

**WESTERN CHINA AGRO-ECOLOGICAL  
VILLAGE DEVELOPMENT PROJECT**

**Socio-Economic Survey Results 2005**

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by



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## **Background and Objective**

The environmental quality of China remains in a long-term trend of deterioration as the growing population places tremendous pressure on the country's diminishing natural resources. Western China is a major priority of the central Chinese government as the region suffers from high incidence of poverty and the most seriously eroding soil and expanding desertification in the world. The extensive soil degradation is a result of intensive cropping, excessive use of woody vegetation and crop residues as fuel or feed, over-grazing by animals, and cultivating crops on steep slopes. These practices further desertification and intensify pressure on the land by increasing land clearing, usage of sensitive areas, high input farming and other unsustainable practices. Additionally, yearly rainfall is decreasing and severe droughts are frequent, meaning rural farmers have limited water available for consumption and irrigation. The demand for irrigation water and high silt output from erosion is so serious that during the past ten years the Yellow River has ceased flowing for extended periods of time.

There also is a growing disparity in wealth in China as peasant farmers are left behind while the nation expands economically. Low commodity prices caused by the globalization of grain markets and the high rural population have created intensive demands on the land to meet the livelihood requirements of small farmers, resulting in a high incidence of poverty. Rural folk, particularly men and young adults, are forced to migrate outwards from their villages to work for income, further destabilizing farm resources and the family structure. This forces women to bear the brunt of labour demands at home including household demands and farm labour. The quality of life for rural women is poor in this historically patriarchal society as their workload is heavy, decision-making and education are limited and they rarely leave their villages.

New strategies and efforts are required to create effective sustainable rural development models to respond to the interrelated challenges of environmental degradation, inadequacies in health and nutrition and low income generating opportunities in the region. The Western China Agro-Ecological Village Development (WCAEV) Project was established in July 2002, to assist the people in communities in Gansu province and in Inner Mongolia. These are two of the poorest and most environmentally degraded regions in the country. The project focused on 325 households in the Dingxi County, encompassing the four villages Zhangjiachuan, Fengjiacha, Chankou, and Beichuan in the Fuxing watershed. Fuxing watershed is located in the Lanzhoong Loess Plateau Hill region, which is 80 km away from the Lanzhou, the capital of Gansu province. The watershed area is 19.32 km<sup>2</sup> and erosion has affected 100% of this region with annual soil loss rate of 5400 tonne/km<sup>2</sup> (Dingxi Soil and Water Conservation Bureau). Since 1999, conversion of agricultural land to grass and trees plantation has been a major component of conservation strategies for soil erosion in this region. The government now prohibits agricultural production on any land with slope greater than 25 degrees. The project also encompassed the Deshengxi watershed in Zhunger County, Inner Mongolia Autonomous region. This area is part of the Erdos plateau region that surrounds the Gobi desert. The

project involved 230 households from the four villages Sujiata, Nalingo, Bainilaing and Oboyen within the watershed.

The long-term objective of the project was to mitigate poverty and increase the self-reliance of marginalized Chinese farmers living in these environmentally sensitive areas, while reclaiming their degraded environment. The project emphasizes participatory development processes with communities using a four-step plan (institutional building process, capacity building and training, farm planning, field level implementation) to increase food and energy production and create sustainable livelihoods, while at the same time protecting and enhancing the natural resource base. The expected impacts of the project include the following:

- Improved environment through increased adoption of ecological farming systems.
- Reduced poverty and outward migration through increased income, employment and agricultural production and marketing.
- Improved health and self-reliance through increased diversity of farm products.
- Improved gender equality and community capacity building through training, education and participatory farm management and research.

Careful monitoring of performance indicators is an effective way to achieve desired project impacts and for that reason is an integral part of the Agro-Ecological Village development model. Baseline information on WCAEV beneficiary communities was obtained before the project was initiated and during its initial stages. Data continued to be collected during implementation and also at the end of the project to evaluate project indicators, outputs and accomplishments and to provide feedback and future recommendations through which programming can be improved.

A detailed longitudinal socio-economic survey was performed each year of the project on 20 households within each region. The survey addressed the indicators identified in the original project concept and quantified them in a numerical or 'grade' fashion so that differences in communities could be compared to measure project impacts over the life of the project and after it was completed. Relevant socio-economic indicators included in the survey and monitored annually include:

- demographic conditions;
- family employment, income and expenditure;
- education;
- living conditions, healthcare and 'quality of life';
- food and nutrition, food security;
- household responsibility distribution and gender equity; and,
- priorities for future development and training needs.

In October 2002, during the initial stages of first year of the project, a detailed Agro-Ecological survey was performed of the local farming practices to evaluate potential ecological impacts and possible training interests of the community. The results of this assessment were analyzed, formally reported and incorporated into the development of the community through inclusion into the WCAEV Annual Workplan. The annual socio-economic survey also included a supplementary Agro-Ecological component intended to

provide a comprehensive and quantitative annual assessment of the local farming methods, as well as to monitor the agricultural development of the communities. Some of the indicators that were incorporated into the Agro-Ecological survey include:

- land use;
- crop, vegetable, fruit, livestock production;
- seed sourcing;
- composting, bio-residue utilization; and,
- farm records and planning

## **Primary Conclusions of the Survey**

### In Dingxi

Total revenue from farm-based sources (crops, livestock and forestry) increased by 64% while total revenue from outside sources (labour, business) increased by 3% during the period surveyed. This dramatic increase in farm revenues compared with outside income is very positive because it indicates an increased economic value of farming which is probably not due to outside economic factors such as inflation. It is apparent from the findings of this study that the overall financial situation of the households surveyed was greatly improved by 2005. Average annual household income increased by 44% between 2003 and 2005 while household expenditures decreased slightly over this same period. Furthermore, the yearly household savings increased dramatically and the number of households with a yearly deficit passed from 50% in 2003 to zero in 2005. These findings indicate a much higher degree of financial stability than was previously present in the community. The elimination of deficits from household accounts in 2005 is probably linked to an observed increase in debt repayment, which will lead to reduction in debt load and greater autonomy. Over the course of the project, respondent's satisfaction with their overall quality of life increased from a ranking of "below satisfactory" in 2003 to "above satisfactory" in 2005.

### In Zhunger

This community showed dramatic development in increased financial independence, food and income security, and subsequent higher quality of life during the three-year project. Income increased significantly by 60%; the majority of income was from on-farm activities. Farming income increased by 68% while outside income sources increased by 35%, indicating that more livelihood was invested in the farm rather than in out-migration to labour. This was despite the fact that the flourishing coal mining industry in the province could attract many farmers once their farms achieved sufficient autonomy. The farmers' total equity increased as well, as livestock holdings were also enlarged. The number of households running a negative financial balance decreased from 45% over the three-year survey period to 15% in 2005, leading to greater financial security for household expenditures. Debt repayment was the largest category of household expenditure that increased, a strong indicator that households had moved beyond simply meeting their basic needs. The percentage of food consumed that originated on the farm increased 8% to 78% in

2005, while the diversity of food eaten in the households increased. Perceptions of overall quality of life and satisfaction in farming sustainability and in the environment/surroundings greatly increased during the survey period.

## Summary of Survey Results

### In Dingxi

#### FARMING

- Crop farming was the single largest income generator for households with half of the respondents involved in this activity followed by labour and livestock rearing. On average, labour generated the highest earnings for individuals. Income generated from forestry, crop farming, and livestock farming increased by a large amount from 2003 to 2005. In particular, farming income experienced a 14% increase compared with income levels in 2003.
- Potato was the major income-generating agricultural product, followed by pig, pea and wheat.
- Respondents indicated a continued interest in 2005 in raising more livestock such as sheep and cattle, having already started raising pig (a priority from 2004).
- On average, 87% of food consumed came from the households' own production.
- Wheat, potatoes and beans constituted the bulk of the diet for most households.
- 2005 showed a more even distribution among farm size as those farmers with smaller farms increased their land area.
- Average land given over to the government land reclamation program jumped by 30% of the total farm area in 2005.
- Many sustainable farming practices were tried over the period from 2003 to 2005. The percentage of farmers using the following practices increased over the survey period: reduced livestock grazing; reduced herbicide; check dams; reduced tillage; reduced insecticide; reduced fungicide; increased crop varieties; reduced chemical fertilizer; nitrogen-fixing crops; improved crop rotation; and contour farming.
- By 2005, households felt their major sources for farm information were training courses, word of mouth, and personal experience/observation. The percentage of households using training courses, government extension staff, and printed information all increased from 2003. All households surveyed reported using training courses.
- The areas of study identified early in the survey period appear to have been addressed by 2005 including soil fertility management, weed management, pest and disease management and farm planning. This seems to indicate that the training and information produced during the project met the needs of farmers. Information on new crops and livestock management remained relatively high through 2005; future work could target sustainable solutions in these areas.

#### FINANCES

- Average household income among surveyed Dingxi residents indicated a statistically significant increase through 2003 to 2005 with income increasing by 44% by 2005.
- The greatest household expenses were food, education, heating/fuel/electricity/transportation, and clothing.

- Farm expenses were comparatively low compared to household expenses; the main categories were seeds, fertilizers and tools.
- Household savings increased dramatically from 2003 to 2005, going from an average of 273 ¥/year in 2003 to 4326 ¥/year in 2005.
- Average annual farm income increased by 93% from 2004 to 2005.
- Income generating activities were increasingly performed on the farm in 2005, with the exception of labour and forestry. This may indicate an increase in the economic capacity of the village and over the long term may counteract outward migration from agricultural communities.

## HOME

- Women's roles were quite traditional in this community: generally women were responsible for most tasks inside the home such as cooking, washing and care of the young and old. In 2005 the number of households where women were responsible for the finances increased to 44% in 2005. This may indicate an increase in women's decision-making power in the household.
- Education and housing were the top priorities for this community.
- Degree of satisfaction in overall quality of life increased in 2005. Expectations of the community increased over the survey period, leading to a decrease in perceived satisfaction in certain categories, reflecting not so much changes in quality of life as changes in mentality.

## In Zhunger

### FARMING

- Farming income, including livestock and crop production, increased by 68% during 2003-2005.
- Livestock provided nearly half of the total income generated by respondents, followed by crop farming and labour; all three activities saw increased income each year with livestock increasing by 67%, crop farming increasing by 71% and labour increasing by 183% between 2003 and 2005.
- Among farm products, sheep and goats showed the greatest increase in income, an adaptation to farming on the rough landscape of the area.
- The proportion of respondents involved in crop production increased over the three-year period, with a greater percentage being female.
- Farm expenses were low, and spending on chemical inputs decreased by 52% from 2003 to 2005.
- The percentage of food consumed originating on the farm increased to 79% in 2005 from 70% in 2003, indicating higher food security for the community.
- Sheep and forage continued to be on the list of desirable crops to increase; future activities could continue to target sustainable forage and livestock production.
- The percentage of farmers making use of sustainable agricultural practices increased from 2003 to 2005, with the largest increases occurring in reduced fertilizer, improved seed quality, crop diversity, increased crop varieties, planting trees on sloped lands, leaving residues on field, and reduced tillage.
- The percentage of farmers using training courses increased by 15%, while personal experience, printed information, and farm meetings all increased as major sources of information over the course of the survey.

- Transformation to stored-livestock feed production systems was well developed by project completion. Farmers were able to produce livestock on stored feed (in particular corn silage, improved alfalfa and warm season grasses), which allowed them to increase their capacity and improve income.

#### FINANCES

- Average annual income increased significantly by 60% from 2003-2005; income from livestock increased by 67%, crop farming by 71% and labour by 183%.
- Households running a negative financial balance decreased from 45% over the three-year survey period to 15% in 2005, leading to greater financial security for household expenditures and improved quality of life.
- The greatest relative increases in household spending were in debt payments and leisure, good indicators that the households moved beyond meeting their basic needs.
- Average annual farm expenditures decreased by 25% from 2003 to 2005, the main decreases being in fertilizers and pesticides. Fertilizer spending decreased by nearly a third of the 2003 value by 2005.

#### HOME

- Many tasks generally assigned as women's roles became shared by both genders over the survey period, notably cleaning, cooking, laundry, and care-taking. The percentage of households where women were involved in decision-making and finances increased.
- Housing and education were the top priorities for this community, indicating that they had moved beyond food concerns.
- Satisfaction in farming sustainability, environment/surroundings, and overall quality of life greatly increased during the survey period. The categories that increased the most were the ones most correlated with WCAEV project objectives, which may indicate the positive impacts of the trainings and farm planning sessions on farmers' outlooks.

# Dingxi County, Gansu Province, P.R.C.

## Analysis of 2005 Results for Socio-Economic Survey

### Dingxi Survey Administration

The 2005 WCAEV Socio-Economic survey was distributed in March 2005, to 20 households in Dingxi County, Gansu Province, P.R.C.

- This sample contained the same households as in the 2004 survey. The 2004 survey omitted seven households of the original 26 that were surveyed in Dingxi the previous year (2003).
- The same households participated in the survey every year in the long-term manner of a longitudinal study. Their individual answers were statistically compared over the years, with the surveys from year 2003 providing a baseline for comparison for future surveys. The 2003 survey was also more detailed than in following years to provide a more comprehensive view of life in the watershed.
- The 2003 data presented in this report were altered from the original report (produced in 2003) to reflect only those 19 households that participated in the 2004 survey, in order to accurately monitor changes within the sample population in a longitudinal manner.
- The 2005 analysis includes those 19 households included in the 2004 and the 2003 analysis.
- Statistics conducted included analysis using repeated measures ANOVA and Bonferroni-adjusted pairwise comparisons to determine the significance of variance in the sample from 2003 through 2005.
- There were 19 households that participated in the 2005 survey with 86 individuals answering some or all of the questions
- Surveys were completed in the 4 villages within the Fuxing watershed that the project is being implemented: Zhangjiachuan, Fengjiacha, Chankou and Beichuan.
- The farmer households sampled in Dingxi included households of average, below average and above average socio-economic status as determined by basic income and social standing. This report does not detail what methodology was used to select households and they were determined to be 'random' or representative samples.
- The selected sample households are not intended to be statistically representative of the entire watershed or direct project beneficiary group (325 households). Rather, the survey is intended to portray a strategic and more detailed view of the conditions of which some inhabitants of the watershed with a widely distributed socio-economic status may experience.

### Sampling Period



Note that the '2005' data from this survey, collected in March 2005, actually represents information from the 2004 fiscal year (March 2004-February 2005). Similarly, the '2004' survey data actually represents information from the 2003 fiscal year (March 2003-February 2004), and the '2003' data represents the 2002 fiscal year (March 2002-February 2003).

## **Dingxi Demographic Characteristics**

### **Question 1: Please fill in the following chart for all household members including name; age; gender:**

This question was intended to provide basic tracking information on the sample populations so that individuals may be compared longitudinally over time. These demographic characteristics can also assist in understanding the basic dynamics of family structure, household composition, ethnicity and human resources in the watershed.

- Forty-four males and 42 females were included in the 19 households, for a total of 86 participants.
- The average household size was 4.5. Two households consisted of seven participants, while the remaining households were made of three to six people.
- The average age of participants was 33.3. Male participants had an average age of 35.6, while the average age of females was 30.8. Sixty-six of 86 participants (70%) were aged 16 or older, and were therefore generally able to work unless occupied in higher schooling.
- In general, the households surveyed were nuclear families with father, mother and children. This is the most common situation in rural China: it is unusual to find more irregular or marginalized families, along with families that have younger children, families with no children, or bachelors or females as the heads of the household.

## **Dingxi Family Employment, Income and Expenditure**

### **Question 2: What is the amount of your total yearly family income (RMB)?**

This question was intended to provide information on the income levels of the sample populations as an indication of poverty and wealth in the watershed.

- Average annual household income of respondents in 2005 was 10,825 ¥/yr (\$1034 USD using an approximate exchange rate of 8.3 ¥ to \$1 USD) with a median value of 10,350 ¥/yr indicating that half of the household incomes are above this value and half are below. (Note: The median can be used as a more robust measure of central tendency, as changing a single value would affect the median only slightly. In contrast, the value of the mean can be strongly affected by a single value that is very low or very high).

- The lowest annual income value reported in Dingxi in 2005 was 5448 ¥/yr, while the highest was 18,140 ¥/yr.

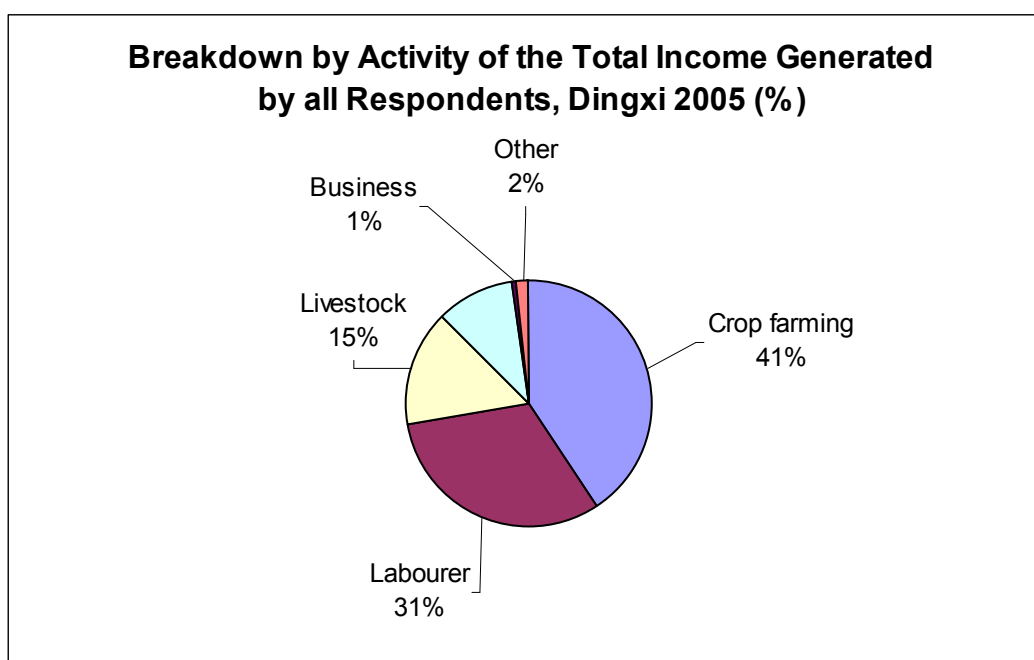
Annual Household Revenue, Dingxi	Mean	Std. Deviation	N
2003	7534.21 ¥	3079.23 ¥	19
2004	7556.05 ¥	2003.72 ¥	19
2005	10,824.84 ¥	3688.16 ¥	19

Statistical analysis was conducted using repeated measures ANOVA and Bonferroni-adjusted pairwise comparisons. There was a highly significant difference in mean annual income in the years 2003, 2004 and 2005 (repeated measures ANOVA,  $P=0,001$ ,  $F=10,788$ ,  $d.f.n,d.=2,17$ ). Using Bonferroni-adjusted pairwise comparisons it was determined that there was a significant difference between all three years (2003-2004 ( $p=0,001$ ), 2003-2005 ( $p=0,001$ ) and 2004-2005 ( $p=0,002$ )).

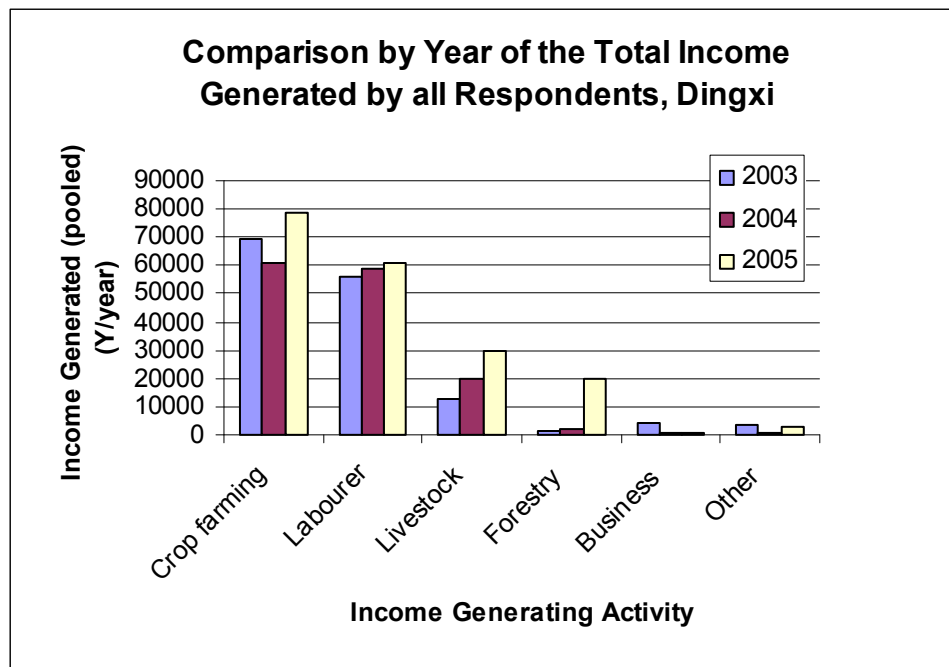
Average household income among surveyed Dingxi residents indicated a statistically significant increase through 2003 to 2005, with income increasing by 44 % by 2005.

**Question 3; What are your primary income generating activities? How much does each activity generate per year? (RMB)**

This question was intended to provide information on employment levels and income sources in the watershed, as well as to provide information on the gender division of labour. Both the number and gender of farmers practicing each activity were counted along with the average income associated with that activity, as well as the cumulative sum of income for all respondents. The cumulative income from farm based-activities versus outside income was also compared.



The activity that generated the greatest proportion of income was crop farming, followed by labour, and livestock. Business and ‘other’ (forestry, etc.) also represented a small proportion of income.



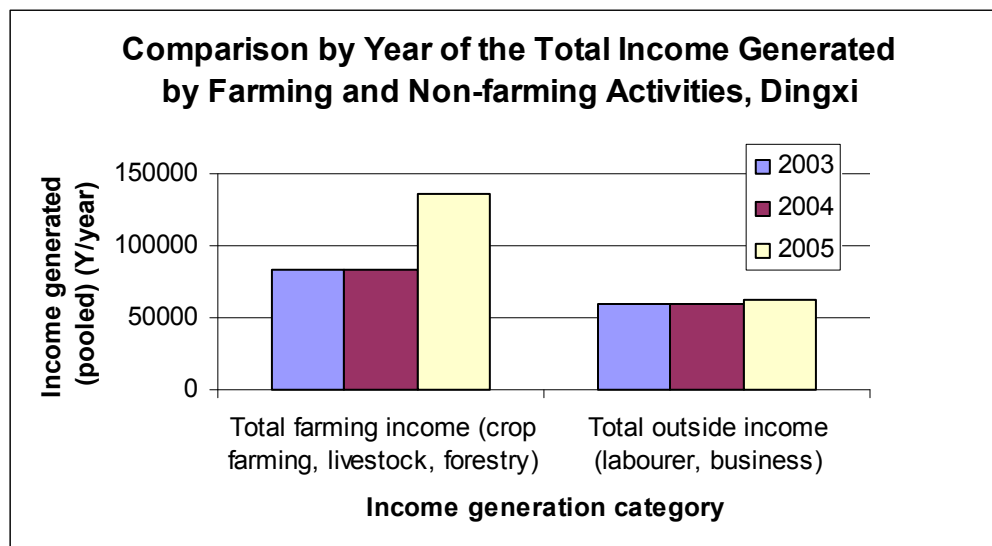
In each of the three years of the survey, crop farming, labour and livestock generated the greatest income, respectively. Income from each of these sources increased from 2003 to 2005. Forestry took a dramatic jump in income generation in 2005 compared to previous years and farming experienced a 14% increase compared with 2003. The increase in forestry income may be connected to the increased amount of land set aside due to the government land reclamation program. In 2005, an average of 33% of the total farm area in this region was given over to this program compared to 3% in 2004 (see question 17). Farmers may be using this land for agro-forestry practices and forage production to feed livestock.

<b>Annual Income Generating Activities and Household Participants by Gender, Dingxi</b>												
Activity	Breakdown of total annual income generated by all respondents (¥) (see graphs above)			Average annual earnings of respondents practicing activity (¥)			Respondents practicing activity (%)			Respondents practicing that are male (% of total participants)		
	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005
Crop Farming	69,131	60,695	78,937	1868	1897	2255	54	47	53	46	53	60
Labourer	56,200	59,000	60,960	2810	2458	2771	29	35	33	100	88	82
Livestock	12,780	20,100	29,890	913	1058	1245	21	28	36	36	63	42
Forestry	1360	2050	20,180	170	186	1441	12	16	21	50	27	64
Business	4000	1000	1000	4000	1000	1000	1	1	2	0	0	0
Other	3580	960	3050	448	320	508	12	4	9	75	67	83

Crop farming generated the greatest total annual income for the community, in each of the three survey years. Total annual income increased from 2003 to 2005 for each activity. However, for an individual, labour generated the highest annual earnings. This finding was consistent in all three years.

Approximately half of the respondents were involved in crop farming as an income-generating activity, with only slight variation from year to year. Average annual earnings of an individual crop farmer rose considerably between 2004 and 2005, but were still behind the average labourer earnings in 2005. In 2003, the next largest proportion of respondents were involved in labour, followed by livestock rearing; this changed by 2005 with slightly more respondents involved in livestock rearing than labour. Average annual earnings for livestock increased after 2003, while they decreased slightly for labour.

Labour was the activity most practiced by male respondents, but the percentage decreased from 100% male involvement in 2003 to 82% male by 2005. Males also dominated the forestry and crop farming activities. The proportion of males involved in crop farming and raising livestock rose slightly in 2005 compared to 2003, perhaps as a result of the smaller male percentage in labour and men returning to practice more traditional farm based activities.



A comparison of income from farm revenue versus outside revenue between 2003 and 2005 shows a 64% increase in farm-based revenue versus a 3% increase in outside revenue. This is a very promising finding, indicating that it is possible to increase income levels and quality of life while maintaining a rural lifestyle and without increasing reliance on outside labour as a revenue source.

The total income generated by women compared over the three years studied shows an increasing trend between 2003 and 2005. The average value is based on the total number of women above the age of sixteen counted in the survey.

<b>Women's income indicators in Dingxi</b>	<b>2003 (¥/year)</b>	<b>2004 (¥/year)</b>	<b>2005 (¥/year)</b>
Average women's income	1604	1294	2336

This data shows a substantial increase in women's income generating activities, both as a total value and averaged over the entire community of women. In Dingxi, average income for women increased by 46% over the lifetime of the project. This may indicate an overall increase women's earning capabilities and financial independence.

**Question 4: Of these income generating activities, which is on your farm (1), in the village (2), in a neighboring town (3) or in another location (4)?**

This question was intended to provide additional information on income sources and employment location as an indication of labour-based migration out of the watershed. Both the average and the mode were compared with similar results:

- Agriculture was generally practiced on the farmer's own land.
- Livestock was generally raised on the farm or somewhere in the local village with an increasing trend towards on-farm production by 2005.
- Labour for income was almost always done in another location from the village, generally farther than the neighbouring towns.

- Forestry for income was usually practiced on the farm or somewhere in the local village in 2003 and 2004, but by 2005 was generally practiced in other locations. This could be the source of the large increase in income generated from forestry in this year. This also implies that the increase in forestry income (question 3) was not solely linked to an increase in forestry or agro-forestry activities on the land set aside from the farm as a result of government land reclamation programs.
- Business was usually conducted in the village of the farmer, or on the farm itself in 2005.
- Other income generating activities that were conducted in neighbouring towns in 2003, moved to the local village in 2004, and were mostly located on the farm by 2005.
- In general, income-generating activities were increasingly performed on the farm in 2005, with the exception of labour and forestry. This may indicate an increase in the economic capacity of the village and over the long term may counteract outward migration from agricultural communities.

Location for income generation, Dingxi	2003 Average	2004 Average	2005 Average
Agriculture	1.26	1.2	1.05
Livestock	1.83	1.6	1.47
Labourer	3.69	3.8	3.54
Forestry	1.73	2.0	4.00
Business	2.0	2.0	1.05
Other	3.0	2.0	1.47

**Question 5: Of farm-generated income, what are your major products and how much income do you generate from each every year? How much do you sell them for?**

This question was intended to provide additional information on income sources; both the average and the total survey sum for all participants in the household were determined.

Annual Income from Farm Products, Dingxi	Mean	Std. Deviation	N
2003	3770.83 ¥	1996.09 ¥	18
2004	3940.83 ¥	1395.20 ¥	18
2005	7597.89 ¥	6789.72 ¥	18

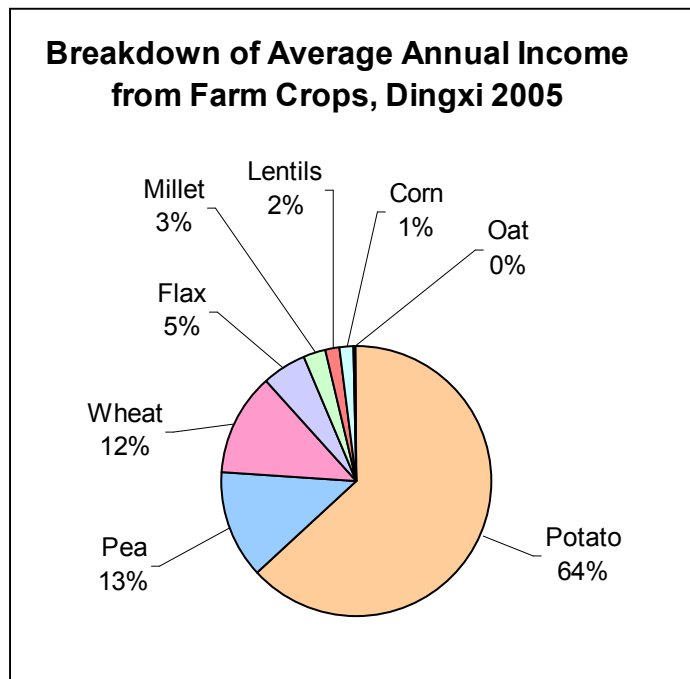
The total annual farm income increased significantly from 2004 to 2005. Statistical analysis was conducted using repeated measures ANOVA and Bonferroni-adjusted pairwise comparisons, resulting in a significant difference in mean annual income in the years 2003, 2004 and 2005 (repeated measures ANOVA,  $P=0,031$ ,  $F=4,327$ ,  $d.f.n,d.=2,16$ ). Household 14 was omitted from this test due to missing data for 2003. Using Bonferroni-adjusted pairwise comparisons it was determined that there was a significant difference in annual farm generated income between 2004 and 2005 ( $p=0,04$ )

equivalent to a 93% increase between these two years but not between 2003-2005 (p=0.088 or 2003-2004 (p=0.088).

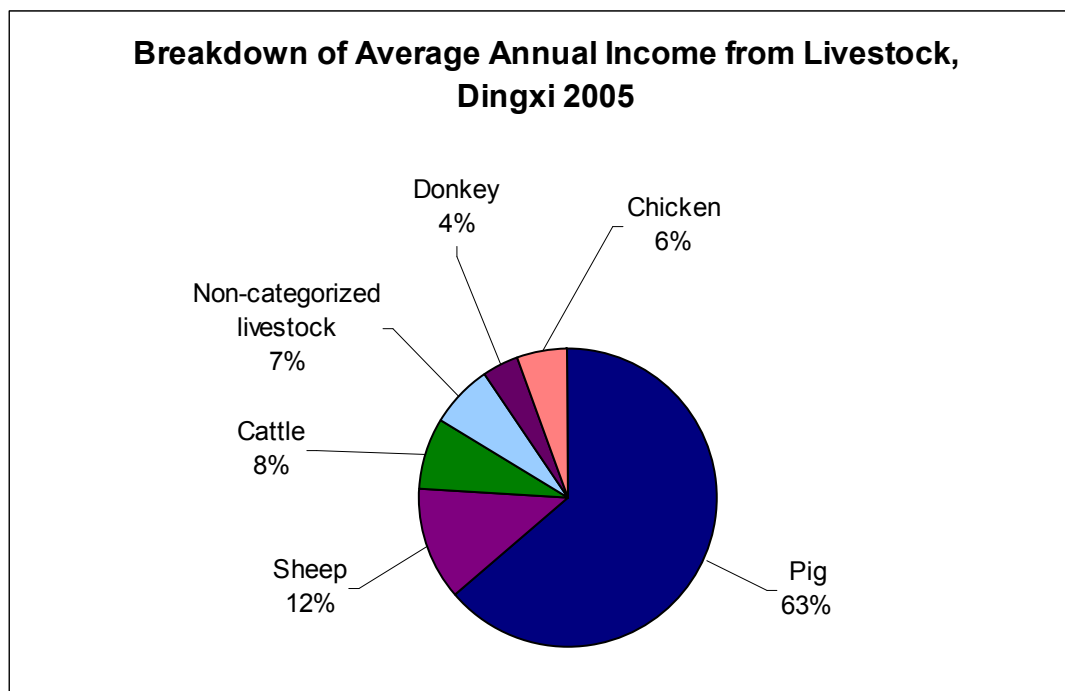
The breakdown of the average annual farm earnings is as follows from highest income to least:

<b>Farm Product, Dingxi</b>	<b>2003 Average Annual Earnings (¥)</b>	<b>2004 Average Annual Earnings (¥)</b>	<b>2005 Average Annual Earnings (¥) (see chart below)</b>
Potato	1387	2021	2905
Pig	528	426	939
Pea	277	513	598
Wheat	488	209	571
Flax	210	258	248
Sheep	189	379	183
Millet	24	23	128
Cattle	67	100	111
Lentils	144	36	79
Corn	38	36	67
Other	50	31	0
Donkey	85	28	56
Oat	19	15	17
Grain	17	7	0
Bean	213	0	0
Alfalfa seeds	21	0	0
Sorghum	6	0	0
Vegetable seed	4	0	0
Chicken	3	0	83
<b>Sum of Average Annual Farm Earnings</b>	<b>3572</b>	<b>4054</b>	<b>7412</b>

Dingxi's major income generating agricultural product in 2005 was potato, followed by pig, pea and wheat. This order generally appears to be consistent from year to year.



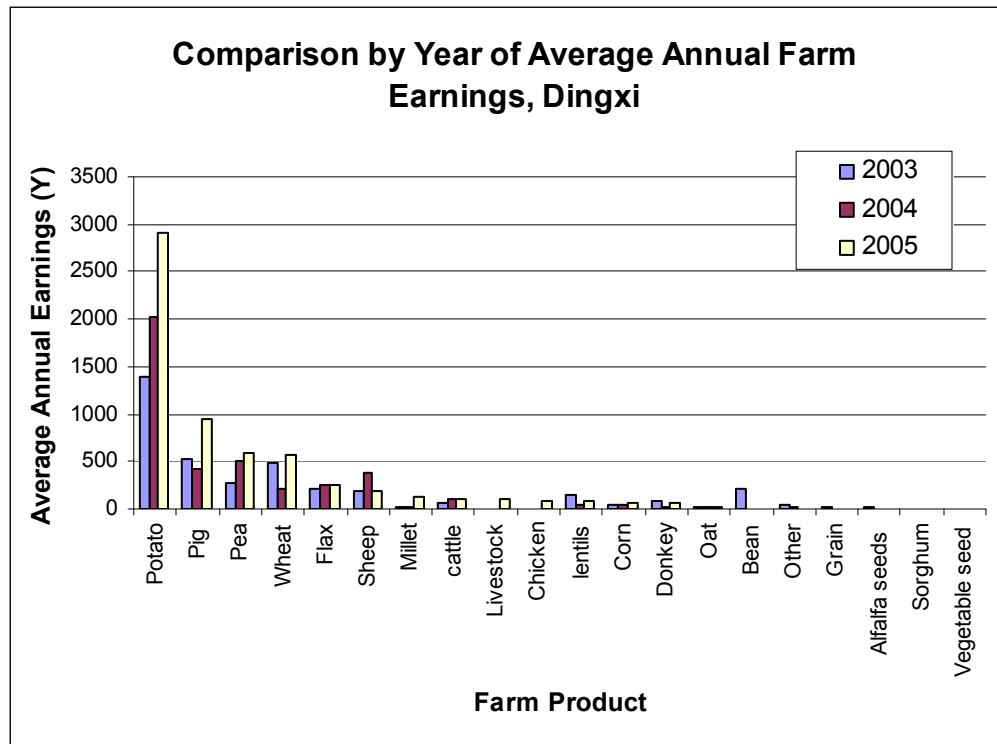
Potato was the major income generator from among the farm crops in Dingxi, representing approximately two-thirds of the farm crop income. Other important crops economically were pea and wheat. The farm crop economy seemed to be relatively diverse, with several smaller income-generating crops such as flax, millet, lentils and corn. Please refer to question 13 for the land amounts associated with the crops.



The importance of pig earnings varied slightly over the three years, although pigs were consistently the dominating livestock in terms of income. In 2004, pig income decreased while sheep earnings increased noticeably (2003: pig 60%, sheep 23%; 2004: pig 45%,



sheep 41%). However, by 2005 this trend was reversed once more. Cattle and donkey represented much smaller percentages, but it must be noted that this does not reflect actual use of the animals, as donkeys are often used to do most of the farm work and are not often sold for income. Please refer to Question 19 for additional information on livestock.



The dramatic increases in average annual earnings from potato and pigs are shown in the chart above. Income from sources such as pig and wheat showed a dip in 2004 but increased again in 2005. People in Dingxi suffered an extreme drought during the spring of 2003, which affected the production levels of such crops as flax, peas, wheat, lentils, oat and beans appearing in the 2004 data. This may be the reason decreases in production are observed between the two years.

**Question 6: What is the amount of your total yearly family expenditures (RMB) and how much do you spend on each item yearly (RMB)?**

This question was intended to provide information on expenditures by household and farm as an indication of poverty and quality of life. Both the average and the median were compared with slightly differing results for average household expenditures:

- Average annual household expenditures of respondents in 2005 were **6499 ¥**, with a median value of 6422 ¥.
- The lowest annual expenditure value reported in Dingxi was 3840 ¥/yr, while the highest was 9952 ¥/yr.

<b>Household Expenditures, Dingxi</b>	<b>2003 (¥)</b>	<b>2004 (¥)</b>	<b>2005 (¥)</b>
Lowest	4200	3980	3840
Highest	22,730	12,000	9952
<b>Average</b>	<b>7261</b>	<b>6759</b>	<b>6499</b>
Median	6356	6710	6422

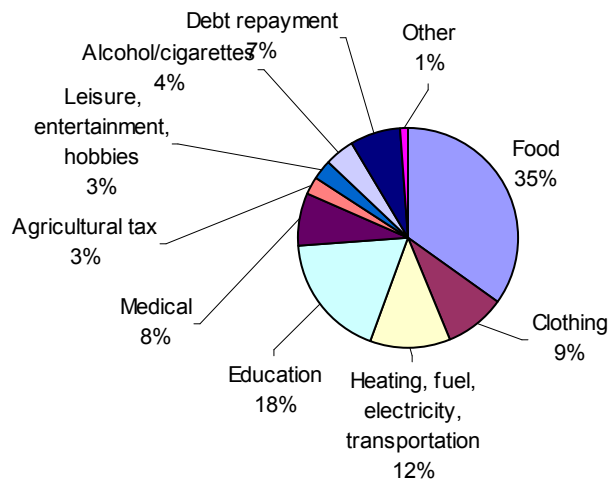
The household expenditures of Dingxi residents showed some interesting trends over the three-year period. The average expenditure decreased each year but the 2005 median reached a higher value than the median of 2003. This value is probably more representative of the community, as the average was being skewed by outlying data points in the very high expenditure noted in 2003 compared to 2004 and 2005.

Details of the Average Annual Household Expenditures (¥) are as follows:

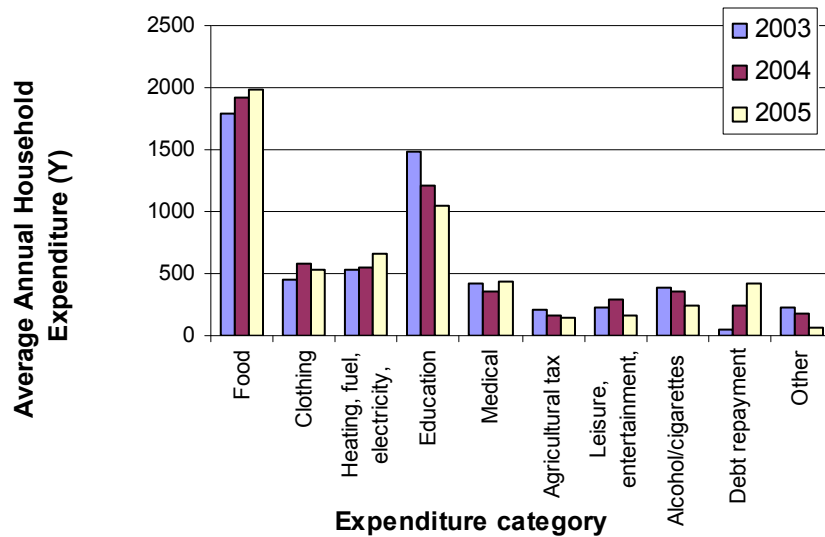
<b>Household expenditures, Dingxi (per year)</b>	<b>Average Annual Expenditures (¥)</b>		
	<b>2003</b>	<b>2004</b>	<b>2005</b> (see chart below)
Clothing	451	583	537
Heating, fuel, electricity, transportation	528	545	661
Education	1491	1211	1043
Medical	425	362	442
Agricultural tax	207	156	145
Leisure, entertainment, hobbies	230	288	168
Alcohol/cigarettes	381	356	247
Debt repayment	53	245	421
Other	224	171	68
Food*	1791	1922	1977
<b>Sum of Average Yearly Expenditures</b>	<b>5780</b>	<b>5837</b>	<b>5710</b>

\*Food expenses data are disproportionately large in this particular data set due to an accounting practice whereby even food that is produced on the farm is considered an expense despite the fact that no money was actually spent purchasing this food.

### Average Annual Family Expenditures, Dingxi 2005



### Comparison by Year of Average Annual Family Expenditures, Dingxi



Average annual family expenditures were **5710** ¥, down slightly from both the 2004 and 2003 averages. When broken down, the greatest relative increases were in food, heating/fuel/electricity/transportation and debt payments. Thirty-five percent of average annual household expenditures were spent on food. As it is known that many food items in this community are produced on-farm, this confirms that the survey reflects surveyors

considering items produced on the farm as an in-kind value recognized as cash. If this data is ignored, the largest spending category is education.

The three largest categories of household expenses during the three study years were:

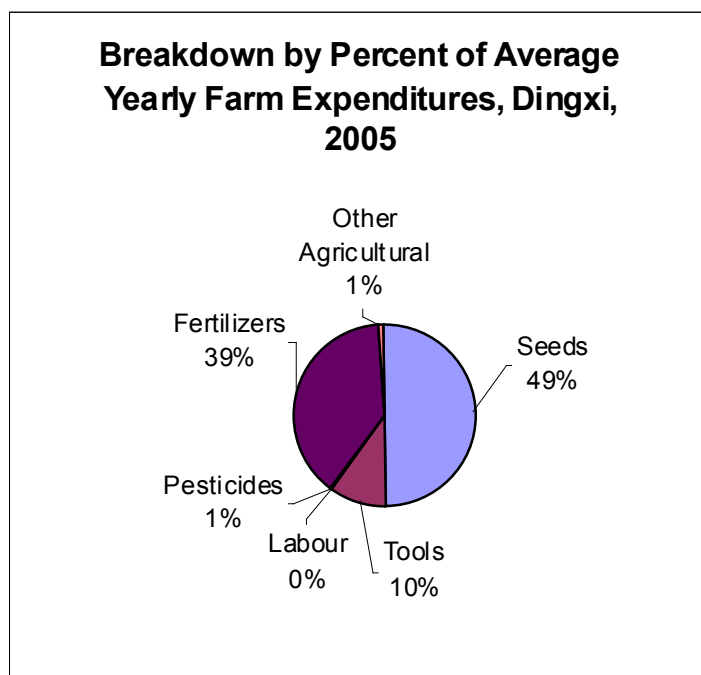
- 2003: food, education, heating;
- 2004: food, education, clothing;
- 2005: food, education, heating.

Food and heating are both basic needs; these expenditures reflected the fact that the community was still at a stage where it required income to meet these needs. Clothing can be used as an indicator here, as it has been found that once spending on food, education and medical costs stabilize and plateau, the next categories to increase are expenditures on housing and clothing, which indicate a direct increase in quality of life. In this case, expenditures on clothing were seen to slightly increase slightly in 2004.

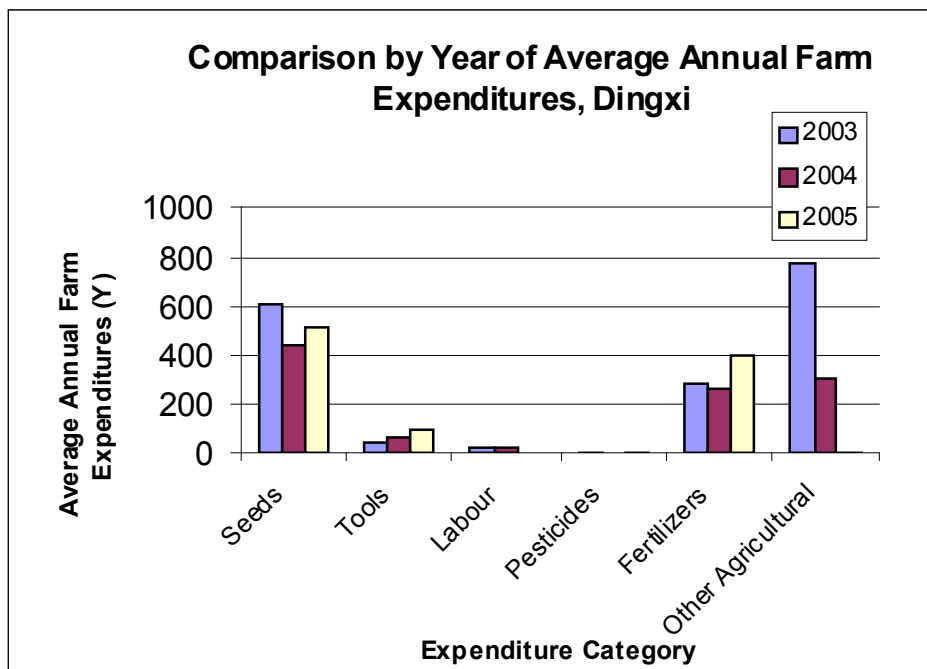
Expenditures that rose consistently each year during the survey period included food, heating, and debt. It is not clear how much this reflected the choice of the community versus reflecting rising costs of these commodities, or if luxury versus basic consumption was involved. Increasing debt payment may also indicate an increase in expendable income versus basic needs, which could reflect the rising stability of the communities. Decreases were observed in the amount of money spent on alcohol and cigarettes which may reflect a positive effect of educational campaigns concerning the health hazards associated with these products.

Details of the Average Annual Farm Expenditures (¥) are as follows:

Farm Expenditures, Dingxi (per year)	Average Annual Farm Expenditures (¥)		
	2003	2004	2005 (see chart below)
Seeds	607	443	515
Other Agricultural	776	306	12
Fertilizers	282	269	402
Tools	52	65	99
Labour	21	25	0
Pesticides	11	4	5
<b>Sum of Average Annual Farm Expenditures</b>	<b>1749</b>	<b>1113</b>	<b>1034</b>



Average annual farm expenditures were **1034 ¥**, less than the 2003 or 2004 values. Seeds for planting remained the largest farm expenditure, followed by fertilizers and tools. For comparative purposes, the amount spent on seeds was approximately the amount spent on clothing in 2005.



Money spent on tools and fertilizers increased each year from 2003 to 2005; labour expenses and other agricultural costs decreased. Seeds also decreased from 2003 to 2004, although jumping slightly up again in 2005. Pesticide expenditures decreased. The

increase in fertilizer expenditure in 2005 may be due the rising cost of fertilizer, which is tied to the increasing price for fossil fuel required for fertilizer production.

Details of the Average Household Savings (¥) in Dingxi are as follows:

<b>Household Savings, Dingxi *</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Average	273	796	4326
Median	-20	690	4099
Percent of households with a deficit	50%	30%	0
Percent of households with no savings	0	5%	0

Between 2003 and 2005 in Dingxi, average household savings increased dramatically, from **273** ¥/year to **4326** ¥/year. Furthermore, there were no household running a deficit or with no savings in 2005. This situation improved consistently over the three years surveyed as demonstrated by the fact that 10 households (or 50% of those surveyed) had a deficit in 2003 compared with 30% in 2004 and none in 2005. This indicates a greater overall fiscal stability was achieved in the community by 2005. The median value of **4099** ¥/year observed in 2005 is also a considerable improvement over the median value of -20 in 2003. The biggest incremental increase occurred between 2004 and 2005 with a 6-fold increase in the average household savings. This data demonstrates a highly improved financial situation for the entire community by the third year of the survey. This greater financial stability will allow households to invest money in new areas such as education and new farm improvements

## Dingxi Quality of Life and Gender

**Question 7: What kind of foods does your family eat? (Please mark never, sometimes or often with an “✓”according to your frequency) Do you purchase the food or produce it yourself? (Indicate % purchased)**

This question was intended to provide information on household nutrition, diversity of diet and food production in the watershed as indications of health and self-sufficiency. Foods were identified as either eaten never, sometimes or often and local farm production was also identified.

The breakdown of the most common foods eaten by families surveyed is as follows:

<b>Common Household Foods Eaten, Dingxi</b>	<b>Percentage of Households that Consume Item ‘Often’</b>		
	<b>2003</b>	<b>2004</b>	<b>2005</b>
Wheat	65	73	73
Potato	65	54	73
Beans	35	23	31
Meat	38	15	15

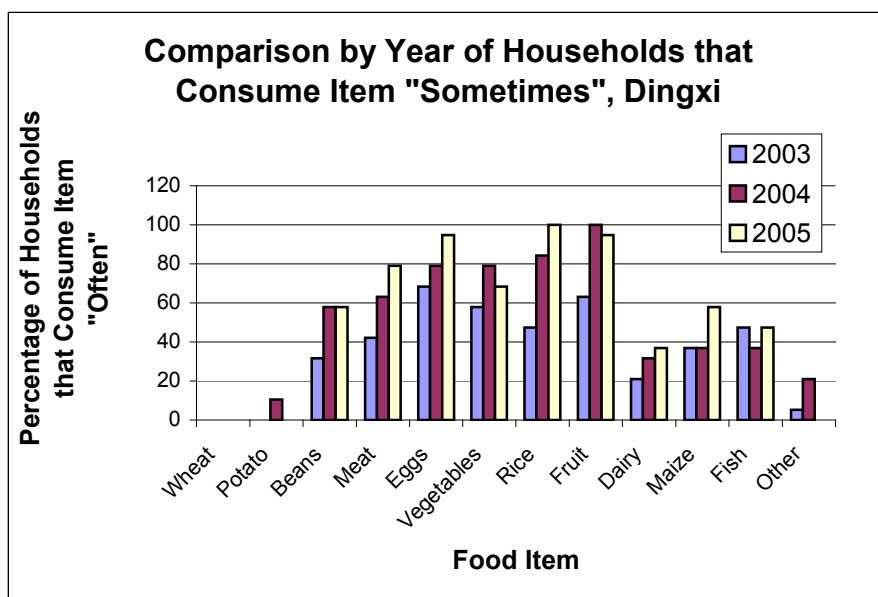
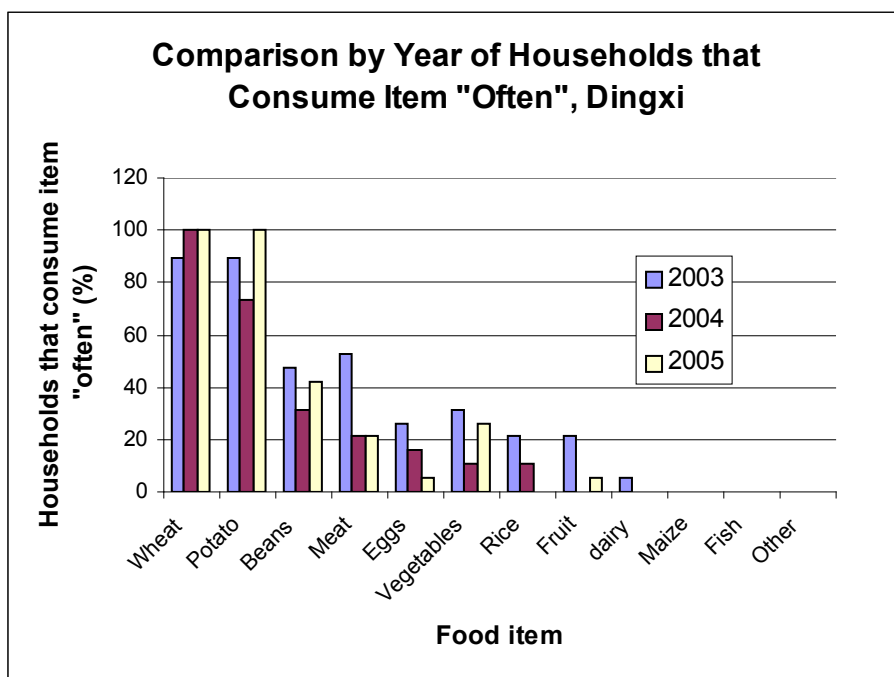
Eggs	19	12	4
Vegetables	23	8	19
Rice	15	8	0
Fruit	15	0	4
Dairy	4	0	0
Maize	0	0	0
Fish	0	0	0
Other	0	0	0

The main staples of the diet in Dingxi included wheat, potatoes, and beans. Other items consumed often by less households included meat, eggs, vegetables and fruit.

The breakdown of the most common foods and the proportions they are **purchased** in is as follows:

Purchased Item, Dingxi	Percentage of people that eat item who must purchase it		
	2003	2004	2005
Fish	100	37	89
Dairy	100	32	71
Rice	50	95	53
Other	50	21	0
Vegetables	41	89	56
Fruit	21	100	53
Maize	14	37	0
Eggs	11	95	11
Meat	6	84	0
Wheat	0	100	0
Potato	0	84	0
Beans	0	89	0

The majority of respondents eating fish, dairy, vegetables, fruit and rice had to purchase these items. Eggs also occasionally had to be purchased. Dairy and fish, however, were not consumed often by any of the households surveyed. The food staples, potatoes, wheat and beans, were not purchased at all; this indicated that families predominantly subsist on their own food resources rather than purchased items.



For Dingxi, household eating habits appeared best portrayed by a set of two graphs depicting changes to foods eaten ‘often’ as well as changes to foods eaten ‘sometimes’. The question asked to households was: “*which foods do you eat, please mark as never, sometimes or often.*” However, definitions for “sometimes” and “often” were not provided and as a result, responses may have been very subjective, influenced by both the interpretation of the interviewer and interviewee. The results in the final version of the survey indicate that many of the foods eaten “often” decreased. However it was also found that many of those eaten “sometimes” increased. This large variation in response is a result of the subjective nature of the question. The total amount of food consumed by the community did not change considerably. Nearly all households ate wheat and potato often. There was an overall increase in bean consumption over the three years, due to households that ate them sometimes. Looking at both graphs, a slight increase can be



seen in the total percentage of households that included meat in their diet. There also appeared to be an overall increase in households that ate dairy and corn. Occasional fruit consumption also increased among households surveyed.

**Question 8: What percentage of your total diet do you think you are producing on the farm?**

This question was intended to provide information on food security in the watershed as an indication of self-sufficiency. An average of **87%** of the total diet of the households surveyed was produced on their own farms in 2003 and 2005. This value was up just slightly from the 2004 value of 84%, where food production was probably influenced by the 2003 drought.

**Question 9: Which foods would you like to grow more of in the future?**

This question was intended to provide information on interest in food and farm diversification in the watershed as an indication improved health, environment and self-reliance. The breakdown of the interest found in households surveyed is portrayed in the chart below, listed from greatest to least interest in growing that product in the future:

Product, Dingxi	Percentage of farmers interested in this product		
	2003	2004	2005
Improved sheep	53	53	63
Cow	21	42	63
Potato	11	21	32
Pea	0	5	11
Livestock	5	16	11
Pig	11	26	11
Flax – edible oil	0	0	11
Donkey	5	0	5
Vegetable	16	11	0
New varieties of crops	-	16	5
Herb Medicine	21	5	0
Pigeon	5	5	0
Corn	0	0	0
Millet	0	0	0
Green bean	0	0	0
Grains	0	0	0
Fruit	0	5	0
Hay	0	0	0
Chinese Yam	0	0	0
Goat	5	0	0
Sunflower	0	0	0
Seed melon	0	0	0
Local grass	0	0	0
Sorghum Sudan	-	5	0

Switchgrass	-	5	0
Chicken	-	5	0
Cash crops	-	5	0
Rabbit	-	5	0

The majority of farming households were still quite interested in raising sheep, according to the 2005 survey. Other key interests tended to be focused on livestock, including cow, unspecified livestock, and pig. There was also interest in more potato, pea and flax for edible oil, all common cash-producing crops.

From 2004 to 2005 there was a decline in interest in pig as a new product; this coincides with an increase in revenue from pig from 2004-2005 (see Question 5) showing that many of the farmers followed up on this new product.

**Question 10: Please name the people in your house responsible for the following?**

This question was intended to provide information on decision-making and gender equality in the households. The breakdown of responsibility for common household activities by gender is as follows:

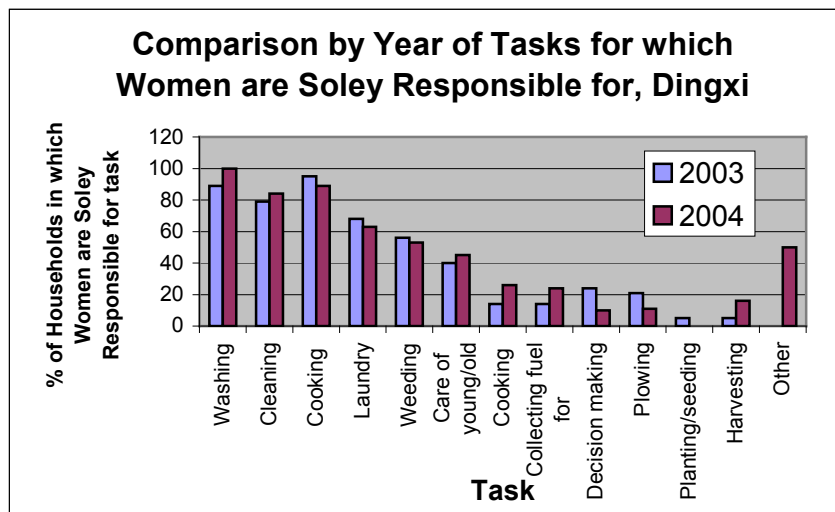
As the 2005 data was skewed by the lack of a “joint responsibility” category, it cannot be considered as accurate when compared with the 2003 and 2004 data. Therefore in this category, only the results from 2003 and 2004 are shown.

Household Activity, Dingxi 2004	% of Respondents that indicate the following		
	Women responsible	Men responsible	Both responsible
Washing	100	0	0
Cooking	89	0	11
Cleaning	84	5	11
Laundry	63	5	32
Weeding	53	11	37
Care of young/old	45	9	45
Other	50	0	50
Decision making	10	70	18
Collecting fuel for cooking/heating	24	53	24
Finances	33	47	20
Plowing	11	83	6
Planting/seeding	0	47	53
Harvesting	16	16	68

In 70% of households surveyed males were responsible for decision making in the household. However, 10% of households indicated it was solely the women who were in charge, while 18% of households indicated that the decisions were made jointly.

It was noted that in 58% of households surveyed males are in charge of financial decisions. However, 26% of households indicated it was solely the women who were in charge, while 16% of households indicated that the decisions were made jointly.

It was found that women were generally responsible for cooking, washing, cleaning, laundry, weeding, the care of others and other miscellaneous tasks while men were generally responsible for plowing and the provision of household fuels for cooking and heating. Most households also agreed that both women and men were responsible for planting/seeding and harvesting, although men were mostly responsible for planting/seeding while harvesting appeared truly shared.



By year, it can be observed that although there are slight variations in women’s tasks in the home, by and large, woman’s role remains fairly consistent between 2003 and 2004. Women’s traditional roles remained strong in this community. However, responsibility for most outdoor chores also appeared to increase as well: weeding, harvesting, collecting fuel, and plowing. One of the largest increases in 2005 was in the number of households where women were responsible for finances. As this is a traditionally male role, this may indicate improved importance of women in decision-making in the home.

**Question 11: If you had more income, how would you prioritize your spending? (Rank 1 as first to 5 as last)**

This question was intended to provide information on the perception of priorities for development by the communities, to ensure that the project adequately addressed local needs. If households had more income, the breakdown on how respondents would prioritize their spending was, on average, as follows (ranked 1-5 with 1 being the most important):

Priority, Dingxi	Rank 2003	Rank 2004	Rank 2005
Education	1.8	1.5	1.6
Housing	3.1	2.7	2.4
Food	4.2	3.1	3.2

Clothing	3.4	3.3	3.4
Other	4.0	4.4	4.1

It was found that education was the first and foremost priority for spending by the respondents, followed by housing, food and clothing. This is in accordance with the finding that education was the largest expenditure category apart from food (question 6). The ranking of priorities changed little over the survey period.

**Question 12: What are your general degrees of satisfaction in life?**

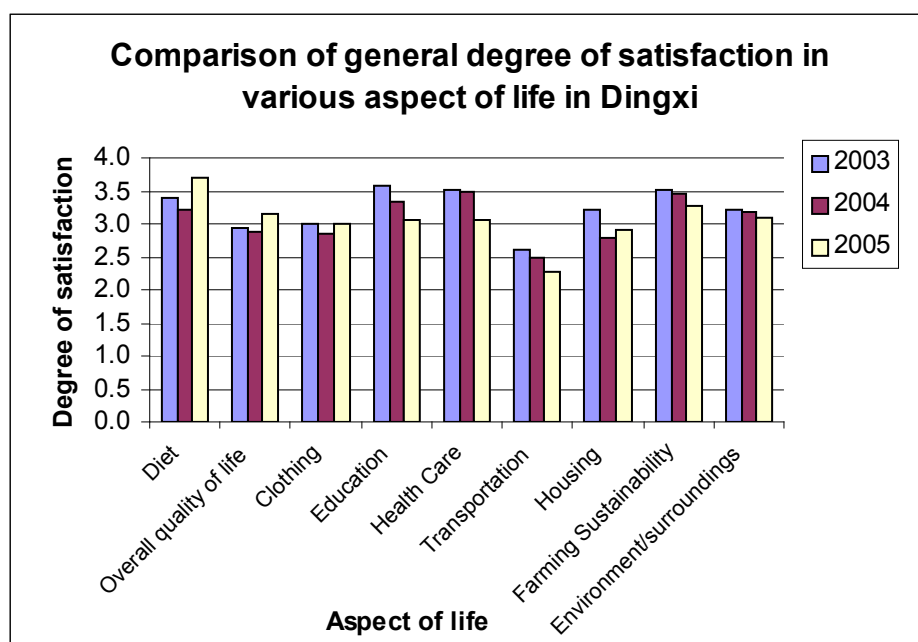
This question was intended to provide information on the degree of satisfaction respondents felt regarding various aspects of their lives according to the following scale:

1. very unsatisfied
2. unsatisfied
3. satisfactory
4. satisfied
5. Very satisfied

The results were an indication of overall perceptions on quality of life and identified priorities for development. On average, household ranking of satisfaction were as follows:

Category, Dingxi	Numerical Ranking			Translated Ranking, 2005
	2003	2004	2005	
Overall quality of life	2.95	2.89	3.16	slightly above satisfactory
Transportation	2.61	2.47	2.26	slightly below satisfactory
Housing	3.21	2.79	2.89	slightly below satisfactory
Clothing	3.00	2.84	3.00	satisfactory
Environment/surroundings	3.21	3.17	3.11	slightly above satisfactory
Diet	3.39	3.21	3.68	slightly above satisfactory
Education	3.58	3.33	3.06	slightly above satisfactory
Farming Sustainability	3.53	3.45	3.26	slightly above satisfactory
Health Care	3.53	3.47	3.05	satisfactory

Perceived overall quality of life increased in 2005 to slightly above satisfactory. Other categories considered slightly above satisfactory included: environment/surroundings, diet, education, and farming sustainability. Most households felt that some aspects of their lives were slightly below satisfactory, including transportation and housing. Clothing and health care were satisfactory.



The 2005 survey results indicated some discrepancies: while the degree of satisfaction in many of the categories declined slightly, the overall quality of life was perceived to increase. Satisfaction in diet also increased. However, the data does show an interesting phenomenon: expectations increased as the project went on. The numerical decreases in the degree of satisfaction can be attributed mainly to an increase in peoples' expectations. Transportation, in particular, did not change during the three-year project but the satisfaction with transportation did, indicating a change in expectations with regards to this indicator. Health care, education and transportation were aspects not directly affected by the project. There were also some outside influences here that may have influenced the degree of satisfaction perceived in farming sustainability and environment/surroundings, notably the 2003 drought, which affected farm productivity levels in 2004.

Some results indicate that the quality of life in both communities is increasing. Although respondents satisfaction in clothing in Dingxi did not change overall between 2003 and 2005, the spending on this item increased by 19%. In the region of Zhunger, farmers expressed a satisfaction level of 3.05 and 3.60 with their clothing in 2003 and 2005 respectively, while spending 345 RMB and 488 RMB in each respective year. Dingxi farmers expressed a satisfaction level of 3.0 in both 2003 and 2005 while spending 451 and 537 RMB per year respectively. In 2005, Dingxi farmers spent 10% more on clothes than Zhunger farmers, yet expressed a diminished level of satisfaction. It appears Dingxi farmers have a much higher expectation in terms of their quality of life than Zhunger farmers (where life has been very difficult). Clothing can be used as an important indicator. Development specialists have found that once more basic needs are met expenditures on clothing tend to increase and are a good indicator of the financial advancement of communities. In the case of our survey, clothing expenditures increased by 41% and 19% in Zhunger and Dingxi respectively in 2005.

**Question 13: What is the total land area that your household farms (mu)?**

This question was intended to provide information on the agricultural resources of the sample populations as an indication of poverty, wealth and its distribution in the watershed.

	<b>Total Farm Area, Dingxi (mu*)</b>		
	<b>2003</b>	<b>2004</b>	<b>2005</b>
Average	26.0	22.9	27.1
Median	30.0	21.0	27.8
Smallest holding	10	11	13
Largest holding	39	39	47

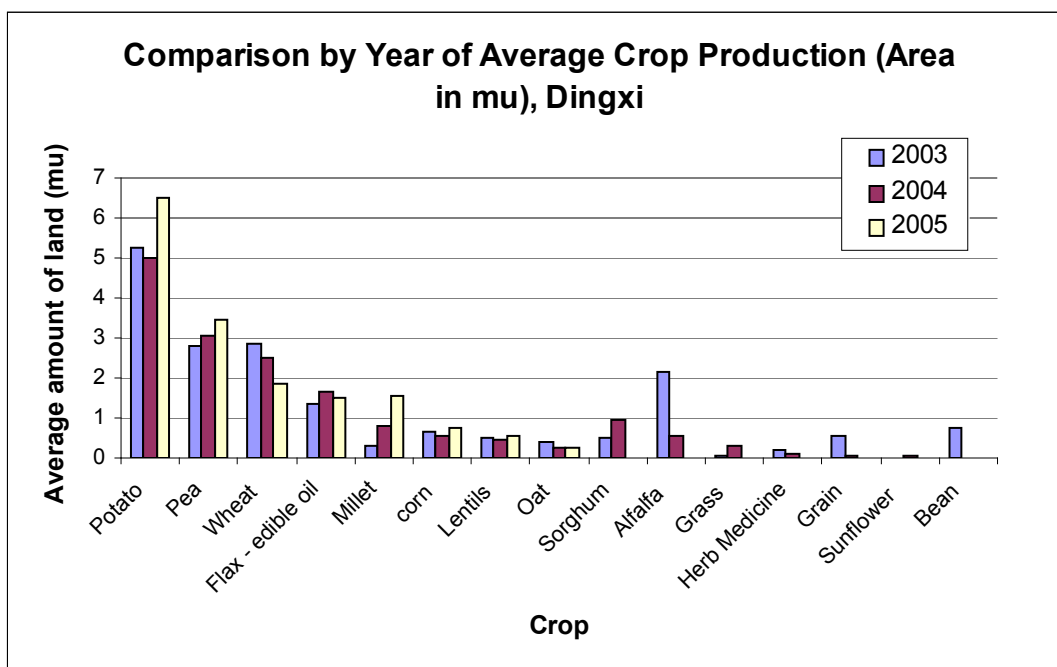
\*one hectare is equivalent to 15 mu

The average farm size dropped slightly in 2004 but increased again in 2005. The median and average values drew close in 2005: this indicated that the smaller farms increased their size by a greater area than their larger counterparts. A more even distribution of farm size was achieved in 2005.

**Question 14: What field crops do you grow and how much area for each on your farm (mu)?**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed. (Note: Since the survey period was only three years, temporal agricultural planning cannot be properly assessed, i.e. crop rotations over a two to three year cycle.)

The following graph indicates average amount of land dedicated to each crop (mu) in each of the three years:



The primary crop by land area was potato, followed by pea, wheat, millet and flax.

From analysis earlier in this survey it was found that the main staples of the diet in the communities were wheat, potatoes and beans, while of agricultural crops potato was overwhelmingly the largest income generating cash crop grown, followed by pea, flax and wheat crops. Thus it may be understood that the primary crops grown, potato, pea and wheat serve both as a primary food source and for income generation. Flax and millet serve different purposes with millet used to feed animals and flax used in household cooking, but also as a cash crop for income generation.

The average amount of land used for growing potato increased, as did the area for pea and millet, with lentils and corn also increasing slightly. Alfalfa, grass and bean decreased after 2003. This may be a result of decreased land available for fodder production and a shift to more resource efficient and permanent fodder crops.

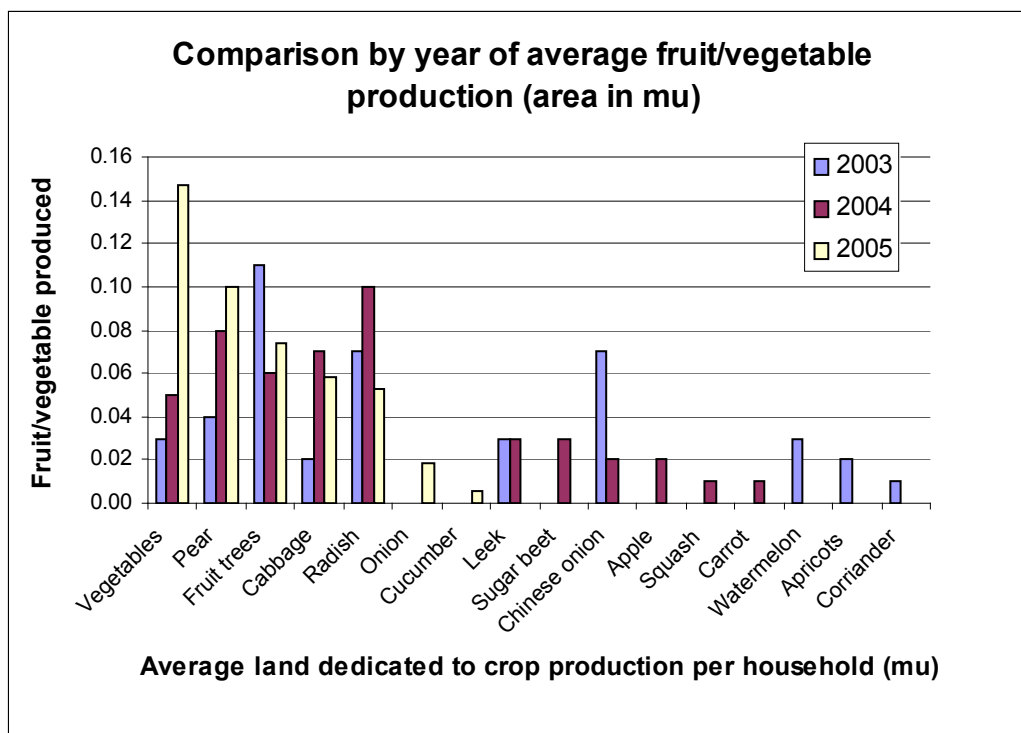
**Question 15: What vegetables and fruit crops do you produce on your farm? (mu)**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed. The average amount of land dedicated to fruits and vegetables (mu) indicated by respondents is listed in the following chart:

Fruit/Vegetable, Dingxi	Average amount of land (mu) 2003	Average amount of land (mu) 2004	Average amount of land (mu) 2005
Fruit trees	0.17	0.16	0.17
Vegetables	0.26	0.32	0.28

<b>Total fruit and vegetables</b>	<b>0.43</b>	<b>0.48</b>	<b>0.46</b>
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The total average land area dedicated to fruits and vegetables grew slightly from 2003 to 2005, but remained relatively constant during the three years considering the small land areas involved.



The primary fruit and vegetable crops by amount of land in 2005 were vegetables (general), pear, and fruit trees. Cabbage, radish, onion and cucumber were also grown. The average land area dedicated to vegetables, pear, and cabbage increased overall from 2003 to 2005. These crops, along with fruit trees and radish were grown each year. It appeared that other crops might have been planted on a trial basis, appearing on a small amount of land for a single year. In 2003, watermelon, apricot and coriander were grown; in 2004 land was used for sugar beet, apple, squash and carrot; and in 2005 onion and cucumber were grown. It is also possible that crops may be grown on a rotating basis.

**Question 16: Do you have hay crops and pasture on your farm? What is the area (mu)?**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed.

On average, the households surveyed had:

- 0 mu in hay (down from 1.03 mu in 2004)
- 1.76 mu in improved pasture (up from 0.27 mu in 2004)



- 8.57 mu in permanent pasture (up from 7.31 mu in 2004)

Improved pasture and permanent pasture both increased, while hay decreased. This could be indicative of a move to more permanent fodder and pasture lands as a result of government grazing restrictions imposed and improved uptake of project activities.

**Question 17: How much land (mu) have you given to the government instituted land reclamation program for reduced cropping and grazing on sensitive slope and eroded land?**

This question was intended to provide information on the impacts of the new government land reforms on the local population, as an indication of what to expect in communities living in such environmentally degraded landscapes. This question was newly developed for the 2004 survey when it was discovered that this program was affecting the local communities.

<b>Year, Dingxi</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Average land given over to government land reclamation program (mu)	0.00	0.76	8.99
Average total farm area (mu)	26.04	22.86	27.12
Percentage of farm to government program	<b>0</b>	<b>3</b>	<b>33</b>

Average land given over to the reclamation program jumped to 30% of the total farm area in 2005. While the average total farm area increased by 4.26 mu, average land given to the program increased by 8.23 mu.

**Question 18: Which of these practices do you employ on your farm? When did you implement them?**

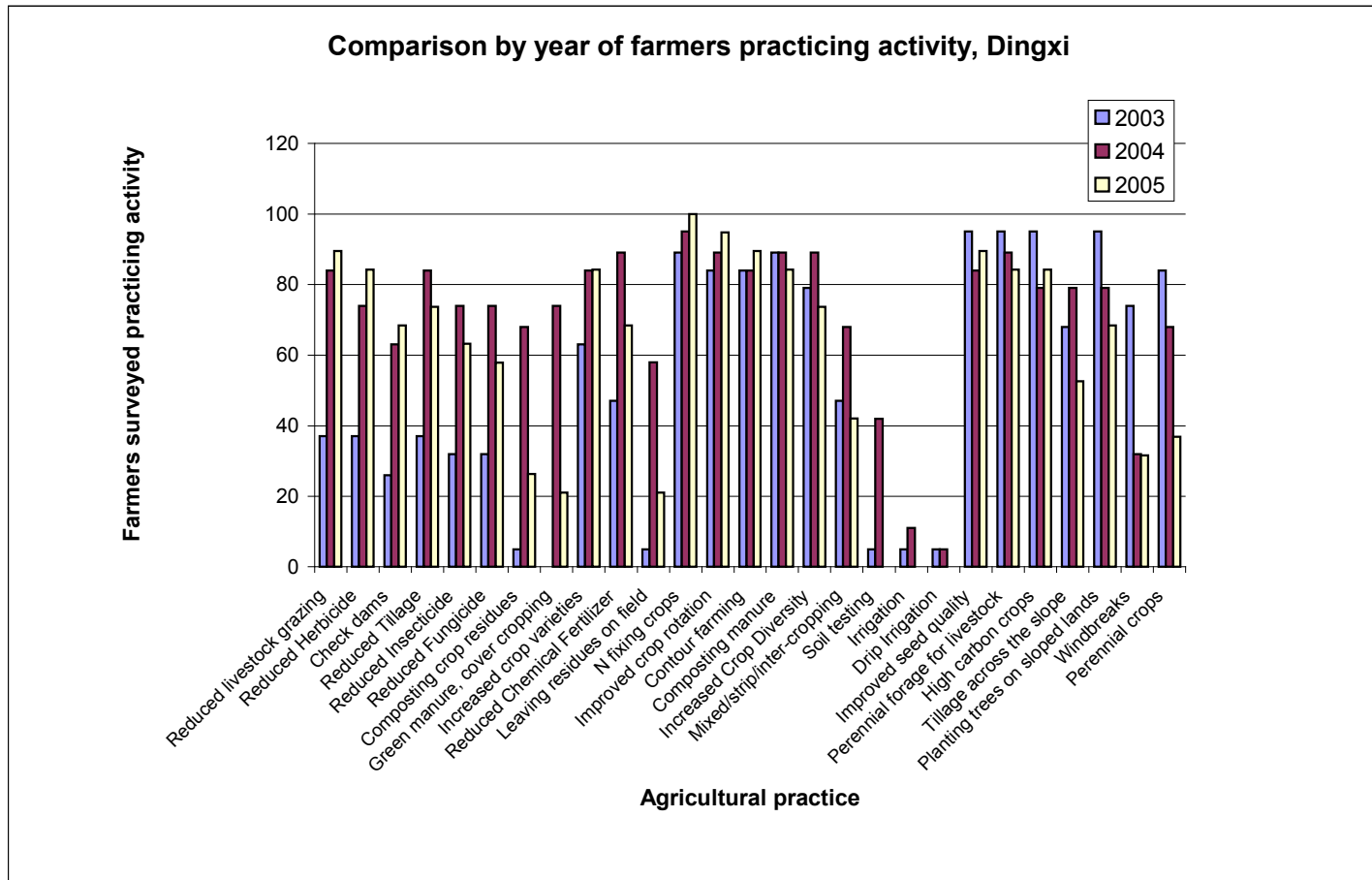
This question was intended to provide information on the frequency of farmers that utilized sustainable agricultural practices on their farms as an indication of agricultural sustainability in the watershed. This question was also to address training and education needs within the communities.

The following percentages for use of each specified practice are found in the chart below:

<b>Agricultural practice</b>	<b>Percent of farmers practicing, Dingxi</b>		
	<b>2003</b>	<b>2004</b>	<b>2005</b>
Reduced livestock grazing	37	84	89
Reduced Herbicide	37	74	84
Check dams	26	63	68
Reduced Tillage	37	84	74
Reduced Insecticide	32	74	63
Reduced Fungicide	32	74	58
Composting crop residues	5	68	26

Green manure, cover cropping	0	74	21
Increased crop varieties	63	84	84
Reduced Chemical Fertilizer	47	89	68
Leaving residues on field	5	58	21
N fixing crops	89	95	100
Improved crop rotation	84	89	95
Contour farming	84	84	89
Composting manure	89	89	84
Increased Crop Diversity	79	89	74
Mixed/strip/inter-cropping	47	68	42
Soil testing	5	42	0
Irrigation	5	11	0
Drip Irrigation	5	5	0
Improved seed quality	95	84	89
Perennial forage for livestock	95	89	84
High carbon crops	95	79	84
Tillage across the slope	68	79	53
Planting trees on sloped lands	95	79	68
Windbreaks	74	32	32
Perennial crops	84	68	37

The chart below shows the same data in graphic form. The graph is listed in order of the largest increases between 2003 and 2005. Towards the right end of the graph are practices which decreased overall and in the middle are practices that increased overall but peaked in 2004 and decreased slightly in 2005.



In 2005, practices employed by the majority of households were:

- reduced livestock grazing\*\*
- reduced herbicide\*\*
- check dams\*\*
- reduced tillage\*\*
- reduced insecticide\*\*
- reduced fungicide\*\*
- increased crop varieties\*\*
- reduced chemical fertilizer\*\*
- nitrogen-fixing crops\*
- improved crop rotation\*
- contour farming\*
- composting manure
- increased crop diversity
- improved seed quality
- perennial forage for livestock
- high carbon crops
- tillage across the slope
- planting trees on sloped lands

\*\*denotes those practices whose adoption increased significantly from 2003 to 2005

\*denotes those practices whose adoption increased moderately (<20%) from 2003 to 2005.

Substantial increases in sustainable farming practices were seen across the first half of the graph after 2003 (reduced livestock grazing through contour farming). From the chart, it can be observed that many practices peaked in 2004 and decreased in 2005 while remaining higher than 2003. With the difficult conditions in 2004 related to the 2003 drought, it is possible that the farmers did not have as many resources to dedicate to experimenting with new techniques as they did in the previous year. It is also possible that as the project progressed farmers gained a more sophisticated understanding of these techniques through the trainings. As a result, they may have become more precise in their descriptions of the techniques practiced. For example, it is possible that in the early years certain techniques such as composting crop residues, green manure and leaving crop residues on the field may have been perceived as being the same thing.

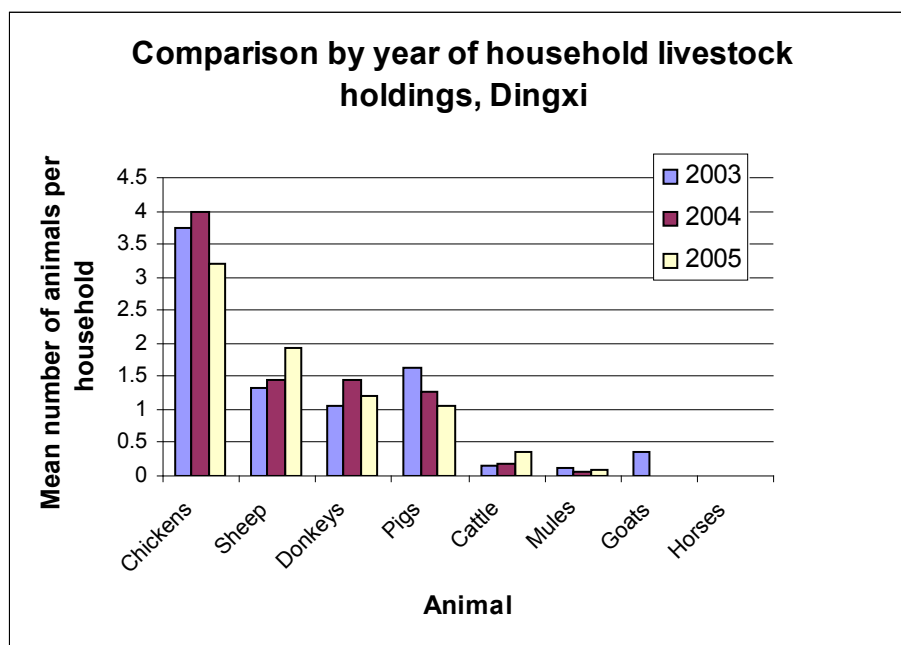
The overall increases in sustainable agriculture techniques between 2003 and 2005 could possibly be attributed to the WCAEV farmer-to-farmer trainings held on soil fertility, organic matter management and the success of the learning farms testing and assessing new and improved crop varieties.

### **Question 19: What types of livestock do you raise? (Indicate number of each)**

This question was intended to provide information on the livestock resources of the sample populations as an indication of poverty and agricultural sustainability in the watershed. The breakdown of average number of animals per household is as below:

Farm Animal, Dingxi	Average number of animals per household 2003	Average number of animals per household 2004	Average number of animals per household 2005
Chickens	3.7	4.0	3.21
Sheep	1.3	1.4	1.95
Donkeys	1.1	1.4	1.21
Pigs	1.6	1.3	1.05
Cattle	0.2	0.2	0.37
Mules	0.1	0.1	0.11
Goats	0.4	0	0
Horses	0	0	0

On average, households had three chickens, two sheep, a donkey and a pig. Some households also had cattle and mules.



Slight differences occurred yearly in the average number and type of livestock held by a household. The number of chickens and pigs decreased between 2003 and 2005, while sheep, donkeys, and cattle increased.

**Question 20: What are your major sources of information for making decisions about management changes? (Mark with “✓”)**

This question was intended to provide information on information sources about management changes as an indication of education and community capacity building as well as to identify links and networks within and outside of the community. The breakdown of information sources available to farmers is as follows, listed from greatest to least:

Source of Information, Dingxi	Percentage of farmers who indicate this source of information, 2003	Percentage of farmers who indicate this source of information, 2004	Percentage of farmers who indicate this source of information, 2005
Training courses	89	89	100
Word of mouth from farmers	84	79	79
Personal experience/observation	79	84	74
Government extension staff	63	58	68
Printed information	37	42	63
Farm Meetings	79	58	58
Company officials	42	42	37

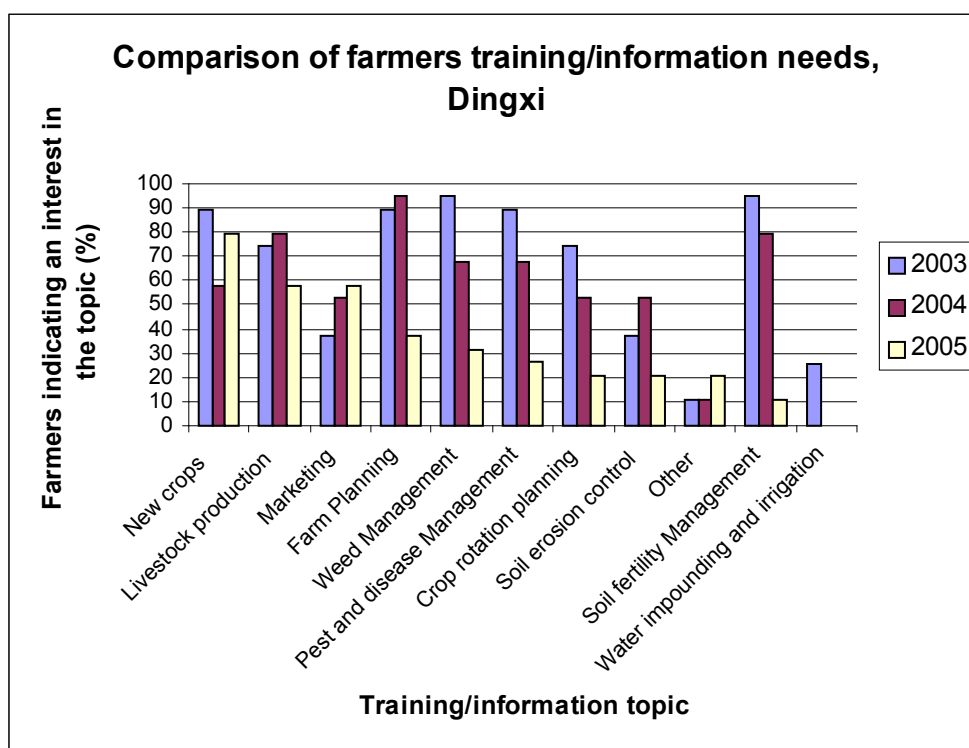
By 2005, households felt their major sources for farm information were training courses, word of mouth, and personal experience/observation. The percentage of households using training courses, government extension staff, and printed information all increased from 2003. All households reported using training courses.

**Question 21: Overall what are your biggest information/training needs?**

This question was intended to provide information on the perception of priorities for agricultural development by the communities to ensure the project is adequately addressing local needs. The breakdown of interest in training and information needs is as follows, listed from greatest to least:

Training/info need, Dingxi	Percentage of farmers who indicate this need 2003	Percentage of farmers who indicate this need 2004	Percentage of farmers who indicate this need 2005
New crops	89	58	79
Livestock production	74	79	58
Marketing	37	53	58
Farm Planning	89	95	37
Weed Management	95	68	32
Pest and disease Management	89	68	26
Crop rotation planning	74	53	21
Soil erosion control	37	53	21
Other	11	11	21
Soil fertility Management	95	79	11
Water impounding and irrigation	26	0	0

In 2005, the biggest training needs felt by households surveyed were new crops, livestock production and marketing. Farm planning, weed management, and pest and disease management were also mentioned by over 25% of households.



The topics identified by the most farmers changed from year to year:

- 2003: weed management, soil fertility management, pest and disease management, farm planning, and new crops;
- 2004: farm planning, soil fertility management, and livestock production;
- 2005: new crops, livestock production, and marketing (the total percentage of households identifying training needs decreased considerably in 2005).

The areas of study identified early in the survey period appear to have been addressed by 2005. The interest in soil fertility management, weed management, pest and disease management and farm planning all decreased considerably. This seems to indicate that the training and information produced during the project met the needs of farmers. Information on new crops and livestock management remained relatively high through 2005; future work could target sustainable solutions in these areas. The increased interest in marketing training probably denotes an increased interest of farmers in controlling the sales of their farm products. This is a positive trend in that it indicates a growing empowerment of the farmers to control their financial stability.

# Zhunger County, Inner Mongolia Autonomous Region, P.R.C.

## Analysis of 2005 Results for Socio-Economic Survey

### Zhunger Survey Administration

The WCAEV Socio-Economic survey was distributed in March 2005 to 20 households in Zhunger county, Inner Mongolia, P.R.C.

- The same 20 households were surveyed as in the two previous years, in the manner of a long-term longitudinal study. Their individual answers were statistically compared from year to year, with the 2003 survey providing a baseline for comparing the later surveys. The 2003 survey was also more detailed than the following surveys, to provide a more comprehensive view of life in the watershed.
- Statistics conducted included analysis using repeated measures ANOVA and Bonferroni-adjusted pairwise comparisons to determine the significance of variance in the sample from 2003 through 2005.
- Twenty households participated in the 2005 survey, involving 70 individuals; 67 of these were aged 16 or older.
- Surveys were completed in each of the groups where the project was implemented: Bainiliang, Aobouyen, Jiayiayaozi, Nalingou and Sujiata, all contained in the Sujiata village in the Deshengxi watershed.
- The farmer households sampled in Zhunger included ten households of average socio-economic status as determined by basic income and social standing, five above average and five below average. This report does not detail what methodology was used to select households and they were determined to be 'random' or representative samples.
- The selected sample households are not intended to be statistically representative of the entire watershed or direct project beneficiary group (230 households). Rather, the survey is intended to portray a strategic and more detailed view of the conditions of which some inhabitants of the watershed with a widely distributed socio-economic status may experience.

### Sampling Period

Note that the '2005' data from this survey, collected in March 2005, actually represents information from the 2004 fiscal year (March 2004-February 2005). Similarly, the '2004' survey data actually represents information from the 2003 fiscal year (March 2003-February 2004), and the '2003' data represents the 2002 fiscal year (March 2002-February 2003).



## Zhunger Demographic Characteristics

### **Question 1: Please fill in the following chart for all household members including name; age; gender:**

This question was intended to provide basic tracking information on the sample populations so that individuals may be compared longitudinally over time. These demographic characteristics can also assist in understanding the basic dynamics of family structure, household composition, ethnicity and human resources in the watershed.

- Forty-four males and 26 females were interviewed for a total of 70 participants in 20 households.
- The average household size was 3.6. One household consisted of two participants, one held five, while the remaining households were made of three or four people.
- The average age of participants was 38. Male participants had an average age of 35, while the average age of females was 43. Sixty-seven of 70 participants (96%) were aged 16 or older, and were therefore generally able to work unless occupied in higher schooling.
- In general, the households surveyed were nuclear families with father, mother and children. This is the most common situation in rural China: it is unusual to find more irregular or marginalized families, along with families that have younger children, families with no children, or bachelors or females as the heads of the household.

## Zhunger Family Employment, Income and Expenditure

### **Question 2: What is the amount of your total yearly family income (RMB)?**

This question was intended to provide information on the income levels of the sample populations as an indication of poverty and wealth in the watershed.

- Average annual household income of respondents in 2005 was 7965 ¥/yr (\$960 USD using an approximate exchange rate of 8.3 ¥ to \$1 USD) with a median value of 7250 ¥/yr indicating that half of the household incomes are above this value and half are below. (Note: The median can be used as a more robust measure of central tendency, as changing a single value would affect the median only slightly. In contrast, the value of the mean can be strongly affected by a single value that is very low or very high).
- The lowest annual income value reported in Zhunger in 2005 was 2800 ¥/yr, while the highest was 13,000 ¥/yr.

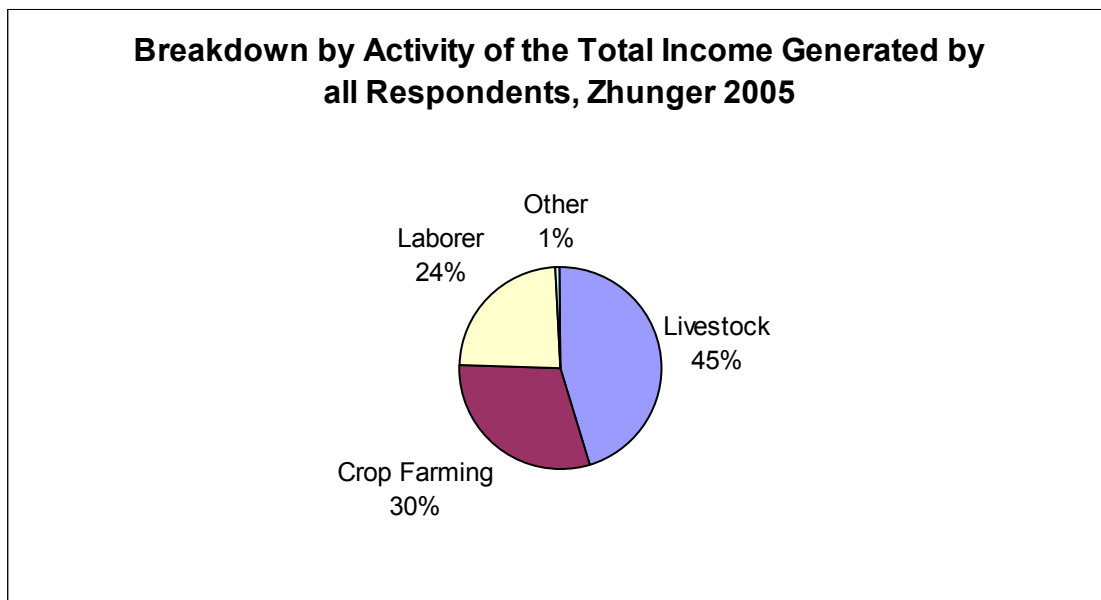
Average Household Income, Zhunger	Mean	Std. Deviation	N
2003	4975 ¥	2484.45 ¥	20

2004	6590 ¥	2862.81 ¥	20
2005	7965 ¥	3367.69 ¥	20

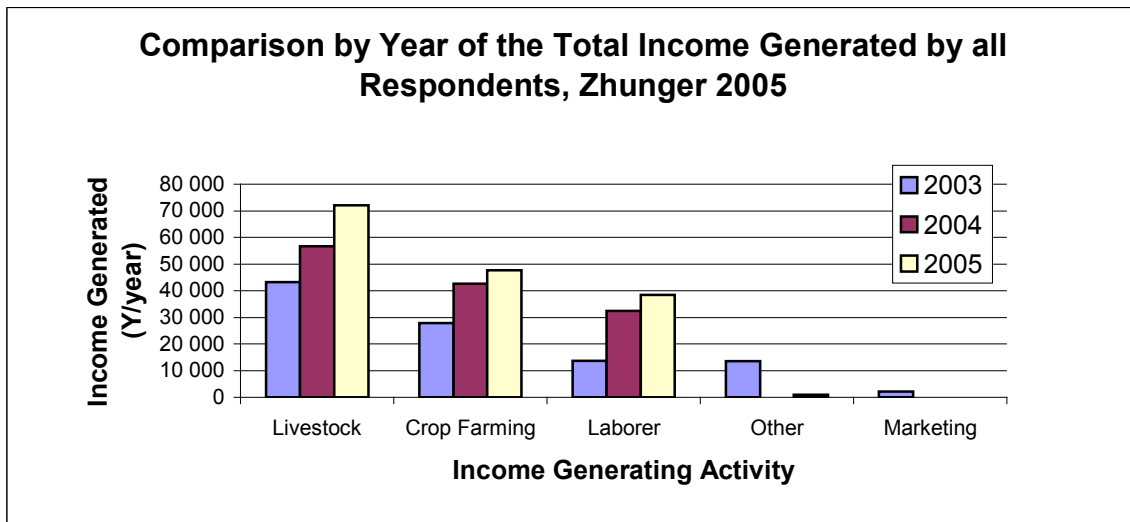
Statistical analysis using repeated measures ANOVA and Bonferroni-adjusted pairwise comparisons indicated a highly significant difference in mean annual income in the years 2003, 2004 and 2005 (repeated measures ANOVA, P=0,000, F=44.167, d.fn,d.=2,18). Using Bonferroni-adjusted pairwise comparisons it was determined that there was a significant difference at the P=0.000 level between all three years (2003-2004, 2003-2005 and 2004-2005). This translates as an overall 60% increase in average annual income over the three years studied.

**Question 3; What are your primary income generating activities? How much does each activity generate per year (RMB)?**

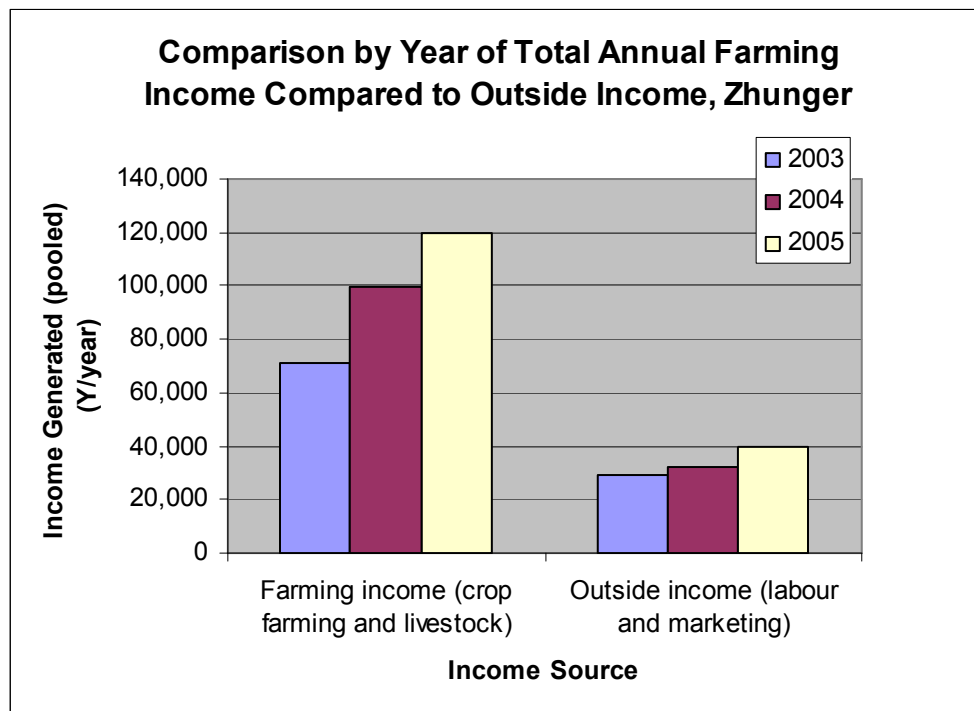
This question was intended to provide information on employment levels and income sources in the watershed, as well as to provide information on the gender division of labour. Both the number and gender of farmers practicing each activity were counted along with the average income associated with that activity, as well as the cumulative sum of income for all respondents.



The activity generating the greatest proportion of income was livestock, followed by crop farming, outside generation of labour, and a small percentage of other income sources.



From 2003 to 2005, income from livestock increased by 67%, crop farming increased by 71% and labour increased by 183%. In each of the three years of the survey, livestock, crop farming, and labour generated the greatest income, respectively. The proportion of income from each source stayed relatively constant from year to year. These results are good indicators of community development in Zhunger. On-farm income, including crop farming and livestock, increased substantially, giving residents the opportunity to access income from outside employment. The potential for labour employment is higher in Zhunger than in Dingxi, due to the growing coal industry in the area.



When the total income generated annually from livestock and crop farming are added together to give a total farming income, this amount is considerably larger than the income from outside sources such as labour and marketing. Farming income increased

68% in Zhunger between 2003 and 2005; outside income increased only 35%. Thus, it was the increase in farming livelihoods that accounted for the income increase seen in the community, rather than an out-migration to labour. This suggests that agro-ecological farming can improve the household's livelihood to a greater extent than moving out to work as a labourer, at the same time as maintaining the family unit and improving rural self-sufficiency.

The total income generated by women compared over the three years studied shows an increasing trend between 2003 and 2005. The average value is based on the total number of women above the age of sixteen counted in the survey.

<b>Women's income indicators in Zhunger</b>	<b>2003 (¥/year)</b>	<b>2004 (¥/year)</b>	<b>2005 (¥/year)</b>
Average women's income	1040	972	1292

This data shows a substantial increase in women's income generating activities, both as a total value and averaged over the entire community of women. In Zhunger, average income for women increased by 24% over the lifetime of the project. This may indicate an overall increase women's earning capabilities and financial independence.

**Annual Income Generating Activities and Household Participants by Gender, Zhunger**

Activity	Breakdown of total annual income generated by all respondents (¥) (see graphs above)			Average annual earnings of respondents practicing activity (¥)			Respondents practicing activity (%)			Respondents practicing that are male (% of total participants)		
	2003	2004	2005	2003	2004	2005	2003	2004	2005	2003	2004	2005
Livestock	43,200	56,700	72,100	1394	1620	2121	49	54	51	58	57	62
Crop Farming	27,900	42,600	47,700	1116	1469	1590	40	45	45	72	62	60
Labourer	13,600	32,500	38,500	2267	2500	2750	6	20	21	83	85	79
Other	13,500	0	1000	2250	N/A	1000	10	0	1	33	N/A	0
Marketing	2,100	0	0	2100	N/A	N/A	2	0	0	100	N/A	N/A

Livestock generated the greatest total annual income for respondents, in each of the three survey years. Total annual income increased from year to year for each activity. However, for an individual practicing one of these activities, labour earned the highest annual earnings. This finding was consistent in all three years. The number of individuals involved in labour jumped from 2003 to 2004, but leveled off in 2005.

Approximately half of the respondents raised livestock as an income-generating activity, with only slight variation from year to year. Average annual earnings of a participant raising livestock rose considerably between 2003 and 2005, to just behind the average labourer earnings. Crop farming was the next most popular activity with 45% of the respondents involved in 2005, up from 40% in 2003; average annual earnings from crop farming also increased.

Labour was the activity most practiced by male respondents. The proportion of males involved in raising livestock rose slightly in 2005; however, a smaller percentage of males were practicing crop farming and labour in 2005 compared to 2003.



**Question 4: Of these income generating activities, which is on your farm (1), in the village (2), in a neighboring town (3) or in another location (4)?**

This question was intended to provide additional information on income sources and employment location as an indication of labour-based migration out of the watershed. Both the average and the mode were compared, obtaining similar results:

- Agriculture was generally practiced on the farmer’s own farmland.
- Livestock was generally raised on the farm or somewhere in the local village.
- Labour for income was almost always done in another location from the village, generally farther than the neighbouring towns.
- No significant differences were observed between 2003, 2004 and 2005 for these values indicating that outward migration from agricultural regions may not have been influenced at this time. However, the high rates of local production of agriculture and livestock may also indicate that this is less of a problem in these areas.

<b>Location for income generation, Zhunger</b>	<b>2003 Average</b>	<b>2004 Average</b>	<b>2005 Average</b>
Agriculture	1.0	1.0	1.0
Livestock	1.6	2.1	2.0
Labourer	4.0	3.3	3.5

**Question 5: Of farm-generated income, what are your major products and how much income do you generate from each every year? How much do you sell them for?**

This question was intended to provide additional information on income sources; both the average and the total survey sum for all participants in the household were determined.

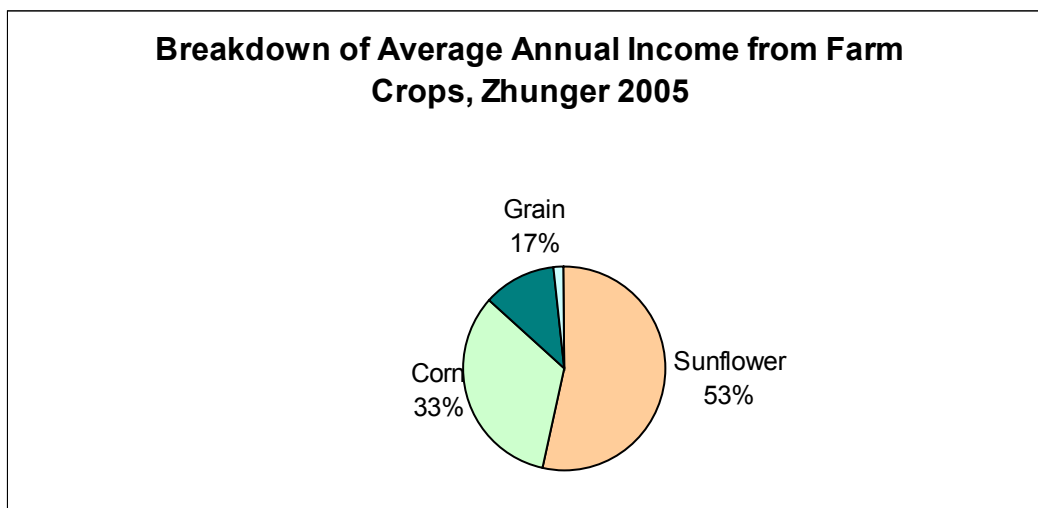
The breakdown of the average annual farm earnings is as follows from highest income to least:

<b>Farm Product, Zhunger</b>	<b>2003 Average Annual Earnings (¥)</b>	<b>2004 Average Annual Earnings (¥)</b>	<b>2005 Average Annual Earnings (¥) (see chart below)</b>
Sheep, goats and fibres	785	2295	2790
Sunflower	265	595	635
Corn	0	280	395
Livestock	225	200	0
Grain (wheat)	250	195	140

Pig	0	180	305
Chicken	0	150	300
Pea	0	75	0
Seed melon	0	25	0
Other	50	0	1410
Bean	20	0	20
Carragana seeds	15	0	0
Potato	5	0	0
<b>Total</b>	<b>1619</b>	<b>4095</b>	<b>5995</b>

Sheep, sheep products, and goats were the major income generators: the average annual earnings from sheep and goats more than tripled from 2003 to 2005. In fact, one family's entire farm-based earnings in 2005 came from sheep. Cash crops such as sunflower and corn drew the next largest earnings. Average annual earnings from corn actually grew from nothing in 2003 to the third highest-earning farm product in 2005. This could be due to the importance of corn as livestock feed. Pigs and chickens also drew earnings in 2005, up from nothing in 2003. This again supports the trend towards greater income coming from livestock. 'Other' income increased significantly in 2005: this may represent income from set-aside land for government agro-forestry. Please refer to Question 13 for the land amounts associated with the crops.

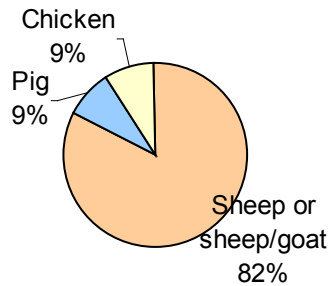
The extremely low income from farm products in 2003 is likely a result of a drought that decimated the crops in 2002. Water-intensive crops such as corn fared poorly. Some of the increases in livestock income in 2004 could be due to a size reduction in herds during that year.



Of the agricultural crops, sunflower was the largest income-generating cash crop, followed by corn and grain (wheat). This breakdown changed little from 2004.

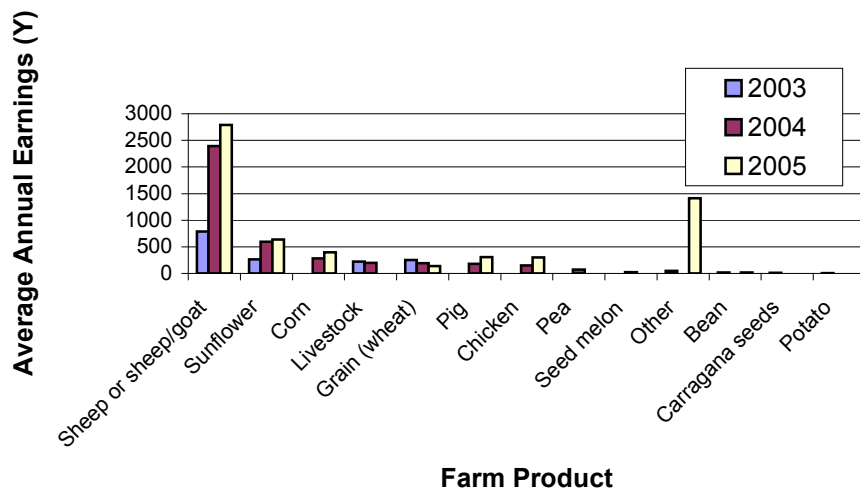


### Breakdown of Average Annual Income from Livestock, Zhunger 2005



Of livestock, sheep and goats drew an overwhelming majority of the income generated. Pigs and chickens also represented a greater proportion of livestock earnings in 2005 compared to the previous year. Note that this does not reflect actual use of the animals, as donkeys are often used to do most of the farm work and are not often sold for income. Please refer to Question 19 for additional information on livestock.

### Comparison by Year of Average Annual Farm Earnings, Zhunger



Most farm products showed an increase in average annual farm earnings from year to year, with the exception of grain (wheat) and the general livestock category. The increase in earnings from sheep and goats was the most noticeable jump. 'Other' products also took a steep jump in earnings in 2005, the probably result of government payments for

set-aside forestry land. Income from sunflower, the most important cash crop in the region, also showed an increase each year. The area dedicated to sunflower and corn increased slightly (see Question 14). However, the total increase in earnings was achieved without a corresponding growth in farm land area (see Question 13), demonstrating greater productivity.

**Question 6: What is the amount of your total yearly family expenditures (RMB) and how much do you spend on each item yearly (RMB)?**

This question was intended to provide information on expenditures by household and farm as an indication of poverty and quality of life. Both the average and the median were compared with slightly differing results for average household expenditures:

- Average annual household expenditures of respondents in 2005 were **5493** ¥, with a median value of 4625 ¥.
- The lowest annual expenditure value reported in Zhunger was 2440 ¥, while the highest was 16,430 ¥.

<b>Household Expenditures, Zhunger (¥)</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Lowest	1600	1900	2440
Highest	20,100	13,550	16,430
<b>Average</b>	<b>6242</b>	<b>5451</b>	<b>5493</b>
Median	4560	4840	4625

While the average household expenditures dropped from 2003 to 2004 and increased again slightly from 2004 to 2005, the median value showed the opposite trend. This would indicate that the average was slightly skewed by a small number of farmers who increased their household spending. This could perhaps be the result of large debt repayments from a couple of families.

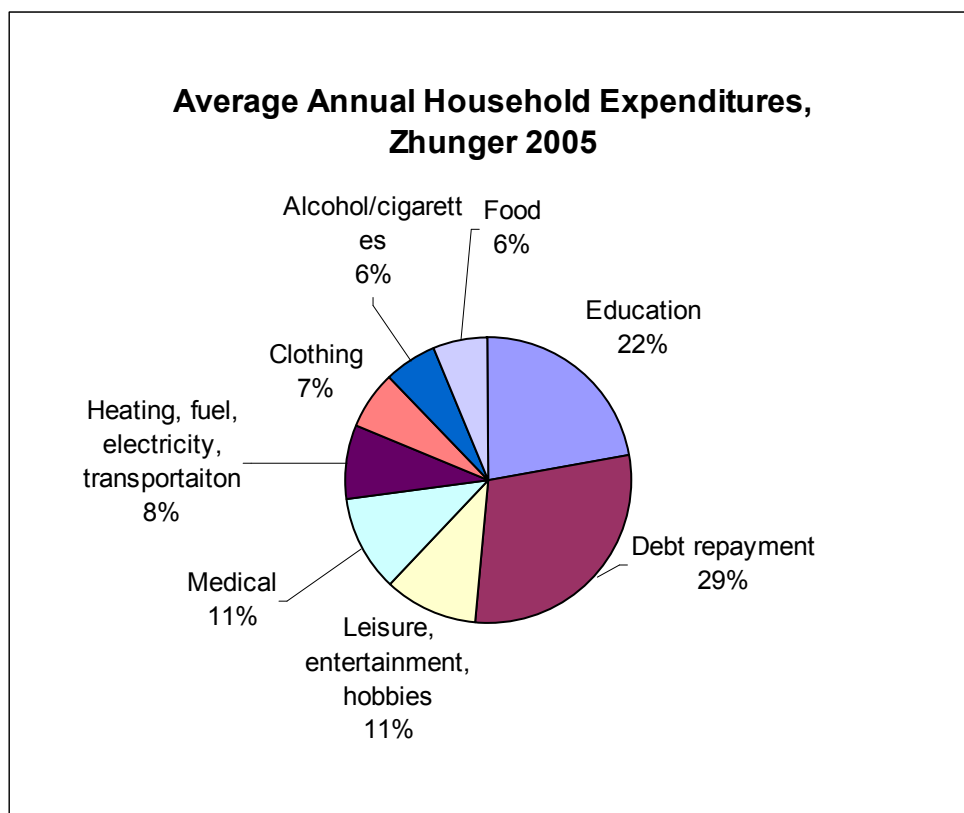
The value of the lowest household expenditure increased notably each year of the study, so that the 2003 value is only a third of the 2005 value. This may indicate that income in the poorest households increased during the length of the study.

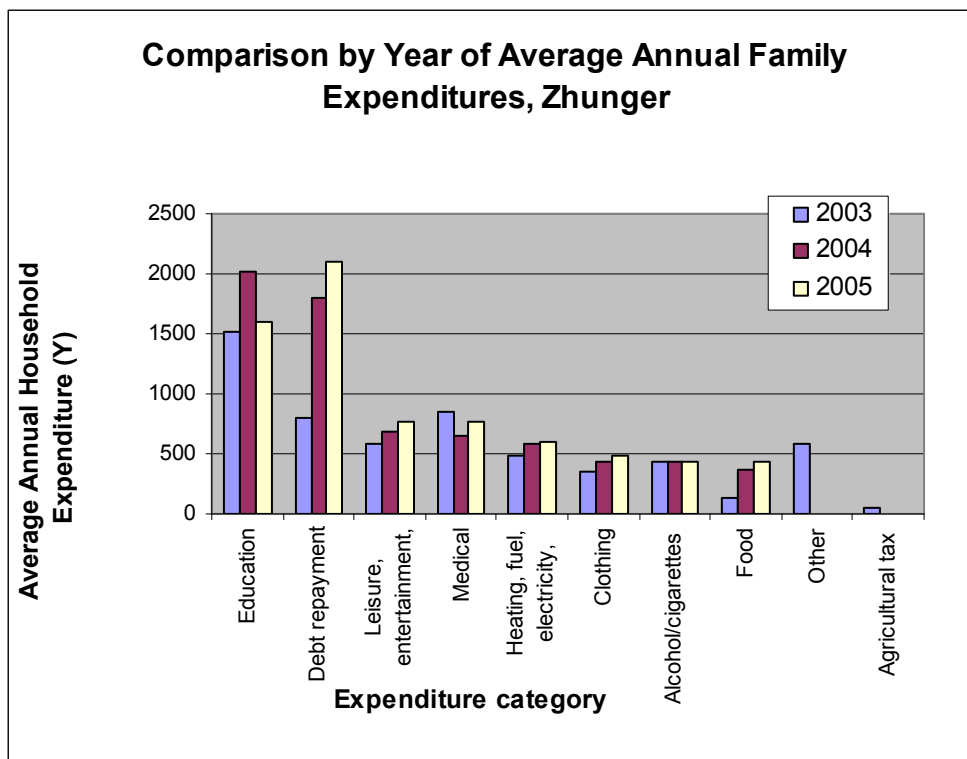
Details of the Average Annual Household Expenditures (¥) are as follows:

<b>Household Expenditures, Zhunger (per year)</b>	<b>Average Annual Expenditures (¥) 2003</b>	<b>Average Annual Expenditures (¥) 2004</b>	<b>Average Annual Expenditures (¥) 2005 (see chart below)</b>
Food	141	368	439
Clothing	345	438	488
Heating, fuel, electricity, transportation	478	580	603
Education	1525	2010	1595
Medical	843	656	773

Agricultural tax	52	0	0
Leisure, entertainment, hobbies	577	680	760
Alcohol/cigarettes	432	435	440
Debt repayment	800	1800	2100
Other	579	0	0
<b>Sum of Average Yearly Expenditures</b>	<b>5771</b>	<b>6966</b>	<b>7196</b>

Average annual family expenditures were **7196 ¥** in 2005, up from both the 2004 and 2003 averages which may indicate that disposable income in the selected communities increased during the length of the study. When broken down, the greatest relative increases were in debt payments followed by leisure, medical expenses and food. Only 6% of average annual household expenditures were spent on food indicating that the communities developed a much higher level of food security.





Average annual household expenditures changed over the three-year period in terms of absolute amounts as well. The three largest categories of family expenditures in the three years of the study were as follows:

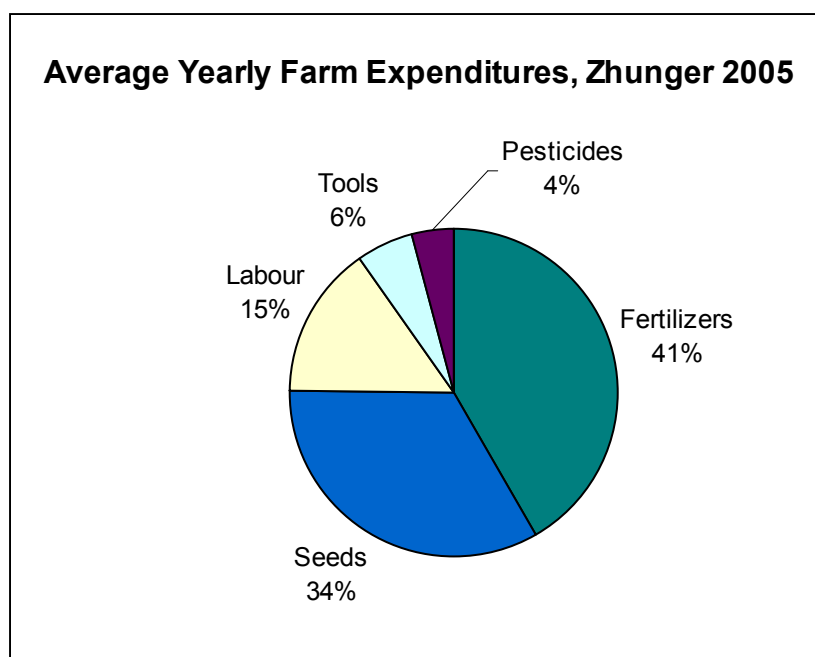
- 2003 - education, medical, debt;
- 2004 - education, debt, leisure;
- 2005 - debt, education, medical.

Expenditures that rose each year during the survey period include debt, leisure, heating/electricity, clothing and food. The fact that households were spending more on debt payments in 2005 may indicate that the basic needs of the households were being met, leaving a greater amount available to pay off past debts. Leisure expenditures rose as well over the years, also supporting the idea that income surpassed the basic necessities of the households. Leisure and alcohol/cigarettes together made up a greater proportion of household expenditure than food and clothing in 2005.

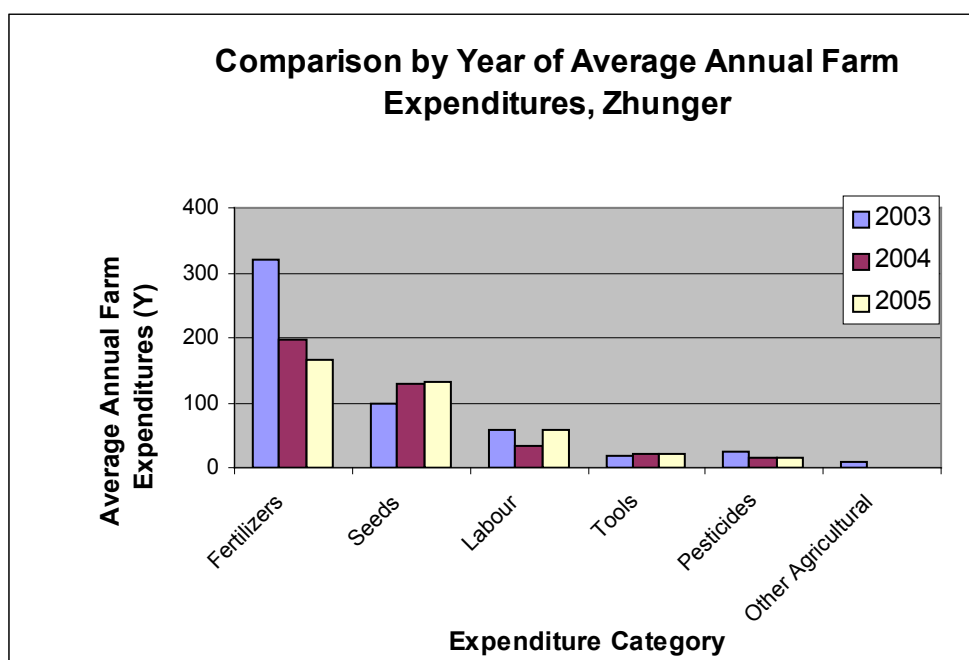
Clothing expenditure is a good indicator of the security of the household: when food and necessities are scarce, expenditure on ‘luxury’ items such as clothing would decrease. Since clothing expenditures increased in Zhunger, this may again indicate a higher level of food security.

Details of the Average Annual Farm Expenditures (¥) are as follows:

Farm Expenditures, Zhunger (per year)	Average Annual Farm Expenditures (¥) 2003	Average Annual Farm Expenditures (¥) 2004	Average Annual Farm Expenditures (¥) 2005 (see chart below)
Seeds	100	130	134
Tools	20	23	23
Labour	58	34	59
Pesticides	24	16	16
Fertilizers	321	196	165
Other Agricultural	10	0	0
<b>Sum of Average Annual Farm Expenditures</b>	<b>531</b>	<b>399</b>	<b>396</b>



Farm expenditures were quite low in Zhunger. Average annual farm expenditures came to **396 ¥** in 2005, just slightly less than the 2004 average of 399 ¥. However, both these years showed a considerably lower total average farm expenditure than in 2003 (531 ¥) with 2005 farm expenditures 25% less than expenditures in 2003. This decrease can be primarily attributed to the decrease in the amount spent on fertilizers. Spending on pesticides also decreased during the survey period; the drop in both fertilizer and pesticide spending was greatest between 2003-2004. The total expenditures on chemical inputs decreased by 52% from 2003 to 2005. Households actually spent more on leisure, entertainment, hobbies, cigarettes and alcohol than on the total allocated to farm production.



The most dramatic change in farm expenditures was the drop in fertilizer spending to nearly a third of the 2003 value by 2005. If the cost of fertilizer per kg remained the same, this means that less fertilizer was added to the land. As the farmers' higher incomes would justify buying greater amounts of fertilizer if it was needed, this decrease in spending would indicate that less fertilizer was required as the project progressed. The same inference can be made for pesticide expenditures. Seed expenditures increased slightly.

Details of the Average Household Savings (¥) are as follows:

These data have important implications for household finances, greatly improving the quality of life as the households become less trapped by debt.

Household Savings, Zhunger *	2003	2004	2005
Average	-1267.25	1139.5	2507
Median	275	1750	2750
Percent of households with a deficit	45%	20%	15%
Percent of households with 0 savings	0	0	0

\*defined as total household income minus total household expenditures

In 2003, the net average annual financial balance of households in Zhunger was negative, **-1267 ¥/year**, with 45% of households incurring large debts. By 2004, the average annual balance was recording savings of **1140 ¥/year**. By 2005, the average annual household savings was **2507 ¥/year**: a remarkable leap from the negative balance of 2003. Households running a negative financial balance decreased from 45% over the three-year survey period to 15% in 2005. These data have important implications for household

finances, showing the greatly improved quality of life and security as the households became less trapped by debt.

## Zhunger Quality of Life and Gender

**Question 7: What kind of foods does your family eat? (Please mark never, sometimes or often with an “✓” according to your frequency) Do you purchase the food or produce it yourself? (Indicate % purchased)**

This question was intended to provide information on household nutrition, diversity of diet and food production in the watershed as indications of health and self-sufficiency. Foods were identified as either eaten never, sometimes or often and local farm production was also identified.

The breakdown of the most common foods that families surveyed eat is as follows:

Common Household Foods Eaten, Zhunger	Percentage of households that consume item 'often'		
	2003	2004	2005
Potato	100	100	100
Meat	40	95	95
Wheat	85	90	90
Eggs	25	90	90
Rice	45	55	55
Vegetables	35	50	55
Fruit	20	45	45
Beans	15	20	25
Fish	0	0	0
Dairy	0	5	5
Maize	5	0	0

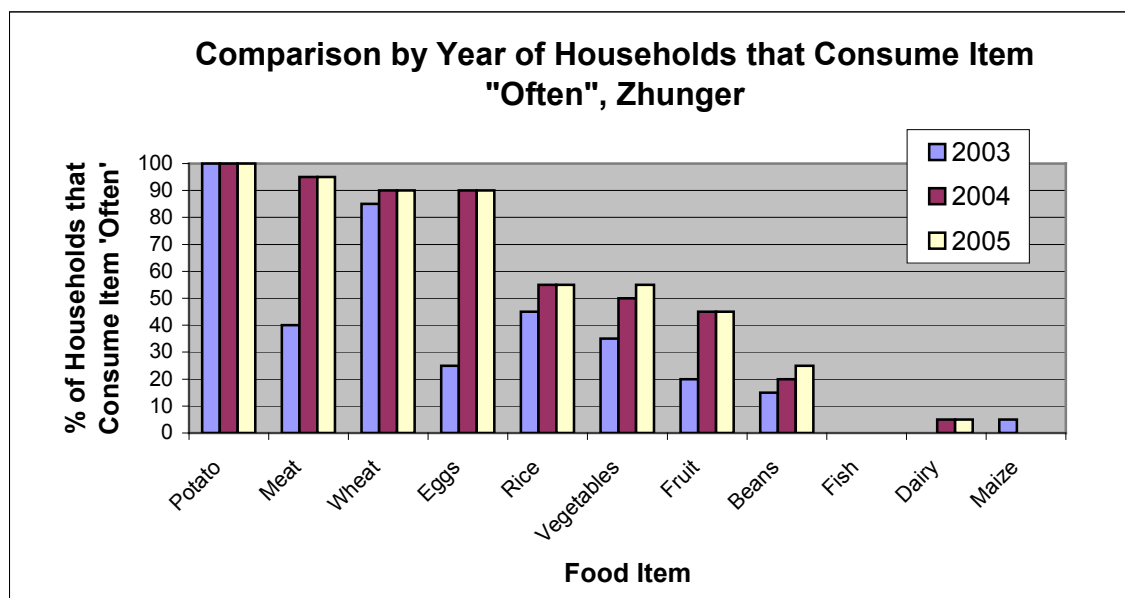
Potatoes, meat, wheat and eggs form the main food staples of the community. About half the households also consume rice, vegetables and fruit on a regular basis. Most households consumed all food items listed in the survey, with the exception of fish, corn and dairy products. The residents of Zhunger appeared to eat many more of these foods on a regular basis than did the residents of Dingxi.

The breakdown of the most common foods and the proportions they are **purchased** in is as follows:

Purchased Item, Zhunger	Percentage of people that eat item who must purchase it		
	2003	2004	2004
Rice	95	95	95

Wheat	45	95	95
Fish	76	89	85
Beans	10	45	35
Vegetables	74	35	35
Fruit	42	25	25
Meat	11	0	0
Potato	0	0	0
Eggs	0	0	0
Dairy	100	64	35
Maize	100	0	N/A

The vast majority of households consuming rice, wheat and fish purchased these items. Beans, dairy products, vegetables and fruit were also occasional purchases. Meat, potatoes, and eggs consumed came from the farms and were not purchased at all. Meat and potatoes are staple foods in most households, indicating that families predominantly subsist on their own food resources rather than purchased items.



A more diverse range of food items were eaten 'often' by 2005. Consumption of meat and eggs increased dramatically, while vegetables, fruit, rice, wheat and beans also were consumed more often. The change in diet to greater protein and animal product consumption may be related to the increase in livestock farming observed in Question 3, while the greater amount of disposable income may have had an influence on the increase in fruit and vegetable consumption, both more purchased items. The greater variety in diet by the increase in foods consumed 'often' would have beneficial health consequences, with possible feedback to lower medical expenses observed in Question 6.

**Question 8: What percentage of your total diet do you think you are producing on the farm?**



This question was intended to provide information on food security in the watershed as an indication of self-sufficiency.

An average of 78.5% of the total diet of the households surveyed was produced on their own farms. This value was up just slightly from the 2004 value of 78%. The jump from 2003 to 2004 was more notable, as households produced an average of 70% of their diet on the farm in 2003. This may indicate that household food security is already high and continues to improve.

**Question 9: Which foods would you like to grow more of in the future?**

This question was intended to provide information on interest in food and farm diversification in the watershed as an indication improved health, environment and self-reliance. The breakdown of the interest found in households surveyed is portrayed in the chart below, listed from greatest to least interest in growing that product in the future:

Product	Percentage of farmers interested in this product, Zhunger		
	2003	2004	2005
Improved sheep	75	100	95
Corn	75	75	75
Forage	5	65	65
Potato	25	25	20
Millet	35	15	20
Pea	5	5	-
Livestock	5	5	-
Chick peas (drought resistant)	-	5	10
Chinese Yam	20	-	-
Goat	15	-	5
Green bean	10	-	10
Fruit	10	-	-
Cow	10	-	-
Vegetable	5	-	-
Grains	5	-	-
Hay	5	-	-
Sunflower	5	-	-
Seed melon	5	-	-
Local grass	5	-	-

Farming households were still quite interested in raising sheep, according to the 2005 survey, with only 5% of households omitting them from the list. Other key products included corn and forage grasses, both common animal fodders. The percentage of households interested in growing drought-resistant chickpea also increased in 2004 and 2005. From these results, future activities could continue to target sustainable forage and livestock production.

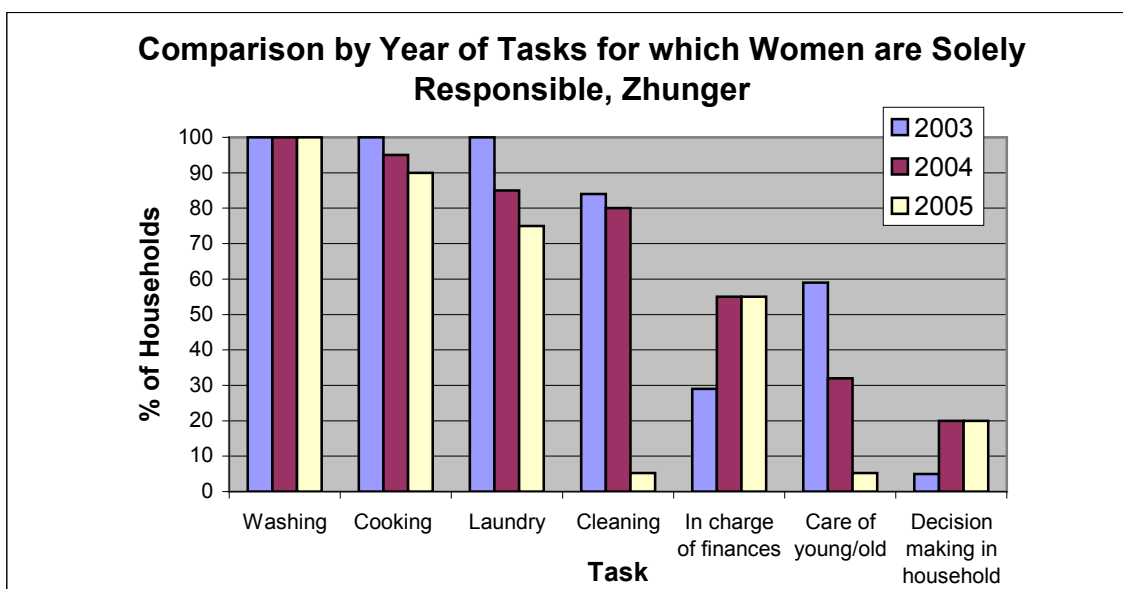
**Question 10: Please name the people in your house responsible for the following?**

This question was intended to provide information on decision-making and gender equality in the households. The breakdown of responsibility for common household activities by gender is as follows:

Household Activity , Zhunger 2005	% of Respondents that indicated the following		
	Women responsible	Men responsible	Both responsible
Washing	<b>100</b>	0	0
Cooking	<b>90</b>	0	10
Laundry	<b>75</b>	0	25
Cleaning	5	5	<b>89</b>
In charge of finances	55	30	15
Care of young/old	5	5	89
Decision making in household	20	30	50
Weeding	0	5	<b>95</b>
Harvesting	0	5	<b>95</b>
Planting/seeding	0	<b>65</b>	35
Plowing	0	<b>75</b>	25
Collecting fuel for cooking/heating	0	<b>100</b>	0

Thirty percent of households surveyed reported that male family members were responsible for decision making, 20% reported decision-making by women, and 50% handling joint responsibility. In the majority of households, women were in charge of finances.

The 2005 survey indicated that in most households women were responsible for washing, cooking, and laundry. Men were responsible for fuel collection, plowing, and planting and seeding. Joint responsibility was common for weeding, harvesting, and cleaning. It can be seen that gender roles are clearly defined in the communities, as evidenced by the large percentages in each category. Compared to Dingxi, however, joint responsibility was much more common and women's roles were more mixed with men's. This may be a result of the heightened focus on women that was part of the project at Zhunger.



In general, tasks that were assigned to women alone decreased over the survey period. While washing remained a women's role for each of the three years, the number of households assigning cooking, laundry, and care-taking to women alone decreased. Cleaning is especially notable: this was a woman's chore for only 5% of households in 2005 compared to 84% in 2003. The percentage of households where women were involved in decision-making and finances increased.

**Question 11: If you had more income, how would you prioritize your spending? (Rank 1 as first to 5 as last)**

This question was intended to provide information on the perception of priorities for development by the communities, to ensure that the project adequately addressed local needs. If households had more income, the breakdown on how respondents would prioritize their spending was, on average, as follows (ranked 1-5 with 1 being the most important):

Priority, Zhunger	2003 Rank	2004 Rank	2005 Rank
Housing	2.05	2.05	2.05
Education	2.35	2.25	2.20
Food	2.55	2.85	2.85
Clothing	3.7	3.55	3.55
Other	4.35	4.3	4.35

It was found that housing was the first and foremost priority for spending by the respondents, followed by education and food. This indicates the inhabitants experience a more day-to-day existence with concerns about the provision of basic goods.

The priorities of households changed little over the survey years, with slightly less emphasis being put on food. In Zhunger, housing was a greater priority than in Dingxi, where education was a first priority.

**Question 12: What are your general degrees of satisfaction in life?**

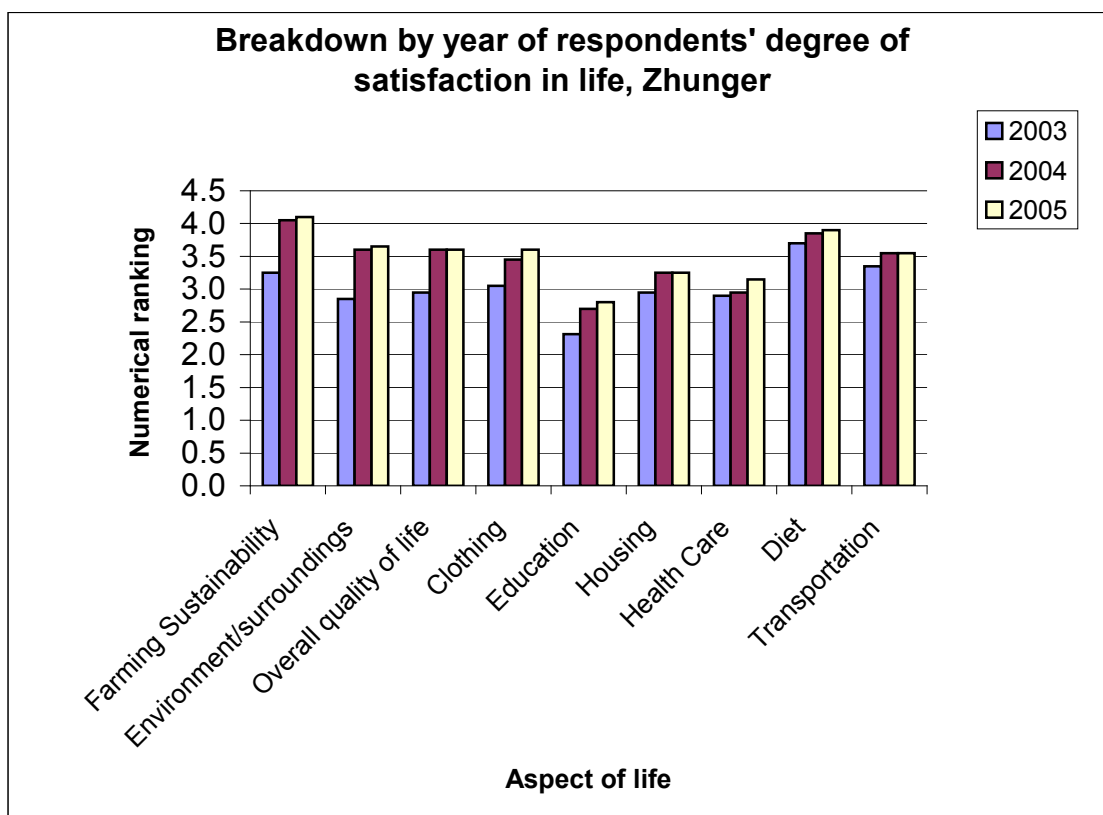
This question was intended to provide information on the degree of satisfaction respondents felt regarding various aspects of their lives according to the following scale:

1. very unsatisfied
2. unsatisfied
3. satisfactory
4. satisfied
5. very satisfied

The results were an indication of overall perceptions on quality of life and identified priorities for development. On average, household ranking of satisfaction was as follows:

Category, Zhunger	Numerical Ranking			Translated Ranking, 2005
	2003	2004	2005	
<b>Overall quality of life</b>	<b>2.95</b>	<b>3.60</b>	<b>3.60</b>	<b>Slightly above satisfactory</b>
<b>Farming Sustainability</b>	<b>3.25</b>	<b>4.05</b>	<b>4.10</b>	Satisfied
<b>Diet</b>	<b>3.7</b>	<b>3.85</b>	<b>3.90</b>	Above satisfactory
<b>Environment/surroundings</b>	<b>2.85</b>	<b>3.60</b>	<b>3.65</b>	Slightly above satisfactory
Clothing	3.05	3.45	3.60	Slightly above satisfactory
Transportation	3.35	3.55	3.55	Slightly above satisfactory
Housing	2.95	3.25	3.25	Slightly above satisfactory
Health Care	2.9	2.95	3.15	Slightly above satisfactory
Education	2.32	2.70	2.80	Slightly below satisfactory

The categories in which surveyed households were most satisfied in 2005 were farming sustainability, diet, and environment/surroundings, respectively. All categories except for education were rated slightly above satisfactory. The chart below presents the data in order from the most improved to the least improved categories:



The average degree of satisfaction of farming sustainability increased greatly from the 2003 value. Environment/surroundings and overall quality of life also increased noticeably between 2003 and 2005. None of the categories decreased in satisfaction ranking over the survey period. It is important to note that the categories that increased in satisfaction ranking during the survey period were the ones most tied to REAP objectives. This may reveal positive impacts of the trainings and farm planning sessions on farmers' outlooks. The improved weather and growing conditions may also have added to the greater increases in satisfaction rankings compared to those at Dingxi.

## Zhunger Agro-Ecological Assessment of Farming Systems

### **Question 13: What is the total land area that your household farms (mu)?**

This question was intended to provide information on the agricultural resources of the sample populations as an indication of poverty, wealth and its distribution in the watershed.

	Total Farm Area, Zhunger (mu*)		
	2003	2004	2005
Average	14.24	14.23	13.96
Median	14.25	14	14
Smallest holding	5	5	4

Largest holding	26	26	26
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\*one hectare is equivalent to 15 mu

The average farm size dropped slightly since 2003. The median and average values were quite close each year, indicated an even distribution of farm size among respondents. The smallest holding decreased by 1 mu (0.07 ha) in 2005. These farm sizes were smaller than the average areas described by participants in Dingxi but farmers appeared to be increasing their productivity on these smaller areas of land in Zhunger.

**Question 14: What field crops do you grow and how much area for each on your farm (mu)?**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed. (Note: Since the survey period was only three years, temporal agricultural planning cannot be properly assessed, i.e. crop rotations over a two to three year cycle.)

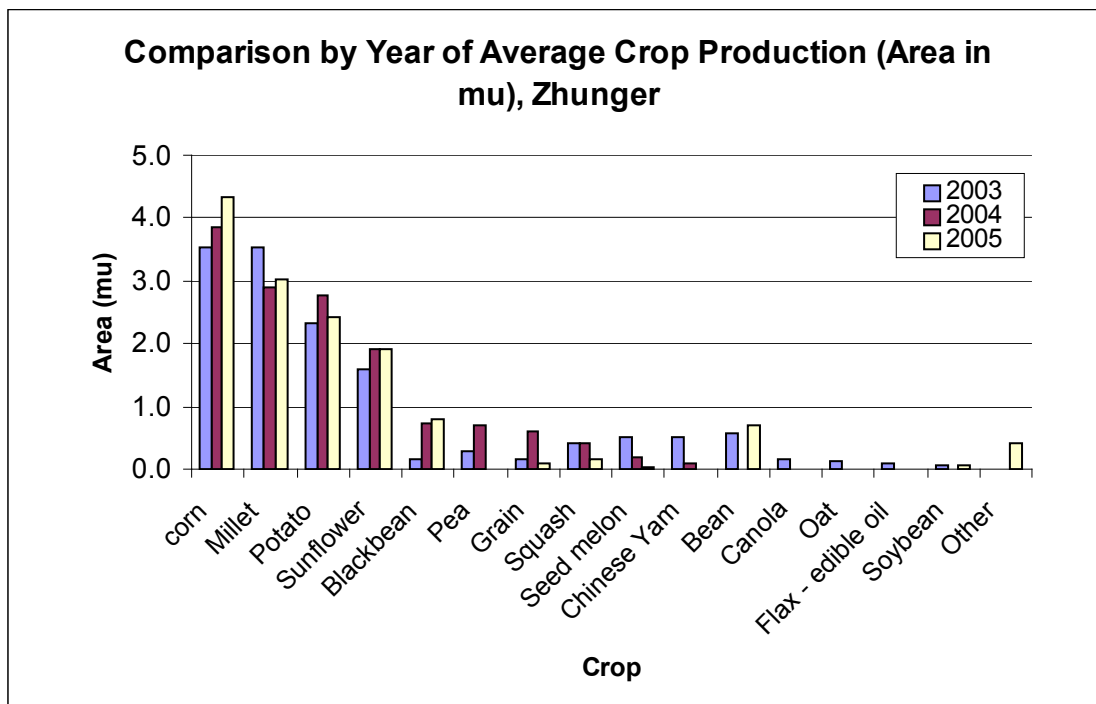
The average amount of land dedicated to each crop (mu) indicated by respondents is listed in the following chart:

Crop	Average amount of land, Zhunger (mu)		
	2003	2004	2005
Corn	3.6	3.9	4.3
Millet	3.5	2.9	3.0
Potato	2.3	2.8	2.4
Sunflower	1.6	1.9	1.9
Blackbean	0.2	0.7	0.8
Pea	0.3	0.7	-
Grain	0.2	0.6	0.1
Squash	0.4	0.4	0.2
Seed melon	0.5	0.2	0.03
Chinese Yam	0.5	0.1	-
Bean	0.6	-	0.7
Canola	0.2	-	-
Oat	0.1	-	-
Flax - edible oil	0.1	-	-
Soybean	0.05	-	0.08
Other	-	-	0.4

The primary crops in 2005 (by amount of land used) were corn, followed by millet and potato. Sunflower and blackbean also used a considerable average land area.

From analysis earlier in this survey it was found that the main staples of the diet in the communities were wheat and potatoes, while of agricultural crops sunflower was the largest income generating cash crop grown, followed by corn and wheat crops. Thus it may be understood that the primary crops grown served as either a primary food source (potato) or for fodder/silage production (corn, millet). Secondary crops were used to

generate cash (sunflower) or produce food (beans – which can also be used for intercropping).



Over the survey period, a change was seen in the distribution of land used for crops. Corn increased, probably due to the demands of greater livestock farming and the greater availability of water after the 2002 drought as corn is fairly water-intensive. Sunflower and bean also increased slightly, while the potato stayed relatively constant. Millet, a low-water crop, and many other smaller crops such as pea, squash and seed melon decreased in importance. This trend may indicate that food needs were being met on a smaller area of land, leaving more land available for cash crops and livestock fodder.

**Question 15: What vegetables and fruit crops do you produce on your farm? (mu)**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed. The average amount of land dedicated to fruits and vegetables (mu) indicated by respondents is listed in the following chart:

Fruit/Vegetable, Zhunger	Average amount of land (mu) 2003	Average amount of land (mu) 2004	Average amount of land (mu) 2005
Fruit	0.32	0.02	0.01
Vegetables	0.30	0.17	0.18
Total	<b>0.62</b>	<b>0.19</b>	<b>0.19</b>

It was found that the primary vegetable and fruit crops (by amount of land) included beans, tomatoes, cucumber, radish, green pepper and cabbage. Carrot and pear were also produced in the communities. Only a very small area was allocated to fruit and vegetable production. The main fruit/vegetable crops by area varied each year:

- 2003: pear, apricot, apple
- 2004: bean, radish, tomato
- 2005: bean, tomato, cucumber

However, as the areas reported were so small they were based on best estimates. Also, farmers often reported the number of trees they owned versus the area in mu. This could indicate less reliability in the results however still shows that the communities are producing a variety of fruit and vegetable products.

**Question 16: Do you have hay crops and pasture on your farm? What is the area (mu)?**

This question was intended to provide information on the agricultural resources, productivity and product diversity of the sample populations as an indication of poverty and agricultural sustainability in the watershed.

On average, the households surveyed had:

- 18.7 mu in hay (up from 16.2 mu in 2004)
- 21.9 mu in improved pasture (up from 18.3 mu in 2004)
- 14.4 mu in permanent pasture (up from 13.2 mu in 2004)

These increases in land area for pasture crops occurred could be indicative of a move to more permanent fodder and pasture lands as a result of government grazing programs and improved uptake of project activities.

**Question 17: How much land (mu) have you given to the government instituted land reclamation program for reduced cropping and grazing on sensitive slope and eroded land?**

This question was intended to provide information on the impacts of the new government land reforms on the local population, as an indication of what to expect in communities living in such environmentally degraded landscapes. This question was newly developed for the 2004 survey when it was discovered that this program was affecting the local communities.

It was found that on average, households had given up no land to the reclamation program in 2004 or 2005. This can be confirmed by the consistency in land holdings data from 2003 to 2004 and 2005 (please refer to question 13 for more information on household land holdings). However, governmental land reclamation is expected in the area in the next upcoming years.



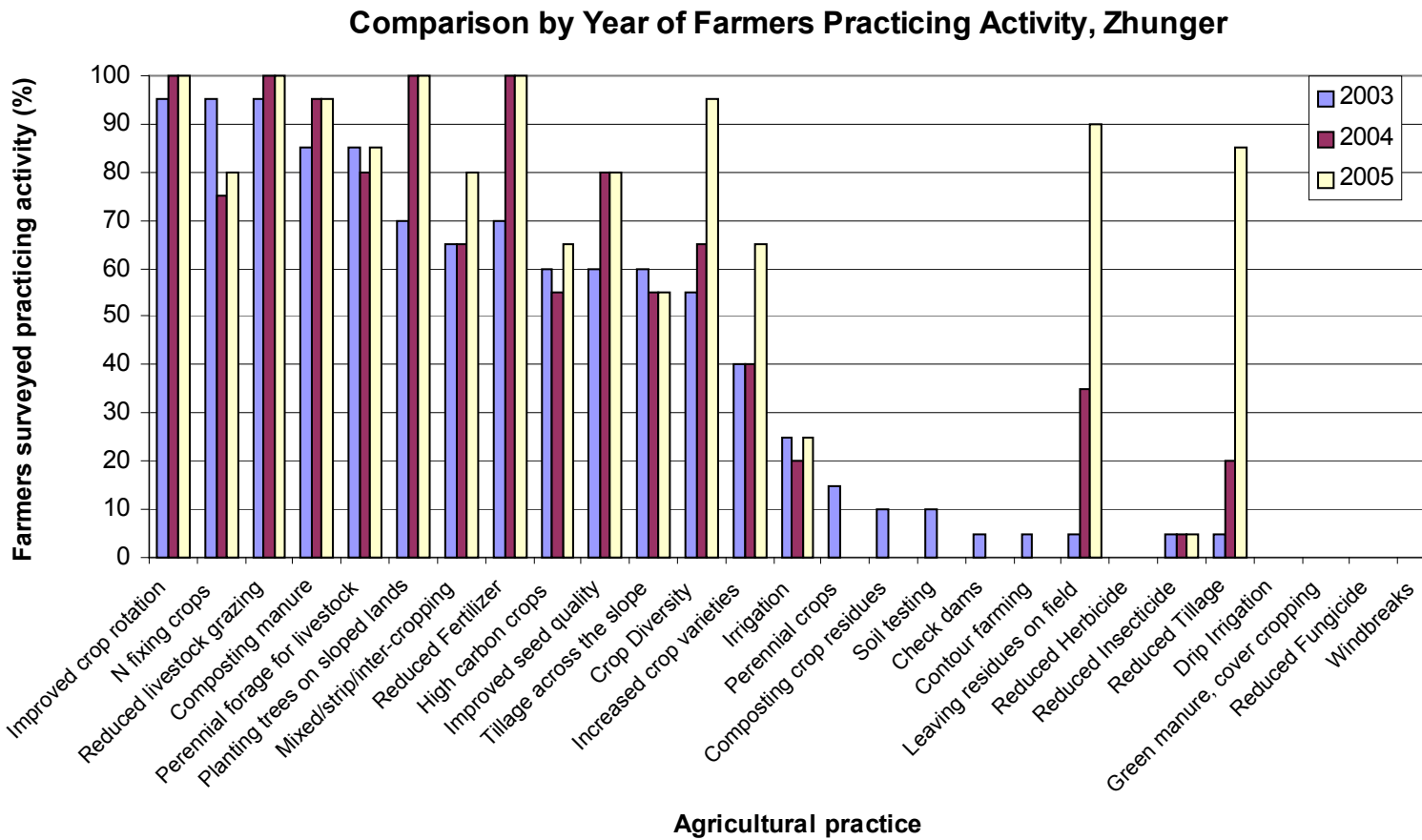
**Question 18: Which of these practices do you employ on your farm? When did you implement them?**

This question was intended to provide information on the frequency of farmers that utilized sustainable agricultural practices on their farms as an indication of agricultural sustainability in the watershed. This question is also to address training and education needs within the communities.

The following percentages for use of each specified practice are found in the chart below:

<b>Agricultural Practice, Zhunger</b>	<b>Percent of Farmers Practicing in 2003</b>	<b>Percent of Farmers Practicing in 2004</b>	<b>Percent of Farmers Practicing in 2005</b>
Improved crop rotation	95	100	<b>100</b>
Reduced livestock grazing	95	100	<b>100</b>
Reduced Fertilizer	70	100	<b>100</b>
Planting trees on sloped lands	70	100	<b>100</b>
Composting manure	85	95	<b>95</b>
Perennial forage for livestock	85	80	85
Improved seed quality	60	80	<b>80</b>
N fixing crops	95	75	80
Mixed/strip/inter-cropping	65	65	<b>80</b>
Crop Diversity	55	65	<b>95</b>
Tillage across the slope	60	55	55
High carbon crops	60	55	<b>65</b>
Increased crop varieties	40	40	<b>65</b>
Leaving residues on field	5	35	<b>90</b>
Irrigation	25	20	25
Reduced Tillage	5	20	<b>85</b>
Reduced Insecticide	5	5	5
Perennial crops	15	-	-
Soil testing	10	-	-
Composting crop residues	10	-	-
Reduced Herbicide	-	-	-
Contour farming	5	-	-
Check dams	5	-	-
Reduced Fungicide	-	-	-
Green manure, cover cropping	-	-	-
Windbreaks	-	-	-
Drip Irrigation	-	-	-





In 2005, practices employed by all households surveyed were:

- improved crop rotation\*
- reduced livestock grazing\*
- reduced fertilizer\*\*
- planting trees on sloped lands\*\*

The majority of households in 2005 also practiced:

- composting manure\*
- perennial forage for livestock
- improved seed quality\*\*
- N-fixing crops
- mixed/strip/inter-cropping\*
- crop diversity\*\*
- high carbon crops\*
- increased crop varieties\*\*
- leaving residues on field\*\*
- tillage across the slope
- reduced tillage\*\*

\*\*denotes those practices whose adoption increased significantly from 2003 to 2005

\*denotes those practices whose adoption increased moderately (<20%) from 2003 to 2005

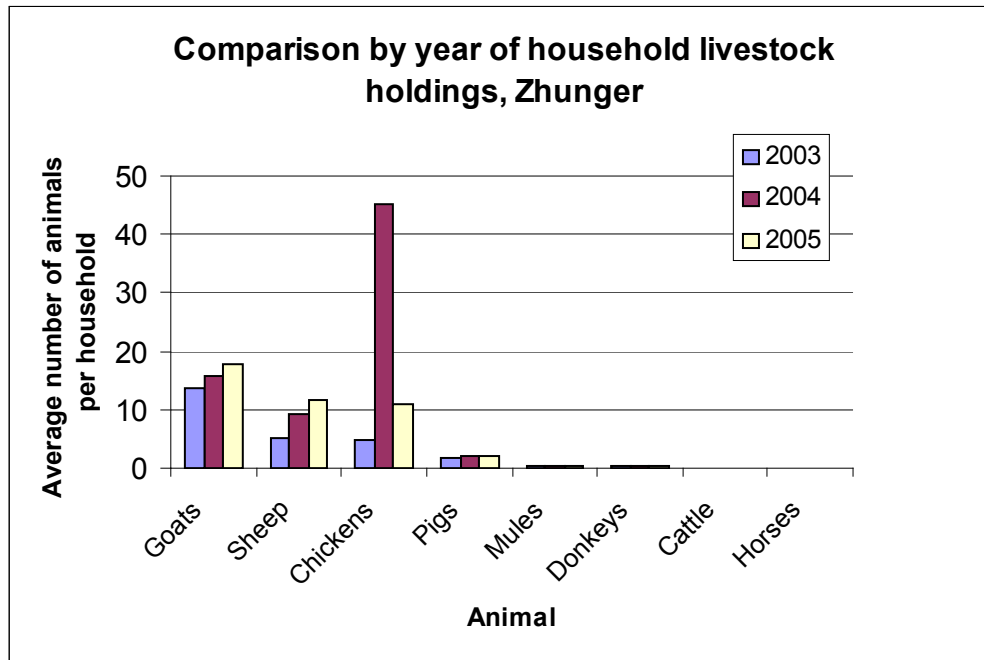
Dramatic acceptance of project initiatives were observed in the areas of crop residue composting, reduced tillage, crop diversity, improved varieties, improved seeds, reduced fertilizer and tree planting. These increases can be attributed to the WCAEV farmer-to-farmer trainings held on soil fertility, organic matter management and the success of the learning farms testing and assessing new and improved crop varieties.

**Question 19: What types of livestock do you raise? (Indicate number of each)**

This question was intended to provide information on the livestock resources of the sample populations as an indication of poverty and agricultural sustainability in the watershed. The breakdown of average number of animals per household is as below:

<b>Animals, Zhunger</b>	<b>Average number of animals per household, 2003</b>	<b>Average number of animals per household, 2004</b>	<b>Average number of animals per household, 2005</b>
Chickens	4.7	45.1	11.05
Goats	13.8	15.6	17.95
Sheep	5.2	9.4	11.8
Pigs	1.6	2.0	1.95
Mules	0.4	0.4	0.3
Donkeys	0.4	0.4	0.4
Cattle	0	0.0	0
Horses	0	0.0	0

On average, households in 2005 had chickens, sheep, goats, and occasionally pigs, mules and donkeys.



Livestock holdings of sheep and goats increased each year, on average. During this time the government had a program to reduce livestock numbers as a way to reduce the pressure of goat grazing on the sensitive landscape and to transition from grazing to confinement feeding. The project supported the farmers to improve fodder production through the production of improved alfalfa and corn silage. These factors may have enabled the farmers to increase their total carrying capacity.

The average number of pigs, mules and donkeys remained approximately constant and fairly low, with few households having an animal. A large peak in chicken holdings appeared in 2004 but then dropped again, a result of an experiment in larger-scale chicken farming by one local farmer.

**Question 20: What are your major sources of information for making decisions about management changes? (Mark with “✓”)**

This question was intended to provide information on information sources about management changes as an indication of education and community capacity building as well as to identify links and networks within and outside of the community. The breakdown of information sources available to farmers is as follows, listed from greatest to least:

Source of Information, Zhunger	Percentage of farmers who indicate this source of	Percentage of farmers who indicate this source of	Percentage of farmers who indicate this source of
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	information, 2003	information, 2004	information, 2005
Personal experience/observation	90	100	100
Training courses	85	100	100
Printed information	90	95	95
Government extension staff	90	80	80
Word of mouth from farmers	65	25	25
Farm Meetings	20	25	25
Company officials	5	0	0

In 2005, households saw their major sources of information as personal experience and observation, training courses, printed information and government extension staff. The percentage of farmers using training courses increased by 15%, while personal experience, printed information, and farm meetings all increased as information sources.

**Question 21: Overall what are your biggest information/training needs?**

This question was intended to provide information on the perception of priorities for agricultural development by the communities to ensure the project is adequately addressing local needs. The breakdown of interest in training and information needs is as follows, listed from greatest to least:

Training/info need, Zhunger	Percentage of farmers who indicate this need, 2003	Percentage of farmers who indicate this need, 2004	Percentage of farmers who indicate this need, 2005
Crop rotation planning	95	100	100
Farm Planning	95	100	100
New crops	95	100	100
Livestock production	90	100	100
Soil erosion control	90	100	100
Soil fertility Management	90	100	100
Pest and disease Management	85	100	100
Weed Management	85	100	100
Water impounding and irrigation	65	85	85
Marketing	65	15	15
Other	0	0	0

Farmers described themselves as interested in nearly all areas of training and information, with increasing interest since 2003.