

# Characterize small-scale irrigation schemes in Northern Ethiopia based on socioeconomic, technical, and institutional aspects

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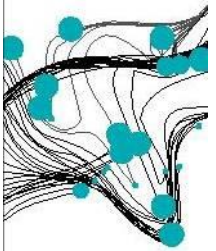
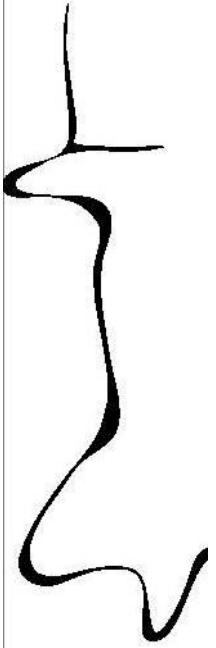
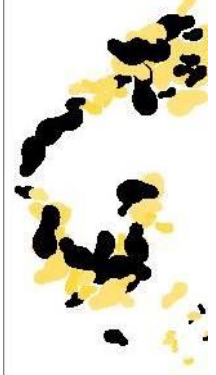
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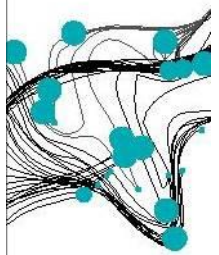
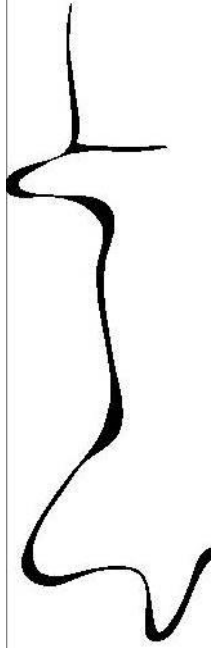
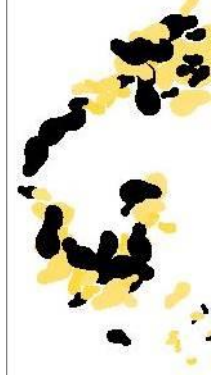
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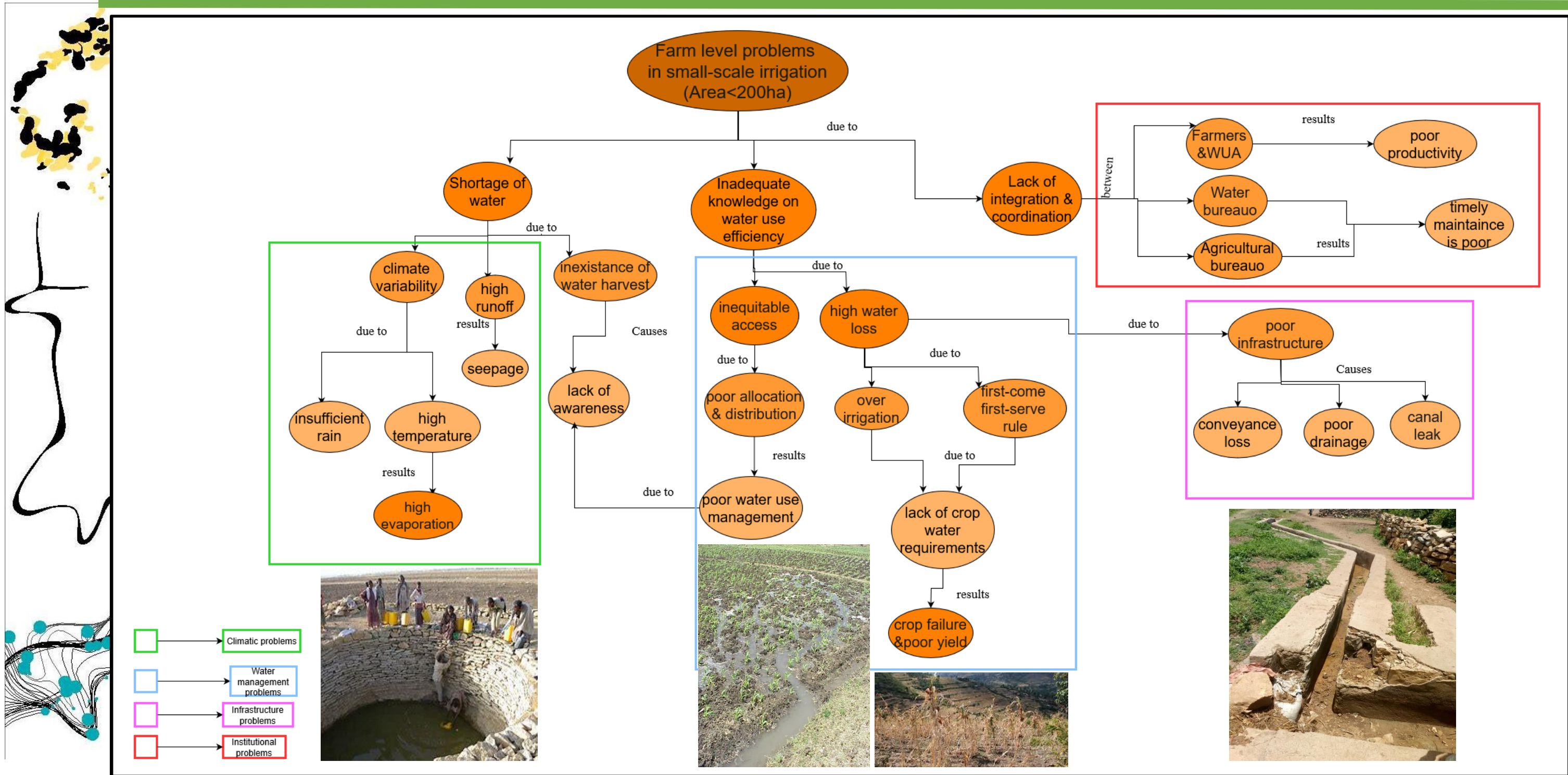
# *Introduction*

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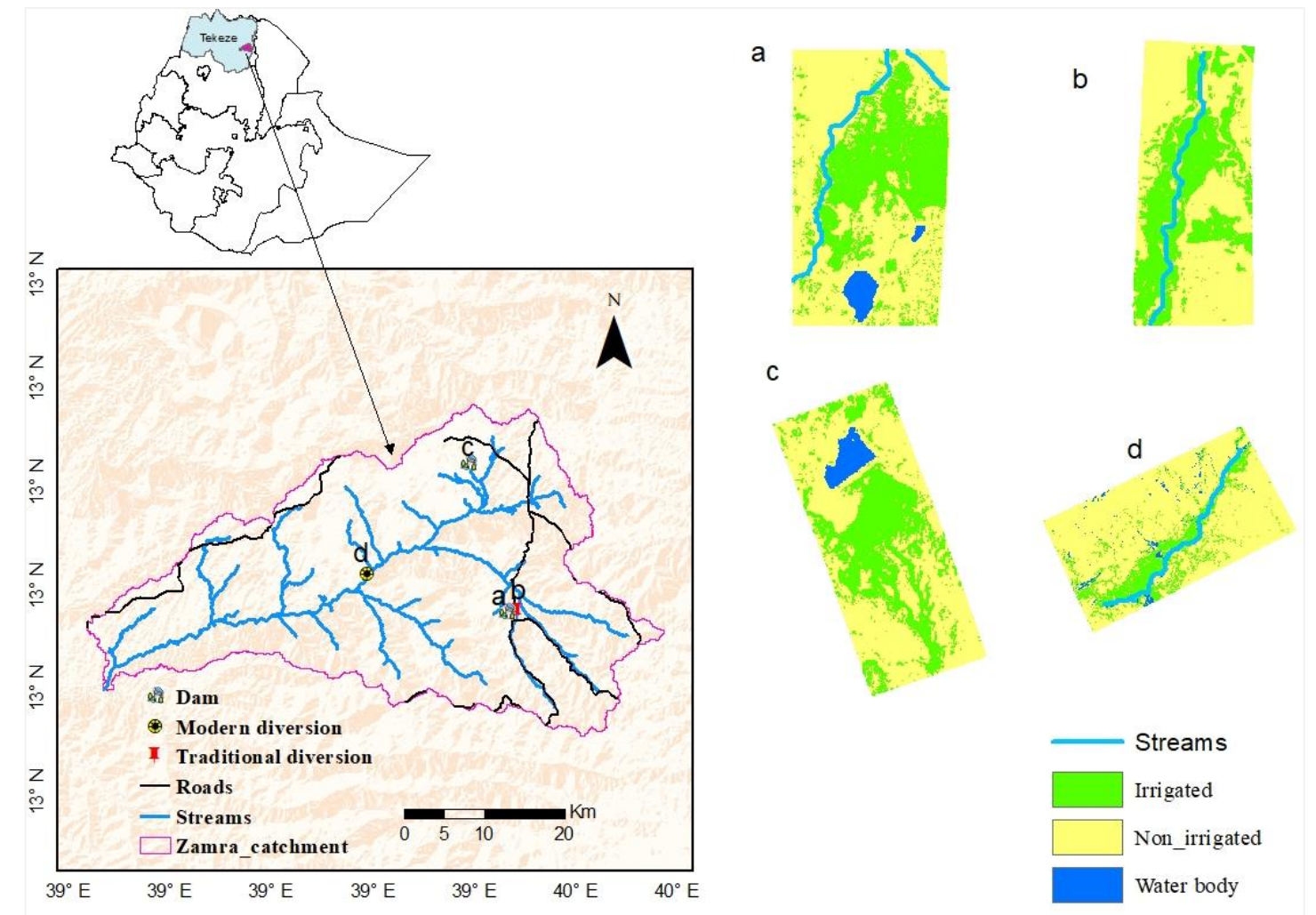
- Irrigation is vital for realizing the full potential of the agricultural sector and is an important means for achieving food security
- In order to maximize the benefits of irrigation, situational analysis is important
- Limited studies in arid and semi-arid parts of Ethiopia that characterize existing irrigation developments from multi-dimensional perspectives

# Problem analysis



# Methodology

- The study area was conducted in the Zamra catchment, which is a tributary of the Tekeze sub-basin
- The catchment has an area of 1588 km<sup>2</sup>
- Located latitudes 12.966<sup>0</sup>N and 13.331<sup>0</sup>N and longitudes 39.003<sup>0</sup>E and 39.668<sup>0</sup>E



Location of the study area: (a) Shilanat-2 dam, (b) Gerebehiwane traditional diversion, (c) Adibashye dam, and (d) Gojibere modern diversion

# Methodology

- Quantitative and qualitative research approaches were used
- A stratified sampling approach was used to select a sample population in which random sampling was used for actual sample points
- The sample survey was grouped into three categories based on the source of water they utilize for irrigation



Traditional diversion (TRD)



Dam

Modern diversion

# Methodology

- Structured questionnaires were prepared for each group
- 242 respondents were selected for all types of irrigation schemes using a proportional method
- These were Dam (89), Modern diversion (120) and Traditional diversion (33)



# Methodology

- Focus group discussions (FGDs) with elders, the irrigation committee and water distributors were held to verify ambiguous issues related to irrigation water use management
- Women-led household discussions with 13 women-led households were held to assess any issues related to irrigation water use management





# Methodology

Key informant's interview (KII) took place in two selected Districts, including Kebele experts and three regional level Bureaus:

- Bureau of Water Resources (BoWR)
- Bureau of Agriculture and Rural Development (BoARD)
- Tigray Agricultural Research Institute (TARI)



Non-governmental organizations:

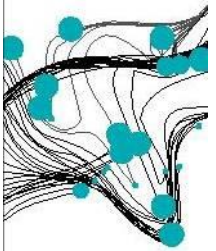
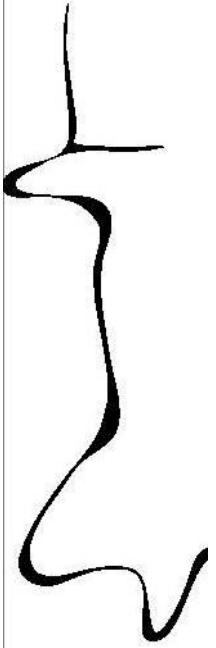
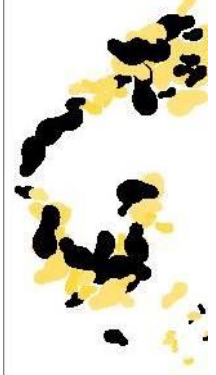
- Agricultural Transformation Agency (ATA)
- Small Scale Micro Irrigation Support Project (SMIS)
- German Society for International Cooperation (GIZ)
- International Fund for Agricultural Development (IFAD)



# Methodology

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- Descriptive statistical methods such as arithmetic means and percentages were used to describe and examine the respondents' socioeconomic characteristics
- The One-way ANOVA was used to show the significant difference between irrigation schemes on farmer's income
- Analyzed using Statistical Package for Social Sciences (SPSS 20) software
- Data generated from the KII and FGDs were analysed using a thematic analysis



# Methodology

Table 1: The synthesis of the study variables and measurement indicators

	Variables	Indicator
	Demographic	Age and gender
Household & Institution	House hold resources	Land access, size of irrigated area and irrigation experience
	Participation in extension	Participate in demonstrations, access to extension and credit services, receiving information related to irrigation and participation in the credit & saving association.
	Irrigation method	Furrow and Flooding
	Access to irrigation	Access to irrigation water, availability of irrigation water, flexibility in irrigation based on crop type and sufficient water for crops.
	To start and stop irrigation	To start, irrigation is determined by water use association, when the soil looks a bit dry and when the plants look dry. However, to stop irrigation when the whole field is completely flooded, based on past experience & if the water user group leader cuts off my water.
Factors	To select crop type	Irrigation water availability, inputs availability, marketability, food value, customs and traditions.
	Irrigation water sources	Quantity, distance to source of water, lack of spare parts, canal problem, siltation, lack of maintenance & canal problem.
	Production	Natural factors, input shortage, use of low level technology, pests and disease and shortage of water.
	Marketing	Price fluctuation, transport problems & distance to market
Challenges	On all irrigation schemes	Shortage of irrigable land, shortage of water for irrigation, wastage of irrigation water, shortage of improved seed, shortage of fertilizer, shortage of chemicals and high post-harvest loss.
Outcome	Irrigation production	Own production (quintal), income (birr) and average yield (Kg/ha).
	Major opportunities	Food self-sufficiency, teaching their children, building a house, and purchasing an ox, a cow, a donkey, and a solar panel.

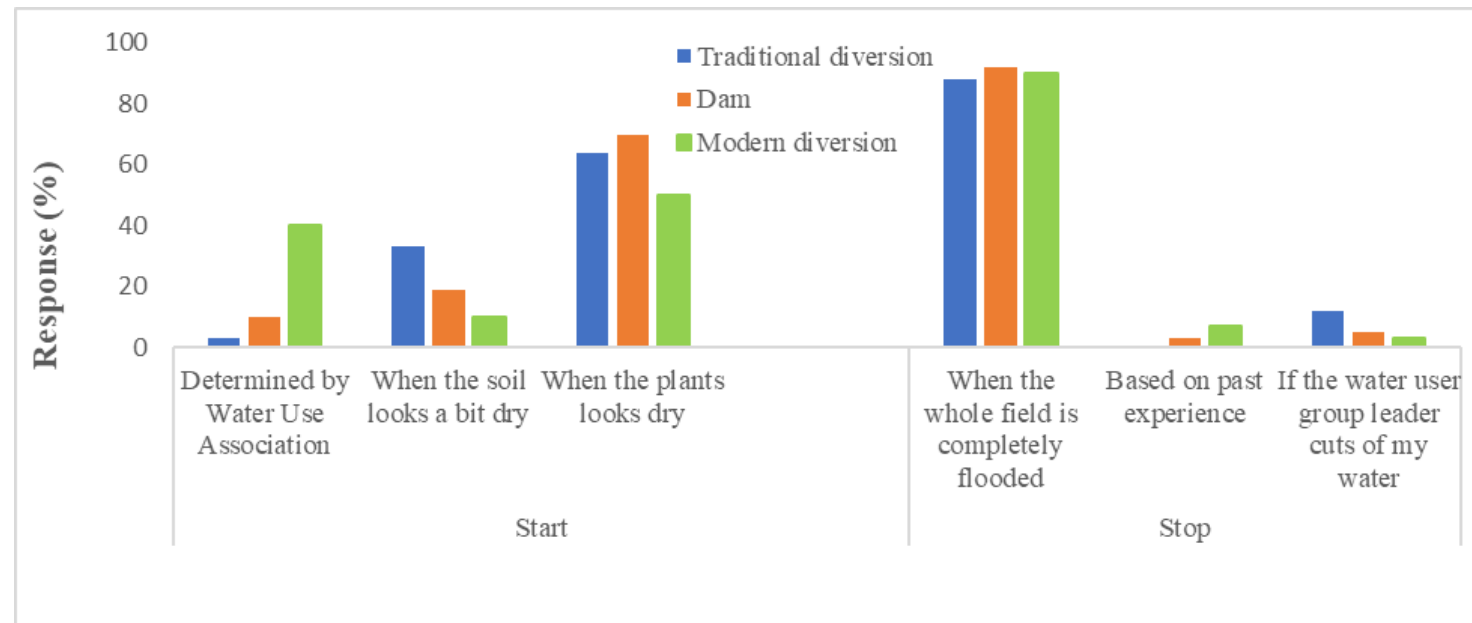
# Results

Table 2: Presents the characteristics of the sample households

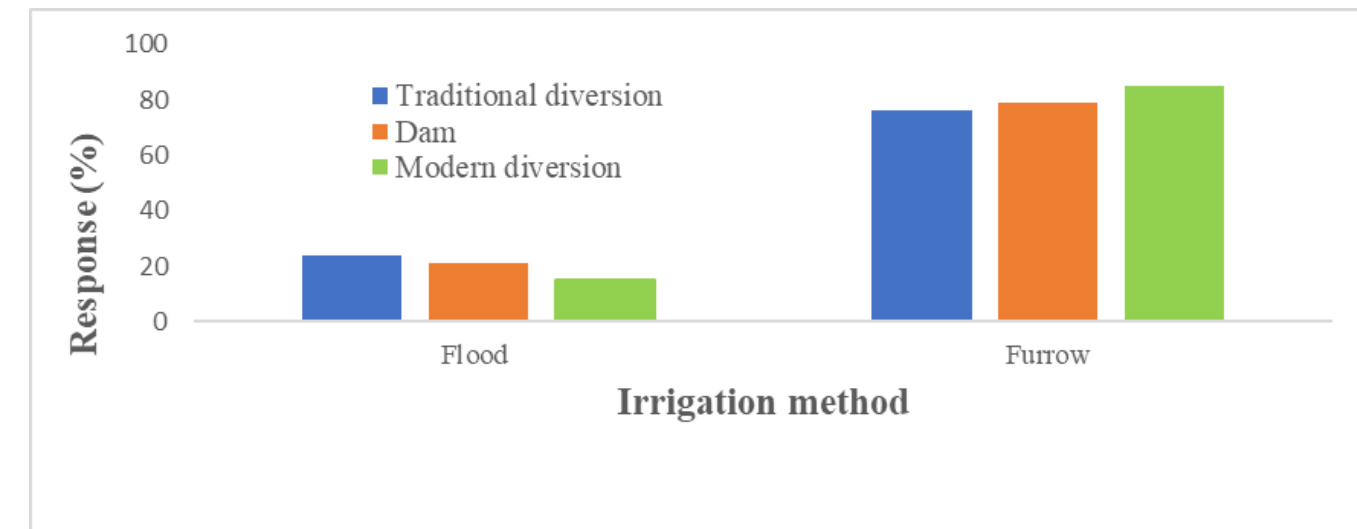
Household characteristics		Major source of water		
		Traditional diversion (n=33) Mean	Dam (n=89) Mean	Modern diversion (n=120) Mean
Demography	Age of the household	51.33	48.00	49.53
	Family size	5.52	5.97	5.82
	Irrigation experience (year)	21.61	15.19	19.33
Irrigation production	Total irrigated area (ha)	0.3598	0.3425	0.2566
	Own production (quintal)	21.45	18.92	10.95
	Income (birr)	17475.75	19582.02	12923.33
	Expenditure (birr)	3830.30	3950.67	2258.08
Gender		Frequency (%)	Frequency (%)	Frequency (%)
	Male	29 (88%)	78 (88%)	102 (85%)
	Female	4 (12%)	11 (12%)	18 (15%)
Literacy status	Literate	21 (64%)	50 (56%)	66 (55%)
	Illiterate	12 (36%)	39 (44%)	54 (45%)
Land access	Own	26 (79%)	64 (72%)	114 (95%)
	Shared	7 (21%)	11 (12%)	1 (1%)
	Rented		2 (2%)	
	Own and shared		12 (13%)	5 (4%)
Crops grow in irrigation season	Cereals	10 (30%)	67 (75%)	15 (12%)
	Vegetables	11 (33.5%)	11 (12.5%)	27 (23%)
	Cereals and vegetables	12 (36.5%)	11 (12.5%)	78 (65%)

# Results

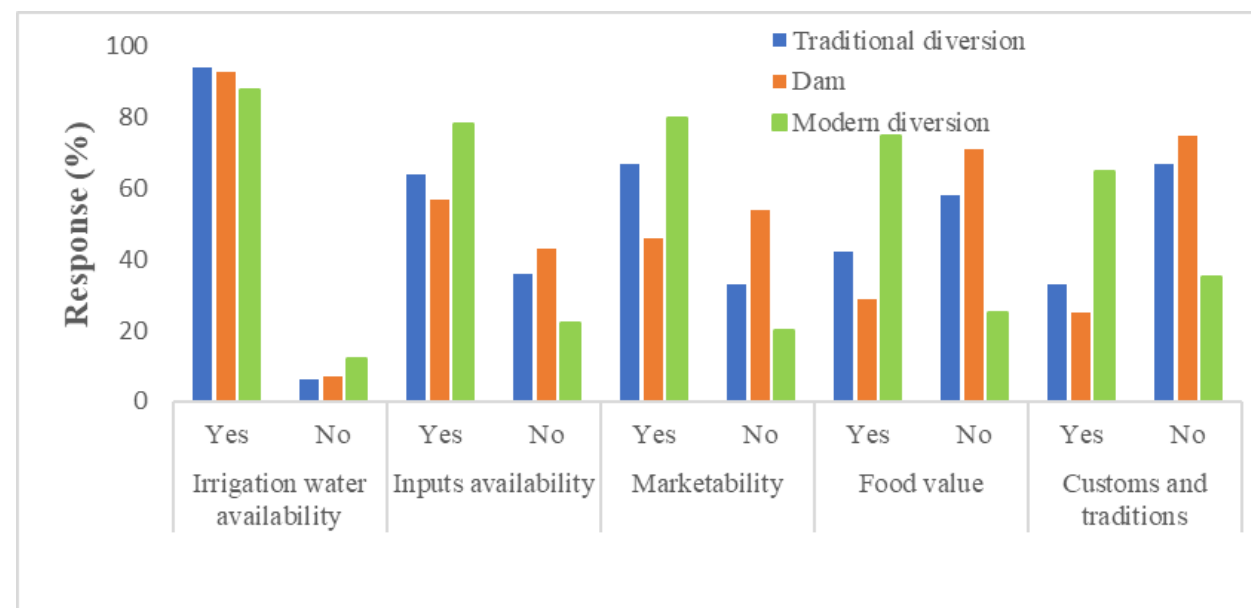
## Factors Affecting Start and Stop Irrigation



The irrigation method commonly practiced in all irrigation schemes is furrow



## Factors that consider to decide on the type of crop plant/ grow on irrigated field



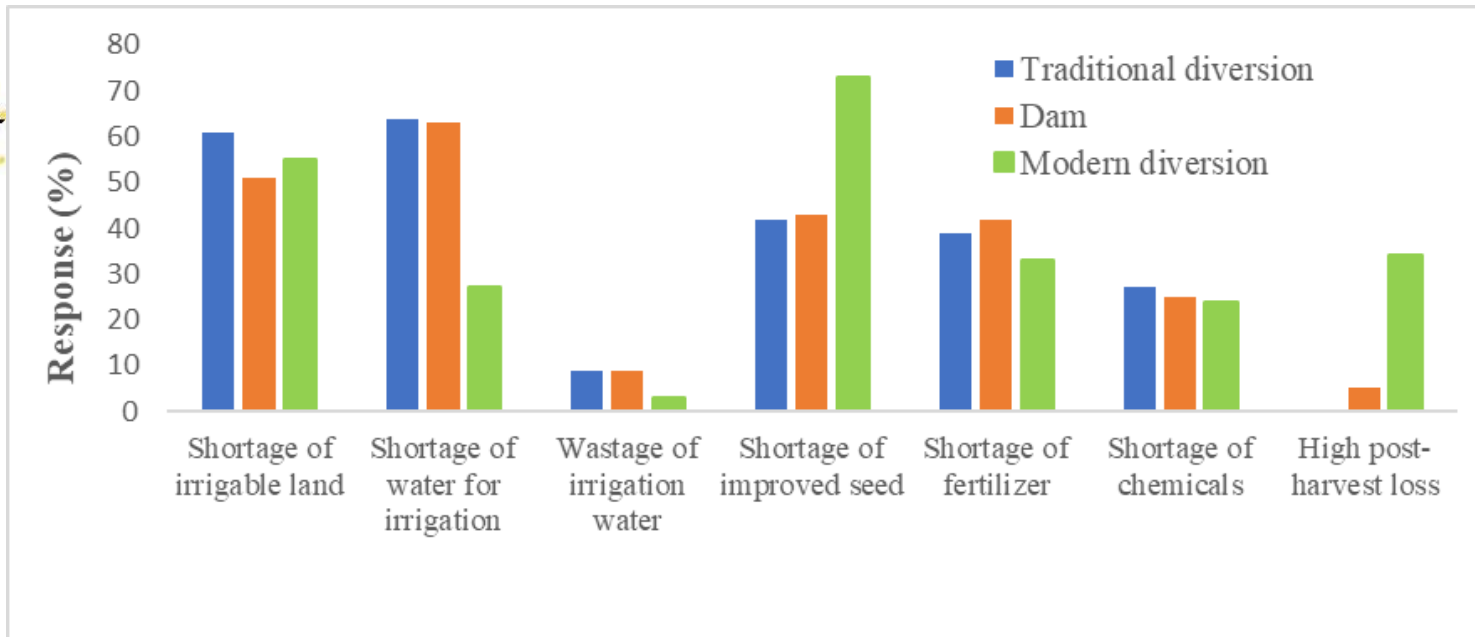
# Results

Table 3: Access to irrigation water and extension services

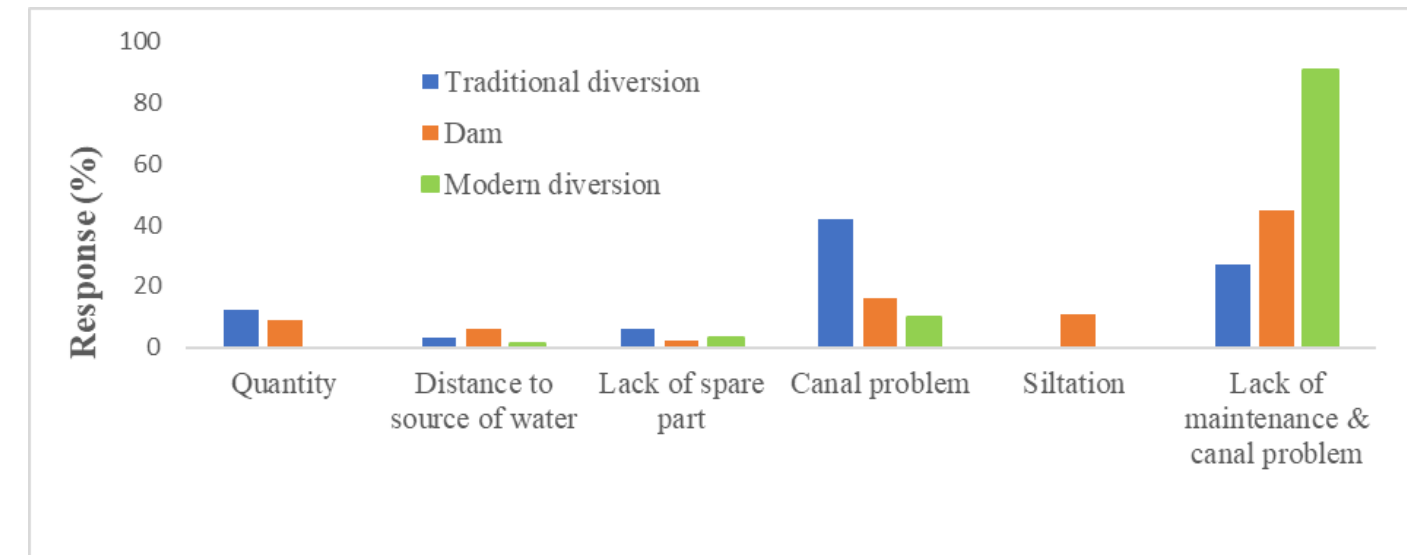
Access to irrigation water and extension services		Major source of water			
		Traditional diversion	Dam	Modern diversion	
		Frequency (%)	Frequency (%)	Frequency (%)	
	On a rotation base	32 (97%)	89 (100%)	118 (98%)	
	On a continuous base			2 (2%)	
	On demand base	1 (3%)			
Access to irrigation water	Availability of	Yes	26 (79%)	46 (52%)	90 (75%)
		No	7 (21%)	43 (48%)	30 (25%)
	Irrigation timing flexibility on crop type	Yes	24 (73%)	39 (44%)	56 (47%)
		No	9 (27%)	50 (56%)	64 (53%)
	Sufficient water for crops as you wish	Yes	27 (82%)	58 (65%)	99 (82%)
		No	6 (18%)	31 (35%)	21 (18%)
Participation in agricultural extension and credit service	Participate in demonstration	Yes	21 (64%)	47 (53%)	54 (45%)
		No	12 (36%)	42 (47%)	66 (55%)
	Access to extension service	Yes	32 (97%)	89 (100%)	121 (97%)
		No	1 (3%)		1 (1%)
		Yes	15 (45%)	57 (64%)	63 (52%)
		No	18 (55%)	32 (36%)	57 (48%)
	Access to credit	Daily	1 (3%)		2 (2%)
		Weekly	11 (33%)	28 (31%)	26 (22%)
	Frequency of advisory service received	Bi-weekly	6 (18%)	19 (21%)	26 (22%)
		Monthly	6 (18%)	31 (36%)	59 (49%)
		Unconditional	9 (27%)	11 (12%)	7 (5%)
	Participation in credit & saving association	Yes	16 (48%)	56 (63%)	60 (50%)
		No	17 (52%)	33 (37%)	60 (50%)

# Results

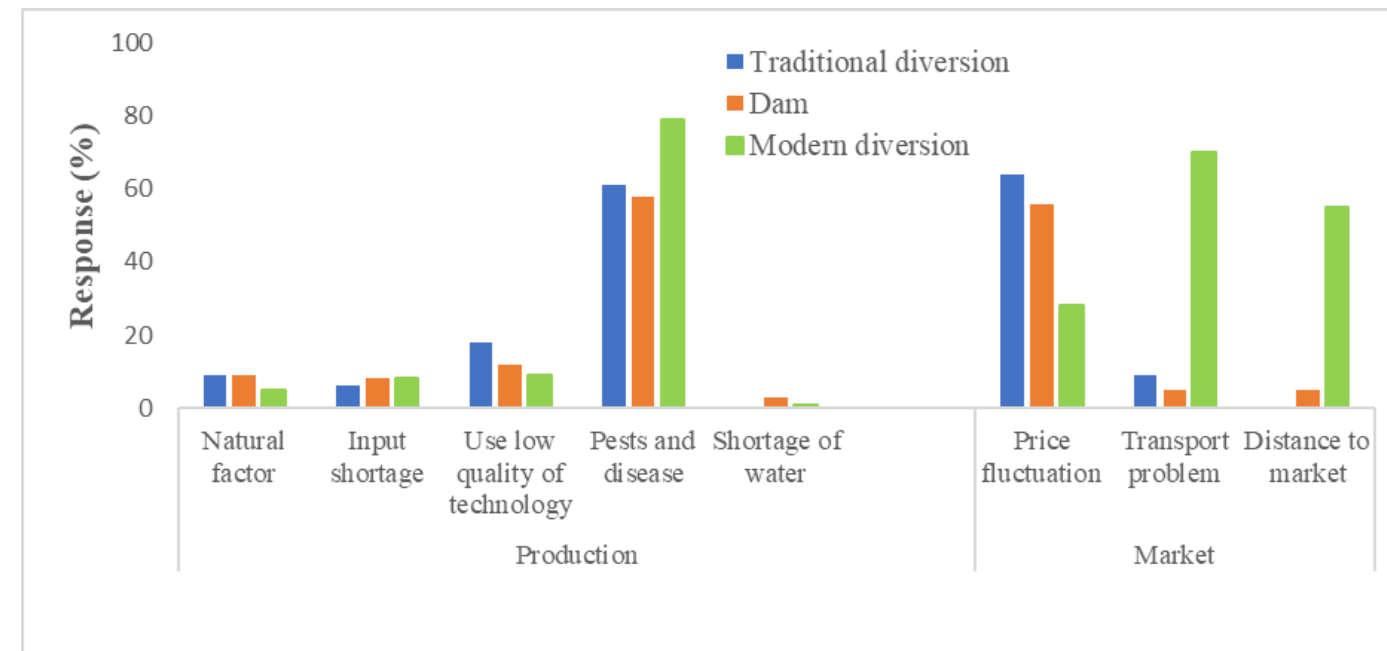
## Major Challenges of the Irrigation Schemes



## Challenge of the Water Source



## Challenges of Production and Marketing



# Results

Table 4: Mean difference between irrigation schemes on farmers income

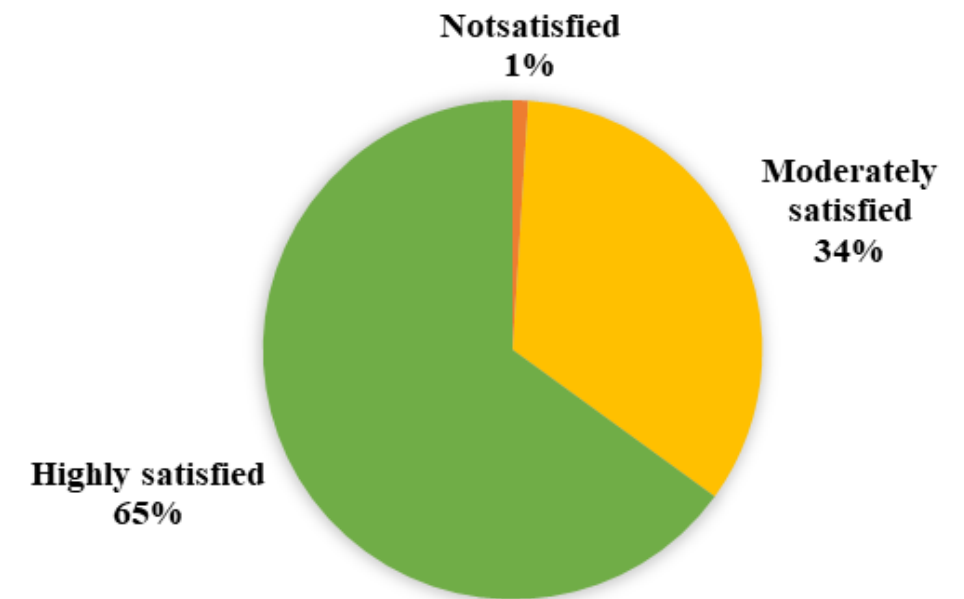
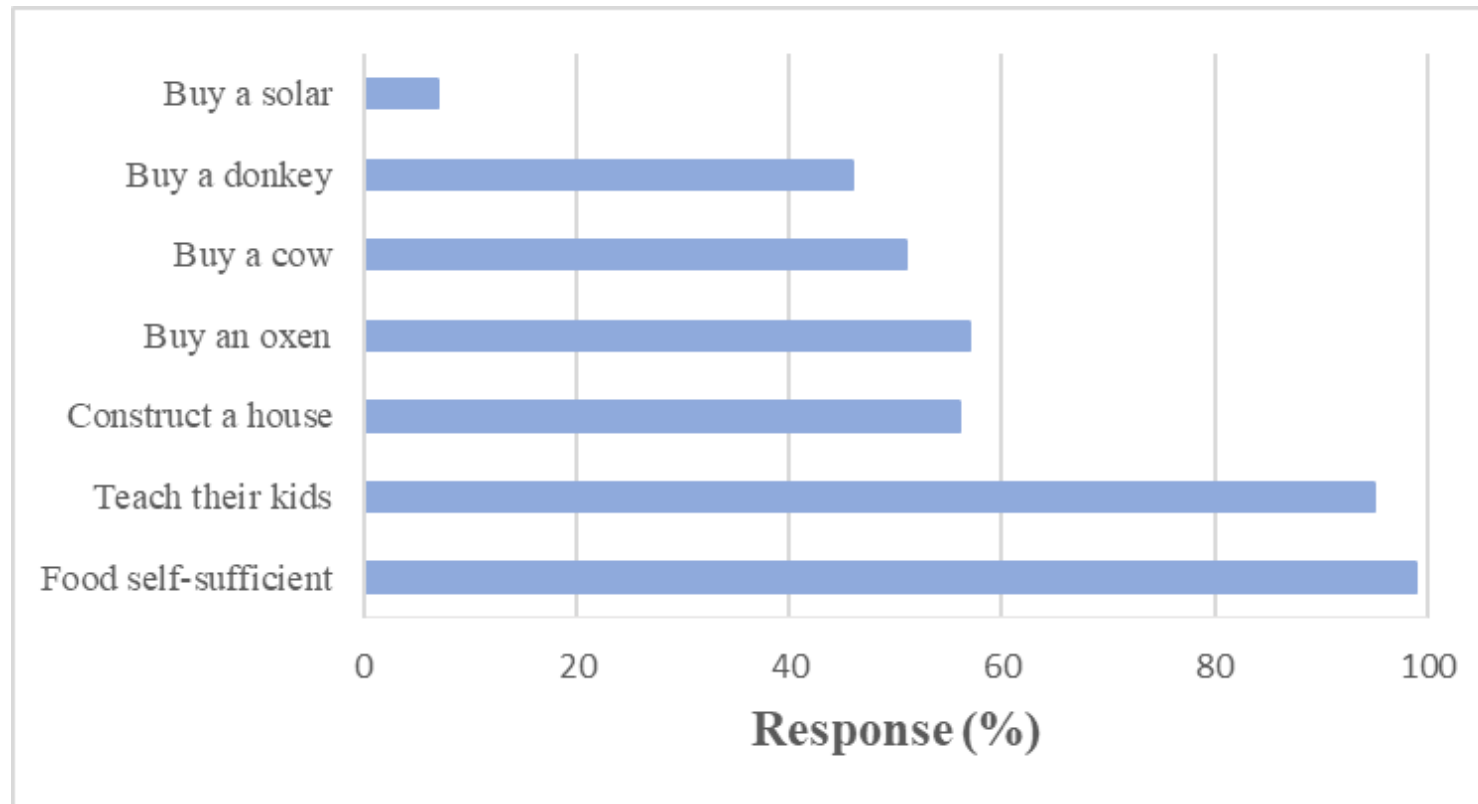
(I) What are the major sources of irrigation water at the irrigation farm?	(J) What are the major sources of irrigation water at the irrigation farm?	Mean Difference (I-J)	Sig.	95% Confidence Interval	
				Lower Bound	Upper Bound
<b>Traditional Diversion</b>	Modern Diversion	4552.42424	.201	-1699.7128	10804.5613
	Dam	-2106.26490	.724	-8589.0005	4376.4707
<b>Modern Diversion</b>	Traditional Diversion	-4552.42424	.201	-10804.5613	1699.7128
	Dam	-6658.68914*	.001***	-11108.2575	-2209.1208
<b>Dam</b>	Traditional Diversion	2106.26490	.724	-4376.4707	8589.0005
	Modern Diversion	6658.68914*	.001***	2209.1208	11108.2575

- There is a significant difference in farmers' income between modern diversion and dam
- However, there is no significant difference between dam and traditional diversion, and modern diversion and traditional diversion



# Results

Irrigation major opportunities of all irrigation schemes

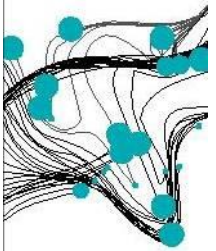
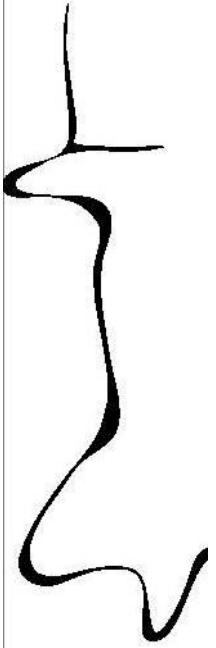
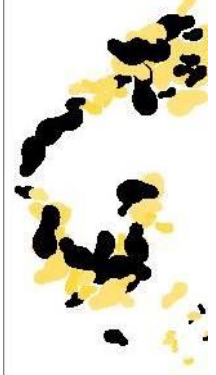


Satisfaction level of farmer's participation in irrigation

# Conclusions

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- Integrating the socio-economic, technical, and institutional perspectives is important to characterize the irrigation schemes
- Alternative mechanisms must be put in place to update scientific technologies in relation to water irrigation management
- Instruments which help to improve irrigation water use efficiency in small-scale irrigation schemes
- As a participant in one the FGDs said, “Even if you don’t produce the crop yourself, it is easy to get goods locally all the time and at reasonable prices”. (45-year-old male farmer in Adibashay irrigation scheme)





**Thank you**

