimated 60% of the electricity used in agriculture.<sup>19</sup> To explore the probable impact of removing these subsidies in a partial equilibrium framework, economic profitability was computed by adjusting: (i) power and fertilizer prices to eliminate the share of the subsidy paid by farmers, and (ii) setting output prices in line with border prices.<sup>20</sup>

**3.43** Simulations with removal of subsidies and border prices are presented in Table 3.12.<sup>21</sup> The impact of the removal of power subsidy (column b) is most pronounced on the profitability of rice, with profits of other crops improving relative to rice. However, it does not significantly

<sup>19</sup> For 2000 and 2001 PSEB data shows that electricity consumption from May-October was 67% of average annual consumption. During the *kharif* season, rice covers 70-75% of area, and due to its high water requirement it would be reasonable to assume that most (90%) of the electricity is used for rice, thus giving about 60% as share of electricity to rice.

<sup>20</sup> These simulations are to obtain rough estimates of likely relative profitability changes, and should be interpreted as such. They implicitly assume input use is inelastic to input price changes. Constructing a more elaborate model is beyond the scope of this study.

<sup>21</sup> Disaggregated input data were not available for fruits and vegetables. Hence the analysis is restricted to the main crops for which such data were available. The impact of removing the canal water subsidy could not be explored because of data limitations.

change the relative ranking of crops. Removing the fertilizer subsidy (column c) further affects

**Table 3.12: Impact of Subsidy Removal on Relative Profitability Across Main Crops (2001-02)**

| Crops               | Gross Profits (Rs./ha) | Gross Profits with no Power Subsidy (a) | Gross Profits with no Power & Fertilizer Subsidy (b) | Gross Profits with no Subsidy & Estimated Exportable Output Prices (c) | Gross Profits with no Subsidy & Estimated Importable Output Prices (d) | Gross Profits with no Subsidy & Actual Exportable Output Prices (e) | Gross Profits with no Subsidy & Actual Importable Output Prices (f) |
|---------------------|------------------------|---|--|--|--|---|---|
| <b>Kharif Crops</b> |                        |   |  |  |  |   |   |
| Rice                | 17,508                 | 12,873                                  | 11,898   | 16,541   | 27,396   | 4,727   | 21,692  |
| Basmati Rice        | 18,421                 | 15,639                                  | 15,005   | na   | na   | na  | na  |
| Summer Maize        | 9,176                  | 8,018                                   | 6,954  | 9,585  | 21,335   | 3,485   | 16,785  |
| Cotton              | 28,428                 | 27,269                                  | 26,737   | 65,902   | 72,027   | 57,702  | 64,177  |
| Sugarcane           | 33,694                 | 31,308                                  | 30,546   | 32,089   | 59,839   | 29,839  | 56,839  |
| Green Gram (Moong)  | 9,731                  | 8,804                                   | 8,439  | na   | na   | na  | na  |
| Pigeon Pea (Arhar)  | 11,629                 | 11,165                                  | 10,701   | na   | na   | na  | na  |
| Groundnut           | 8,435                  | 7,740                                   | 7,393  | na   | 12,488   | na  | 8,415   |
| <b>Rabi Crops</b>   |                        |   |  |  |  |   |   |
| Wheat               | 21,810                 | 20,651                                  | 19,479   | 13,003   | 29,383   | 9,118   | 25,078  |
| Barley              | 14,840                 | 14,376                                  | 13,844   | na   | na   | na  | na  |
| Winter Maize        | 22,608                 | 20,754                                  | 19,971   | 20,492   | 37,236   | 11,800  | 30,752  |
| Gram                | 19,408                 | 18,945                                  | 18,728   | na   | 26,994   | na  | 34,914  |
| Rapeseed & Mustard  | 12,890                 | 12,195                                  | 11,412   | na   | 9,374  | na  | 8,114   |
| Sunflower           | 9,278                  | 7,192                                   | 6,525  | na   | 15,004   | na  | 11,924  |

Note: Gross Profit is difference between gross revenue and variable cost of production. Sugarcane profits accrue over a year. Source: Estimated. Data from PAU; Gulati et al (2003)

rice profitability, and in addition to basmati and cotton, sugarcane (which being an annual crop is compared to the rice-wheat combination) and pigeon pea also become competitive.<sup>22</sup> In the *rabi* season, removal of these two subsidies makes water efficient gram competitive to wheat. Cotton profitability increases sharply in *kharif*, but relative ranking of crops does not change materially. In *rabi* season, winter maize and gram remain competitive to wheat.

3.44 Columns (c) to (f) set output prices in line with border prices.<sup>23</sup> For several crops, border prices are set at both import and export parity to reflect the fact that India is self-sufficient in these commodities or fluctuates between export and import status. Two alternative sets of border prices were used. In the first case (columns (c) and (d)) output prices for 2001/02 under the exportable and importable hypothesis were estimated using 20 year (1981-2000) trends. Analytically, this methodology irons out short term price fluctuations (such as the currently depressed international prices), and is therefore preferred. In the second case (columns (e) and (f)), actual international prices prevailing in 2001/02 were used.

3.45 Expressing gross profits at economic prices negatively affects the profitability of wheat (exportable hypothesis). For rice (and maize), there is a material difference in absolute

<sup>22</sup> To remove the entire budgetary subsidy on fertilizers, it is estimated that fertilizer prices would have to be increased by about 61% (see Annex 1). However, as argued by Gulati and Narayanan, 2003, over the period 1981-2000, farmers' share in the fertilizer subsidy has been only 67.5% and the remaining has accrued to the fertilizer industry. Taking this into account only the subsidy to farmers has been eliminated in the simulations. This implies an increase of 41% in fertilizer prices to remove the subsidy.

<sup>23</sup> The analysis is restricted to commodities for which international price series were readily available.

profitability depending on whether estimated or actual border prices are used, as the difference between the two sets of prices was significant.<sup>24</sup> Using actual prices sharply decreases rice profitability and this is because of the extremely low rice prices in 2001/02 – since then international prices of rice have firmed up. Cotton profitability increases sharply in *kharif*, but relative ranking of crops does not change materially. In rabi season, winter maize and gram remain competitive to wheat.

3.46 In sum, removal of subsidies improves profitability of a number of crops relative to rice and wheat. Cotton, in particular, using the complete package of recommended practices (which is an important caveat), is an attractive alternative to rice. However, given the low price and yield risks in rice and wheat which have not been factored into the simulations, it also appears that ‘getting prices right’ by itself may not be sufficient to usher in the size of area shifts that GOP has targeted. Other issues too need to be addressed and options in this regard are discussed in the next chapter.

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<sup>24</sup> On the exportable hypothesis, for instance, the estimated rice price was Rs. 947 per quintal against the actual price of Rs. 637 per quintal. For maize the estimated exportable hypothesis price was Rs. 452 per quintal compared to the actual price of Rs. 330 per quintal. Other crops are not as affected, although in all cases, excepting gram, actual prices in 2001/02 were less than the estimated ones reflecting the overall depression in international commodity prices.

## Chapter 4

### Options and Recommendations

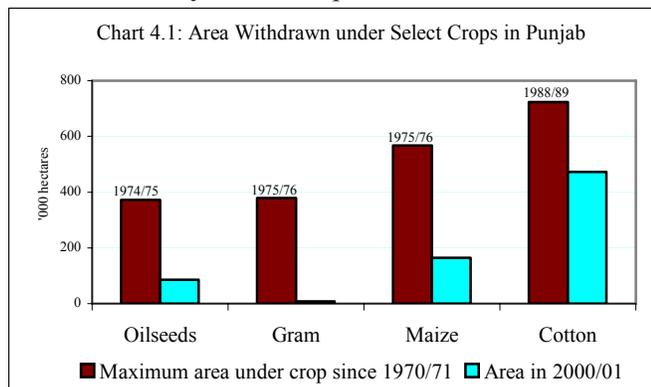
4.1 The previous chapters suggest that without significant reforms in government policies and institutions, accelerating growth in an environmentally sustainable manner will be difficult to achieve. While diversification away from the rice-wheat system has correctly been identified by GOP as a priority, the question is how, in the current distorted incentive system, is that to come about? This chapter looks at various policy and institutional options in this regard.

#### A. Enterprise Options for Growth and Diversification

4.2 Before moving to a discussion of reform options, one often-asked question is to identify what might be the commodities in which Punjab will have a competitive advantage in a liberalized economy, and that would renew growth in a more sustainable manner. These have been extensively discussed, and even notional areas assigned to various crop substitutes for wheat and rice (GOP, 2002). However, it is not the role of this study or even of the GOP to pick ‘winners’. Rather the emphasis should be on providing the appropriate enabling environment that will stimulate market-driven diversification.

4.3 Nonetheless, some discussion of possible crop substitutes is needed to set the scene for the analysis of policy and institutional options. Clearly on all grounds -- growth, environment and fiscal implications -- rice is of major concern, and diversification out of rice should be the priority. Rice yields have stagnated, some 60% of all irrigation water is applied to rice, and excessive stocks of rice cost the GOI Rs. 2,400 per ton per year. While wheat contributes to the fiscal problem, wheat yield has continued to increase although relatively slowly at 2% per year, and it is an efficient user of water. Against this background, it may be useful to consider diversification options at three levels.

4.4 ***Focus on environmental and fiscal sustainability through large area substitution.*** A sustainable resolution of environmental and fiscal problems requires substitution out of rice, and to a lesser extent wheat, over a large area. Some estimates (GOP, 2002) calculate that one million ha of land should be diverted from rice and wheat to restore the water balance in the state. In the short to medium term, this substitution can only be achieved through field crops — cereals (basmati rice, maize), oilseeds (rapeseed, groundnut, sunflower), pulses (gram, moong, arhar) and cotton. Under current technology, and especially with a liberalized price regime, basmati rice and cotton are promising in kharif, and gram and winter maize in the rabi season. A static indication of the potential of these crops is given by the area that they once occupied before the rice-wheat system dominated, and which sums to well over one million hectares (Chart 4.1). Basmati rice is not included since it has never reached a significant area— however, in neighboring Pakistan Punjab with a more liberalized price system, basmati occupies around three quarters of total rice area. In addition, changes in markets and technology have opened new possibilities for field crops, especially hybrid varieties of gram, winter maize, sunflowers, pigeon pea, and down the road, hybrid Bt cotton.



Source: GOP, Statistical Abstract of Punjab, various issues

4.5 *Focus on growth through higher-value activities for the Indian market (with some prospects for exports).* The Indian market for high-value commodities, especially fruits and vegetables, dairy products and fish, is growing rapidly with increasing incomes and urbanization. These commodities are the best prospects in the short to medium term for revamping growth. However, markets although expanding rapidly, are limited and Punjab faces stiff competition from other states with lower labor and land costs. The prospects for large area substitution in the short to medium term, are therefore also limited, although fodder already occupies about 10% of the cropped area, and there are good prospects to expand dairying.

4.6 *Focus on growth through export-oriented high-value activities (also for upper end domestic market).* Punjab has much potential in the long run to stimulate growth by expanding into exports of horticultural products, organic products, flowers, medicinal plants, spices, and mushrooms, and processed products derived from them. International markets for these products are growing rapidly. However, markets for these products are very competitive and demanding in terms of quality, and the challenge is to stimulate private sector led initiatives, backed by public investment in critical infrastructure and the appropriate regulatory environment (e.g., for sanitary and phyto-sanitary measures). In the long run, one vision for Punjab would be to be a major producer of horticultural products for the Indian market, as is California in the USA, or a major exporter of off-season fruits and vegetables for the rapidly expanding Asian market, as Chile is for the Americas.

## **B. Conceptual Matrix for Analyzing Policy and Institutional Options**

4.7 The previous chapters have highlighted the three-dimensional nature of the challenges facing agriculture in Punjab -- restoring growth, promoting environmental sustainability, especially sustainable ground water use, and reducing the drain on fiscal resources from subsidies, both at the GOI and GOP levels.<sup>1</sup> Two broad groups of policy and institutional options are available for moving forward on these three fronts. The first group of options relate to price policies and public expenditures -- changes in the MSP system for rice and wheat, elimination of input subsidies, public investment for agriculture (R&D and infrastructure), and various forms of transfer payments. The second group of options deal with reform of key institutions serving the agricultural sector -- research, extension, irrigation, and regulated markets. These various options are schematically laid out in Table 4.1, along with the likely direction and relative magnitude of effects on the three main challenge areas -- growth, environment, and fiscal. To complete the picture, the last column shows likely effects on farmers' incomes. In a state where farmers have a strong political voice, the effects on their incomes is an indicator of the political feasibility of promoting the reform.

4.8 A number of observations are clear from this matrix. First, there is no single instrument or 'magic bullet' for resolving Punjab's agricultural challenges. Most instruments have a significant impact on only one of the challenges. Reform of MSP, for example, largely addresses the fiscal problem, although it should also contribute to environmental sustainability, and in the long run, to enhanced growth. Therefore, sustained reform on a number of fronts will be needed to resolve the crisis. Second, some of the instruments are the responsibility of the GOI, others of

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<sup>1</sup> Punjab is in an extremely stressed fiscal situation. One indicator is that 'committed' expenditures (salaries, pensions and interest) alone exceed total state revenues, which implies that any expenditures beyond the 'committed' expenditures have to be met through borrowing. In such a situation it will be difficult to find additional budgetary resources for the agricultural sector; hence redeployment of existing resources -- from subsidies to more productive uses -- is necessary.

the GOP, and some of both. The GOP cannot resolve the crisis alone, but must act in concert with parallel reforms by the central government. Third, many of the reforms, especially of price policies, will adversely affect farmers' incomes, at least in the short term. Although larger farmers will suffer absolutely and relatively more, small farmers will also feel the pain. Other reforms, such as enhanced public investment will have strong positive effects on farm incomes, but it will take several years for these reforms to have full impacts. This raises issues of political trade offs between short term pain and long term gains. Finally, the set of reforms is inter-dependent and requires sequencing. Reform of MSP and input subsidies is needed to free public resources for increased public investment and to meet critical operational and maintenance needs. Likewise, the pain of increased input prices can be lessened by reforms that ensure reliable supply of inputs, especially electricity. And public investments will not have their desired effects without deep institutional reforms to make publicly-funded services, such as irrigation, research and extension, more efficient and responsive to markets.

**Table 4.1: Matrix of Effects of Different Instruments in Addressing the Major Agricultural Issues in Punjab**  
(Number of + indicates positive effect; – indicates negative effect)

|   | Gol or GoP | Impact on Major Problem           |                              |                       |     | Impact on Farmers (Short term) |
|---|------------|-----------------------------------|------------------------------|-----------------------|-----|--------------------------------|
|   |            | Enhanced Growth                   | Environmental Sustainability | Fiscal Sustainability |     |                                |
|   |            |                                   |                              | GOP                   | GOI |                                |
| <i>Price Policies and Public Expenditure Policies</i> |            |                                   |                              |                       |     |                                |
| Freeze MSP but above operating costs                  | GOI        | – in short term<br>+ in long term | +                            | –                     | +++ | --                             |
| Phase out fertilizer subsidy                          | GOI        | – in short term                   | +                            | +                     | +++ | --                             |
| Phase out electricity subsidies and meter             | GOP        | – in short term<br>+ in long term | +++                          | +++                   |     | --                             |
| Phase out canal water subsidy                         | GOP        | – in short term<br>+ in long term | ++                           | +                     |     | –                              |
| Income support program                                | ??         | ++ in long run                    | ++                           |                       | +   | +                              |
| Matching grants for diversification                   | ??         | ++                                | ++                           | –                     | +   | ++                             |
| Investment in research                                | GOP/GOI    | +++                               | ++                           | –                     | –   | +++                            |
| Investment in market infrastructure                   | GOP        | +++                               | +                            | –                     | –   | +++                            |
| <i>Institutional Reforms</i>                          |            |                                   |                              |                       |     |                                |
| Research *  | GOP/GOI    | +++                               | +                            | +                     | +   | ++                             |
| Extension*  | GOP        | +++                               | +                            | ++                    |     | ++                             |
| Farmer organizations**                                | GOP        | ++                                | +                            | +                     |     | ++                             |
| Market regulations ***                                | GOP        | ++                                | +                            | –                     | +   | ++                             |
| Contract Farming ****                                 | GOP        | ++                                | +                            | –                     |     | +                              |
| Water regulations *****                               | GOP        | ++                                | ++                           | +                     |     | +                              |

\* Increase private participation, co-financing by farmers, public-private partnerships

\*\* Strengthening of farmer organizations

\*\*\* Liberalized market regulations, grades and standards, reduced market taxes

\*\*\*\* Promotion of contract farming

\*\*\*\*\* Delay paddy transplantation, O&M with water user groups, groundwater legislation

### C. Reforming Price Policy and Public Expenditures

4.9 The first priority is to reform the price support and subsidy regime. Subsidies on the output side through the MSP and on key inputs, are the main obstacle to efficient markets for promoting agricultural growth. They encourage the inefficient use of resources, and they distort the distribution of farm incomes toward larger farmers who receive the bulk of the subsidies. These subsidies have to be contained, and over the long term, eliminated. Getting prices right will also provide incentives for diversification, and free resources for key public investments to facilitate diversification.

4.10 *Reform of MSP.* The problems of the MSP system have been discussed in earlier chapters -- huge losses in storage (or for exports) of rice and wheat, gross inequities with a few states and large farmers capturing the benefits, and the lack of incentives for private sector participation in the market. For a state like Punjab seeking to reduce area under the rice-wheat system, the steep increase in MSPs around the late-1990s has further worsened farmer incentives for diversification to other, potentially more risky, crops.

4.11 Reform of the MSP system is in the GOI domain, and is a much bigger problem than the Punjab problem. The high level of GOI stocks of foodgrains, which are expected to mount further during the course of next year following the good monsoon in 2003, are likely to remain a major cause for concern. GOI therefore has an interest in addressing the fiscal problem resulting from the MSP system. In this context it is relevant to note that to correct the MSP, the GOI High Level Committee on Long Term Grain Policy, 2002 (also known as the Sen Committee) recommended the following: Immediately lower MSP from present levels to levels of average C2 cost; to manage the transition offer a compensation package to states based on historical procurement levels; and finally for Punjab, recognizing the need to reduce rice area by one million hectares on environmental grounds, the committee recommended an additional compensation of upto Rs. 3 billion conditional on an upper limit to rice procurement. Action has yet to be taken on any of these suggestions, but judging from the 2002/03 GOI Economic Survey, it would appear that reducing the MSP has not found favor with GOI.<sup>2</sup> However, some sort of an agreement between GOI and GOP whereby compensation is paid to states like Punjab in exchange for a cap on grain procurement is apparently being considered. Prospects of a speedy solution depends, among other things, on how GOI manages objections raised by other states to the proposed cash transfer to Punjab.

4.12 GOP, meanwhile, is caught in a paradoxical situation. On one hand it wants to promote diversification because of environmental considerations, while on the other hand political considerations force it to lobby hard with GOI each year for ever higher MSPs for rice and wheat. It would appear that unless GOI and GOP can speedily reach a mutually acceptable agreement to reign in MSPs and government procurement, the situation may worsen before it gets better. Since Punjab will in the long run gain most from the reforms, both in enhancing growth prospects and sustainable use of natural resources, it would be in the interest of the state to lead the national effort to reform MSP.

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<sup>2</sup> To correct the MSP, the GOI, Economic Survey, 2002/03, p. 97, after summarizing some of the Sen Committee recommendations, concludes "...perhaps the only solution we have at hand is to freeze the current MSP until such time it becomes equal to C2 cost or until annual procurement settles down to earlier levels of 24-30 million tons..."

4.13 There remain valid reasons from the point of view of both risk to farmers, and to national food security, for continuing efforts to reduce sharp price fluctuations in basic grains to both producers and consumers, that would result from completely liberalized markets in rice and wheat. These risks are potentially larger in India than in other countries, given the fact that India fluctuates between an importer and an exporter of grains, and also because as a very large country, it can influence world prices through its trading activities, especially in rice. Thus retaining some form of MSP for food grains, combined with a strategic reserve of about 15-20 mmt is appropriate.

4.14 Given the political sensibilities, the appropriate transitional arrangement may be to freeze MSP prices in nominal terms (i.e., real prices decline by the rate of inflation), until one of three situations occurs; (i) central stocks are reduced to the level of the recommended buffer reserve, (ii) India can regularly export rice or wheat without subsidy, or (iii) the MSP falls to the level of variable costs (highly unlikely given the conditions (i) and (ii)).

4.15 ***Reduction of input subsidies.*** By far the largest subsidy is that on electricity supplied to agriculture through the PSEB, followed by the central government subsidy on fertilizer. There is also a smaller state subsidy on canal water. There is no escape in the long run to pricing the supplies of these inputs at their real costs. For the transitional period, adverse effects on the poorest farmers, might be alleviated through other programs (such as targeted vouchers).

4.16 In terms of both fiscal drain, and efficient use of resources, the removal of the electricity subsidy is the priority, a decision that is under the control of the GOP. A gradual and planned withdrawal of subsidies may be more acceptable but must be sustained over time. However, to be effective in terms of providing incentives for efficient use of scarce groundwater, the system of charging has also to be changed from a flat rate system, to charging according to consumption, i.e., metering of all agricultural connections. In terms of sequencing, metering should be considered a priority and initiated as soon as possible. This view is supported by the national Electricity Act, June 2003 which calls for metering of all consumers within two years, and also by the Punjab State Electricity Regulatory Commission which in its tariff order of September 2002 asked PSEB to prepare a plan at the earliest for shifting agricultural consumers from the flat rate system to metered supply. There are likely to be administrative and implementation challenges, such as higher transaction costs of meter reading in rural areas, by-passing or tampering of meters by farmers, and these will have to be addressed through a program of public awareness, incentives, and strictly enforced penalties on those found guilty of malpractices.<sup>3</sup> Finally, a seasonally higher tariff for May should be seriously considered to discourage early transplanting of rice when evapotranspiration is very high.

4.17 Elimination of subsidies must be accompanied by reforms that ensure reliable and efficient supply. When the farmer is given proper supply, he/she is willing to pay the full cost, as in the case of hiring machinery and even irrigation water from neighbor farmers. In particular, farmers will save from reliable electricity supply, since despite 100% electrification of all villages, nearly 20% of irrigation water was supplied by much more costly diesel engines, that act as a standby to power cuts.

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<sup>3</sup> Suggestions in this regard include introducing a system of differential tariff and other incentives for farmers who opt for metering, use of electronic meters which are less prone to tampering, meter reading at periodic intervals rather than every month (say, once a quarter), and imposition of strict penalties on unscrupulous consumers and PSEB employees found guilty of connivance with those who indulge in pilferage of electricity.

4.18 **Income support payments** One ‘sweetener’ that has been used in a number of countries to reduce price distorting subsidies has been lump sum annual income support payments made directly to farmers based on their crop area prior to phasing out price supports for these crops. These direct income support programs are less distortionary as they decouple payments from production decisions and facilitate a transition from price-distorting subsidies to a price regime that allows resources to be allocated more efficiently.

4.19 The EU and until recently the USA, have been slowly moving toward these types of payments, and some developing countries have now adopted the system. For example, Mexico introduced income support payments at the time it joined the North American Free Trade Association, since domestic prices for several key commodities, such as maize, were considerably above import parity prices, and Mexico committed to moving to free trade in these commodities. Over 90% of farmers receive a fixed annual payment per ha, based on their area in the affected crops at the time of the trade agreement effectiveness. Farmers are free to use the payment as they wish, and are also free to produce any crop, although the land cannot be left idle. Turkey has also introduced a similar scheme to compensate farmers for phasing out high price supports that resulted in huge surpluses. To date, these experiences have been rated in a recent review as a mixed success (Baffes and Gorter, 2003).

**Box 4.1: Characteristics of Existing Decoupled Support Programs**

|                                | EU: CAP Reform   | Mexico: PROCAMPO   | US: FAIR Act  | Turkey: DIS   |
|--------------------------------|--|--|---|---|
| Objective                      | To compensate producers from a reduction in support prices   | To compensate producers for elimination of guarantee prices on support crops                           | To compensate producers for the elimination of deficiency payments  | To cover the reduction in income associated with the removal of administered prices |
| Time Profile                   | Fixed in nominal terms; no expiration date but subject to CAP reforms  | Total of 15 years; first 10 years fixed in real terms; declining in the last 5 years                   | Program lapsed after 7 years and was extended for another 7 years   | No expiration date  |
| Implemented                    | 1993   | 1994   | 1996  | 2001  |
| Payment basis                  | Average acreage in support crops during 1989-1991  | Average acreage in support crops during 1991-93  | Acreage for which deficiency payments were received during 1990-95  | Annual area sown as shown by cadastral records                                      |
| Supported commodities          | Wheat, maize, barley, rye, oats, rapeseed sunflower, soybeans, dried pulses, beans, tobacco, beef, lamb                | Wheat, maize, sorghum, barley, rice, cotton, beans, soybeans, safflower                                | Wheat, maize sorghum, barley, rice, cotton, oats  | All crops eligible for support under the previous programs                          |
| Payment limits                 | None   | \$ 6,700 per farm  | \$ 40,000 per farm  | \$ 5,000 per farm   |
| Restriction on the use of land | Should be allocated to support crops; large producers must put into fallow a predetermined level of support-crop land. | Should be allocated to support crops but since 1996 land could be allocated to other agricultural uses | Should be kept in agriculture (excluding fruits and vegetables); must be in compliance with existing conservation plans | Land has to be cultivated but includes fallow land.                                 |

Sources: Baffes and Gorter (2003); Tsakok (2003)

- 4.20 A number of lessons are emerging for effective income support program implementation:
- Programs must be time bound. The number of years for which producers will be eligible for payments must be clearly limited.
  - Payments should where possible be targeted to poorer farmers (e.g., paying less per hectare as farm size increases, with a ceiling on the numbers of hectares eligible for payment).
  - Eligibility rules and registration procedures need to be clearly defined from the outset.
  - Accurate land titles and cropping pattern prior to announcement of the scheme should be available, and rural banking systems need to be sufficiently well developed to allow payment by check.
  - The program should resist all pressures to make changes in the rules, the time period for payments, and the amount of payments.
  - An independent, highly qualified and incorruptible monitoring system must be in place.
  - The level of payments in aggregate and per farm and the specific terms should be consistent with WTO agreements and protocol.

4.21 Income support payments alone are insufficient. To promote diversification away from affected crops, income support payments should be accompanied by investments in market infrastructure, information systems, institutional reforms to promote more efficient markets, R&D and provision of technical advice to farmers and agribusiness on alternatives economic activities, in which they have a competitive advantage.

4.22 For Punjab, the Johl Committee (Box 4.2) has proposed an income support program that has an additional objective of requiring that farmers do not plant rice and wheat on the area for which they receive payment. This would place additional burden on monitoring, that was not present in the Mexican and Turkish schemes.

4.23 On the positive side, such payments would allow for fiscal savings to the GOI, given the large losses through procurement, reduce price distortions, and provide incentives and a contractual commitment by farmers to move out of rice and wheat. However, the scheme also begs several key questions.

- Could the scheme be efficiently and equitably implemented in Punjab?
- Could the scheme be politically acceptable, by confining it to the Punjab, or even to areas where the MSP for rice and wheat is active, especially without significant state co-financing?
- What are the risks that vested interests created by the scheme would perpetuate this as another form of subsidy, undermining in the long run the competitive position of Punjab, especially through high land values?
- What are the opportunity costs of using scarce fiscal resources for income transfer at the expense of other high payoff public investments that are needed to revamp growth (see below)?

These are difficult questions but ones which need to be thoroughly debated before any decisions are taken.

**Box 4.2: The Johl Committee on Agricultural Policy and Restructuring**

GOP has long recognized the problems of depending on a rice-wheat system and in 1985, set up a Committee on 'Diversification of Punjab Agriculture' under the chairmanship of the distinguished agricultural economist, Professor S.S. Johl. The Committee called for a reduction in at least 20 per cent of the area under rice and wheat. After analyzing the profitability of alternatives, the Committee placed heavy emphasis on diversifying to dairy, with a target of bringing some 17 per cent of total cropped area under fodder crops by 2000.

Over the next 17 years, the area under rice and wheat continued to expand, and the associated problems of low growth, environmental degradation and burgeoning food stocks further intensified. Accordingly, in 2002 the GOP set up a second Committee on "Agricultural Production Pattern Adjustment Program in Punjab for Productivity and Growth", again under the chairmanship of Professor Johl. This report recommends a set of adjustment measures aimed to shift one million hectares out of rice and wheat. Given the experience of the first Committee, this report provides a number of specific recommendations that recognize the difficulties of adjustments, given current price incentives. One of the central recommendations is for the GOI to provide income support payments of Rs 12,500 per hectare to those Punjab farmers who agree to reallocate land from rice and wheat to other crops. This payment (a total of Rs. 12.8 billion, including administrative costs) would be made out of estimated savings of some Rs.50 billion that GOI would realize by **not** having to procure rice and wheat from the one million hectares diverted from these crops. The report also provides an incentive measure, based on existing state marketing costs, to encourage the private sector to enter rice and wheat procurement for exports.

The potential advantages and disadvantages of income support payments, and experiences in other countries are discussed elsewhere. While clearly altering the incentives, it is doubtful, given existing farmer yields and the profitability advantage of rice and wheat, if income support payments of Rs 12,500 would be sufficient to shift much area, given current prices, yields and risks. The Johl report recognizes that support payments would only work if they are combined with a concerted research and technology transfer effort to close the yield gap of competing crops, and to improve their marketing systems. Effective MSP support and procurement would be broadened to cover other major crops and reduce their market risks. However, little is said about reforming underlying price distortions from output and input subsidies, and institutional reforms to make markets and public services more efficient.

4.24 **Matching grant schemes.** Another option is to provide matching grants to farmers, communities, and agri-business to facilitate transition to other enterprises. One-time grants matched by cash contributions from the recipient (depending on farm size) could support a variety of activities.

- Technical support, training and study tours for groups of farmers in alternative crop and livestock enterprises
- Marketing studies, business development services, and market information development for agri-business
- Market infrastructure development by groups of farmers and agribusiness
- Cost of converting current market infrastructure, farm machinery, and irrigation systems to alternative enterprises

4.25 Matching grants have been used in a number of situations, such as Turkey, to support adjustment under liberalization. They are often best administered in a decentralized manner, at the community or local government level. Participatory approaches that bring all stakeholders together along the commodity chain to identify priority diversification activities, can help coordinate grants and other initiatives for input supply, production, processing, and marketing. This allows the implementation of a market-led strategy of developing specialized blocks (of basmati, groundnut, maize, vegetables/fruits, or even milk blocks) that would reap economies of scale, and create needed infrastructure.

4.26 Matching grants have the advantage of being tied to specific diversification initiatives decided on by farmers and agri-business. As one time grants, there would be less expectation of them becoming a permanent subsidy. However, they require many of the same checks as an income support scheme, such as clear eligibility rules, transparent administration, and an independent monitoring system. In addition, special care should be taken to ensure that grants to individual farmers or businesses do not undermine rural financial markets.

4.27 ***Increasing public investment.*** An important challenge is to reverse the decline in agricultural public investment in Punjab. This is in turn tied to reforms of subsidy policy and public sector agricultural institutions to release funds for this purpose. The key public investments supporting agricultural growth are:

- Agricultural R&D
- Rural infrastructure—roads, electricity, canal irrigation and communication
- Critical market infrastructure, including market yards, port facilities, and market information systems.
- Human resources development, especially to serve a growing private sector

4.28 Recent work by IFPRI documents the high payoffs to public investments in India over the past 30 years both in terms of growth and poverty reduction (Fan, Hazell and Thorat, 2000). Reallocation of public expenditures from GOP subsidy transfers (now about 6.8% of agriculture SDP) to public investment would provide a sharp increase over current levels of investment. However, increased public investments should be combined with institutional reforms to ensure that resources are used most efficiently. Unlike in the past, there is now also a recognition that many of these investments can be funded through various types of public-private partnerships, especially R&D and market infrastructure. These types of investments have the potential to sharply increase the profitability and competitiveness of alternative crops (see below).

4.29 Finally, GOP needs to find ways of moving toward a less distortionary tax system to fund public goods. The total taxes and fees on product sales in regulated markets amount to at least 11.5% which represents a substantial disincentive to producers and agr-business. Although it is widely accepted that some types of investments, especially R&D which have considerable economies of size, can be funded through a farmer-managed levy on output (usually 0.5%), other types of taxes and fees (such as for markets infrastructure and rural roads), should be shifted to local users and local communities, through non-distortionary taxes, such as land taxes.

#### **D. Institutional Reform**

4.30 While ‘getting prices right’ is necessary to create a less distorted incentive structure for diversification, it also appears that price and subsidy reform by itself will not be enough. As seen in the profitability analysis in Chapter 3, removing input subsidies and price support improves profitability of a number of crops (particularly cotton using the full package of recommended practices) relative to rice and wheat, but perhaps not enough to overcome the low risk associated with these two crops and usher in vast area substitution. Reforms in the research, extension, irrigation and marketing systems are equally, if not more, important to create an environment where public services can respond quickly to changing farmer and market demands, and work more closely in partnership with the private sector and farmer groups to support the diversification agenda, than has been the case.

## Revamping Agricultural Research and Extension

4.31 Modernization of the agricultural research and extension system to enhance their overall efficiency and effectiveness will be a central element of a strategy to renew agricultural growth in the Punjab. Reform of these systems can also contribute to environmental sustainability (e.g., through development and dissemination of management practices to conserve water), and fiscal sustainability (e.g., privatization of selected services). These reforms involve: (i) defining public and private sector roles, (ii) re-orienting to farmer demands, (iii) re-allocating public funding, and (vi) positioning to tap into new knowledge and technologies.

4.32 *Defining public-private roles.* Extension systems globally are undergoing rapid evolution as the private sector assumes a greater role. In Punjab, the first priority should be to privatize input-related services, such as planting materials, fish fingerlings, and veterinary services. With sophisticated farmers and a commercialized agriculture, there is little reason for the public sector to remain engaged in these activities, beyond regulatory oversight. For example, in the case of veterinary services, extensive surveys in India have shown that even the landless poor are willing to pay for good quality services. Privatization would not only enhance fiscal sustainability but also improve service delivery, even to the poor. GOP needs to draw up a list of the services being provided and delineate those that are private goods, those that are public goods, and those where there may be a role for both (see Table 4.2 for an example for animal health services).

4.33 Although public funding of many services continues to be a priority, private delivery of services, with farmer co-financing, is often a more efficient option, especially for new skills, such as marketing, that are not available in the existing system. In the long run, the role of public sector extension should evolve from front line extension to a role of facilitator, that can link farmers to multiple sources of advisory services and information.

4.34 Public-private partnerships also have much potential for R&D, and there are already some promising initiatives, such as the partnership between PAU and Pepsi, and the interest by the textile industry to fund cotton research. However, there are also many missed opportunities in higher value crops and dairy for supporting adaptive research and post-harvest research through partnerships with horticultural and milk processors. Competitive funding has been shown to be a one mechanism for promoting partnerships, and drawing other potential participants into the research system. PAU could do more to tap GOI sources of competitive funding from ICAR and the Departments of Biotechnology, and Science and Technology. It should also begin to allocate some of its own research funds on a competitive basis, not only to promote partnerships but also to reward productive scientists.

4.35 Ultimately, these reforms imply a smaller, higher quality, more agile public sector. PAU has already started to rationalize its staffing (e.g., amalgamation of departments) and intends to reduce the ratio of support to technical staff. It should also consider developing and implementing an objective, transparent and coherent time-bound action plan for this purpose. Staffing levels in the line departments of GOP have also declined slightly in the last two years, due to budget austerity and by not filling positions vacated by retiring staff. However, GOP needs to draw up a long term human resources plan for shedding agricultural staff, and upgrading remaining staff, as some activities are privatized. Such a plan would also spell out initiatives to pilot various forms of decentralization, co-financing and contracting out of other services that will continue to be at least partially publicly funded. University training and in-service training programs need to be revamped to lay adequate emphasis on marketing, post-harvest processing, and agribusiness.

**Table 4.2: Economic Characteristics and Delivery of Animal Health Services**

| Service  | Type of Economic Good                  |                                 | Sectoral Delivery |                                  |
|--|--|---------------------------------|-------------------|----------------------------------|
|  | Public                                 | Private                         | Public            | Private                          |
| Clinical diagnosis and Treatment                   |  | Mostly private                  |                   | YY                               |
| Vaccine production                                 |  | Pure private                    |                   | YY                               |
| Vaccination, major contagious diseases             | Public because of strong externalities |                                 | Y                 | YY (contracted by public sector) |
| Vaccination against minor diseases                 |  | Private but some externalities  |                   | YY                               |
| Veterinary surveillance (quarantine, epidemiology) | Public because of strong externalities |                                 | Y                 | Y (contracted by public sector)  |
| Control of veterinary pharmaceutical sales         | Public                                 |                                 | Y                 | Y (contracted by public sector)  |
| Food safety control (meat inspections)             | Public                                 |                                 | Y                 | Y (contracted by public sector)  |
| Veterinary research and extension                  | Public for small-scale farmers         | Private for commercial purposes | Y                 | Y (contracted by public sector)  |
| Training of animal health workers                  | Public                                 |                                 | Y                 | Y (contracted by public sector)  |

“Y” = Yes, acceptable; “YY” = “Yes, strongly recommended”

Source: World Bank, Agricultural Investment Source Book, 2003 (forthcoming).

**4.36 Decentralization and participation to enhance demand for services.** Reform of agricultural services will also require a more decentralized and demand-driven approach. Decentralization of agricultural extension to the district level has been piloted successfully in a number of states (Box 4.3), but has yet to be fully implemented even on a pilot basis in the Punjab. Demand for services can be greatly enhanced through strong farmer organizations who have the capacity to formulate priorities, express demands, contract and co-finance services, and link farmers to markets. Farmer organizations appear to be weak in the Punjab, and dominated by the quasi-state run cooperatives. The GOP should formulate a policy for strengthening and mobilizing farmer organizations and modernizing the cooperatives, as an integral part of the reform process.

**4.37 Re-allocation of public funds to meet a market-driven agenda.** The aggregate level of public funding for agricultural research and extension needs to be enhanced. The priority also is to utilize public funds more efficiently, by delineating public and private roles (as above), providing sufficient operating budgets to remaining staff, and re-allocating public funds from extension to research to bring the ratio to one to one, consistent with international norms for a commercial agriculture. Within both research and extension, a rigorous priority setting exercise is needed to ensure that resources are allocated to drive the future agricultural growth and diversification agenda. This would very likely result in re-allocation from production agriculture to marketing and policy, post-harvest, high value commodities with strong market demand, and cost-saving technologies (e.g., broad bed furrow, precision agriculture, IPM etc). Monitoring, evaluation and impact assessment mechanisms for research and extension need to be strengthened and institutionalized.

### **Box 4.3: Decentralizing Extension**

The World Bank supported National Agricultural Technology Project (NATP) is piloting an innovative demand-driven extension service with strong linkages to researchers and farmers, improved coordination among line departments, and public-private partnerships for technology testing and extension. NATP institutional innovations include: Agriculture Technology Management Agencies (ATMAs) at the district level; Farmers' Information and Advisory Centres, Farmers' Advisory Committees, and Block Technology Teams (BTTs) at the block level; Farmer Interest Groups and Self-Help Groups at the village level. The project became operational in 1998 and covers 28 districts in 7 States including Punjab.

To provide operational and financial flexibility and freedom, the ATMA, chaired currently by the District Magistrate, is registered as an independent society under the Societies Registration Act. Its management structure provides for improved inter-agency coordination and greater accountability to all the stakeholders, including farmers. Bottom-up planning processes has been institutionalized through preparation of district level Strategic Research and Extension Plans based on participatory rural appraisals involving all stakeholders followed by Block Action Plans prepared by BTTs. ATMAs support private extension initiatives by contracting NGOs to take on extension responsibilities in selected blocks/areas, using farmer-to-farmer extension services through individuals or through farmer organizations; and developing partnerships with input providers for demonstrations and farmer training.

Early results are encouraging, but the long-term success of this model will depend upon ability of State Governments to make these institutions increasingly farmer-driven. ATMAs, especially in Andhra Pradesh, Himachal Pradesh, Maharashtra and Orissa, have shown good progress with farmers and other stakeholders developing a sense of program ownership. Operational flexibility has allowed extension services to respond to local needs and improved program relevance and effectiveness. After initial delays, Punjab is now trying to catch up, having been dogged by delays in registering of ATMAs, staff appointments, and internal conflicts between ATMA priorities and departmental responsibilities at block and district levels.

**4.38 International alliances to capture technology and knowledge.** Punjab has to tap into the very rapid advances in science and technology globally, especially biotechnology and information technology. While the private sector is playing an increasing role in both of these technologies, it is narrowly based on certain crops (e.g., hybrids) and commercial farmers. PAU needs to develop strong linkages with advanced research organizations both within India and abroad, to ensure access to modern biotechnology tools and products, as well as upgrade capacities to utilize and regulate these technologies, especially in intellectual property rights and bio-safety. Even most traditional research areas have increased in complexity, requiring new approaches that integrates expertise from several disciplines to address problems along the commodity chain.

### **Box 4.4: Use of Information and Communications Technologies**

Modern communications technologies offer opportunities to deliver a richer array of information to farmers and rural households. New information and communications technologies (ICTs) can lead to higher-quality products that are more effective in delivering information messages and transmitting knowledge. Broadcast media (radio, television) was one-way communication, but new technologies allow for interactive two-way communications. Private service delivery, cost recovery and wholesaling of information are important strategies for expanding use of ICTs in rural extension systems.

Some Indian states, in partnership with the private sector, are setting up information kiosks for disseminating information to rural producers. After successfully using radio, television and print media for spreading green revolution technologies in 1970s and 1980s, not much has been done by the extension system in Punjab to use ICTs for disseminating new technologies and market information to farmers and other stakeholders. There is also virtually no private sector participation in promoting use of ICTs for agricultural extension in Punjab.

4.39 Finally, efficiency of farmer information and extension services can be greatly enhanced and made more efficient by use of modern information and communication technologies. Punjab extension departments require a major upgrade to exploit this technology. Despite substantial investments PAU is yet to operationalize the use of ICTs in its programs and management systems.

### **Regulation and Reform of Canal Irrigation and Groundwater Management Policies**

4.40 The importance of managing Punjab's water resources in a more efficient and sustainable manner can hardly be overemphasized. Unless this is done, groundwater tables will continue to recede rapidly. According to one estimate, the total sustainable water resource available in Punjab is estimated at 3.13 million hectare meters (including surface canals and groundwater recharge from rainfall and canal seepage) against which the estimated demand at current production levels is 4.37 million hectare meters (GOP, 2002). This excess demand is being met through overexploitation of groundwater. According to a PAU projection, unless the overexploitation is arrested, farmers will have to make additional investments to the tune of Rs. 50 billion to deepen tubewells and shift to submersible pumps to continue accessing water till 2020.<sup>4</sup> In addition, electric power requirement in Central Punjab will double from current levels since water will have to be pumped from deeper strata. To avoid this, immediate and concerted action is required to improve management of surface and groundwater resources.

4.41 **Canal irrigation.** A 40% decrease in area irrigated by canals during the 1997-2002 period of free water has added enormously to the pressure on groundwater resources. Rehabilitation of the canal system and its distributaries, minors, and surface drains is therefore a priority. To raise resources to enable this, an increase in water tariffs has to be considered. Punjab's water rates, at Rs. 200/ha/year introduced in October 2002, represent about 43% cost recovery of O&M expenditures (Rs. 600 million are expected revenues against actual O&M expenditures of Rs. 1392 million in 2001/02). These rates are also lower than what other states are currently charging. For instance, the *per season* rate for paddy cultivation is Rs. 500/ha in Andhra Pradesh, Rs. 287/ha in Uttar Pradesh and Rs. 250/ha in Karnataka.

4.42 The institutional arrangements for O&M and water delivery need to be revisited to make the system more responsive to farmers demands. Rather than leave maintenance solely to the Irrigation Department, GOP would do well to seriously consider the example of a number of other Indian states (Andhra Pradesh, Rajasthan, Tamil Nadu, Orissa, to name a few) and begin involving beneficiaries in this task. Experience suggests that beneficiary involvement brings down unit costs, improves service delivery, and beneficiary groups take on maintenance responsibilities, starting with field channels and minors and gradually working up to distributaries and main canals as the groups mature and federate. For this to happen, though, political support is required and also legislation, as in other states, that formalizes the role and responsibilities of water user groups and other stakeholders. To help with group mobilization, assistance from NGOs and other social intermediaries will be necessary. These are still relatively little known concepts in Punjab.

4.43 **Groundwater management.** To arrest the depleting groundwater table it is necessary to evolve a pragmatic strategy that encompasses short term and long term solutions. Options in this regard include:

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<sup>4</sup> Dr. D.S. Taneja, Department of Soil and Water Engineering, PAU, personal communication.

- Delay paddy transplantation to June. This would be facilitated by: (i) ensuring GOI does not begin procurement operations for paddy/rice before October 1 (already in effect); (ii) metering of agricultural power connections and introduce higher tariff for the month of May.
- Encourage use of sprinklers/drip systems, through matching grants, to improve water use efficiency in high value crops. Note that this would work effectively only when electricity is metered and adequately priced, otherwise the incentive to shift to alternative (relatively expensive) systems like drip etc., is weak.
- Approve the Punjab Groundwater Control and Regulation Act, which aims to regulate groundwater extraction, and has been in draft since 1998. Enactment of this legislation needs to be expedited, but after addressing gaps in the current draft such as the issue of water rights, specific restrictions on spacing of wells in command and non-command areas, and establishment of an adequate monitoring mechanism to ensure effective implementation.
- Promote efficiency of water use through other water management practices such as bed and furrow planting, limited ponding in rice, etc.

4.44 **Water Policy.** GOP had prepared a State Water Policy in 1997, which is now being revised in light of the National Water Policy of 2002. This exercise provides an opportunity to GOP to take a holistic and futuristic look at water availability and demands across different sectors. Issues related to water entitlements (for surface water) and water rights (for groundwater), and social, environmental, technical and institutional arrangements should be critically examined to ensure sustainable development in the future.

### **Reforming the Marketing System**

4.45 Modernization of the marketing system to meet the needs of a competitive and diversified agricultural sector has to be a key element of future agricultural strategy. In view of the main issues highlighted in Chapter 3 on agricultural marketing, options and recommendations to improve current practices can be grouped under two heads – regulatory changes, and those where more direct investment type support is required.

4.46 On the regulatory side the following actions are suggested, in order of priority:

- Amend the APMC Act to allow private sector entry in establishment and management of wholesale markets.
- Amend mandatory requirement that all produce sold wholesale has to be sold through regulated markets. In the last year or so some exemptions have been made to this, primarily to encourage contract farming and exports of selected commodities, whereby fruits and vegetables purchased by processing industries through contract farming, wheat and maize bought by industry for processing within Punjab, and exports of fruits, vegetables and rice are exempt from market fee. However, what needs to be deliberated are not simply *ad hoc* exemptions to respond to specific circumstances but a systematic reform across the board.
- Reduce various market fees and cesses, which at the moment are the highest in the country, to improve farm profitability and attract private trade back to the state.
- Restrictions on storage and movement of agricultural produce that used to be regularly applied in the past under the Essential Commodities Act (ECA) have been lifted for some time in view of the agricultural surpluses in the country. However, the potential of their *ad hoc* re-imposition continues to deter private investments, for example, in warehousing and bulk storage and movement. GOI should consider an amendment of the ECA to permanently remove these trade restrictions, with provisions for their use only in emergency conditions.
- Abolish levy on rice procurement.

4.47 To create an enabling environment for market modernization, the following actions and investments appear necessary:

- Develop and enforce a grades and standards system that reflects market requirements. In doing so it is important that private companies, millers and other private players take a leading role in the development of these standards with GOP role that of facilitation and enforcement of an agreed system. Information on sanitary and phytosanitary standards in different countries is an area where information flows need particular strengthening.
- Support strategic market research to assist GOP in deciding which crops should be supported in terms of research, extension and other facilities. Knowledge in this area is sketchy. PAU, in close coordination with line departments and private agribusiness players seeking to establish new ventures in the state, could take the lead in this task.
- Emphasize marketing issues in agricultural extension to: (i) help farmers and others better understand the market and become more commercially numerate; (ii) link farmers to agribusiness; and (iii) encourage them to take self-help initiatives to improve the system.
- Encourage development of private market information systems, including electronic ‘kiosks’ and service providers.<sup>5</sup>
- Introduce a system whereby private warehouses can issue negotiable warehouse receipts. This requires amendment of the GOI warehousing laws, a warehouse certification process that allows certification of quantity and quality of produce, and acceptance by banks of the warehouse receipt as collateral.
- Expand awareness and use of market based risk management instruments such as futures trading in commodities such as oilseeds and cotton.

### **Contract Farming**

4.48 In the last year Punjab’s diversification agenda has become closely associated with the concept of contract farming (CF). Given the political difficulties with changing price policies, CF is increasingly being seen by GOP as an instrument to wean farmers away from the rice-wheat system. In view of the importance attached to this approach by the state, Annex 2 contains a detailed note assessing CF in Punjab against generally accepted best practice. The following paragraphs draw on the annex.

4.49 Contract farming is not a new concept in Punjab. In the crop sector, CF in Punjab began around the late-1980s with Nijjer Foods and Pepsico successfully organizing CF for the processing of tomatoes, chilies and potatoes. However, only a few hundred farmers were involved, and they farmed not more than 1,200 hectares under these schemes. Since then there have been a few other players – Hindustan Lever Limited (HLL) who bought Pepsico’s tomato operations and also Indomint Agriproducts who run a CF program for mint which covers about 5,000 hectares currently.

4.50 In the last year, GOP has taken a conscious decision to vigorously promote contract farming throughout the state. A public sector corporation, Punjab Agro Foodgrains Corporation (PAFC), has been assigned this task. PAFC has developed a five-year CF plan that aims to shift one million hectares out of rice-wheat cultivation to a variety of other crops including oilseeds, maize, basmati rice, durum wheat, and cotton (See Annex 2). For *kharif* 2003 the main focus is on basmati rice (target 34,000 hectares) and maize (target 20,000 hectares).

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<sup>5</sup> Such as, for example, Agriwatch or the eChoupals promoted by ITC in a number of states.

4.51 PAFC sees its approach to be that of a facilitator, tying up farmers with agribusinesses which will supply quality seeds and technical assistance, and buy back the crop. Various models are being tried out, including:

- a) In the *rabi* 2003 hyola and sunflower schemes, covering about 7,000 hectares, PAFC contracted with seed companies to provide seed to farmers, subsidized the extension cost, committed to buy the crop at the GOI minimum support price on behalf of NAFED which is the designated GOI procurement agency for oilseeds – no commercial buyer was involved. However because of high market prices for oilseeds, PAFC did not need to act as buyer, and simply allowed farmers to sell on the open market.
- b) In the *kharif* 2003 basmati scheme, expected to cover around 40,000 hectares, there are four main players – a *sponsor* (registers farmers and provides inputs and technical assistance), *farmer* (produces crop under sponsor’s supervision), *buyer* (contracts with sponsor and PAFC to buy the crop at a pre-determined price) and *PAFC* (contracts with sponsor for technical assistance to farmer, contracts with buyer for sale of produce, and acts as buyer of last resort in event of a default by buyer). This is unlike conventional CF schemes where there are only two players – the sponsor and the farmer. The commercial functions are divided between the sponsor who provides the inputs and technical assistance, and the buyer who markets the crop internationally and/or domestically. Then there is the State Government/PAFC which provides certain incentives and support, and acts as buyer of last resort at a “comfort price” in case the buyer defaults on his commitment to buy from the farmer.
- c) In *kharif* 2003, PAFC planned to promote 20,000 hectares of maize, but had difficulty in attracting sponsors, due to the low profitability of the crop vis-a-vis rice. The overall area planted is unlikely to be more than 10,000 hectares. Mahindra Shubhlabh Services Ltd. (MSSL) will act as sponsor for 20% of this, and PAFC will directly promote the remainder, using its own extension staff. In both cases PAFC guarantees to buy the crop, and is offering farmers an alternative of fixed or variable price contracts. PAFC has a loose arrangement for marketing the maize with a local starch manufacturer.

4.52 **Assessment of the PAFC scheme.** Contract farming has a place in the development of Punjab’s agriculture. The physical and social environment is suitable – highly productive with assured irrigation, widespread mechanization, all villages connected by roads, good telecommunications, and average farm size more than twice the India average. Moreover, PAFC’s venture into this field embodies a more market-oriented approach to agricultural development and a significant shift away from the state’s traditional focus on production as an end in itself. To be successful, however, attention will have to be paid to a number of aspects:

- International experience suggests that CF tends to succeed only in certain types of crops/activities such as perishable products, or those where exacting market specifications have to be met, or close supervision is needed during production. Basic field crops like standard rice, wheat, maize, oilseeds, pulses do not normally figure highly in CF programs and there is also a high risk of ‘side selling’ i.e., farmer will sell output to another buyer. In the PAFC plans, maize and oilseeds figure prominently.
- The absence of a quick and effective contract enforcement and dispute resolution system in Punjab (and India) magnifies the risk of farmers ‘side selling’ if market prices at time of harvest significantly exceed the contracted price, or conversely the risk of buyer default if market prices are well below the contract price. To address this, GOP needs to facilitate initiatives by agribusiness and farmers organizations wishing to develop speedy dispute-resolution systems. This might lead to a system for registration of contracts. The government’s facilitative role needs to be stressed, since, to be successful, such measures are best designed by the interested parties.

- Direct commercial involvement of the state should be minimal. In the models being adopted this is not always the case as PAFC exposes itself to a high degree of risk by contracting to buy output from farmers at a ‘comfort price’, which is akin to a support price, in case the buyer backs out. In some cases there are no formal contracts in place with buyers but PAFC has signed up with farmers for CF.
- Minimize the number of parties in contractual arrangements. In the PAFC case this would mean that sponsor and buyer should preferably be the same.
- Crops promoted for CF should be selected after a thorough analysis of the profitability of the crops, and a strategic analysis of the commodity system involved. It is not clear that this has been adequately done. Despite requests, PAFC was not able to provide any data or calculations to back up the returns shown in the leaflets it distributes to farmers.
- GOP should encourage development of farmers’ organizations capable of contracting with sponsors, with a view to reducing transactions costs, increasing information flow and improving farmers’ negotiating position. Development of farmers groups is lacking in Punjab, even relative to other states in the country.
- Finally, without significant reforms in other areas (e.g., price support, marketing, research and extension) to correct the presently distorted incentive structure that favors rice and wheat cultivation, there is little to suggest that the target of 1 million hectares will be attained by 2007.

## **E. Conclusion**

4.53 After leading Indian agriculture in the 1970s and 1980s, the decade of the 1990s was a difficult one for Punjab agriculture. Productivity of the dominant rice-wheat cropping system slowed – with the rice part of the system in particular disarray due to stagnant productivity and adverse environmental impacts. Revamping growth in an environmentally and fiscally sustainable manner is the main challenge confronting the state today. This study has identified a number of priorities for moving ahead. These include correction of administratively determined support prices for rice and wheat, introduction of metering for agricultural power, and reduction of input subsidies to better align prices of inputs with their scarcity values and also to release public resources for more productive uses. Without these reforms, of which the important one of correction of support prices is in the GOI domain, it will be difficult for public services in research, extension, irrigation, and marketing to substantively shift their focus away from the rice-wheat system, and without this shift in focus it is unlikely that the scale of diversification being sought by the state will materialize. On the institutional side, the state needs to encourage greater public-private partnerships in agricultural research and extension, and private participation in modernization of agricultural markets, while local level institutional arrangements involving beneficiary groups need to be actively promoted for operation and maintenance of existing public infrastructure and delivery of public services.

4.54 Given political realities, the reform process will need to be accelerated by a program of public awareness, education and informed debate. Wide stakeholder participation, particularly from amongst the farming community, is necessary to realize reforms that may run counter to established interests in the status quo. There is a mismatch in the state between the high level of technical accomplishment in agriculture and an underdeveloped debate on policy issues facing the sector. While the State Government is aware of the critical policy issues discussed in this study, it is constrained by prevailing public opinion. GOP should itself work to raise public awareness, being as frank as possible about the problem, and cautious about claims of what can be achieved through measures such as contract farming in the absence of more fundamental reforms. With the right leadership and commitment there is no reason to believe that Punjab agriculture cannot regain its past glory.

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## **Annex 1**

### **Methodological Note on Input Subsidies and Profitability Analysis**

#### **A. Estimation of Input Subsidies**

##### *Size of Subsidies*

A1.1 Canal water subsidy is estimated as the difference between Operations and Management expenditures of the Irrigation department (including wage and non-wage expenditures) and the actual irrigation charges collected (Table A1.9).

A1.2 Power subsidy is the difference between the total cost of supply (agricultural consumption multiplied by average cost of supply as reported by PSEB) and total revenue collected from agriculture (Table A1.10).

A1.3 Fertilizer subsidy for Punjab has been estimated by using the ratio of Punjab fertilizer consumption to All India fertilizer consumption each year, and applying this ratio to the All India fertilizer subsidy figure as reported in GOI budgets (Table A1.11).

##### *Incidence of Subsidies across Farm Sizes*

A1.4 Distribution of input subsidies across farm sizes is based on percentage area cultivated by each group as per the Agricultural Census, 1995/96, and per hectare use of inputs by different groups. For the power and fertilizer subsidy, per hectare input use is estimated from information in Singh and Jain (2002) which contains an analysis of the 1995/96 detailed cost of cultivation (COC) data collected by the Commission for Agricultural Costs and Prices (CACP) for Punjab. For the canal water subsidy, data from crop cutting experiments of the Department of Agriculture is used to approximate input use. The subsidy share of each farm size group is obtained as the product of per hectare input use and the percentage area cultivated by the group.

A1.5 Farm size distribution. For this analysis, marginal, small, medium and large farmers are those operating: less than 1 ha, 1-2 ha, 2-6 ha and above 6 ha respectively. This is different than the classification sometimes adopted at the all-India level where farms more than 4 ha are referred to as large farms. In Punjab, however, where the average operational farm size is 3.6 ha as against 1.6 ha at the national level, it is more appropriate to categorize 2 to 6 ha as medium farms and above 6 ha as large farms.

A1.6 The analysis of COC data in Singh and Jain (2002) is reported according to the following farmer groups: less than 1 ha, 1-2 ha, 2-4 ha, 4-6 ha and above 6 ha. For this study, the farm size groups of 2-4 ha and 4-6 ha were clubbed to constitute medium farmers in Punjab. Classification as per the Agriculture Census (1995/96) posed a problem as, for the medium farmers as per our classification, data are reported for 2-3 ha, 3-4 ha, and 4-10 ha groups. To overcome this problem, results from the 1990-91 census were used which were available for 2-3 ha, 3-4 ha, 4-5 ha, and 5-7.5 ha farm size groups also. First, the data on number of farmers and area operated for 4-10 ha from the 1995-96 census was split into 4-5 ha, 5-7.5 ha and 7.5-10 ha groups in the same proportion as 1990-91. The average farm size in the census for the 5-7.5 ha farm size group is 5.70 ha. To apportion the 5-7.5 ha farm size group into 5-6 ha and 6-7.5 ha groups, an average farm size of 5.25 ha for the 5-6 ha group and 6.30 for the 6-7.5 ha group was assumed. The rationale for this assumption is the observed distribution of average farm sizes in the census data - average farm sizes get relatively closer to the lower end of the range as the farm sizes increase.

Hence, the estimated number of holdings and area apportioned to 5-6 ha and 6-7.5 ha is as follows:

| Farm size group<br>Ha | Average farm size<br>(ha) | Number of holdings | Area operated<br>Ha |
|-----------------------|---------------------------|--------------------|---------------------|
| 5-6                   | 5.25 (A)                  | 71644 (D)          | 376131 (D)          |
| 6-7.5                 | 6.30 (A)                  | 53732 (D)          | 338512 (D)          |
| 5-7.5                 | 5.70                      | 125376             | 714643              |

Note: A – Assumed, D – Derived. All other figures are actual/available.

A1.7 The appropriation gives 18.5 per cent large farmers (i.e., >6 ha) operating 50.2 per cent area and 46.2 per cent medium farmers operating 41.1 per cent area, which are reasonable estimates in light of the observed distribution (see Table A1.1)

**Table A1.1 Distribution of Operational Holdings and Area, Punjab**

|               |          | Marginal | Small    | Medium   |          | Large   | Total   |
|---------------|----------|----------|----------|----------|----------|---------|---------|
| Item          |          | < 1 ha   | 1 – 2 ha | 2 – 4 ha | 4 – 6 ha | > 6 ha  |         |
| Holdings      | Number   | 203876   | 183453   | 320340   | 184176   | 201228  | 1093073 |
|               | Percent  | 18.65    | 16.78    | 29.31    | 16.85    | 18.41   | 100.0   |
|               |          |          |          | 46.16    |          |         |         |
| Area operated | Hectares | 122365   | 239828   | 832732   | 871272   | 2080833 | 4147030 |
|               | Percent  | 2.95     | 5.78     | 20.08    | 21.01    | 50.18   | 100.0   |
|               |          |          |          | 41.09    |          |         |         |

A1.8 The use of **fertilizers** per farm according to different size groups was taken from Singh and Jain (2002). This, in conjunction with average farm sizes reported in the same study, was used to estimate fertilizer use per ha, which was then multiplied with the Census distribution of area operated to get the distribution of fertilizer subsidies according to farm size.

**Table A1.2 Fertilizer Subsidy by Farm Size**

| Farm size group<br>ha | Average Farm Size<br>Ha | Fertilizer use<br>kgs/farm | Fertilizer use<br>kgs/ha | % area operated<br>(Census) | % subsidy benefit |
|-----------------------|-------------------------|----------------------------|--------------------------|-----------------------------|-------------------|
| < 1                   | 0.970                   | 220                        | 227                      | 2.95                        | 2.5               |
| 1 – 2                 | 1.929                   | 433                        | 224                      | 5.78                        | 4.8               |
| 2 – 4                 | 3.157                   | 796                        | 252                      | 20.08                       | 18.6              |
| 4 – 6                 | 4.967                   | 1404                       | 283                      | 21.01                       | 21.9              |
| > 6                   | 8.889                   | 2517                       | 283                      | 50.18                       | 52.2              |
| Average               | 3.982                   | 1075                       | 270                      | 100.00                      | 100.0             |

A1.9 To estimate the **electricity subsidy** by farm size, electric motor hours per farm and electricity charges per electric motor (which reflect horse power of the electric motor as per the system of flat rate tariffs levied in Punjab) were taken from Singh and Jain (2002). The electric motor hours per ha have to be standardized to reflect the horse power of electric motors (small farmers have small hp motors and large farmers have large hp motors). The standardization factor used was the proportion of electric motor bill in each farm size category to the average electric motor bill. This gave an estimate of standard electric motor hours per ha used by each

farm size group which was then multiplied by the census distribution of operated area to give the distribution of electricity subsidy by farm size group.

**Table A1.3 Electricity subsidy by Farm Size**

| Farm Size Group (ha) | Avg farm size (Ha) | Electric Motor (EM) (hrs/farm) | Electric charges per EM (Rs / EM) | Electric motor use per ha (hrs/ha) | Correction Factor For HP of EM | EM hrs/ha standardized with power of EM | % operated area (Census) | % of electricity subsidy |
|----------------------|--------------------|--------------------------------|-----------------------------------|------------------------------------|--------------------------------|---|--------------------------|--------------------------|
| A                    | B                  | C                              | D                                 | E=C/B                              | F=D/2954.65                    | G=E X F                                 | H                        | I                        |
| < 1                  | 0.970              | 170.83                         | 1994.78                           | 176.11                             | 0.68                           | 118.90                                  | 2.95                     | 1.80                     |
| 1 – 2                | 1.929              | 354.09                         | 2247.49                           | 183.56                             | 0.76                           | 139.63                                  | 5.78                     | 4.14                     |
| 2 – 4                | 3.157              | 648.15                         | 2794.00                           | 205.31                             | 0.95                           | 194.14                                  | 20.08                    | 19.98                    |
| 4 – 6                | 4.967              | 968.29                         | 3662.16                           | 194.94                             | 1.24                           | 241.63                                  | 21.01                    | 26.01                    |
| > 6                  | 8.889              | 1631.81                        | 3009.20                           | 183.58                             | 1.02                           | 186.97                                  | 50.18                    | 48.08                    |
| Average              | 3.982              | 778.20                         | 2954.65                           | 195.43                             | 1.00                           | 195.43                                  | 100.00                   | 100.00                   |

A1.10 The **canal water subsidies** are relatively much smaller than the fertilizer and electricity subsidies; nonetheless their distribution is important. COC data to approximate actual water consumption are not available. Instead crop cutting experiments data, which are collected by the Department of Agriculture every season, was used for this purpose. (The analysis of these data, in a different context, has been done and reported in the study: Karam Singh, P. S. Rangi and Sajla Kalra (2002) “Analysis of productivity changes and future sources of growth for sustainable rice wheat cropping system in Punjab” NATP Project Report, Agro Economics Research Centre, PAU Ludhiana). Data for more than 2000 observations for wheat for 1998-99 with details of the farm size and source of irrigation which were available with Karam Singh were analyzed to estimate the percentage of plots/area irrigated by surface sources according to the farm size. Information on whether a particular farm received irrigation from canal water was available, but not how many irrigations were given. Consequently it was assumed that all farms received water in proportion to their size, to obtain the subsidy distribution. Further refinements according to the number of irrigations, field size, etc. could not be done for want of detailed information.

**Table A1.4 Canal Water Subsidy by Farm Size**

| Farm size (ha) | % farms receiving canal irrigation | % area operated (Census) | % of canal water subsidy |
|----------------|------------------------------------|--------------------------|--------------------------|
| Up to 1        | 13.3                               | 2.95                     | 1.4                      |
| 1 – 2          | 16.5                               | 5.78                     | 3.6                      |
| 2 – 4          | 22.5                               | 20.08                    | 16.9                     |
| 4 – 6          | 28.4                               | 21.01                    | 23.0                     |
| Above 6        | 30.4                               | 50.18                    | 55.1                     |
| Total          | 23.9                               | 100.0                    | 100.0                    |

## B. Profitability Analysis

A1.11 **Crop budgets.** Data on costs and returns across different crops have been taken from two sources. For 1992-93, the data have been taken from Ramesh Chand (1999), “Agricultural Diversification in India”, pp 137-138, which is based on a survey of 299 farmers in 4 villages of Ludhiana district. Other than this, the main source is the Department of Economics and Sociology (DES), PAU. Every season, DES (which also collects COC data for the CACP) prepares enterprise budgets (EB) using the PAU recommended package of inputs and technologies, with corresponding output yields. For some years, the DES has adjusted these EBs

to conform to actually realized state average output yields by rationalizing the EB with farmers' adoption levels of various inputs and results of other studies of the DES. These adjusted EBs were available for 1995/96 and 2001/02 (the 2001/02 crop budgets have also been used in the 2002 GOP Report of the Johl Committee). Some further rationalization was done to make these comparable. For instance, the yield of basmati for 2001/02 had been taken as of shelled but multiplied by price of unshelled, which has been corrected. In case of moong, the yields were very low in 2001/02; the average yield of the previous three years, therefore, has been taken. Again in the EB, the FYM has been used for some crops without reducing the corresponding dose of chemical fertilizers; the FYM, therefore has been deleted. The interest on operational costs has been calculated at 12 per cent for half the period of crop, as per standard methodology.

**Table A1.5 Gross Profits across Crops in Punjab (Rs./ha).**

| Crops               | 1992-93 |               |                |               | 1996-97 |               |                |               | 2001-02 |               |                |               |
|---------------------|---------|---------------|----------------|---------------|---------|---------------|----------------|---------------|---------|---------------|----------------|---------------|
|                     | Yield   | Gross Revenue | Variable Costs | Gross Profits | Yield   | Gross Revenue | Variable Costs | Gross Profits | Yield   | Gross Revenue | Variable Costs | Gross Profits |
|                     | Kgs/ha  |               | (Rs./ha)       |               | Kgs/ha  |               | (Rs./ha)       |               | Kgs/ha  |               | (Rs./ha)       |               |
| <b>Kharif Crops</b> |         |               |                |               |         |               |                |               |         |               |                |               |
| Rice                | 6192    | 18678         | 8575           | 10103         | 5075    | 19031         | 13698          | 5334          | 5320    | 29792         | 16920          | 12872         |
| Basmati Rice        | na      | na            | na             | na            | 2750    | 20625         | 12920          | 7705          | 2328    | 29100         | 15905          | 13195         |
| Summer Maize        | 1582    | 6345          | 4905           | 1440          | 2120    | 9198          | 11525          | -2327         | 2720    | 13590         | 12180          | 1410          |
| Cotton              | 1030    | 11315         | 5338           | 5977          | 1400    | 25594         | 12708          | 12886         | 1150    | 21362         | 15125          | 6237          |
| Sugarcane           | 48460   | 27570         | 10205          | 17365         | 59000   | 47282         | 38378          | 8905          | 64250   | 68750         | 50120          | 18630         |
| Moong               | 880     | 10592         | 2765           | 7827          | 853     | 10085         | 7320           | 2765          | 609     | 11320         | 8000           | 5320          |
| Arhar               | 800     | 7645          | 2095           | 5550          | 880     | 8503          | 6925           | 1578          | 860     | 9080          | 6948           | 2132          |
| Groundnut           | na      | na            | na             | na            | 1024    | 12444         | 11915          | 528           | 880     | 13650         | 11422          | 2228          |
| Bajra               | na      | na            | na             | na            | 900     | 4053          | 8443           | -4390         | 930     | 5100          | 7425           | -2325         |
| <b>Rabi Crops</b>   |         |               |                |               |         |               |                |               |         |               |                |               |
| Wheat               | 4352    | 17515         | 5658           | 11857         | 4250    | 17769         | 8910           | 8859          | 4480    | 30016         | 11665          | 18351         |
| Barley              | 3435    | 12592         | 3622           | 8970          | 3250    | 11098         | 5270           | 5828          | 3380    | 18100         | 9085           | 9015          |
| Gram                | na      | na            | na             | na            | 925     | 8896          | 7178           | 1718          | 870     | 14900         | 5662           | 9238          |
| Mustard             | 1012    | 9370          | 2425           | 6945          | 1375    | 14169         | 7795           | 6374          | 1210    | 13610         | 9248           | 4362          |
| Sunflower           | na      | na            | na             | na            | 1562    | 17969         | 12565          | 5403          | 1150    | 13848         | 11715          | 2133          |

Notes: Gross Profit is the difference between gross revenue and variable cost of production; Profits in case of sugarcane accrue over a year.

Sources: 1992-93 figures from Chand (1999); 1996-97 and 2001-02 figures from PAU, Department of Economics and Sociology.

**A1.12 Dairy budgets.** Data on various parameters for 1994/95 relevant to developing the dairy budget under actual farm conditions was available from Gill, G. S. et al (1995). These parameters were updated to 2001/02 using cost indices from an ongoing study in PAU "Livestock Crop Production Systems Analysis for Sustainable Production" (PI: P.S. Khatra). To account for the improvement in the milk yield per animal, it was observed that between 1994 and 2001 milk production increased by about 28% in Punjab, and the number of milch animals in milk increased by about 18%; thus the improvement in milk yield per animal was taken as 10%. In order to compare the relative profitability of dairy with the rice-wheat system, a ratio of 8 animals per ha was used. As per current fodder crop yields, one hectare of land can support fodder requirement of 8 animals for a year..

**Table A1.6 Dairy Budget, 2001-02.**

| Item  | 1994-95           | Index for<br>2001-02<br>(1994-95=100) | 2001-02 |
|---|-------------------|---------------------------------------|---------|
| Milk yield per animal per year (litres)             | 1974              | 110                                   | 2171    |
| Total fixed cost                                    | Rs/ litre<br>1.56 | 145                                   | 2.26    |
| Variable costs                                      | Rs/litre          |                                       |         |
| Green fodder  | 1.25              | 136                                   | 1.70    |
| Dry fodder  | 1.36              | 138                                   | 1.88    |
| Concentrates  | 0.77              | 133                                   | 1.02    |
| Human labour  | 1.22              | 137                                   | 1.67    |
| Veterinary costs                                    | 0.05              | 300                                   | 0.15    |
| Fuel & Electricity                                  | 0.13              | 151                                   | 0.20    |
| Repairs   | 0.06              | 283                                   | 0.17    |
| Milk fed to young stock                             | 0.38              | 138                                   | 0.52    |
| Miscellaneous                                       | 0.04              | 150                                   | 0.06    |
| Total variable costs                                | 5.23              |                                       | 7.37    |
| Total Cost  | 6.79              |                                       | 9.63    |
| Gross revenue per litre*                            | 8.39              | 124                                   | 10.60   |
| Annual gross revenue per animal per year            | 16550             |                                       | 23013   |
| Gross variable costs per animal per year            | 10306             |                                       | 16000   |
| Gross profits per animal per year                   | 6244              |                                       | 7013    |
| Gross profits per ha per year<br>(8 animals per ha) | 49951             |                                       | 56104   |

\* Includes the value of manure and that of the young stock  
Source: Estimated. Data from Gill *et al* (1995)

**A1.13 Exploring economic profitability.** Rice and wheat are generally more profitable than other alternatives. The relative profitability of other alternatives was, therefore, judged with reference to rice and/or wheat. In case of sugarcane, in view of its annual cycle, the comparison is to wheat + rice. The PAU enterprise budgets with the full package of technology (unadjusted) are presented for a range of crops in Table A1.7.

**Table A1.7 Agriculture Profitability in Punjab**  
(2001/02; as per the technology package recommended by PAU)

| Crop                | Yield<br>(Kgs/ha) | Gross<br>Revenue<br>(Rs./ha) | Variable costs (Rs./ha) |                          |              |            |                |                             |       |          | Total<br>Variable<br>costs | Gross<br>Profits<br>(Rs./ha) |
|---------------------|-------------------|------------------------------|-------------------------|--------------------------|--------------|------------|----------------|-----------------------------|-------|----------|----------------------------|------------------------------|
|                     |                   |                              | Seed &<br>treatment     | Manures &<br>Fertilizers | Insecticides | Irrigation | Human<br>Labor | Machine<br>/ Tractor<br>use | Misc. | Interest |                            |                              |
| <b>Kharif Crops</b> |                   |                              |                         |                          |              |            |                |                             |       |          |                            |                              |
| Rice                | 4333              | 36400                        | 282                     | 2309                     | 3350         | 1000       | 8125           | 2250                        | 1000  | 550      | 18892                      | 17508                        |
| Basmati Rice        | 3000              | 36000                        | 640                     | 1503                     | 4700         | 600        | 7375           | 1750                        | 500   | 512      | 17579                      | 18420                        |
| SummerMaize         | 5000              | 23750                        | 531                     | 2518                     | 1250         | 250        | 5975           | 2625                        | 1000  | 425      | 14574                      | 9176                         |
| Cotton              | 2500              | 46500                        | 528                     | 1261                     | 5469         | 250        | 7475           | 1750                        | 812   | 526      | 18072                      | 28428                        |
| Sugarcane           | 30000             | 79688                        | 4516                    | 1755                     | 5870         | 500        | 22500          | 2625                        | 5625  | 2603     | 45994                      | 33693                        |
| Moong               | 1500              | 21750                        | 775                     | 865                      | 3280         | 200        | 4925           | 1312                        | 312   | 350      | 12019                      | 9731                         |
| Arhar               | 1500              | 21375                        | 470                     | 1098                     | 1182         | 100        | 4925           | 1312                        | 375   | 284      | 9746                       | 11628                        |
| Groundnut           | 2250              | 27625                        | 4075                    | 823                      | 5446         | 150        | 6075           | 1312                        | 750   | 559      | 19190                      | 8435                         |
| <b>Rabi Crops</b>   |                   |                              |                         |                          |              |            |                |                             |       |          |                            |                              |
| Wheat               | 5250              | 37025                        | 1418                    | 2774                     | 468          | 250        | 1800           | 6812                        | 1250  | 443      | 15215                      | 21810                        |
| Barley              | 4500              | 25475                        | 967                     | 1259                     | 700          | 100        | 2800           | 3750                        | 750   | 310      | 10635                      | 14839                        |
| Winter Maize        | 7125              | 35456                        | 536                     | 1856                     | 731          | 400        | 3825           | 2625                        | 2500  | 374      | 12848                      | 22608                        |
| Gram                | 2000              | 30875                        | 1407                    | 513                      | 725          | 100        | 5700           | 2188                        | 500   | 334      | 11467                      | 19408                        |
| Mustard             | 2000              | 24700                        | 125                     | 1855                     | 1349         | 150        | 4425           | 3062                        | 500   | 344      | 11810                      | 12890                        |
| Sunflower           | 2000              | 23000                        | 1004                    | 1581                     | 1800         | 450        | 4800           | 3062                        | 625   | 400      | 13722                      | 9278                         |

Source: PAU, Department of Economics and Sociology

A1.14 The following simulations were carried out:

- (i) Profits as in the PAU enterprise budgets (i.e. Table A1.7)
- (ii) Profits without power subsidy
- (iii) Profits without power and fertilizer subsidy
- (iv) Profits without power and fertilizer subsidy and with estimated trend international output prices under the exportable hypothesis.
- (v) Profits without power and fertilizer subsidy and with estimated trend international output prices under the importable hypothesis.

A1.15 Table A1.8 shows the impact of the above simulations on the profitability of important crop enterprises. To facilitate comprehension of relative rankings, results are presented in the form of indices with rice=100 among *kharif* crops and wheat = 100 among *rabi* crops. Table 3.12 in Chapter 3 shows the actual Rs/ha values. Commodities which are clearly exports or imports have been treated under only one appropriate situation.

**Table A1.8 Impact of Subsidy Removal on Relative Profitability Across Main Crops  
2001-02**

| Crops               | Yield<br>(Kgs/ha) | Index of                              |  |   |   |   |
|---------------------|-------------------|---------------------------------------|--|---|---|---|
|                     |                   | Profits<br>with<br>existing<br>prices | Profits<br>with no<br>Power<br>Subsidy | Profits with<br>no Power &<br>Fertilizer<br>Subsidy | Profits with no<br>Subsidy &<br>Exportable<br>Output Prices | Profits with no<br>Subsidy &<br>Importable Output<br>Prices |
| <b>Kharif Crops</b> |                   |                                       |  |   |   |   |
| Rice                | 4333              | 100                                   | 100                                    | 100   | 100   | 100   |
| Basmati Rice        | 3000              | 105                                   | 121                                    | 133   | na  | na  |
| Summer Maize        | 5000              | 52                                    | 62                                     | 62  | 51  | 69  |
| Cotton              | 2500              | 162                                   | 212                                    | 237   | 348   | 235   |
| Sugarcane           | 30000             | 86                                    | 93                                     | 102   | 101   | 99  |
| Moong               | 1500              | 56                                    | 68                                     | 75  | na  | na  |
| Arhar               | 1500              | 66                                    | 87                                     | 95  | na  | na  |
| Groundnut           | 2250              | 48                                    | 60                                     | 65  | na  | 41  |
| <b>Rabi Crops</b>   |                   |                                       |  |   |   |   |
| Wheat               | 5250              | 100                                   | 100                                    | 100   | 100   | 100   |
| Barley              | 4500              | 68                                    | 70                                     | 74  | na  | na  |
| Winter Maize        | 7125              | 104                                   | 101                                    | 106   | 158   | 126   |
| Gram                | 2000              | 89                                    | 92                                     | 100   | na  | 91  |
| Mustard             | 2000              | 59                                    | 59                                     | 61  | na  | 32  |
| Sunflower           | 2000              | 43                                    | 35                                     | 35  | na  | 51  |

Note: Profits are defined as difference between Gross Revenue and Variable Costs. Sugarcane profits accrue over a year.  
Source: Estimated. Data from PAU, Enterprise Budgets (2001-02); Gulati et al (2003)

A1.16 *Fertilizer cost without subsidy.* Farmers' actual expenditure on fertilizers in 2001/02 was estimated as Rs. 20,222 crores using data on nutrient use and prices per nutrient (Fertilizer Statistics, 2001/02). The total GOI fertilizer subsidy in 2001/02 was Rs.12,808 crores (GOI, Economic Survey, 2002/03). Thus a 61% increase in fertilizer prices would eliminate the subsidy. However, in view of the estimates by Gulati and Narayanan (2003) that between 1981-2000 farmers received, on average, 67.5% of the GOI fertilizer subsidy with the rest accruing to industry, only the farmer share of subsidy was eliminated in the simulations. This implied a price increase of 41% ( $61 \times 0.675$ ) in fertilizer prices paid by farmers to eliminate the subsidy.

A1.17 *Electricity cost without subsidy.* In the crop budgets, irrigation costs are available, but not separately for canal water irrigation and groundwater irrigation. Given the relatively much larger size of the electricity (i.e., groundwater irrigation) subsidy relative to the canal water subsidy, the simulations for removal of the electricity subsidy assume total irrigation costs increase by the same proportion as increase in electricity tariff. The increase in electricity tariff to eliminate the subsidy was derived as follows. Farmers are charged at a flat rate which as per PSEB is presently equivalent to a metered rate of Rs. 0.57 per unit. Cost of electricity supply as per PSEB is Rs.3.11 per unit. Thus to remove the electricity subsidy, power tariff (and hence irrigation charges in the crop budgets) would need to be raised by 5.45 times, which was rounded off to 5.5.

A1.18 *Output prices.* Finally, the 2001/02 output prices under scenarios (iv) and (v) were estimated using a 20 year trend from 1981/82-2000/01. This was done to iron out short term fluctuations and use border prices which would be expected in a 'normal' scenario (i.e., unlike the currently depressed international prices). For comparative purposes, results using actual 2001/02 international prices were also computed and have been reported in Table 3.12 of the main text.

**Table A1.9 Canal water subsidy in Punjab (Rs. Lacs)**

| Year    | O&M<br>expenditure | Irrigation<br>charges<br>paid | Subsidy |
|---------|--------------------|-------------------------------|---------|
| 1990-91 | 3199               | 849                           | 2350    |
| 1991-92 | 3703               | 976                           | 2728    |
| 1992-93 | 4053               | 962                           | 3091    |
| 1993-94 | 4472               | 1291                          | 3181    |
| 1994-95 | 4511               | 2045                          | 2466    |
| 1995-96 | 5445               | 1880                          | 3565    |
| 1996-97 | 6343               | 1401                          | 4942    |
| 1997-98 | 8078               | 276                           | 7801    |
| 1998-99 | 8770               | 168                           | 8601    |
| 1999-00 | 12626              | 136                           | 12490   |
| 2000-01 | 11932              | 179                           | 11753   |
| 2001-02 | 13917              | 60                            | 13858   |

Source: GoP, Punjab Irrigation Department (Canal Administration).

**Table A1.10 Power subsidy in Punjab**

| Year    | Consumption<br>(MKW) | Cost in Rs.<br>per KWH | Total Cost of<br>Supply<br>(Rs. Crores) | Recovery in<br>Rs./ KWH | Tot. Revenue<br>(Rs. Crores) | Subsidy on<br>Electricity<br>(Rs. Crores) |
|---------|----------------------|------------------------|---|-------------------------|------------------------------|---|
| 1985-86 | 2799                 | 0.5                    | 140                                     | 0.16                    | 46                           | 95  |
| 1986-87 | 3571                 | 0.52                   | 186                                     | 0.09                    | 32                           | 154                                       |
| 1987-88 | 4242                 | 0.63                   | 269                                     | 0.15                    | 63                           | 206                                       |
| 1988-89 | 4220                 | 0.75                   | 317                                     | 0.09                    | 36                           | 281                                       |
| 1989-90 | 5186                 | 0.79                   | 412                                     | 0.07                    | 34                           | 375                                       |
| 1990-91 | 5095                 | 0.84                   | 430                                     | 0.09                    | 45                           | 385                                       |
| 1991-92 | 5542                 | 0.86                   | 475                                     | 0.1                     | 54                           | 421                                       |
| 1992-93 | 6144                 | 1.07                   | 660                                     | 0.11                    | 67                           | 593                                       |
| 1993-94 | 6344                 | 1.31                   | 833                                     | 0.19                    | 123                          | 710                                       |
| 1994-95 | 5980                 | 1.47                   | 878                                     | 0.34                    | 206                          | 672                                       |
| 1995-96 | 5735                 | 1.6                    | 919                                     | 0.39                    | 226                          | 693                                       |
| 1996-97 | 6347                 | 1.7                    | 1079                                    | –                       | 180                          | 899                                       |
| 1997-98 | 6050                 | 1.96                   | 1189                                    | –                       | free                         | 1189                                      |
| 1998-99 | 6175                 | 2.34                   | 1445                                    | –                       | free                         | 1445                                      |
| 1999-2K | 8233                 | 2.35                   | 1939                                    | –                       | free                         | 1939                                      |
| 2000-01 | 5535                 | 3                      | 1659                                    | –                       | free                         | 1659                                      |
| 2001-02 | 5452                 | 3.26                   | 1777                                    | –                       | free                         | 1777                                      |

Note: Tariff on Agriculture sector was re-imposed @ Rs.60/HP from 2002-03 onwards.  
Source: PSEB.

**Table A1.11 Fertilizer subsidy in Punjab**

| Year        | Fertilizer<br>consumption<br>(‘000 tonnes) |        | Fertilizer Subsidy<br>(Rs. Crores) |        |
|-------------|--|--------|------------------------------------|--------|
|             | India                                      | Punjab | India                              | Punjab |
| 1980-81     | 5516                                       | 762    | 505                                | 70     |
| 1985-86     | 8474                                       | 1098   | 1923                               | 266    |
| 1990-91     | 12546                                      | 1220   | 4389                               | 427    |
| 1991-92     | 12728                                      | 1262   | 4800                               | 476    |
| 1992-93     | 12155                                      | 1199   | 6136                               | 605    |
| 1993-94     | 12366                                      | 1119   | 5079                               | 460    |
| 1994-95     | 13564                                      | 1285   | 5769                               | 547    |
| 1995-96     | 13876                                      | 1263   | 6735                               | 567    |
| 1996-97     | 14308                                      | 1208   | 7578                               | 640    |
| 1997-98     | 16188                                      | 1314   | 9918                               | 805    |
| 1998-99     | 16798                                      | 1375   | 11596                              | 932    |
| 1999-00     | 18070                                      | 1447   | 13244                              | 1061   |
| 2000-01     | 16702                                      | 1314   | 13811                              | 1086   |
| 2001-02 (P) | 19306                                      | 1400   | 11944                              | 1028   |

Source: Estimated using data from Fertilizer Statistics, 2001-02.

## **Annex 2**

### **Contract Farming in Punjab**

A2.1 Contract farming (CF) can be described as “an agreement between farmers and processing and/or marketing firms for the production and supply of agricultural products under forward agreements, frequently at predetermined prices. The arrangement also invariably involves the purchaser in providing a degree of production support through, for example, the supply of inputs and technical advice” (Eaton and Shepherd, FAO, 2001). An important point to note is that the company supplying the inputs/technical assistance and buying the crop is normally one and the same. Henceforth this party is referred to as the “sponsor”.

A2.2 In the last year, Punjab’s diversification agenda has become closely associated with the concept of contract farming. CF is not a precondition for diversification. However the willingness of companies to contract with farmers is a powerful incentive, particularly in view of the security provided by traditional markets for rice and wheat. To address this topic this annex first considers the types of activity for which contract farming is appropriate, and how this tallies with the pattern of activities which have in practice developed in Punjab. This is followed by a discussion of initiatives to introduce the approach in Punjab.

#### **When Is Contract Farming Normally Appropriate?**

A2.3 Contract farming tends to focus on certain types of activity:

- Perishable products required for processing, e.g. sugarcane or milk. The sponsor, a processing factory, uses contracting to ensure the supply of sufficient raw material of the required quality, and from within a close radius of supply whereby freight costs can be minimized.
- Perennial crops, e.g. rubber, oil-palm and citrus, requiring support for farmers to make long-term investments before generating any income.
- Activities where producers must meet exacting delivery schedules and product standards, in terms of varietal purity, sensory attributes, appearance, pesticide residues and other factors. CF has long been practiced with developing country producers of fresh bananas and pineapples. Developed country importers are increasingly demanding that agricultural products, and particularly those of higher value, be traceable back to origin. This can only be achieved if there is some sort of vertical integration, involving plantation production or, where many farmers are involved, CF.
- Activities where farmers must produce to established protocols and under close supervision, using inputs supplied by sponsors. Seed production and contract poultry production are good examples of this.
- Activities where farmers are critically dependent upon credit from the sponsor.

Against these criteria, the CF experience in Punjab is summarized in Table A2.1.

**Table A2.1**  
**Activities/Crops Suitable for Contract Farming and Examples in Punjab**

| Activity/crop   | Examples/sponsors in Punjab   | Scale  | Observations   |
|---|---|--|--|
| Perishable products for agro-processing                           | Milk  | 7.9 million tons by 2001/02; 43 milk plants  | <ul style="list-style-type: none"> <li>Highly successful, grew by 4% per annum during 1990s</li> <li>Net returns much greater than rice &amp; wheat</li> <li>Some logistical diseconomies due to large procurement zones</li> </ul>  |
|   | Tomatoes, chilies and potatoes for processing: Pepsi (started 1989), HLL (1995) and Nijjer Foods.   | Never more than 1,200 hectares   | <ul style="list-style-type: none"> <li>Pepsi/HLL operations terminated due to underlying economics, but</li> <li>the CF system proved fully viable</li> <li>it facilitated R&amp;D and highly productive system</li> <li>it had major beneficial side-effects on non-CF production</li> </ul>                |
| Perennial crops, e.g. rubber, oil-palm, citrus                    | None  |  |  |
| Crops with very exacting delivery schedules and product standards | Basmati rice: <ul style="list-style-type: none"> <li>HLL and Pepsico – since 1998</li> <li>under PAIC programme – 4 new sponsors – in 2003</li> </ul> | In 2003: <ul style="list-style-type: none"> <li>original sponsors: 7,500 hectares</li> <li>under PAIC programme, over 32,000 ha</li> </ul> | <ul style="list-style-type: none"> <li>original sponsors doing R&amp;D</li> <li>all sponsors arranging seed supply and TA, and organizing traceability systems</li> <li>some of the PAIC supported area may not be new</li> <li>to date international trade pays no premium for traceable basmati</li> </ul> |
|   | PAGREXCO airfreighting fresh vegetables (okra, bitter gourds, green chillies, baby corn) to UK market   | 150 growers; 200 hectares; 1-1.5 tonnes per week   | <ul style="list-style-type: none"> <li>production located in Patiala; why not close to airport in Amritsar?</li> <li>small supplier compared to major players in Kenya and other countries</li> <li>plan to charter flights of 23-24 tons, with transshipment through Dubai</li> </ul>                       |
| As above, + requiring close adherence to production protocols     | Seed production, e.g. Punseed, flower seeds for export  | Not known  | Minimal problems of side-selling because the seed company pays premium prices  |
| Production is critically dependent upon credit from the sponsor   | None  |  | Formal and informal credit is widely available in Punjab   |

A2.4 Basic food or feed commodities, such as wheat, rice<sup>1</sup>, maize, oilseeds and pulses do not normally figure highly in CF schemes. They are not highly perishable, do not face very exacting market specifications or supervision during production. Moreover providing inputs on credit is risky with these crops because there are typically many potential buyers and a high risk of ‘side-selling’, i.e. the farmer will sell the output to another buyer, making the activity financially unprofitable for the sponsor. In developed countries such risks are minimized by legal and

<sup>1</sup> The reference here is to rice of standard qualities; as indicated elsewhere special quality rice such as basmati may offer more potential for contract farming.

contractual frameworks which allow sponsors to take charges on farm assets and if necessary foreclose, but this situation does not pertain in Punjab. Cereals may however prove easier when the contract farming activity results in the companies involved obtaining premium prices on account of quality or traceability; the extra value generated compensates for the costs of technical support, supervision and default.

A2.5 Cotton lends itself to contract-farming in the sense that the market is highly sensitive to quality, particularly in terms of staple-length, contamination and uniformity, but it is nonetheless absent from the list of commodities farmed this way in Punjab. A successful experience is reported in Tamil Nadu, involving superior coordination of the market chain; the ginner obtains premium prices for his lint while passing on major benefits to the farmers (National Institute of Agriculture Extension Management, 2003) . There are opportunities for similar approaches in Punjab, particularly given the large textile industry located in Ludhiana.

### **Early Contract Farming Experiences With Vegetables And Basmati Rice**

A2.6 Pepsico and Nijjer Foods successfully organized contract farming for the production of tomatoes, chilies and potatoes for processing. Only a few hundred farmers were involved in all, and they never farmed more than 1,200 hectares under these schemes. Pepsico started with tomatoes in 1989 and, employing PAU scientists and 3 foreign experts, claim to have tripled commercial yields to 45 tons per ha. It sold the operation to HLL which finally ceased processing altogether in 2001. This did not fail on account of any weaknesses in the contract farming model adopted but due to unfavourable economics; the processing unit was established in Zehura, 40 km north of Jalandhar, where it was only possible to get one crop a year. The cost of production was high and paste from the Punjab plant could not compete with product from southern India and highly subsidized imports from China<sup>2</sup>. After this the company started producing chili paste but this operation was likewise closed, according to Pepsi due to unfavourable market conditions stemming from the economic crisis of South East Asia.

A2.7 Sponsors generally limited themselves to R&D, extension, the supply of seed (sometimes organising transplanting), and buy-back. Sukhpal Singh (2002) reviewed these schemes and reported a lack of formal contracts between the scheme operator and the farmer, and what contractual terms existed favored the scheme operator over the farmer. However, sponsors will not in practice take legal action to enforce contracts. In signing up farmers, they typically opt for a simple registration procedure along lines described by Eaton and Shepherd (2001, p.67), with main terms and conditions spelt out on the registration document.

A2.8 Pepsico started contract-farming with basmati rice in 1998, and was followed by Hindustan Lever Ltd. (HLL) in 2000. Both companies have broadened their selection to include other special quality or 'super-fine' rice. Here the logic was to ensure the supply to highly quality-conscious export markets in Europe and the Middle East, and to facilitate the development of brand loyalty. They have gradually increased their involvement with the crop and in 2003 have registered farmers to plant a combined area of 7,500 hectares. They have guaranteed a price, typically around Rs 1,200 per quintal, and paid out in the years when market prices fell below this level.

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<sup>2</sup> Pepsico originally became involved in Punjab agriculture for PR reasons, and this may explain a lack of full business rigour at the project appraisal stage. However, the company remains in Punjab and claims that its tomato operation has brought lasting benefits to Punjabi farmers who have adopted the high-yielding technology it introduced, in order to supply the market for fresh vegetables. Significantly the latter have continued without the aid of contract farming.

A2.9 All contract farming initiatives to date have been characterized by a high level of ‘side-selling’, involving significant costs to the sponsors involved. HLL and Pepsico report levels of recovery of between 35% and 85% of estimated production, i.e. side-selling between 15% and 65%. The unusually high figure of 65% occurred in 2002 when prices rose very suddenly above the guaranteed price. Sponsors find they can reduce side-selling significantly by developing long-term relationships with farmers, and by paying them market-related bonuses – indeed the experience of 2002 has taught them that they have little alternative with crops which can be easily sold to other parties.

### **Punjab Agro’s Plans For Contract Farming**

A2.10 Punjab Agro Foodgrains Corporation (PAFC), a fully owned subsidiary of Punjab Agro Industries Corporation (PAIC), has been assigned the task of diversifying agriculture through promotion of contract farming in the state. PAFC has developed a five-year CF plan as shown in Table A2.2.

**Table A2.2**  
**PAFC’s Five-Year Plan for Contract Farming**  
(‘000 hectares)

| <i>Crop</i>             | <i>Season</i> | <b>2003</b> | <b>2004</b> | <b>2005</b> | <b>2006</b> | <b>2007</b>  |
|-------------------------|---------------|-------------|-------------|-------------|-------------|--------------|
| Hyola (hybrid rapeseed) | Rabi          | 20          | 80          | 120         | 160         | 180          |
| Barley                  | Rabi          | 2           | 6           | 10          | 16          | 28           |
| Winter maize            | Rabi          | 1           | 2           | 4           | 5           | 6            |
| Durum wheat             | Rabi          | 20          | 80          | 120         | 160         | 180          |
| Sunflower               | Spring        | 4           | 16          | 40          | 60          | 90           |
| Spring maize            | Spring        | 2           | 6           | 6           | 16          | 32           |
| Basmati rice            | Kharif        | 34          | 40          | 60          | 60          | 60           |
| Kharif maize            | Kharif        | 20          | 120         | 160         | 200         | 240          |
| Guargum                 | Kharif        | 1           | 2           | 3           | 4           | 6            |
| Castor                  | Perennial     | 1           | 4           | 8           | 16          | 20           |
| Groundnut               | Kharif        | -           | -           | 6           | 8           | 10           |
| Organic basmati         | Kharif        | 2           | 1           | 2           | 3           | 6            |
| Vegetables              | Kharif/Rabi   | 1           | 2           | 2           | 4           | 8            |
| Cotton                  | Kharif        | 6           | 20          | 48          | 60          | 80           |
| Moong/other             | Kharif        | 5           | 20          | 10          | 28          | 54           |
| <b>Total</b>            |               | <b>120</b>  | <b>400</b>  | <b>600</b>  | <b>800</b>  | <b>1,000</b> |

A2.11 PAFC sees its approach to be that of a facilitator, tying up farmers with agribusinesses which will supply quality seeds and technical assistance, and buy back the crop. Under current circumstances, PAFC considers these companies’ technical assistance aspect of particular importance in view of the limited resources and capabilities of the state extension system. A key factor in attracting these companies has been the state authorities’ willingness to waive certain of the usually mandatory charges associated with procurement of grain.

A2.12 Before describing the operation of this scheme, it should be emphasized that there is considerable variation in the approach adopted with the different crops, and by the different companies involved. Moreover at the time of preparation of this study, some of the arrangements between the parties were still being worked out or subject to change. The following paragraphs provide a general description of how the system has been implemented with basmati rice, and then other variations are discussed. However, we do not pretend to cover all the different experiences and variations under the scheme.

*Approach adopted with basmati rice*

A2.13 PAFC promotes all the crops with leaflets in Punjabi indicating the profitability of new cropping rotations involving the above crops, vis-a-vis the traditional rice-wheat rotation. However, despite various requests, it could not provide the study team with the workings or assumptions behind these calculations.

**Table A2.3**  
**Players in PAFC Scheme for Basmati**

| <b>Player</b>             | <b>Role</b>  |
|---------------------------|--|
| Sponsor                   | Register farmers<br>Provide seed and technical assistance<br>Institute traceability system<br>Find reliable buyer and agree terms to purchase the crop on behalf of the farmer                               |
| Farmer                    | Produce the crop under sponsor's supervision   |
| Buyer                     | Contract (with sponsor and PAIC) to buy the crop, at an agreed minimum price with market-related bonus<br>Buy the crop from the farmer (either directly or through the sponsor who acts as commission agent) |
| State Government/<br>PAFC | Provide incentives to sponsor (reduced market charges), and additional extension support<br>Act as buyer of last resort, in the event of default by buyer  |

A2.14 In the 2003 basmati scheme there are four players (Table A2.3). This is unlike conventional CF schemes where there are only two players - the sponsor and the farmer (or farmers' organization). The commercial functions are divided between the sponsor (which provides the inputs and technical assistance) and the buyer which markets the crop internationally and/or domestically. Then there is the State Government/PAFC which provides certain incentives and support, and acts as buyer of last resort, at a "comfort price" in case the buyer defaults on his commitment to buy from the farmer.

A2.15 All the sponsors are corporate agribusiness companies,<sup>3</sup> and these first entered into a preliminary agreement with PAFC to contract for a certain number of acres in selected districts. They then proceeded to register farmers on their own behalf and on behalf of PAFC, charging an initial registration fee. This registration agreement states the area of crop that the farmer will plant and that the crop will be bought at a minimum guaranteed price. It may also provide for a market-linked bonus.

A2.16 It is the sponsor's job to find the buyer and tie up a buy-back contract for the paddy. The agreement with the buyer is tied up in a tripartite contract involving the sponsor, the buyer and PAFC, which spells out the duties and obligations towards each other and to the farmers. Buying companies guarantee to buy back the basmati (the price of Rs 1,350 per quintal being most frequently mentioned) to ensure farmer commitment and some sort of a market-related bonus. Certain contracts provide for buyers to provide corporate and bank guarantees. PAFC also provides its "comfort price" of Rs 1,100 per quintal.

A2.17 Sponsors provide seed and technical assistance, and at this time are being required to enter into a final agreement with farmers, for which purpose they are formally empowered to act on PAFC's behalf and provide PAFC's "comfort price" guarantee. The sponsor follows this up

<sup>3</sup> Sponsors include Mahindra Shubhlabh Services Ltd. (MSSL), Rallis India Ltd, M/S Escorts (working in partnership with rice miller Graintec) and DCM Shriram Group.

by regular visits during the growing season, with a view to keeping fully traceable records of the operations carried out. Some sponsors are also arranging low cost financing for farmers, under an arrangement with ICICI bank.

A2.18 Sponsors typically charge farmers, or plan to charge at harvest time, an initial registration fee and a per acre fee to cover the cost of TA provided. They also earn margins on the provision of inputs, arranging credits and acting as commission agents for the buyer.

A2.19 For 2003, PAFC has planned for 34,000 ha, but according to data from the sponsors, this area will be exceeded by 6,000 ha, and this excludes 3,200 ha under Pepsico which has a looser association with the PAFC scheme, and 4,280 ha from HLL which continues to operate independently (see Table A2.4). However, there is a question as to how much new basmati area will really be brought into production through CF, and how much is simply a case of signing up farmers who would in any case produce the crop. Some parties believe that less than half of the basmati area is in fact new; the true situation can only be ascertained through detailed field investigation.

**Table A2.4**  
**Summary of Basmati Contract Farming Schemes**  
**(as per information supplied in early July 2003)**

|  | Sponsors under PAFC scheme |  |   |             | Independent sponsor                                    |                                 |
|--|----------------------------|--|---|-------------|--|---------------------------------|
|  | MSSL                       | Rallis India Ltd.                                  | M/S Escorts                                     | DCM-Shriram | Pepsico  | HLL                             |
| Hectares signed up                                     | 8,000 <sup>1</sup>         | 12,000   | 16,000  | 4,000       | 3,200 <sup>2</sup>                                     | 4,280                           |
| Fee/hectare, payable by farmer to sponsor <sup>3</sup> | Rs 375 Before planting     | Rs 200 down to Rs 25, at sale time <sup>4</sup>    | Rs 200 down to Rs 50, at sale time <sup>4</sup> | ---         | None   | None                            |
| Prospective buyer from farmer                          | Sunstar Overseas           | L.T. Overseas                                      | Satnam Overseas; Anima Foods; DD Int'l          | KRBL        | Sponsor  | Sponsor                         |
| Contract with buyer and PAFC                           | To be signed               | Signed   | Signed  | ---         | n/a  | n/a                             |
| Minimum prices per qt:                                 |                            |  |   |             |  |                                 |
| Contract price   | Rs 1,350                   | Rs 1,100   | Rs 1,350  | ---         | Rs 1,200   | Rs 1,200                        |
| PAFC "comfort price"                                   | Rs 1,100                   | Rs 1,100   | Rs 1,100  | Rs 1,100    | n/a  | n/a                             |
| Price adjustment                                       | ---                        | Based on seasonal average price in Amritsar market | ---   | ---         | To be based on basmati market & returns on other crops | Av market price – Rs 50 per qtl |

--- = information not available or undecided at the time of interview

<sup>1</sup> Expected acreage. At time of visit MSSL reported having 5,600 hectares signed up

<sup>2</sup> Includes other fine rices

<sup>3</sup> In addition to registration fees + price of seed, typically around Rs 40 per kg

<sup>4</sup> Fees decrease according to number of acres planted, and are payable on delivery of crop to buyer

A2.20 It is also evident that the sponsors' efforts are very widely spread, with each company covering between three and seven districts. All districts are being covered, not simply traditional basmati growing areas.

A2.21 At the time of the study team's visit in July 2003, not all tripartite contracts had been signed and there was significant uncertainty as to some terms and conditions, notably regarding the exact exemptions to market charges and taxes, the commissions which the sponsors would earn in acting for the buyers and the formula according to which farmers would be paid market-related bonus.

#### ***Other crops under the PAFC contract farming initiative***

A2.22 PAFC started operations with the rabi crop of 2002, with a target of 12,000 ha. In practice the main realization was 3,920 ha of hyola (rapeseed) and 3,290 ha of sunflower. PAFC contracted with seed companies to provide the seed to farmers, subsidizing the extension cost, and committed to buy the crop at the GOI minimum support price on behalf of NAFED which is the designated GOI procurement agency for oilseeds – no commercial buyer was involved. However because of abnormally high market prices for oilseeds, PAFC did not need to act as buyer, and simply allowed farmers to sell on the open market.

A2.23 PAFC planned to promote 20,000 ha of maize in the kharif season, but had difficulty in attracting sponsors, due to the low profitability of the crop vis-a-vis rice. The overall area planted is unlikely to be more than 10,000 ha. Mahindra Shubhlabh Services Ltd. (MSSL) will act as sponsor for 20% of this, and PAFC will directly promote the remainder, using its own extension staff. In both cases PAFC guarantees to buy the crop, and is offering farmers an alternative of fixed or variable price contracts. PAFC has a loose arrangement for marketing the maize with a local starch manufacturer.

A2.24 These activities with oilseeds and maize can hardly be described as contract farming. They would be better described as one-off exercises to promote the growing of particular crops. As noted above, basic food and feed commodities do not normally fit well into contract farming, and the difficulty in attracting sponsors and buyers could be related to the relatively high risks of 'side selling' by farmers.

#### **Assessment of the PAFC scheme against “Key Preconditions”**

A2.25 The FAO Agricultural Services Bulletin No 145 on Contract Farming (Eaton and Shepherd, 2001) spells out a series of “Key Preconditions for Successful Contract Farming. The main criteria concern the prospective *profitability* of the activity to be promoted, *physical and social environments* and *government support*.

A2.26 In Table 2.5, the PAFC scheme is assessed against these preconditions. It scores highly with regard to *physical and social environments*, but less well in the other two areas. PAFC was unable to provide any data or calculations to back up the *profitability* calculations in the leaflets it distributed to farmers. As noted above, basmati has so far been most attractive to farmers, but their enthusiasm is largely a result of current conditions in the international market (low stocks and high prices). In order to persuade farmers to register in large numbers, sponsors have had to commit buyers to buying back at a relatively high price, but in the light of past price volatility, this level may have to be lowered slightly in future years. Moreover exporters have so far not been able to obtain a premium for 'traceable' basmati produced under CF arrangements, though they have expectations of obtaining such premiums in the future.

**Table A2.5**  
**Assessment of PAFC-Sponsored Program Against FAO's 'Key Preconditions for Successful Contract Farming'**

| <i>Key Preconditions</i>   | <i>Assessment*</i> |          |          | <i>Remarks</i>   |
|--|--------------------|----------|----------|--|
|  | <i>F</i>           | <i>A</i> | <i>M</i> |  |
| <b>A PROFITABLE MARKET</b>   |                    |          |          |  |
| <b>The sponsor:</b>  |                    |          |          |  |
| Must have identified a market for the planned production   |                    | •        |          | Markets so far identified for basmati (with contractual commitments) and maize (without). Less clarity on other crops.   |
| Must be sure that such a market can be supplied profitably on a long-term basis  |                    |          | •        | Lack of data available about long-term prospects for most crops envisaged; however sponsors are optimistic concerning basmati.<br>Lack of focus on most favorable basmati areas; most sponsors are promoting over wide geographical area, risking loss of critical mass and economies of scale |
| <b>The farmer:</b>   |                    |          |          |  |
| Must find potential returns more attractive than returns from alternative activities and risk acceptable                 |                    | •        |          | Returns on sunflower and hyola acceptable for recent harvests, and basmati for 2003 harvest; but will they find them acceptable over long-term?  |
| Must have returns demonstrated on the basis of realistic yield estimates   |                    |          | •        | Returns shown in PAFC leaflets, but the underlying calculations are not available  |
| <b>PHYSICAL AND SOCIAL ENVIRONMENTS</b>  |                    |          |          |  |
| The physical environment must be suitable in general, and in particular for the product to be produced                   | •                  |          |          | Highly productive environment (with irrigation) for a wide range of crops  |
| Utilities and communications, must be suitable for farming (e.g., feeder roads) and agro-processing (e.g., water, power) | •                  |          |          | Mostly excellent (all villages connected by metalled roads; good telecommunications), but prone to power cuts  |
| Input availability   | •                  |          |          | Seed assured by the sponsor; other inputs and credit readily available in the market. Sponsors also able to arrange cheaper credit.  |
| Social considerations  |                    | •        |          | Significant side-selling to be expected; time required to build trust  |
| <b>GOVERNMENT SUPPORT</b>  |                    |          |          |  |
| <b>The enabling and regulatory role</b>  |                    |          |          |  |
| Suitable laws of contract and other laws are required as well as an efficient legal system                               |                    |          | •        | Contracts with farmers cannot be enforced, but sponsors can reduce losses through long-term relationships.   |
| Support through research and extension   |                    |          | •        | Government research focuses on traditional crops; extension services in disarray   |
| <b>The developmental role</b>  |                    |          |          |  |
| Bringing together agribusiness and suitable farmers  | •                  |          |          | PAFC has strong promotional role, though sponsor generally had to identify individual farmers  |

Notes: \* F=favorable; A=average; M=marginal. Key Preconditions are from Eaton and Shepherd, 2001, Chapter 2.

A2.27 Some of the other crops seem to have been included without due analysis of production and/or market prospects. Organic basmati needs planting on land where chemical inputs have not been used for the previous three years, so it is difficult to conclude that Punjab has comparative advantage with this crop. Traceability is heralded as an advantage of this scheme, but it remains

to be seen whether this will enhance prospects for commodities marketed within India. If not, it will make it more difficult for sponsors to recover their promotional expense.

A2.28 Historical price levels do not favor the production of oilseeds and maize in Punjab. However, the situation may change in the future as a result of the burgeoning demand for animal feed. Nevertheless, any attempt to promote contract farming with these crops should have been preceded by a thorough analysis of the oilseeds and feed sub-sector, and price projections covering the next five years. It is not clear that PAFC has commissioned or carried out any such analysis.

A2.29 In the area of *government support*, it has already been noted that there is no legal framework allowing sponsors to enforce contractual commitments with farmers. Sponsors indicated that while it is unlikely they would take legal action against a farmer, the existence of a clear legal proscription would diminish the frequency of farmers' defaulting.

### **Assessment of Risks Under the PAFC Scheme**

A2.30 Given the risks faced by the sponsor, there is some uncertainty as to whether they will remain committed to the activity over the long term. These risks include:

- Lack of underlying profitability due to (i) dissemination of effort over large area and lack of economies of scale; (ii) "side selling" by farmers; (iii) market induced variations in farmer effort – possible scenario with basmati; and (iv) lack of profitable alternatives to basmati.
- Fall in market prices causing buyer to default on minimum contracted price. Sponsor loses confidence of farmers.
- Buyer may allege quality not up to standard.
- PAFC fails to honor comfort price

A2.31 Sponsors have to cover significant promotional costs, while promoting crops over a large geographical area. They face substantial risks of "side-selling" by farmers, based on HLL and Pepsico's earlier experience, and particularly given the physical difficulties in supervising the large numbers of farmers which are being rapidly registered. Changes in world market prices may cause farmers to vary in their commitment to basmati, and, without corrections to wheat and rice MSPs, there appears to be a lack of profitable alternatives with which to maintain their interest.

A2.32 At the same time sponsors face a finite risk that the buyer will default in the event that the market price is below the minimum guaranteed price; or the buyer may quibble over the quality of the basmati delivered, or fail to pay the agreed market-related bonus. As the buyer will wish to protect his reputation within the trade and with the Government of Punjab, these things will hopefully not happen, but if they do happen the sponsor will have limited recourse, due to the absence of efficient dispute-settlement systems in India. Counterparties within a particular trade normally resolve disputes through informal mechanisms (peer pressure being very strong) but this is less applicable between members of two different trades (e.g. agribusiness service providers and rice traders). India has had no less than 5 pieces of legislation on arbitration<sup>4</sup>, but trade sources report they are of limited use in solving trade disputes. The practice in Western countries

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<sup>4</sup> The Arbitration Act, 1940, Arbitration Protocol and Convention Act, 1957 and the Foreign Awards Registration and Enforcement Act, 1961, were amalgamated into the Arbitration and Conciliation Act, 1996. Lastly an Amendment of Section 89 of the Civil Code came into force on July 1, 2002 (personal communication, Mr. P.K. Agarwal, Marketing Advisor, MOA, GOI).

is for the courts to automatically enforce arbitration awards, but in India they usually end up in the courts as subjects for further litigation, thereby defeating the whole object of the arbitration, which is speedy settlement and award of damages.

A2.33 If the buyer defaults, the sponsor faces the risk that PAFC will lack the necessary resources to honor the “comfort prices”. However, given the political implications, it is likely the state will find one or other way of paying the farmers.

A2.34 HLL and Pepsico run much less risk than the new sponsors because their schemes have been built up more gradually, giving them time to carry out R&D and field testing (Pepsico claims to have evaluated 30 types), to develop their own seed supply, to select and evaluate farmers, organise training and follow-up. Moreover both export the commodity in their own name, and their contracts are not dependent on third party buyers.

A2.35 PAFC is supporting this scheme as part of its public service role, and expects to earn little in the form of fees. However, it is also exposed to a significant level of risk:

- If farmers fail to deliver, sponsors may be reluctant to continue operations in Punjab.
- If the buyer defaults it will face the anger of farmers, and be forced to procure significant volumes of commodities and possible losses through standing in at the comfort price.

## **Conclusion**

A2.36 Contract farming has a place in the development of Punjab’s agriculture. Moreover, PAFC’s venture into this field embodies a more market-oriented approach to agricultural development and a significant shift away from the state’s traditional focus on production as an end in itself. However, it appears that PAFC has set over-ambitious targets (particularly for maize and hyola), and there are significant risks of failure, and that the latter could cause a loss of confidence in the CF approach. Without significant reforms in other areas (e.g., price support, marketing, research and extension) to correct the presently distorted incentive structure that favors rice and wheat cultivation, there is little to suggest that the target of 1 million hectares will be attained by 2007.

A2.37 The following are suggested options/guidelines for GOPs involvement with contract farming:

- a) Promote CF only where it is likely to result in added value, compensating sponsors for the significant costs involved.
- b) Any terms and conditions attaching to sponsors’ participation (e.g. tax concessions) should be transparent and announced well in advance of the season.
- c) Back up any cropping recommendations with thorough analysis of the viability of the crop, and strategic analysis of the commodity system involved.
- d) Attract sponsors willing to make a long-term commitment. For example GOP might provide exclusive advantages in particular blocks to sponsors willing to make a three year commitment to building up contract farming. The sponsor might be required to back this up with a bankers’ guarantee in favor of the state.
- e) Minimize the number of parties in contractual arrangements – sponsor and buyer should preferably be the same.
- f) Minimize the direct commercial involvement of the state.

- g) Facilitate initiatives sponsors and farmers' organizations wish to take in developing speedy dispute-resolution systems. This might lead to legislation and a system for registration of contracts. The government's facilitative role needs to be stressed, since, to be successful, such measures are best designed by the interested parties.
- h) Encourage development of farmers' organizations capable of contracting with sponsors, with a view to reducing transactions costs, increasing information flow and improving farmers' negotiating position. Farmers' groups will be more effective if members are jointly and severally liable for their commitments to sponsors, and this generally means that they should be small and cohesive. Group savings can be used for collective insurance of members, as performance guarantees or for other joint purposes. Primary groups might federate to form larger organizations. The aim would be to create high quality farmer organizations with a high level of internal discipline and which can transact with agribusiness at low cost, and thereby earn favorable treatment from their sponsors.
- i) Encourage ginning companies to develop contract farming for cotton along the lines reported to have been successfully employed by Appachi Cotton Company in Tamil Nadu.