

EXECUTIVE SUMMARY

1. Excessive water is used for irrigating crops in Central Asia, environmental damage is serious and an expensive resource is wasted. Water saving measures can be taught but without incentives to improve, would not be sustainable. Raising the productivity of water by concurrently increasing crop yield while improving the application efficiency during irrigation offers a sustainable solution if some of the extra revenue were to be returned to operators in the form of incentives. The EC of EFAS has attached importance to demonstrating the technology to achieve improvement in water productivity but the proposed WUFMAS programme to do this in summer 1999 was not approved until mid-March when crop planting was about to start.
2. In late March, Supervisors from a selection of 9 of the original 36 farms, with National Co-ordinators, received training and a manual (Annex A) and guidelines for improving crop yield and saving water on the demonstration field. Two survey teams were trained in the field in April and visited the farms to make a topographic survey of the selected control and demonstration fields, to sample soils, and make several *in situ* measurements. The data collected were analysed and revised prescriptions for irrigation were issued in a report in July (Annex B). A further short report on furrow profiles was issued in September (Annex C). During the season, members of the RWG and the consultant made 36 visits to the nine farms to augment training and assess progress. Data sheets were collected at intervals as in previous years and data were entered into the WUFMAS database. The objective of this report is to summarise the data and reveal whether or not the WUFMAS team has met the target of 250 percent improvement in the water productivity index.
3. Economic gross margin return to water in US\$/thousand cubic metres (tcm) of water is chosen as the best index of water productivity. Excluding one abnormal field, the index was improved by 187 percent on average on the demonstration compared with the control field. Was this achieved by yield increase, lower costs of production or use of less water?
4. Average yield of cotton on the control fields was 2.05t/ha, but was 91 percent greater on the demonstration fields with an average yield of 3.59t/ha. Both control and demonstration fields of rice did well, with more than 6t/ha on the demonstration field, an increase of 18 percent. All demonstration fields out-yielded the corresponding control fields.
5. Detailed crop gross margins are given in Annex E and are summarised in Annex D. The average financial gross margin of cotton on the demonstration fields was 198 percent greater than the controls, but two control fields had negative gross margins at both financial and economic prices. The best farm in Bukhara had a spectacular economic gross margin of \$1680/ha of cotton on the demonstration field, but it was more than \$800/ha at financial prices. The financial gross margin of rice was prominently greater at financial than economic prices.
6. The prognosis for improved water management in the July report was not good, mainly due to poor land levels and too long furrows. Most demonstration fields were subdivided by temporary field canals as recommended but staff mostly did not achieve a marked improvement in water economy. The need to irrigate more frequently and the considerable contribution by capillarity from the watertable confuse the analysis of water use. Overall, 30 percent less water was used on the cotton demonstration fields than on the controls, and with rice the saving was 12 percent. Nonetheless, the cotton farm in Tadjikistan and the rice farm in Karakalpakkia both used more than 20tcm/ha on both fields. The average for the other farms was close to the loss by evapotranspiration of about 6-7tcm/ha.
7. The methodology introduced by WUFMAS for local scheduling of irrigation was employed to signal the ideal day for irrigating the demonstration field. Most farms came close as shown by schedules in Annex F. The daily water balance kept by the farm assistant also shows the net irrigation requirement on the day of irrigation. On the average cotton control field, 1.74tcm/ha was applied each irrigation compared with 1.45tcm/ha on the average demonstration field.
8. Overall application efficiency (E_a), relating the water delivered to the field compared with the estimated net requirement averaged 32 percent on the cotton controls and 37 percent on the demonstration fields. The average improvement was 43 percent. E_a was much lower in the first irrigation but improved as the rooting depth increased. Some fields were under-irrigated in mid-summer perhaps due to supply problems.

9. Detailed analysis of the data failed to reveal the components of the improved technology that most contributed to the yield or productivity increase. There was no evidence that planting cotton under plastic film increased water productivity.
10. The analysis of returns to the different inputs shows that at economic prices, investment in production is well balanced at the rates used on the demonstration farms. At financial prices, the return to water far out-stripped that of other inputs indicating that there is considerable scope to raise the financial price of water and re-allocate existing expenditure without jeopardising yield. The break-even yield of cotton was estimated from the data to be at about 1.9t/ha at financial prices but only about 1.4t/ha at economic prices, further evidence in favour of increasing water price.
11. Despite the late start, the WUFMAS team came close to achieving their targets and they have certainly demonstrated that marked improvement in water productivity is possible without a massive investment in extra resources. However, the demand for water from the supply canal was satisfied in most cases by co-operative farm staff, but it is doubtful if the system could accommodate if the technologies used were expanded to large areas.
12. It is strongly recommended that this programme should be expanded to more farms in year 2000. The financing decision needs to be made early enough in the season to be able to tackle some of the constraints of silted canals, poor land levels and compacted sub-soils, limitations that could not be removed in 1999.