Adoption challenges and potential beneficiaries of improved livestock management practices

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Overview:

- •Tibet Autonomous Region
- •ACIAR Project:
 - Socio-economic study goals
- Methodology
- Descriptive overview of surveyed households
- •Challenges to Agricultural Production/ Adoption of new technologies
- Potential adopters of new/recommended technologies
- Conclusion

Historical Tibet



http://news.bbc.co.uk/2/shared/spl/hi/guides/456900/456954/html/nn4page1.stm

Overview of Tibet Autonomous Region

Seven Prefectures:

Lake region & River Region

Climate & Rainfall:

Dry and Cold Climate Winter Avg min: -5°C to -10°C Avg max: 5°C to 10°C Summer Avg min: 5°C to 10°C Avg max: 20°C

400 - 440 mm per year



Overview of Tibet Autonomous Region

Population: 3,371,500 (2017)

- Rural Population: 69.11%
- Urban Population: 30.89%

Per capita income:

2000: 640 USD

2017: 5,497 USD

China: ~10,000 USD

| 2位: % | | | | | | | | |
|--------|-----------------------------|-------------------------|------|------|-------|-------|-------|--|
| 指 标 | Item | 1978 | 1994 | 2000 | 2010 | 2016 | 2017 | |
| 住人口 | Population | | | | | | | |
| 城乡 | Urban and Rural Composition | | | | | | | |
| 城镇 | Urban | 11.3 | 16.6 | 18.9 | 22.67 | 29.56 | 30.89 | |
| 乡村 | Rural | 88.7 | 83.4 | 81.1 | 77.33 | 70.44 | 69.11 | |
| 性别 | Sexual Composition | aliter a straight state | | | | | | |
| 男 | Male | 48.8 | 49.4 | 50.6 | 51.38 | 50.78 | 50.79 | |
| 4 | Female | 51.2 | 50.6 | 49.4 | 48.62 | 49.22 | 49.21 | |
| 也区生产总值 | Gross Domestic Product | | | | | | | |
| 第一产业 | Primary Industry | 50.7 | 46.0 | 30.9 | 13.5 | 10.0 | 9.4 | |
| 第二产业 | Secondary Industry | 27.7 | 17.1 | 23.2 | 32.3 | 37.3 | 39.1 | |
| 第三产业 | Tertiary Industry | 21.6 | 36.9 | 45.9 | 54.2 | 52.7 | 51.5 | |
| 就业 | Employment | | | | | | 0 | |
| 第一些业 | Primary Industry | 82.0 | 77.1 | 72.9 | 53.6 | 37.7 | 37.6 | |
| 第二产业 | Secondary Industry | 5.9 | 3.7 | 5.9 | 10.9 | 16.4 | 17.6 | |
| 第三产业 | Tertiary Industry | 12.1 | 19.2 | 21.2 | 35.5 | 45.9 | 44.7 | |

Agriculture in TAR

Cropping and agro-pastoral zones:

Intensive Cropping and Dairy production on the fertile valley floors and lower hill slopes, and extensive sheep production systems on marginal and pastoral areas.



Agriculture in TAR

Cropping:

- Cropping land is scarce. On average two to three mu per person (15 mu = 1 hectare)
- Cropping land usage: Spring Barley 50%, Winter wheat 20%, Oil seeds 10%, Pulses, vegetables, tubers and forages 15%.
- Irrigation infrastructure expansion (up to 70% of crop land)
- Ploughing traditionally by yaks, dzos, but two and four wheel tractors are quite prevalent.
- Most grain is for household consumption
- Reclaimed land

Agriculture in TAR

Dairy Cattle:

- Most important livestock; milk used primarily for butter (butter tea), meat, and as an 'asset bank'
- Two to six cattle tethered around the house
- 30% are improved cross between local cattle and Jersey or Holstein.
- Primarily fed cereal straw, but supplemented with weeds, grain, oil seed meal, brewer's waste, etc.
- Allowed to browse cereal stubble and weeds post harvest.
- · Low productivity primarily due to inadequate nutrition
- Calving in the spring coincides with periods of largest feed gap

Sheep:

- Over half of farm households keep sheep (between 5 and 20, but can be much larger)
- Grazed on communal grasslands; grazed together to save labour
- Kept in lower areas over winter and compete with cattle for resources

Government Policies:

- Initial periods of stagnation
- China's strategy for reducing inequality and diffusing political tensions: economic development and modernization
- 'Open the West Campaign'
- Most investment in urban services and construction with agriculture and livestock mostly neglected
- 'People first Approach'
 - Comfortable Housing Program
- More recently agriculture (particularly livestock) has made it back on the agenda
 - Having met earlier targets related to self-sufficiency in grain production
- Sustained investments have created plenty of off-farm employment opportunities which contribute significantly to overall household incomes.

ACIAR Project: Developing profitable dairy and sheep meat production systems in central Tibet - China

Aim and objectives

The overarching aim of this project is to improve the livelihoods of smallholder livestock farmers in the cropping and agro-pastoral areas of central Tibet by increasing dairy and sheep meat production.

Objective 1. Increase the quality and year-round availability of feed available for livestock.

Objective 2. Produce recommendations on nutrition requirements and genetic suitability of local and improved livestock breeds for dairy and meat production.

Objective 3. Evaluate the potential economic impacts and risks of proposed changes to farming systems.

Objective 4. Identify potential pathways to adoption.

Methodology: Planning and Preparation of Household Surveys

April 2017/ November 2017/ May 2018: Focus group discussions and household interviews



Sample sites for household surveys



Data Collection:







Sample Design

A representative sample of mixed farming systems in the central river valleys of Tibet

Stratified random sampling:

| Sheep Equivalents | Strata |
|-------------------|---------|
| Less than 20 | Dropped |
| Between 20 and 40 | Small |
| Between 40 and 80 | Medium |
| Over 80 | Large |

| Livestock Type | Sheep Equivalents | | | | |
|--------------------------------|-------------------|--|--|--|--|
| Horse | 6 | | | | |
| Cattle/ Yak/ Dzo | 5 | | | | |
| Donkey/ Mule | 3 | | | | |
| Sheep | 1 | | | | |
| Goat | 0.8 | | | | |
| Note: Young animals worth half | | | | | |

Total Sample size: 24 households in each village \rightarrow 144 households

Characteristics of Respondents/households:

•Two thirds were household heads

- •One third were women
- •Average Age of Respondent: ~ 49 years
- •Farm work involvement: Full time: 36%, Part time: 61%, None: 3%
- •Off-farm employment: 38%
 - 82% of households (60% Construction)
- •Average Household size: 4.8 individuals
- •Average farm labour availability: 2.8 full time workers
 - (Assuming 2 part time workers to be equivalent to 1 full time worker)



Farm Characteristics by County:

Average privately accessible land area (average): 18 mu

Land Quality based upon: Remoteness, ability of irrigate, fertility , amount of stones/ rocks on the field



Cropping land use by County



| County | Accessible Pasture Area |
|----------|----------------------------|
| Qonggyai | 295 |
| Nagarze | 1,125 |
| Gyangze | 443 |
| Average | 621 |

Livestock ownership by County

| County | Livestock Units | improved cows | local cows | dzo | yak | sheep | goats | horse | chickens |
|----------|--------------------|------------------|---------------|-----|-----|-------|-------|-------|----------|
| Qonggyai | 33.9 | 1.7 | 1.7 | 0.1 | 0.3 | 11.7 | 3.4 | 0.3 | 2.1 |
| Nagarze | 61.4 | 1.2 | 3.6 | 0 | 1.2 | 29.1 | 3.1 | 0.7 | 0 |
| Gyangze | 97.1 | 1.4 | 5.3 | 1.1 | 0 | 42.1 | 7.7 | 1.4 | 3.8 |
| Average | 64.2 | 1.4 | 3.5 | 0.4 | 0.5 | 27.6 | 4.8 | 0.8 | 2 |

Challenges to Agricultural Production

- Farm Labour Scarcity
- Future of the farm:
 - Heir to the farm

| No | Please rate on a scale of 1-5 where 1 indicates that you | Strongly | Dicagroo | Neither Agree nor | Agroo | Strongly |
|----|---|----------|----------|-------------------|-------|----------|
| | strongly disagree and 5 indicates that you strongly agree. | Disagree | Disaglee | Disagree | Agree | Agree |
| 1 | I am very interested in increasing the overall agricultural | 1 | 2 | 2 | Λ | E |
| | production from my farm | L T | 2 | د ١ | 4 | 5 |



Mean = 3.78;

Std. Dev. = 1.11





Mean = 3.51; Std. Dev. = 1.12

Overall labour was hired by almost 55% of households in the previous year.

Daily wage rates have increased from between 50-60 RMB per day in 2012 to an average of 160 RMB (ranging between 100 and 300 RMB)





Mean = 3.53; Std.

Std. Dev. = 1.14

Future of the Farm:

Mean = 3.70; Std. Dev. = 1.07

Heir to the Farm:

Future of the Farm:

Mean = 24.3; Std. Dev. = 9.6

Potential challenges to adopting new technologies

- •Lack of Autonomy:
 - Fencing
- •Religion:

Lack of Autonomy

Mean = 3.11; Std. Dev. = 1.31

Lack of Autonomy:

Independent vs. Collective work related to cultivation practices

Preferences related to fodder production vary: Where to grow, annual vs. perennial, cut and carry vs. grazing, etc.

Lack of Fencing:

- Fences around privately accessible lands are non-existent
- Reluctance and inability to fence
- Vetch (annual) can be grown with existing system, but perennial forage species require fencing

No Fence alternatives:

- Restrict post harvest grazing practices
- Only plant annual forages with similar cultivation timing/methods

Culture and Religion

- Strong influence of Tibetan Buddhism on all aspects of life
- Key teachings 'Do not kill'
- Meat is a big part of Tibetan diets
- Slaughtering animals for meat consumption is controversial
- Is meat eating justified in Tibet?
- Muslim traders belonging to the Hui ethnic group involved in meat trade.
- Type of animal/meat selection is on religious grounds
 - Size of Animal
 - Age of Animal
- Drain on resources?

Culture and Religion

Average age of male cattle when they are sold: 5.0 Years

| County | Average Age |
|----------|-------------|
| Qonggyai | 4.51 |
| Nagarze | 5.50 |
| Gyangze | 5.40 |
| Average | 5.00 |

If improved breeds and/or better management practices led to faster growth rates that allowed male cows to reach their maximum size/weight earlier, would you be willing to sell them at <u>an earlier age</u>?

Challenges: Culture and Religion

Average age of sheep when they are sold: 4.67 Years

| County | Average Age |
|----------|-------------|
| Qonggyai | 4.31 |
| Nagarze | 4.90 |
| Gyangze | 5.27 |
| Average | 4.67 |

If improved breeds and/or better management practices led to faster growth rates that allowed sheep to reach their maximum size/weight earlier, would you be willing to sell them at <u>an earlier age</u>?

Preliminary Results of Sheep Experiments

Pengbo semi fine

Suffolk cross

Live weight gain: Kilograms per day

Sheep: Specific Challenges

| No. | Specific Challenges Related to Sheep Production | Mean | Std. Dev |
|-----|---|-------|----------|
| 1 | Increase in the number of wild dogs killing sheep | 3.871 | 1.010 |
| 2 | Poor health of sheep resulting from parasites and diseases | 3.870 | 1.093 |
| 3 | The lack of improved sheep breeds | 3.697 | 0.989 |
| 4 | The lack of sufficient amount of feed | 3.623 | 1.135 |
| 5 | The lack of adequate levels of nutrition in the available feed | 3.619 | 1.086 |
| 6 | Government regulations related to restrictions on sheep numbers | 3.511 | 1.200 |

https://www.amazing-world-in-free-stock-pictures-and-photos.com/free-yaks-tibet-animals-pictures.html

Potential adopters of new/recommended technologies

Dependent Variable:

A measure of general openness and inclination towards technology adoption

| Please rate on a scale of 1-5 where 1 indicates that you strongly disagree and 5 indicates that you strongly agree (<i>Please circle only one of the</i> <i>numbers</i>) | Strongly Disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree | Not Applicable |
|---|----------------------|----------|-------------------------------|-------|----------------|----------------|
| It is important to engage in modern agriculture even if it means letting go of traditional practices | 1 | 2 | 3 | 4 | 5 | 99 |
| I like to be one of the first in my village to try new farming methods | 1 | 2 | 3 | 4 | 5 | 99 |

| Variables Definition | | Obs. | Mean | Std. Dev. | Min | Max |
|------------------------|--|------|--------|-----------|-------|-------|
| Dependent Variable | • | | | | | |
| Adopt Ag Tech | Factor variable measuring the degree to which farmers are receptive to modern agricultural technology adoption | 139 | 0.00 | 1.00 | -3.78 | 0.84 |
| Independent Variables | • | | | | | |
| Age | Age of respondent in years | 144 | 48.81 | 11.61 | 20 | 74 |
| Female | 1, if respondent is a woman; Otherwise, 0 | 144 | 0.35 | 0.48 | 0 | 1 |
| Education Zero | 1, if respondent has had no formal education; 0 otherwise | 131 | 0.15 | 0.36 | 0 | 1 |
| Education 1-3 | 1, if respondent has had between 1 and 3 years of formal education; 0 otherwise | 131 | 0.28 | 0.45 | 0 | 1 |
| Land Area | Area of privately accessible land in mu | 144 | 18.22 | 20.13 | 1.53 | 98.13 |
| Pasture Area | Area of designated pasture area in mu | 135 | 609.74 | 461.70 | 0.5 | 2755 |
| Livestock Units | Total number of animals measured by livestock units (horse = 6 units, local and improved cattle, dzo, and yak = 5 units, sheep = 1 unit, and goat = 0.8 units) | 144 | 64.17 | 38.09 | 10.6 | 216.6 |
| Farm Labour | Total farm labour available within the household (involvement with farm work full time $= 1$ and part-time involvement $= 0.5$) | 144 | 2.77 | 1.30 | 0.5 | 9 |
| Nagarze | 1, if county = Nagarze; 0 otherwise | 144 | 0.33 | 0.47 | 0 | 1 |
| Gyangze | 1, if county = Gyanze; 0 otherwise | 144 | 0.33 | 0.47 | 0 | 1 |
| Farmer Group | 1, if any household member is associated with any farmer group or agricultural organization; 0 otherwise | 142 | 0.31 | 0.46 | 0 | 1 |
| Off Farm Work | 1, if respondent is involved in off-farm work; 0 otherwise | 143 | 0.38 | 0.49 | 0 | 1 |
| Full Time Farmer | 1, if respondent is a full-time farm worker; 0 otherwise | 144 | 0.36 | 0.48 | 0 | 1 |
| Heir to Farm | 1, if household has a nominated heir to the farm; 0 otherwise | 142 | 0.80 | 0.40 | 0 | 1 |
| Reduce Labour Priority | 1, if rating on the Likert scale was greater than three for the statement "In my farm reducing the amount of labour is more important than increasing production" where 1 indicated 'Strongly Disagree' and 5 indicated 'Strongly Agree' | 141 | 0.63 | 0.48 | 0 | 1 |
| Increase Ag Production | 1, if rating on the Likert scale was greater than four for the statement "I am very interested in increasing the overall agricultural production from my farm" where 1 indicated 'Strongly Disagree' and 5 indicated 'Strongly Agree'; 0 otherwise | 142 | 0.30 | 0.46 | 0 | 1 |
| Higher Ag Prices | 1, if rating on the Likert scale was greater than four for the statement "I believe prices of agricultural products will keep increasing steadily into the future" where 1 indicated 'Strongly Disagree' and 5 indicated 'Strongly Agree'; 0 otherwise | 136 | 0.45 | 0.50 | 0 | 1 |

Linear Regression using Ordinary Least Squares

Dependent Variable: Adopt Ag Tech

| Independent Variables | Coefficients (Standard Deviation) |
|------------------------|-----------------------------------|
| Age | -0.025** (0.01) |
| Female | -0.026 (0.26) |
| Education Zero | 0.876** (0.37) |
| Education 1-3 | -0.160 (0.25) |
| Land Area | -0.007 (0.01) |
| Pasture Area | 0.000 (0.00) |
| Livestock Units | 0.002 (0.00) |
| Total Farm Labour | 0.153 (0.11) |
| Nagarze | 0.433 (0.49) |
| Gyanze | 0.147 (0.37) |
| Farmer Group | -0.138 (0.27) |
| Off Farm Work | -0.121 (0.27) |
| Full Time Farmer | -0.102 (0.25) |
| Heir to Farm | 1.080*** (0.32) |
| Reduce Labour Priority | -0.450** (0.22) |
| Increase Ag Production | 0.428* (0.24) |
| Higher Ag Prices | 0.510** (0.22) |
| Constant | -0.337 (0.66) |
| Observations | 108 |
| F(17,90) | 2.19 |
| Prob > F | 0.0057 |
| R-squared | 0.3048 |
| Adj R-squared | 0.1734 |

Conclusions:

- Attitudes and goals related to agricultural production vary.
 - Increasing agricultural production not necessarily the main goal for all households
- The continuation of the farm by the future generation is a key predictor of new technology uptake.
- Plans to boost (livestock) production should not be labour intensive
- Traditional/Collective agricultural practices mean alternative methods should fit into existing systems or planning/dissemination of new methods should be at a wider scale
- Religion still plays a dominant role and needs to be taken into account; although attitudes and priorities are changing