China – UK, WRDMAP
Integrated Water Resources Management Document Series

Example 5.2: Assessment of an ISC System: Donghe Irrigation District (Jinchang, Gansu)

May 2010

中国水利 CHINA WATER

DFID Department For International Development

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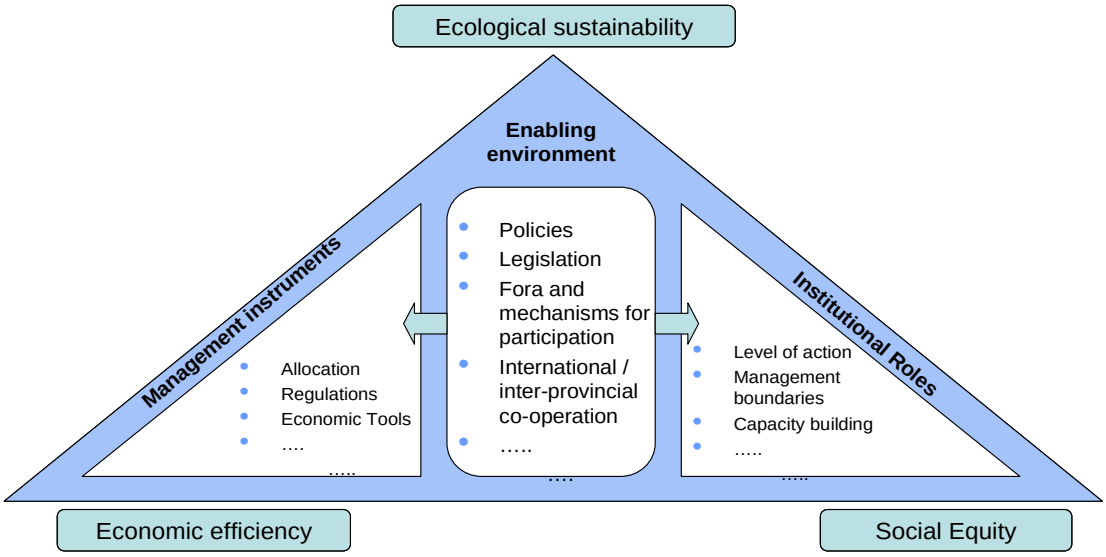
Integrated Water Resources Management (IWRM)

(Basics after Global Water Partnership)



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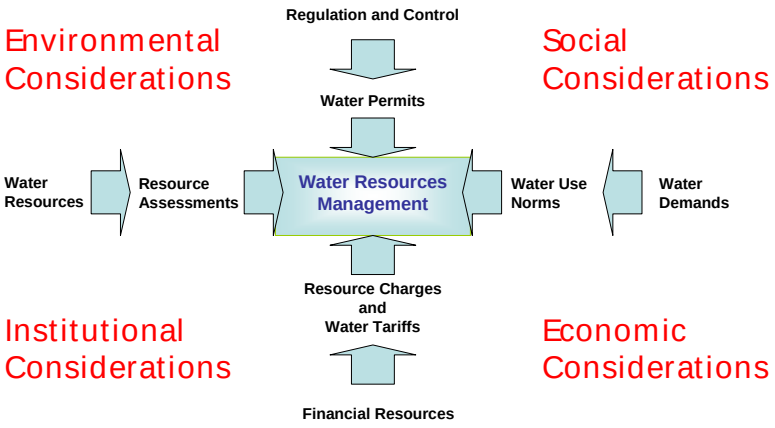

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Summary: This example describes how an existing **irrigation service charging (ISC)** system can be evaluated to ensure that it meets its objectives of achieving cost recovery whilst being affordable by farmers.

The example is based on the Donghe Irrigation District in Jinchang Municipality, Gansu Province. This is a large scale surface irrigation district used mainly for growing cereal crops. The charging system is well-designed, with the main constraint being the application of volumetric charges at farmer level as the measurement infrastructure is very limited. Simplified methods for calculating fees due are used in practice on the basis of proxy indicators.

Small farm sizes and restricted cropping options limit income from farming and therefore the ability of farmers at Donghe to pay ISCs is a key consideration in setting the appropriate ISC level.

The example is structured as follows:

- Introduction
- Assessment of the charging system using a 5-step checklist
- Details of calculation of the fee required, and the ability to pay
- Assessment conclusions

This document is one of a series covering topics on sustainable water resources planning, allocation and management. It should be read in conjunction with Advisory Note 5.2 'Formulation of Irrigation Service Charges for Surface Water Irrigation Schemes'. Details are given in the bibliography.

The Ministry of Water Resources have supported the Water Resources Demand Management Assistance Project (WRDMAP) to develop this series to support WRD/WAB at provincial, municipal and county levels in their efforts to achieve sustainable water use.

1 Introduction

1.1 Approach for assessing irrigation service charges

This example presents an assessment of the irrigation service charging (ISC) system for the Donghe irrigation district (ID) in Jinchang (Gansu Province). This is based on the method and assessment framework described in Advisory Note 5.2 'Formulation of Irrigation Service Chargers for Surface Water Irrigation Schemes', and more generally on the conclusions of the international and national review of best practice in that note. The framework was used as a checklist against which to assess the Donghe ISC system in 2006. Most of the conclusions from this will be equally applicable to other surface IDs in comparable areas in northern China.

1.2 Donghe Irrigation District

The Donghe ID is situated in the water-short Shiyang River Basin. The Donghe ID serves around 250,000 *mu*, although the actual area cultivated is less that this and not easy to quantify accurately (it was estimated to be around 170,000 *mu* in 2006). Cultivation is sparse and does not cover the whole area – water rather than land is the limiting factor (especially in the mid and tail parts of the system). Water allocations have been reduced in recent years and further reductions are envisaged; the land area irrigated will also be gradually reduced.

The cultivated area is used for low value field crops (wheat, barley) which are grown at high altitude (1,800 - 2,200m), where there are few cropping options. Switching to greenhouses and higher value crops is difficult because of the irrigation schedule.

Significant improvements in management would require far-reaching changes to system operation. More flexible operation could theoretically increase the productivity of water significantly, but it is feared that this would lead to an increase in water use. There are sparse arrangements for flow measurement, relying on staff gauges and occasional current metering, which limits the accuracy of measurements.

Donghe ID is situated in the water-short Shiyang River Basin

There is reported to be a low dependency on agriculture as compared to off-farm employment, with extensive local short-term urban migration. This means that farmers are mostly unwilling or unable to invest in agricultural improvements

2 Assessment of the Charging System

2.1 Framework for assessment

This section draws on the **5-step assessment framework** (Table 1) which is described in detail in Advisory Note 5.2, and applies this to the Donghe ID.

2.2 Step 1: Policy, institutional and legal framework

In most respects the required policy, institutional and legal framework is in place and the situation is satisfactory. There are clear and sound national and provincial policies and regulations for irrigation charging. A single organisation, the Jinchang Municipality Water Resources Bureau (WRB), manages the schemes and collects the ISCs whilst the Provincial and Municipal Price Bureaus are responsible, in consultation with the WRB, for fixing the charge levels. Judging by recent experience in Jinchang, these organisations appear to work together satisfactorily.

With regard to the institutional framework, the main weakness from the ISC viewpoint is probably at the water user association (WUA) / farmer group level, since there is no provision for their financing. Although the WUAs are intended to take over some management responsibilities from the Water Management Divisions and Stations (WMDs and WMSs), they are not entitled to the fees collected for that purpose. Operation of the ISC system at this level is likely to be suffering as a result, and the WUAs' lack of authority over their own financial matters undermines their existence.

This differs from the practice in many other countries, where WUAs are entitled to retain a proportion of fees to cover their own costs - up to 50% of fees are retained by WUAs in Nepal, depending on the extent of management transfer.

Table 1: Steps in Irrigation Service Charge design and implementation

Steps	Factors, alternatives, tasks
1. Assessment of policy, institutional and legal framework	Government fiscal, water, agricultural, social welfare, environmental and other policies Relevant laws and regulations Institutions involved in irrigation, their roles and responsibilities
2. Setting the objectives of irrigation service charging	***Alternative objectives*** *Cost recovery*: - Recovery of only the O&M costs. - Recovery of O&M costs plus part or all replacement costs - Recovery of O&M and capital replacement costs plus part or all non-replacement capital costs Directly *influencing demand* (to reduce water consumption) *Economic efficiency* (increasing the productivity of water, encouraging re-allocation to more productive uses)
3. Establishing the basis for irrigation service charges	***Alternative forms of charge*** *Land area-based*: charge per *mu* of land irrigated or land in 'effective' irrigation area *Crop area-based*: charge per *mu* of crop irrigated: - Same for all crops - Different charges for different crops *Volumetric:* charge per m^3, with or without a rising block tariff
4. Quantifying the charges	*Calculation of O&M costs*, depreciation charges(for replacement capital costs) and amortisation charges *Ability to Pay:* Assessment of farmers' repayment capacity *Allocation of charges* between different categories of user, different areas etc
5. Implementing the ISC system	Assessment of the ISCs due from each user *Billing and payment*: - Timing of payment: pre-payment per season or irrigation, payment after harvest etc - Collection/payment arrangements: who actually receives the money? - Form of payment: cash or kind - Sanctions for non-payment or late payment Achieving good *revenue performance*: - Collection percentages achieved - Percentages of O&M and other costs recovered - ISC administration and transaction costs *Use of the revenues* collected: - Spent on the irrigation scheme itself (O&M etc) - Spent elsewhere in irrigation or water sector. - Passed to Provincial or Central Government Treasury Monitoring and feedback

2.3 Step 2: Setting the objectives of irrigation charges

The main objectives of the irrigation charging system in Jinchang are well-understood in practice. Although the NDRC / MWR 2003 regulation on "Management Measures for tariff of water supplied from water resources works' gives cost recovery as the basic objective, demand management has become a prominent objective in areas of severe water shortage like the Shiyang River Basin.

This is a major reason why most of the overall irrigation charge for Donghe ID is now in the volumetric charge per m^3 rather than the basic fee per *mu*. In the 2003 Regulation it was intended that the basic fee should recover a *substantial proportion* of the total operation and maintenance (O&M) costs, including all direct salaries and management expenses and 50% of scheme repair and depreciation costs.

In addition to O&M costs, the 2003 Regulation requires the recovery of capital costs plus interest charges where these have been funded by loans and bonds. This would normally be done through amortisation charges. Based on the WRB costing for Donghe, it appears that the WRBs may be including amortisation costs as a standard procedure, possibly even where loans and bonds were not involved.

As noted in Advisory Note 5.2, in few countries, even developed countries, do the Government or irrigation agencies attempt to recover the non-replacement capital costs of irrigation schemes. The requirement to do so set out in the 2003 Regulation is a demanding one. Fortunately, the 2003 Regulation also requires account to be taken of the affordability of ISCs to farmers. If inclusion of amortisation charges results in ISC levels which cause hardship to farmers, there is provision for waiving them.

However, it is clear that the overarching objective is that the fees are for cost recovery, but should be structured in a way which gives a signal to farmers to save water.

2.4 Step 3: Establishing the basis for ISCs

ISCs are typically based on area irrigated or on volume of water delivered, or some combination of the two

Most of the O&M costs of gravity-fed schemes like Donghe and the others in Jinchang are fixed rather than variable. In principle, to ensure adequate cost recovery, most of the ISC should therefore also be fixed (a charge per *mu*) rather than variable. This would protect the WMD against shortfalls in revenues in seasons where above-average rainfall, drought or other factors cause a reduction in irrigation water use.

However, the basic fee is now only Y2/*mu* in Jinchang and thus makes only a small contribution to these fixed costs. The majority of the fee is in the form of a volumetric charge. This is despite the fact that it is difficult to implement this because volumetric measurement to individual users is not possible.

Volumetric measurements to WUAs are more often possible (although very difficult in practice in Donghe). WUAs then need to adopt proxy methods (such as time-to-irrigate or crop-area methods). These then need to be converted into volumetric equivalents (presumably with the agreement of the WMSs) so that users can be charged.

This is a slightly convoluted approach, but is the only practical way of meeting the requirement to charge volumetrically. There may also be additional fees for WUA or production group costs.

The approach adopted in Jinchang is thus that the majority of the fee should be based on flow volume, but that there should be a small fixed 'basic fee'.

2.5 Step 4: Quantifying the charges

In the checklist above (Table 1) three tasks are listed under this heading. Only two are relevant to Jinchang: (1) the calculation of O&M costs (charges), depreciation charges (replacement capital costs) and amortisation charges; and (2) the assessment of farmers' repayment capacity. All users are in the same category, so there is no need to develop differential charges for different users or different parts of the system.

Calculation of costs

The Jinchang and other WRBs in the province already have a well-established and detailed system for estimating the costs under item (1), based on Gansu Province regulations published in 1999. These were, in turn, based on national regulations published by the Ministry of Water Resources in 1995.

The WUA costs are not identified in these regulations, as the concept of WUAs was not well-developed or accepted then. As it is now expected that WUAs will to take over certain responsibilities from the WMSs they should also take over part of the costs. This is permitted in some parts of the country (e.g. in Zhangye the WUA retains about 1% of the fee collected) but does not appear to be permitted in Jinchang. The reason given for this is that 'end-irrigation systems' (i.e. the lowest level canals) do not exist and therefore there is nothing for the WUA to manage and hence no requirement for funds. This ignores the practical management that the WUA or Production Group has to undertake with the available infrastructure, and also the costs that they incur in collecting fees (or in assisting the WMD to collect fees.

This process is described in more detail in Section 3.

Ability to pay

In contrast to the calculation of scheme costs, there do not seem to be well-established and published procedures for calculating farmers' payment capacity (item 2). In the recent process of increasing the Jinchang ISC rates an assessment was reported to have been made of farmers' **ability to pay** (ATP) by the Jinchang Price Bureau, but it was not possible to obtain information on this. There are provincial guidelines giving a ceiling proportion of the net income which can be charged for water.

Nevertheless, calculation of farmers' ATP is an important part of the process of setting or modifying ISC rates. The results of the ATP assessment made in the review of the Donghe ISC system are included in Section 3.2.

An analysis of the capacity of the average Donghe farmer to pay the current and planned ISC charges was carried out as part of the assessment (Section 3).

2.6 Step 5: Implementing the ISC system

In terms of the implementation aspects listed under Step 5, at the WRB level Jinchang appears to have a well-established ISC system. The fact that the revenues collected are used almost entirely within the irrigation sector is a major advantage.

The main recommendation which can be drawn from international practice is that charges should be applied on a volumetric basis to WUAs, who would collect and manage fees from the farmers using simpler methods. Current policy and practice, by contrast, is for direct collection from farmers. This means that volumetric flows have to be calculated from proxy indicators. From the limited information available, this is done thoroughly by the WUA and farmers. Improvement of this system will depend on acceptance of a better defined division of responsibilities between WUAs and WMSs, and probably a change from the current practice – a change which neither party is seeking at present.

3 Calculation of Fees and the Ability to Pay

3.1 Operation and maintenance (O&M) costs

According to information from the Jinchang Municipality WRB office, the average surface water irrigation cost in the Jinchang municipality as a whole is Y0.114/m^3, This is reported to be made up of the following cost categories.

- 'Production Costs': direct salaries, materials, repairs, depreciation of capital assets, water resources fees (if charged – they are not charged for SW irrigation at present)
- 'Management Costs': office costs, reservoir management costs, water resource management costs
- 'Financial costs': interest on loans, bank charges

This is in accordance with the *'Provisional Regulations on Water Supply Cost Accounting for Water Projects in Gansu Province'*.

Since it includes depreciation and loan interest, the Y0.114/m^3 cost referred to above covers more than just O&M. At a typical rate of water use for barley in 2006 of 420 m^3/*mu* the O&M cost per *mu* would be Y48/*mu*.

By international standards this is a relatively high cost for medium-sized SW irrigation schemes – a typical equivalent cost in the USA is reported to be around Y0.08/m^3 (Dinar and Subramaniam 1998), while estimates for typical O&M costs on large gravity-fed SW irrigation schemes are in the range of Y0.02-0.04/m^3 (Perry 2001).

More detailed information on the breakdown of these costs is given in. Table 2, although these are slightly different from the figure of Y0.114/m^3 quoted above.

Canals in Donghe

Table 2: Irrigation supply costs for Donghe Irrigation Scheme

	2004	2005	2006
Annual water supply quantity (million m^3)	70	70	70
Expenses (Y'000)			
Salaries and wages	1,160	1,560	1,610
Management	400	619	622
Maintenance	320	516	540
Amortisation fund	3,990	7,852	7,852
Loan interest	0	500	500
Other expenses	630	421	450
Total expenses	6,500	11,468	11,574
Cost/m^3 irrigation including amortisation & loan interest (Y)	**0.09**	**0.16**	**0.16**
Total without amortisation & loan interest	2,510	3,116	3,222
Cost/m^3 irrigation excluding amortisation & loan interest (Y)	**0.04**	**0.04**	**0.05**

Source: Donghe WMD

If all the costs in Table 2 are included, the 2006 irrigation cost at Donghe is very high, at Y0.16/m^3. This is primarily due to the very large amortisation charge, which was doubled in 2005 - rising to about Y0.11/m^3. As a capital, rather than recurrent cost, it should not be included in the O&M costs even though it may be included in the irrigation charges made to farmers.

If the capital cost items in Table 2 (the amortisation and loan interest costs) are excluded, so that only the genuine O&M costs are included, the cost per m^3 is reduced to Y0.04-0.05/m^3. Although this is comparable to costs in many other countries, it may not be sufficient to maintain and operate the scheme satisfactorily in the future (i.e. to guarantee its sustainability), Calculation of the cost per m^3 is, of course, highly dependent on the volume supplied. The above calculations are based on the reported volume supplied to Donghe, 70 million m^3 per year. With an irrigated area of about 170,000 *mu* this works out to an average of 412 m^3/*mu* (6,200 m^3/ha). This agrees almost exactly with the average water use of 420 m^3/*mu* reported for barley in 2006.

On this basis the 2006 costs per *mu* and per hectare with and without amortisation and loan interest are summarised in Table 3.

Table 3: O&M costs per unit area (2006)

Costs	Y/ *mu*	$/ha
Including amortisation and loan interest	65	125
Excluding amortisation and loan interest	20	40

The amortisation and interest costs, appear very high, but Table 2 contains no provision for depreciation. The assumption made, therefore, is that the depreciation element is contained within the amortisation charge. Taking the lower figure as representative of the real expenditure on operating and maintaining the scheme, by international standards the O&M cost of US$40/ha is believable (assuming that it does not cover the cost of the Huangcheng reservoir).

Costs from other surface water irrigation districts (in Wuwei Municipality) can also be used for comparison (Table 4). These include O&M costs and depreciation, but **not** amortization costs. Two of these schemes (Huangyang and Zamu) are similar in cost to Donghe. Annual costs on these two schemes look reasonable (Y0.06-0.07/m^3, Y41-43/*mu*). The costs of the other two schemes, Xiying and Jinta, are unusually high, at Y0.15-0.23/m^3 and Y151-166/*mu*.

Table 4: Irrigation costs for Wuwei surface water irrigation schemes

Parameter	Unit	Xiying	Huanyang	Jinta	Zamu
Area irrigated	10^3 *mu*	502	280	147	463
Water source					
Surface	%	82	100	86	68
Groundwater	%	18		14	32
Water supply	10^6 m^3	326	159	162	361
Annual costs	10^6 Y				
O&M costs		56	8	18	15
Depreciation		20	3	6	5
Total		76	11	24	20
Unit costs					
Cost/volume	Y/m^3	0.23	0.07	0.15	0.06
Cost /area	Y/*mu*	151	41	166	43

Source: Project studies

The annual costs in Table 4 can be used to estimate the component of the Donghe costs which relates to replacement. The annual depreciation cost is equivalent to 35% of the O&M cost. Applying the same percentage to Donghe, its depreciation cost per *mu* would be Y6. Overall costs per *mu* would then be as follows (Table 5).

Table 5: Costs per unit area

Cost elements	Annual cost (Y/*mu*)
O&M costs alone	20
O&M + depreciation	25
O&M + depreciation+amortisation	65

3.2 Ability to Pay

Introduction

It is important for the sustainable operation of the Donghe irrigation scheme that farmers are able to afford the fee at the level set. When revising the level of ISC, the Municipal Price Bureau and WRB need to establish the capacity of average and poor farmers on the scheme to pay the ISC. This section describes in detail the ATP assessment of Donghe farmers for the 2006 ISC and identifies key features of the Donghe scheme that must be taken into account in future revisions to the ISC for the scheme.

Collection of crop yield and crop price data

Crop yields (kg/*mu*) and crop farm-gate prices (Y/kg) are the two most important parameters affecting the level of crop net returns per *mu*. Considerable care was taken to ensure that the data collected were as realistic as possible. Table 6 presents information gathered for selected parts of the Shiyang River Basin.

Table 6: Preliminary crop yield and price data

Source of data	Crop Yield (kg/*mu*)* and Price Data (Y/kg)							
	Wheat		Barley		Grain Maize		Cotton	
	Yield	Price	Yield	Price	Yield	Price	Yield	Price
1. Baseline Socio-economic Study, 2006								
- Donghe ID villages	400	1.5	450	1.2	500	1.6	-	-
- Yongchang Groundwater ID	425	1.5	-	-	725	1.4	-	-
- Minqin villages	425	1.6	-	-	575	1.1	275	3.7
2. Yongchang Groundwater ID (Wuwei Price Bureau)								
- 2005	430	1.4	-	-	680	1.0	-	-
- 2006	420	1.5	-	-	650	1.4	-	-
5. Minqin Agricultural Committee survey								
-2003	400	1.3	-	-	850	0.9	269	6.3

The yield and price data required are the averages achieved on the scheme as a whole in each year for each of the main crop outputs (wheat, barley and maize grain, seed cotton, vegetables and fodder). Usually the value of crop residues (wheat, barley and maize straw, cotton stalks etc) is not sufficient to justify the effort required to collect their price data.

The data can be obtained from the WMD, but it should be checked against other sources (e.g. official price statistics). If it proves difficult to obtain specific crop yield figures for a particular year, the best solution is to ask what is considered to be the 'normal' yield of that crop on the scheme in a 'normal' year.

Crop yields: The data in Table 6 give an indication of approximate yield levels and prices, but the sample is too small to provide a reliable estimate of these two parameters for the Shiyang basin as a whole. Nevertheless, the wheat yield estimates do seem to be very consistent, at between about 400 kg/*mu* and 425 kg/*mu* (6.0 tonnes/ha and 6.4 t/ha). Barley yields are similar, but maize yields appear to vary more widely, from 500 kg/*mu* to 850 kg/*mu* (7.5 t/ha to 12.75 t/ha). The highest yield of 12.75 t/ha seems exceptional and is open to question.

Crop prices: As with its yields, the prices of wheat in the various estimates are relatively consistent, at Y1.4-1.5/kg in 2005-06. According to information from Donghe, there was a pronounced fall in barley prices there between 2005 and 2006, with the price in 2006 being only Y1.2/kg, a 25% reduction from the previous year. In other countries the price of malting barley is normally similar to that of wheat (prices for barley grown for livestock feed are usually somewhat lower). Thus the Y1.2/kg price was considered not to be representative of 'normal' barley prices. Maize prices appeared to vary much more from scheme to scheme than wheat prices. In other countries maize grain prices tend to be slightly lower than wheat prices. On the basis of the figures in Table 6, a maize price of Y1.3-1.4/kg was assumed, slightly below the wheat price of Y1.4-1.5/kg.

Crop budgets

At present, few detailed crop budget data are available for irrigated crops in the Shiyang River Basin. Table 7 shows crop budgets for wheat, grain maize, seed maize and cotton prepared by the Wuwei Municipality Price Bureau for Yongchang Tubewell Irrigation area in 2005 and 2006, and by the Wuwei Municipality Agricultural Committee for Minqin County for 2003,

from a field survey carried out for that year.

Both sets of budget figures shown in the table exclude labour costs as most crop labour is provided by the farmers and their families.

Table 7 shows the costs of each crop input and operation in monetary terms but does not show the physical quantities involved; for example, the amount and types of fertilisers used and the seed rates per *mu*.

Table 7: Crop budget data (excluding labour costs) (Y/*mu*)

Item	Yongchang Tubewell Area (2006)			Minqin County (2003)		
	Grain maize	Seed maize	Wheat	Wheat	Grain maize	Cotton
			GROSS RETURNS (Y/mu)			
(i) Main output:						
Yield (kg)	650	430	420	401	850	269
Price (Y/kg)	1.44	2.00	1.50			
Value (Y)	936	860	630			
(ii) Crop residues						
Value (Y)	50	50	20			
Total output value	**986**	**910**	**650**	**521**	**765**	**1,695**
			COST OF PRODUCTION (Y/mu, excluding labour costs)			
Seed	20	50	54	40	12	18
Farmyard manure	25	35	43	0	0	0
Fertiliser	90	165	110	95	134	75
Chemicals	9	9	10	5	5	9
Plastic sheeting	50	50	0	0	40	40
Machinery operations	85	85	80	47	33	25
Pumping electricity	100	100	100	38	45	20
Irrigation charges	6	6	6	27	27	27
Total costs	**385**	**500**	**403**	**252**	**296**	**214**
			NET RETURNS (Y/mu, excluding labour costs)			
	601	**410**	**247**	**269**	**469**	**1,481**

Irrigation farmers' ability-to-pay

With a total population of about 45,000, the irrigated area per capita on Donghe is 3.8 *mu* (0.25 ha). Malting barley is the predominant crop. Average yield is 450 kg/*mu* (6.75 t/ha). The average farm-gate price for 2006 was taken to be Y1.5/kg. Gross returns would then be Y675/*mu*, plus the value of the barley straw, giving a total of approximately Y750/*mu*.

It was reported in 2006 that total costs of production for barley were typically about Y350/*mu*, including ISCs. It is not known whether this includes any labour element. No other data are available for barley, but comparison with cost of production data for wheat, a similar crop in terms of input levels and yields, suggests that Y300/*mu*, excluding ISCs and labour costs, would be a reasonable estimate. On this basis net returns would be Y450/*mu*. This net return could be considered also to be applicable for wheat, which is the largest single crop in the Shiyang River Basin.

With 3.8 *mu* of irrigated land, the crop net returns *per capita* at Donghe would be Y1710 per year. This is above the provincial poverty line of Y1100. If this Y1100 figure were taken as the living allowance, the taxable surplus available to pay ISCs would be Y610/capita or Y110/*mu*. On the basis of this set of assumptions, Table 8 shows the Donghe farmers' ability to repay each of the three levels of cost (from Table 5), taking three alternative percentages of the farmers' total surplus.

Table 8: Indicative estimates of Ability-to-Pay different levels of scheme cost

Taxable surplus		O&M costs Y20/*mu*	O&M+Deprec Y25/*mu*.	O+Dep.+Amort Y65/*mu*
% of total surplus	Y/*mu*	% of costs that can be recovered		
30	48	100%	100%	75%
40	64	"	"	99%
50	80	"	"	100%

Table 9: Indicative estimates of Ability-to-Pay different levels of ISCs

Taxable surplus		Irrigation service charge Y0.085 (Y/m^3) 36 (Y/*mu*)	Y0.105 (Y/m^3) 44 (Y/*mu*)
% total surplus	Y/*mu*	% of ISC which can be paid	
30	48	100%	100%
40	64	"	*
50	80	"	*

Note: Based on the average water use of 420 m^3/*mu* for barley.

Farmers' ability to pay (ATP) actual scheme costs

These approximate estimates suggest that the Donghe farmers could probably repay the O&M costs plus depreciation costs but would have great difficulty in paying the amortisation costs. Only by taking half of their total irrigation income above the official poverty line could the Irrigation District recover the amortisation cost from farmers. This would clearly be unacceptable. This situation is typical of many countries and is a major reason why Governments normally do not attempt to recover the original capital costs (in the form of an annual amortisation charge) of irrigation schemes from farmers.

Moreover, the calculation of taxable surplus is based on a low level of living allowance, namely the provincial poverty line of Y1100/capita. If the living allowance were taken to be nearer the Gansu farmers' average annual living allowance of Y1,820/capita, the ATP would be zero or negligible.

Ability to pay current and proposed volumetric ISC charges

The figures in Table 9 suggest that the Donghe farmers would have to pay about 25% the estimated total surplus (Y110/*mu*) above the poverty line to

meet the current ISC of Y0.085/m^3 in full. This is probably just about acceptable. To meet the proposed future rate of Y0.105/m^3, they would have to pay almost 30% of the taxable surplus above the poverty line.

If the surplus is based on the average living expenses for farmers in Gansu, the ATP would be zero. Based on the indicative figures in Table 4, it is therefore questionable whether ISC is affordable.

The basic reason for the low ATP of the average Donghe farmer is the small farm size (3.8 *mu*/capita on average). The crop yields and net returns per *mu* are satisfactory but his farm size is too small to enable him to earn an adequate level of income from his irrigated farming alone. This is why many of the Donghe farming population rely on off-farm work to supplement their incomes.

The Irrigation District and WRB should give the WUAs sufficient authority in managing irrigation charging

4 Conclusions of this Assessment

As described above, the ISC system in Jinchang appears to be working reasonably satisfactorily at the irrigation agency level, although it does not take account of the WUAs' role in management or allow for their costs.

An aspect which needs attention is a rigorous assessment of farmers' ATP. The current level of charges appears to absorb over 20% of farmer surplus above the official poverty line, and to exceed their surplus above average living expenses. However this assessment is based on approximate data and may not fully represent the actual situation.

If the charges are set at a level sufficient to recover amortisation costs as well as O&M and depreciation costs are likely to be too high to be affordable.

Irrigation charging and revenue collection for management at the WUA/farmer group level is probably working less well, and this needs to be addressed. This should be a matter for the WUA itself, but the WUAs need to be given sufficient authority over such matters. The WRBs and Irrigation Districts should provide advice, encouragement and provide them with some funding from the irrigation charges.

The combination of farm size and low value of the crop makes farming a marginal activity in this area. The situation will become more severe in the future as irrigated areas are reduced in accordance with the Shiyang River Basin Master Plan.

Document Reference Sheet

Glossary:

Amortisation	Regular (annual) charge made to recover the cost of a capital investment or a loan. It includes two elements (i) repayment of the principal (the capital sum expended or borrowed) and (ii) payment of interest charges on a loan.
ATP	Ability to pay – capacity of the irrigation farmers to pay the ISC.
ID	Irrigation district
ISC	Irrigation service charge - the total payment made by a user for an irrigation service. It may comprise fixed elements (e.g. a Basic Fee per *mu*) plus variable elements (e.g. a volumetric charge per m^3 of water delivered or a charge per *mu* of land actually irrigated).
mu	Unit of area, where 15 *mu* is equivalent to 1 hectare
O&M	Operation and maintenance
WMD	Water Management Division
WMS	Water Management Station
WRB	Water Resources Bureau
WUA	Water User Association

Bibliography:

NDRC / Ministry of Water Resources, 2003, 'Management Measures for tariff of water supplied from water resources works'

Related materials from the MWR IWRM Document Series:

Advisory Note 5.2	Formulation of Irrigation Service Charges for Surface Water Irrigation Schemes
Thematic Paper 5.3	Water Resource Fees
Advisory Note 5.4	Tariff Setting for Small to Medium Size Water Supply Company
Advisory Note 5.5	Willingness to Pay Surveys (Urban Water Supply)

Where to find more information on IWRM – recommended websites:

Ministry of Water Resources: www.mwr.gov.cn

Global Water Partnership: www.gwpforum.org

WRDMAP Project Website: www.wrdmap.com

China – UK, WRDMAP

Integrated Water Resource Management Documents
Produced under the Central Case Study Documentation Programme of the GoC, DFID funded, Water Resources Demand Management Assistance Project, 2005-2010.

Documents will comprise of:

Thematic Papers

Advisory Notes

Manuals

Examples

Training Materials

IWRM Document Series materials, English and Chinese versions, are available on the following project website

WRDMAP Project Website: www.wrdmap.com

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