

**Smart Water for Agriculture Project**

**Baseline Survey Report**

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**Prepared For:**

**Smart Water for Agriculture**

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# List of Acronyms

AFK Amiran Farmers Kit

ASDSP Agricultural Sector Development Support Programme

ATC Agricultural Training Centres

CDF Constituency Development Fund

CIDP County Integrated Development Plan

FAO Food Agricultural Organisation

GPS Global Position System data

KIHBS Kenya Integrated Household Budget Survey

KPHC Kenya Population and Housing Census

KARLO Kenya Agricultural Research and Livestock Organisation

MFIs Micro-finance Institutions

ROSCA Rotating Savings and Credit Association

SME Small and Medium Entrepreneurial Farmer

SPSS Statistical Package for Social Scientists

SW Smart Water

SWA Smart Water for Agriculture

SWS Smart Water Solutions

SWPS Smart Water Products and Services

# Executive Summary

The SWA project seeks to contribute to increased water productivity in agriculture and increased income and food security through the development of a dynamic and sustainable “Smart Water Solutions”. The main target of this 4-year program is the Small-Medium Entrepreneurial (SME) farmers in the five counties of Uasin Gishu, Nakuru, Laikipia, Meru, and Machakos. Other key stakeholders in the project include: suppliers and providers of smart water solutions, whose capacities, quality and range of services and products will be strengthened to adequately meet the demands of SME farmers; financial institutions that could provide products aimed at supporting farmers in uptake of Smart Water Solution (SWS); and both Kenyan and Dutch companies interested in investing and bringing innovation into this sector.

At the inception phase, a baseline survey was required and the survey was implemented in the five counties among the project target groups. The overall objective of the baseline survey was to review, survey, and verify SWA project goals, objectives, target groups and expected result areas so as to establish the baseline indicator profile against which project targets would be set for implementation, performance monitoring and evaluation. This baseline survey was carried out in the months of October and November 2016.

**Survey approach**

A mixed research methods approach was used to obtain primary data required to address the survey objectives. A cross-sectional survey was designed to target SME farmers in the five counties and key informant qualitative interviews were used to collect data from SWA project stakeholders. Primary data gathered from the survey was complimented with relevant secondary information from recent relevant literature to address the wide scope of the project information needs and diverse program target stakeholders.

A multi-stage random sampling design was employed in this survey to identify a representative sample to collect the required data for the SWA baseline survey in the counties selected. First the selection of SWA project target counties and clusters used purposive sampling design to identify counties that already show propensity to successfully adopt smart water technologies and also representative of the geographical scope of targeted farmers. To support this process, a rapid assessment was carried and the results of the assessment aided the sample design of the baseline survey. To determine the sample size used for the baseline survey, the sample size was determined by employing the standard sample size equation. Using a standard confidence level of 95% and 5% margin of error, and providing for a 30% for contingencies such as non-responses, the final sample arrived at was of 544. This baseline survey achieved a sample of 557 households randomly selected from twenty-nine clusters in the five counties. The need to balance between the allocated sample per county and clusters resulted in a higher sample than expected.

The inclusion criteria for the survey considered the SWA project definition of an SME farmer. The farmer cultivates between 0.25 to 12.5 acres of land, is involved in some commercial farming and is growing horticulture and/or fodder crops for sale. With the consideration that the project sought to work to support smart water agriculture, the target farmer was selected among those already involved in irrigation activities in an area that has water sources such as perennial rivers and springs, dams, boreholes and seasonal sources and swamps.

Data collection was done on mobile devices using Akvo Flow electronic data collection platform. At the end of each day, and after all quality checks had been done, data was electronically transmitted to a secure server. Data was finally downloaded at the end of the survey for analysis using Statistical Package for Social Sciences (SPSS).

**Findings**

The SWA project is focused and seeks to work with already existing partners to improve and scale-up the water productivity for agriculture and increase income among SME farmers in five counties. The project targets to reach 20,000 SME farmers, male and females, to effectively adopt SWS, which are supplied by market actors. The baseline survey has validated this as a viable target. An analysis of secondary data triangulated against the primary data shows that there are in excess of 62,018[[1]](#footnote-1) farmers in the targeted counties who already are practising some irrigated agriculture with a potential of being upgraded into SWS users. Within this number, the SWA project might still meet the target of 50% women as indication is that women largely have access to land (the critical production resource) and are involved in decision making in irrigated agriculture. But there are some major bottlenecks to reach this 50% target - women currently lag far behind men in their access to finance, market and representation in agricultural groups and water user association.

Below are the findings against each of the five major SWA outcome areas.

1. **Irrigation Acceleration Platform (IAP)**

At baseline, there were no SWA Irrigation Acceleration Platforms (IAP) formed yet. The baseline however sought to understand what agricultural groups or associations farmers belong to, as the IAPs seeks to build on existing initiatives and farmer groups where possible. Overall, 42 percent of farmers interviewed were currently members of an agricultural group/association. Current membership is largely male (74 percent). Farmers across all the sampled clusters mentioned at least 99 agricultural groups or associations in which they are involved in.

At least half (58 percent) of farmers interviewed are members of a water resource users association. Overall, the main activities of the group are water resource management (55 percent) and produce marketing or assistance to access market (29 percent). Farmers groups supporting water management are more prominent in Meru at 73 percent and Nakuru at 87 percent respectively. At the time of the baseline survey, farmer training/extension services and promotion of modern methods of production/technology ranked very low – 4 and 3 percent respectively, therefore pointing to a gap that SWA project stakeholders can support.

The baseline survey unveiled the most pertinent challenges facing the farmer the SWA project and in particular the IAP may address. The most critical challenge cited by the surveyed farmers is inadequate water flow/scare water resources (63 percent). Farmers also are concerned about poor market prices and cost of inputs (mentioned 47 percent and 41 percent of farmers respectively).

1. **Use of irrigation technologies**

The survey estimated that there are about 57,805 farmers in the five counties currently practising irrigated agriculture. This is a projection from secondary data and a 95 percent of the total number of 62,018 farmers who reported in this baseline that they had functioning irrigation system. Sprinkler irrigation was the most widely (48 percent) used method of irrigation across the surveyed counties and particularly high (83 percent) in Meru County. There are opportunities to improve water productivity in the selected counties by working together with other actors in the regions. Technologies in use currently and water use practices are not optimal. For instance, about a fifth of the sampled farmers are using non-equipped irrigation methods such as use of a bucket while only about six percent use storage water tanks to conserve or store irrigation water. These methods the SME farmer already considers are less energy efficient, costly, labour intensive and are not optimal. For instance a farmer cultivating an acre of land uses six litres of fuel per day to pump water from a river in Laikipia County. Therefore supported with knowledge and capacity to fund the upgrade to water to more efficient technologies, the farmers express strong will to shift to better technologies as evidenced by about 54 percent who indicated they seek to adopt either drip or sprinkler irrigation.

There lacks supporting infrastructure to repair and maintain irrigation systems in the counties as indicated by only five percent of SME farmer who currently are supported by technology or solution providers. Farmers are traveling long distance to have equipment repaired-losing time during travel and on redundant systems. This has led to waste of energy, water and at times capital invested where the equipment is absolute or is retired before its full life time.

This baseline identified over one hundred different water technologies providers working with farmers in the SWA project counties. Considering that farmers cite inadequate water flow/ scarce water resources (63 percent) as one of the key challenges that they face, then SWA project working with these providers has an opportunity to support the farmers with smart water solutions including knowledge and training, access and acquisition or upgrade of technologies, maintenance and servicing of technologies.

Thirty six percent of the farmers also point that weeds and pests management, lack of information on farming methods (16%) and lack of loans (11%) as some of the other main challenges faced. It will therefore be important for the SWA project to conduct field visits in the different project implementation areas, identifying gaps in technology use and information and incorporate these in the training and information sharing sessions with farmers. This will go a long way in helping farmers to adapt and implement viable solutions, thus gaining more benefits from irrigation technology and for the SWA project to achieve the target of increasing water productivity and increase food security.

1. **Finance**

To support the farmers adoption of SWS, financial sector providers together with technology providers are a critical success factor. The areas surveyed show 76 percent-translating to an estimated 42,934 farmers who have access to at least one of the several financial services options ranging from commercial banks, mobile money services, SACCOs to informal saving and lending group. There are however gaps from both supply and demand side of financial services providers. There is very limited access to credit to support SWS (only about 6,885 farmers, roughly 12%, are currently accessing credit). In the target clusters, farmers have used diverse saving tools to acquire the technologies they currently have. Seventy two percent of all farmers indicate they save from the income with major reasons for saving being education (59%). Forty seven percent of the farmers who save are mainly investing in farming inputs financing while close to a third (30%) save to finance agriculture assets.

The sector is characterised by information asymmetry, lack of awareness among farmers on available solutions to support their needs, unmatched product design and execution, costly credit and insurance and general limitations in financial literacy among SME farmers. A few players however have innovative financial solutions that need support to achieve scale.

There currently lacks structured interventions that support the financial knowledge and skills capacity building initiatives tailored for SME farmers. Financial institutions players indicate there exists gaps in their understanding the smallholder farmer in general but specifically the staff lacks knowledge that would support the development of appropriate for SME farmer needs.

1. **Access to knowledge and information**

Only 15% of the surveyed farmers have received new information or training on irrigation practices. Generally, the main source of agricultural information for SME farmers is word of mouth from other farmers, friends and information obtained from demonstrations sites (52%). Radio is a source of information for 41% of the farmers while 18% said they accessed information on agriculture from television, 11% mentioned specifically *Shamba Shape Up* television program on Citizen Television. The only other significant TV program is Smart Farm on the same channel-Citizen TV. Based on the low proportion of farmers in the program counties accessing information from *Shamba Shape Up*, it is unlikely that the program will have the earlier expected reach of 8million viewers as the SWA project estimated. The SWA project will therefore need to re-evaluate additional or alternative media. It is important to note vernacular radio programs with agricultural content across the different languages have a wide reach of farmers. This should be considered medium to complement television communication especially considering that radio programs are usually significantly cheaper to sponsor compared to television.

1. **Business linkages created between Dutch and Kenyan companies**

Partnerships potential between local players and Dutch players exist for providing smart water solutions including technology, knowledge transfer, training and capacity building, market linkages, supply of affordable farm inputs, as well as collaboration for solution-oriented scientific research on water productivity and socio-economic issues. To this end, the survey identified about 20 Dutch companies and a further 40 Kenyan companies that are of interest to the SWA project.

**Summary of baseline indicators**

|  |  |  |
| --- | --- | --- |
| **Baseline Survey Findings** | **Key SWA Desired Results** | **Conclusion** |
| 1. Developed Irrigation Acceleration Platforms which stimulate private sector driven, market led, innovation and business collaboration tailored for SME farmers | | |
| Identified 99 associations & groups currently supporting an estimated 46,244 SME farmers in SWA project counties | 1 or more IAPs per county covering 200,000 SME farmers and promoting SWS | At least one IAP per county, and one national IAP but covering at least 46,244 SME farmers a viable outcome |
| 1. Improved access to and use of Smart Water technologies and services | | |
| An estimated 57,805 are currently practicing irrigation, 36,000 SME farmers, 35% are women | 20,000 SME-farmers (50% women) adopt SWS | SWA project can achieve a target of 20,000 SME farmers with a 50% of them women |
| 1. Improved access to and use of financial products and services | | |
| Estimated 5,760 have access to and use credit during the 2016 baseline survey | 12,500 SME-famers have access to and use finance | A target of linking 12,500 SME farmers to finance to support SWS is viable outcome |
| 1. Increased access to knowledge and demand created for SWS | | |
| Estimated 100 relevant organizations identified in the baseline survey | 200 SWS suppliers have improved service to SME farmers | Achievable target |
| * Estimated 8220 is number of farmers who have accessed information about irrigated agriculture from any organization at the time of baseline survey * Only 11% of 57,805 (6,358 farmers) had access to Shamba Shape Up at baseline stage | 8 million people aware of SWS through *Shamba Shape Up* | * Revise target for *Shamba Shape Up* to 383,000 (the 2016 total number of viewers of the program) * Compliment the media campaign with other programs including vernacular stations specific to each county |
| Estimated 20 existing training centers with potential of providing knowledge on SWPS to SM farmers 20. |  | Roll out initiatives to use the centers as SWA -partner knowledge centers |
| 1. Investor business linkages created between Dutch and Kenya Companies in SW services and products for small and medium farmers | | |
| Baseline survey identified 60 relevant companies 20 Dutch | 10 Dutch & more Kenyan companies invest in SWS sector | There is potential to recruit, retain and grow more than 20 enterprises as part of the solutions to SME farmers SWS needs under SWA project |

# Introduction

## Background of the Smart Water for Agriculture Project

The Kenya Smart Water for Agriculture (SWA) is a 4 year, 6 million Euro project funded by the Embassy of the Kingdom of the Netherlands in Nairobi as part of its food security and private sector development agenda. SWA is implemented by a Consortium of partners. The Consortium consists of SNV as the lead organisation, MetaMeta, The Royal Tropical Institute (KIT), PRACTICA and Aqua for All.

The project aims to improve food security through optimized water availability and efficiency by small and medium farmers and businesses. Overall, SWA wishes to support small and medium entrepreneurial (SME) farmer-led irrigation. The project seeks to contribute to increased water productivity in agriculture and increased income and food security through the development of dynamic and sustainable “Smart Water Solutions”. The project’s overall objective is to increase water productivity by 20 percent for 20,000 small and medium-sized entrepreneurial (SME) farmers. This will ensure increased resilience to climate change.

In effect the farmer-led, market-based and women empowering are principles that are entrenched in this project and are aimed at promoting market-led farming enterprises for the selected value chains. The Smart Water Solutions (SWS) that are promoted concern market–based options, both products and services that will save water, energy and serve sustainable resource use, but also in many cases reduce labour and inputs. Many SWS increase yields and timeliness/ quality of products – positioning them in value chain dynamics.

The SWA project will work to support entrepreneurial irrigated agriculture in Kenya, through promotion of a range of smart water solutions. The smart water solutions are targeted at different groups of farmers, strengthening of the financial and commercial products and services around irrigated agricultural development and the relevant value chains. This it is hoped will open up the development of long term linkages with Dutch and Kenyan businesses.

The project will work with small and medium entrepreneurial farmers in five non-arid and marginally arid counties of Uasin Gishu, Nakuru, Laikipia, Meru, and Machakos. To start with, the project is working in selected crop value chains – fodder growing and horticulture - to transform the SME farming into sustainable enterprises. On the other hand, the project is demand driven and its success is hedged on partnerships with suppliers and providers of smart water solutions supporting their capacity, quality and range of products and services to meet market demand. In its foundation year, SWA is seeking to support the project with information on the current status of affairs in the targeted counties and verify the SWA goals, objectives and target groups for the project. This baseline supports the SWA project by informing programing and monitoring and evaluation of this 4-year project.

## Research Objectives

The objective of the baseline is to undertake a review, survey and verification of SWA project goals and objectives, target groups and expected result areas so as to establish baseline indicator profile against which project targets shall be set for implementation, performance monitoring and evaluation. Using outcome indicators derived from the projects’ log frame, augmented by gender as a cross-cutting indicator, the baseline study aimed to document the initial status of target groups in regards to smart water solutions as follows:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Outcome** |  | **Indicators** |
| 1 | Developed Irrigation Acceleration Platforms which stimulate private sector driven, market led, innovation and business collaboration tailored for SME farmers | 1 | No. of SME women and men farmers and suppliers of smart water products and services (Finance, knowledge, markets, technology) engaged in irrigation platforms in every county |
| 2 | Type and No. of SWP & services and business linkages facilitated by the platform that meet specific needs for both women and women |
| 2 | Improved access to and use of Smart Water technologies and services | 1 | Number of farmers (a) with access to SW technologies and associated services (b) using SW technologies and associated services |
| 2 | No. of SW technology and associated services providers responding to specific needs of the SME farmers |
| 3 | Number of new SW technologies supply chains developed |
| 3 | Improved access to and use of financial products and services | 1 | Number of farmers with demand to access financial products and services to adopt SW technology |
| 2 | Number of farmers with access to and using financial products and services for SW technology |
| 3 | Number of financial institutions and amount of investment in supporting to farmers to adopt SW technology |
| 4 | Increased access to knowledge and demand created for SWS | 1 | Number of suppliers of SWPS with access to and have gained new knowledge tailored for SME farmers |
| 2 | Number of farmers with access to and gained new knowledge on SWS opportunities to their farming systems / working area |
| 3 | Number and capacity of existing centres providing knowledge on SWPS |
| 5 | Investor business linkages created between Dutch and Kenya Companies in SW services and products for small and medium farmers | 1 | Number of Dutch and Kenya companies engaged in joint businesses that promote SWS in project areas |
| 2 | Number of Dutch and Kenyan companies interested in investing in SWPS businesses tailored for SME farmers |
| 3 | Number of SME farmers benefitting from the business linkages |

## Baseline Research Methodology

### Research Design

The SWA project proposes to work with Smart Water Solutions (SWS) providers, State and Non-State Actors among other interested stakeholders to transform the access and use of SWS among SME farmers. Therefore the design utilised mixed research methods to obtain primary data required to address the above objectives. A cross-sectional survey was designed to target SME farmers in five counties and key informant qualitative interviews were used to collect data from SWA stakeholders. Primary data gathered from the survey was complimented with relevant secondary information from recent relevant literature to address the wide scope of the project needs and diverse program target stakeholders.

### Data Collection Process

The SWA baseline survey process was planned and executed collaboratively by Impact Matters, Akvo and SNV SWA project team. Each of the stages of the process is briefly described below:

Baseline survey planning: SWA program team briefed Impact Matters’ lead consultants on the 28th September 2016. The briefing was instrumental in facilitating survey work plan (appended to this report). The survey work plan provided adequate time to develop a survey questionnaire, upload to an electronic data collection platform, survey team recruitment, team training, pilot testing and sampling. Each of these stages of the survey is detailed below.

*Survey questionnaire development:* Quantitative survey data was collected using a structured questionnaire developed together with SWA project team in line with the study objectives. The questionnaire was pilot –tested and input obtained from the pilot incorporated to improve the survey instrument. The post pilot survey questionnaire was translated into Swahili for use among those respondents who are not conversant with English language. The survey questionnaire developed through this inclusive process was signed off by SWA project team for use in this survey.

*Electronic Data Collection system:* The finalised questionnaire was programmed into the Akvo Flow[[2]](#footnote-2) application system to facilitate electronic data collection using hand-held electronic devices. The survey was supported with smartphones equipped with Android operating system. The use of mobile technology eliminated the need for data entry, drastically saving on time and reducing errors associated with pen and paper data collection alternative that necessitates manual data entry. Akvo Kenya team supported the SWA project baseline survey design and training of the team used to collect the baseline data using Akvo Flow survey data collection support platform.

*Survey Team Selection:* The data collection team was selected based on previous experience with survey work and included enumerators resident in each of the target counties. This was important in ensuring that the teams are familiar with sampled clusters in the SWA project counties. The team comprised of three research consultants who doubled up as survey managers as well as qualitative data collection lead persons. The data collection team included a field team leader, five supervisors representing each of the counties and twenty enumerators. A data analyst and translator were also included to support the analysis and translation of the instrument respectively.

*Enumerator Team Training:* Training for this project was conducted centrally in Nanyuki on the 18th and 19th of October 2016. Centralised training reduces survey time and also improves quality of training by ensuring uniformity of training delivered using a common pool of trainers. Group training also enhances learning from peers and the rich discussions which are part of the training. The training was planned to be in one of the five SWA program counties to provide first-hand experience through a field visit and survey administration in circumstances close to or similar to the actual situations teams encounter in survey work. Nanyuki town (within Laikipia County) was selected as it is central and easier to access by teams drawn from across the five counties.

The training participants included the SWA project team, Impact Matters team and Akvo Kenya team. The training covered the overview of the SWA project, survey objectives, interviewing skills refresher, the content of the survey, survey target sample, sample selection, electronic data collection using Akvo Flow application system, and a pilot feedback review session. Extra training was conducted for the supervisory team on the scope of the study and survey logistics and planning.

*Pilot testing:* After the survey team training, a half-day pilot testing was conducted in Laikipia County. The survey pilot was undertaken in Nkando and Nturukuma villages in Laikipia East Sub-County. These pilot sites were selected as logistically; they were easily accessible from the training venue and could support a large team of enumerators since they have a potential large number of SME farmers practicing irrigated horticultural farming and fodder production using waters abstracted from Nanyuki River among other sources.

Besides giving the team first hand field experience with the survey and the Akvo Flow application, the pilot test was essential in verifying that the survey questions were well understood by the respondents. The tests helped the enumerators to test various aspects of the survey platform including but not limited to how to synchronize the collected data, clarity of survey questions, recording of survey data, capturing of GPS location data among others. This therefore helped identify any gaps that the enumerators may have had with the electronic survey data collection platform and address the same before the data collection rollout.

The pilot test provided the survey team with a chance to objectively determine if the survey questions were clear to respondents, and if the flow of the questions was logical. Besides, the test also helped to estimate the timing of the survey and testing of the teams’ understanding of the survey objectives, targeted respondents and sampling procedures.

*Survey data collection& Quality Control:* The survey data was collected across all the counties concurrently from the 24th of October to the 2nd of November 2016. Fieldwork in the counties with lower samples particularly Nakuru and Uasin Gishu however took a shorter time. Key stakeholder interviewers continued up to the 14th of November 2016.

The data collection team worked closely with the supervisors and lead consultants to ensure that:

* SWA project clusters were correctly identified and visited
* where required to, county officials and lead farmers were contacted
* the random selection of the farmers was followed and that only SME farmers practising irrigated horticultural farming and fodder production were included in the survey sample
* interviewing protocols and survey administration was done as per plan and training
* all data quality checks-to ensure survey completeness, data accuracy, and consistency were done before data was uploaded to the electronic platform, and
* any additional data likely to contextualize survey data was collected.

The fieldwork supervisors and baseline consultants accompanied the enumerators during data collection to at least ensure that ten percent of each enumerators work was done in the presence of a supervisor. The survey questionnaire included inbuilt quality controls (mandatory checks) where some fields had to be filled in for the survey to be accepted by the system. This was an essential control step that helped in data completeness. Logic checks were also inbuilt and helped keep the enumerators in check during data collection.

Data was checked to identify any outliers with regard to length of time taken to complete each survey, and the GPS reading of each household visited. Data was regularly uploaded onto a secure data portal on Akvo system. Data collection devices were connected to a secure wireless internet connection regularly to ensure data was synchronized. Data collected and submitted was reviewed daily during the fieldwork period. Sample achieved each day in each of the clusters visited was communicated to team leaders. After data was uploaded, additional checks on the data collected were done, as explained in the data analysis section below.

*Secondary and qualitative data collection:* because of the nature of the information sought in this baseline, some of the data was gathered from secondary research sources. Desk data was gathered from various sources including SWA Program documents, Ministry of Agriculture reports, county governments publications, research reports from Kenya Agricultural Research and Livestock Organisation (KARLO), Agricultural Sector Development Support Programme (ASDSP), Agricultural Training Centres, Agricultural Information Resource Centre to name but a few, as well reports from various international organisations such as Food Agricultural Organisation (FAO).

Some of the questions that were responded to using secondary data include:

* No. of SME women and men farmers and suppliers of smart water products and services (Finance, knowledge, markets, technology) engaged in irrigation platforms in every county
* Number of farmers (a) with access to SW technologies and associated services (b) using SW technologies and associated services
* Number of farmers with demand to access financial products and services
* Number of farmers with access to and using financial products and services
* Number of financial institutions and investment in support of farmers to adopt SWS

Information from secondary research and the quantitative survey was complimented with information gathered from qualitative research data obtained from different stakeholders including but not limited to water and irrigation services providers, financial services providers, SWA project team, Water Resource Management organisations, farmers’ groups or associations, among others.

### Sampling

*Survey Scope:* A multi-stage random sampling design was employed in this survey to identify a representative sample to collect the required data for the SWA baseline in the counties selected. First the selection of SWA Counties and Clusters used purposive sampling design to identify counties that already show propensity to successfully adopt SWS and are also representative of the geographical scope of targeted farmers. This selection was done through rigorous rapid assessment that identified five target counties-Laikipia, Machakos, Meru, Nakuru and Uasin Gishu - and various clusters (see details in the following sections) where the baseline survey was conducted.

*Sample size:* To determine the sample size used for the baseline survey, the sample size was determined by employing the standard sample size equation below:

Where:

n = the sample size

Z = 1.96 = the corresponding standard score with a confidence level of 95 percent

p = is the occurrence level of the phenomenon under study (i.e. proportion of SME

farmers) and is equal to 0.5 where the occurrence level is not known

D = is the design effect, and the power calculations for the population size of the

counties and is estimated at 1

d = required level of precision taken to be 5 percent

Replacing the above values in the equation we get n≈381, which after increasing the sample by 30 percent to compensate for contingencies (like non-responses) gives 544 households. Therefore, the sample size calculation for a standard confidence level of 95 percent gives an n of 544.

Since the country generally lacks good data on smallholder farmers and in particular SME farmers practising irrigated agriculture, there doesn’t exist a proper sampling frame upon which this calculated sample can be distributed. The survey sample distribution across the counties of interest therefore relied on the secondary data of farmers identified during the rapid assessment. To distribute the calculated sample to the five counties, the baseline survey used an equal proportion sample to the number of SME farmers identified by the rapid assessment in each county as follows:

Table 1: Sample distribution across the SWA Project Counties and Clusters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **County** | **No. of clusters identified** | **Total farmers** | **Proportionate sample** | **Sample by cluster type:** | | |
| **Rank 1 clusters** | **Rank 2 clusters** | **Rank 3 clusters** |
| Machakos | 45 | 10,660 | 160 | 64 | 56 | 40 |
| Laikipia | 21 | 4,824 | 83 | 33 | 29 | 21 |
| Meru | 35 | 16,686 | 248 | 99 | 87 | 62 |
| Uasin Gishu | 19 | 2,193 | 32 | 13 | 11 | 8 |
| Nakuru | 17 | 1,406 | 21 | 8 | 7 | 5 |
| **Totals** | **137** | **35,769** | **544** | **218** | **191** | **136** |

*Cluster sampling:* The criterion used to determine the cluster to include in the baseline was informed by the rapid assessment survey undertaken by the SWA project before the start of the baseline survey. The criteria and scoring matrix employed is as summarized below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Criteria** | **Weight** | **Mark** | **Maximum score** |
| 1 | No. of SME farmers currently practicing irrigation (land holding: 0.25-12.5 acres irrigated) |  |  |  |
|  | 1 to 50 | 1 | 5 | 5 |
|  | 51 to 100 | 2 | 5 | 10 |
|  | >100 | 3 | 5 | 15 |
| 2 | No. of potential SME farmers (0.25-12.5 acre irrigable land) |  |  |  |
|  | 1 to 50 | 1 | 5 | 5 |
|  | 51 to 100 | 2 | 5 | 10 |
|  | >100 | 3 | 5 | 15 |
| **3** | **Need for SWS** |  |  |  |
|  | Technology | 1 | 5 | 5 |
|  | Market | 1 | 5 | 5 |
|  | Finance | 1 | 5 | 5 |
| 4 | Demand for technology |  |  |  |
|  | Abstraction | 1 | 5 | 5 |
|  | Conveyance | 1 | 5 | 5 |
|  | Application | 1 | 5 | 5 |
| 5 | Water Availability |  |  |  |
|  | Perennial rivers and springs | 3 | 5 | 15 |
|  | Boreholes/water pans/seasonal rivers only | 2 | 5 | 10 |
|  | Swaps only | 1 | 5 | 5 |
| **Total Score** | | | | **75** |

Clusters with a total score of less than 35 are not selected. Those with a score of above 55 are categorized as Rank 1 and are considered the top impact areas for SWA project. Rank 2 clusters belong to the score range of 45 to 55 and the rest are grouped under Rank 3.

Table 2: Distribution of the sample achieved across SWA Project counties

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Counties | Rank 1 clusters | Sample | Rank 2 clusters | Sample | Rank 3 clusters | Sample | #of clusters sampled | Total Achieved sample |
| Machakos | 3 | 61 | 3 | 55 | 3 | 42 | **9** | **158** |
| Laikipia | 2 | 32 | 2 | 38 | 1 | 16 | **5** | **86** |
| Meru | 4 | 129 | 4 | 107 | 3 | 17 | **11** | **253** |
| Uasin Gishu | 1 | 17 | 1 | 15 | 0 | 0 | **2** | **32** |
| Nakuru | 0 | 16 | 1 | 0 | 1 | 12 | **2** | **28** |
| **Total** | **10** | **255** | **11** | **215** | **8** | **87** | **29** | **557** |

To facilitate identification of the clusters and ensure smooth data collection process, the survey team worked with county agricultural officials and lead farmers already identified during the SWA project rapid assessments. The lead farmers only helped map the clusters to be surveyed and the team proceeded to randomly select households to include in the survey. These leaders were also helpful in defining the boundaries of the farming clusters besides helping explain the purpose of the visit to randomly selected farmers.

*Differences between the proposed sample and the achieved sample*

This baseline survey achieved a sample **of 557 households** randomly selected from clusters in the five counties. This over quota sample is generally acceptable where there was need for an oversampling to cater for non-response. There was need to balance between samples across different rankings described above, total sample per clusters as well as the need to cater for some over-quota contingency sample.

During sample selection and implementation, the survey received fewer than expected rank three clusters. Specifically in Meru, in the rank 3 cluster selected randomly, majority of the farmers had stopped irrigation farming due to water scarcity. This resulted in higher samples being drawn from rank one and two cluster types in Meru.

*SME Farmer Household Selection:* The SWA project has a very specific target farmer. However, there is no scientific data to show how these farmers are distributed in the clusters. To reduce human bias in selecting households to be included in a survey, simple random selection method was developed to apply a random route walk approach[[3]](#footnote-3). After identifying the boundaries of the selected clusters, the survey team randomised the starting point where the random household selection begun. This was done by picking an easily identifiable landmark/point (such as a church, school, bridge, cattle dip, road junction, etc.) from where the first household would be sampled. At the start of the survey in each selected cluster, a random way of selecting the first household to be included was developed. The team used the date of the interview to allocate the household from which the first survey would take place. For instance on the 24th of the month, the survey team started interviews from the sixth household from the identified starting point i.e. 2+4=6th household while on the 30th of the month the starting household was the 3rd household from the starting point. This reduced the individual tendency of simply walking to the next household. After defining the starting point the next team member then proceeded to the 5th household from the first household selected i.e. skipping four households to ensure there is dispersion of the sample within a cluster.

*Eligibility of Household:* To select eligible households that fit the SME farmer definition provided by SWA project, a set of questions to select the households to include in the baseline survey sample was outlined as follows:

1. Land size must be within 0.25 to 12.5 acres, used for horticulture activities and under irrigation. Clusters where more farmers had less than 0.25 or more than 12.5 acres were not considered in the survey. Small and Medium Entrepreneurs are considered to be owning land within 0.25 and 12.5 acres
2. Within the cluster, farmers must have showed the need for Smart Water Solutions including technologies for storing, abstracting, conveying and applying water; agronomic practices; approaches to access and use market and financial schemes
3. To support irrigation, water availability is a key factor for consideration. As such, for inclusion in the survey, clusters must have water sources such as perennial rivers and springs, dams, boreholes and seasonal sources and swamps.
4. The smallholder farmers had to either be practising horticulture or fodder growing for dairy production.

### Data Analysis

Data collected using compatible Android devices was uploaded onto the Akvo Flow online platform at the end of every day. Survey data from the devices was transmitted through an electronic transfer system after successful completion of the interviews. After data quality checks to check the completeness of the surveys, the naming of clusters vis a vis the already known location of each enumerator every fieldwork day, the length of each interview, and unique case identifier numbers, the Microsoft Excel data file was downloaded from the system. This process was carefully done by the two lead researchers and the data analyst allocated to the project.

Data cleaning to address mainly duplicated identification numbers and typing errors was done after the completion of fieldwork. Specific duplicated identification numbers in this survey was brought about by manual allocation of identification numbers allocated to each interviewer each data collection day and where enumerators use numbers out of their allocated range. The duplication was sorted and cleaned out using unique identifiers in the data including GPS locator data of each household and field case reports filed by the supervisor during the data collection. The Akvo Flow system also provided a unique instance case identifier which means that this process authenticates each case through multiple data variables to ensure there no possibilities of repeated cases.

The data was also carefully restructured to fit into SPSS compatible format by:

* Restructuring responses from matrix-type questions which by the nature of the Akvo Flow application were mapped onto rows instead of unique column per variable. To ensure the downloaded file from the Akvo Dashboard was compatible with the software used for analysis for this survey-SPSS, extra columns were created to accommodate the extra data variables.
* Multiple responses questions survey data that automatically is combined into a single column by the Akvo Flow application were split into separate columns per variable to capture the unique responses for all survey questions.
* In a few cases where enumerators had reported that they made errors in the cluster names, these were cleaned to map such households into their respective clusters using the field reports of such errors and confirming unique location identifiers.

The cleaned quantitative data was then analysed using SPSS. Quantitative findings were broken down by county, type of cluster or cluster ranking and type of household. The data was reported mainly through descriptive statistics and where necessary data was triangulated using secondary and/or qualitative data. Numeric data on land size, yield, income data etc. were processed into averages.

# Literature review

## Overview of Water for Agriculture in Kenya

Agriculture is the largest contributor to Kenya’s GDP, directly contributing about 25.4 percent of the country’s Gross Domestic Product (GDP) and another 27 percent indirectly via linkages to agro-based industries and the service sector, giving an overall 52 percent contribution to Kenya’s GDP[[4]](#footnote-4). The crops (horticulture, food crops and industrial/ cash crops), livestock (beef, dairy, etc.) and fisheries subsectors are the main components of the agricultural sector, contributing about 78, 20 and 2 percent of the Agricultural GDP respectively. The sector is a largely driven by small-scale producers who account for 75 percent of the total agricultural output and 70 percent of marketed agricultural produce.

Smallholder farmers have however in recent years experienced declining farm productivity owing to low fertility levels, high input costs and unreliable weather and pressure on limited arable land. Previous research has identified development issues that need to be addressed to support the smallholder agriculture. These include:

* Overdependence of agriculture on poor and erratic rainfall (rain-fed agriculture).
* Inadequate infrastructure development for irrigation, drainage and water storage
* Inefficient use of existing irrigation systems.
* Low productivity on existing irrigation systems.
* High water wastage and poor water management.
* Inadequate and un-coordinated information in irrigation research, science and technology.

This means therefore there is need for the country to invest in irrigated agriculture to expand agricultural production and mitigate against effects of climate change and ensure sustainability of the millions of small-scale farmers in Kenya through investment in irrigated agriculture. Irrigation agriculture in Kenya is carried out mainly in irrigation schemes and in largescale irrigation of crops such as rice and coffee. Large commercial farms account for 40 percent of irrigated land, smallholder farmers 42 percent, and Government-managed schemes 18 percent[[5]](#footnote-5). Smallholder irrigation plays an important role in Kenya’s irrigation activities. Tea, coffee, rice, and horticulture are the main sectors where smallholders have a major share in the irrigated produce.

The use of low-cost small-scale irrigation technology is relatively widespread, and (financial) infrastructure and access to markets are relatively well developed[[6]](#footnote-6). Food and Agriculture Organisation of the United Nations (FAO) estimates that there is potential to expand investment in modern irrigation systems in Kenya. To realise this potential, the stakeholders recognise that the country is generally a water-scarce country. Thus, there is high competition over limited water resources and a need to consider the environmental sustainability of agricultural investment, increase water productivity and invest in advanced irrigation systems that are already showing increasing demand.

The SWA project therefore is timely and working with both national and international partners in the agriculture sector, has a potential to respond to the need to improve water productivity. The selected counties therefore form a good starting point to demonstrate what is possible and provide learning for the scaling the project to other counties and countries.

## Overview of the agricultural sector in the SWA Project Counties

The SWA project is staged in five counties – Machakos, Liakipia, Meru, Nakuru and Uasin Gishu. Brief profile of each county including on the agriculture sector is given in the following sections.

### Machakos

The county covers an area of 6,208.20 km2 with most of it being semi-arid. Administratively, Machakos County is divided into eight sub-counties, namely Machakos, Masinga, Yatta, Kangundo, Matungulu, Kathiani, Athi River and Mwala. According to the 2009 Kenya Population and Housing Census, the county has a population of 1,098,583 (male–49 percent, female–51 percent). The poverty level in the county is at 59.6 percent against a national average of 47.2 percent based on Kenya Integrated Household Budget Survey (KIHBS, 2009).

The total arable land in the county is 372,020 Ha but only 248,333 Ha has been put under crop production. Total acreage of land under food crops in the county is 161,695 Ha while the total acreage under cash crops 86,638 Ha (County Integrated Development Plan, 2015). The main cash crops grown in the county are coffee, French beans, pineapples and sorghum which are mainly grown in Kagundo Matungulu, Kathiani, Yatta and Mwala sub-counties. The main food crops are maize, beans, pigeon peas and cassava which are normally grown in small scale. Most of the crops are rain fed and due to unreliable rainfall, productivity is leading to food insecurity.

Water resources in the county are under pressure from agricultural chemicals and urban and industrial wastes, as well as from use for hydroelectric power. The county has two permanent rivers namely Athi and Tana. Tana River is mainly used for hydroelectricity generation (specifically in Masinga) while Athi River is used for domestic and industrial uses. There are also several dams that serve as water reservoirs and springs from the hilly areas. Underground water sources supplement surface water sources. The main water sources are rivers, dams and boreholes. The average distance to the nearest water source in the county is 5 Km. Fetching of water is mainly done by women especially in the rural areas who end up spending a lot of man-hours on this activity (Machakos CIDP, 2013-2017).

The County Ministry of Environmental Protection, Water and Housing, is the department that is in-charge of water and irrigation in the county. The department targets to use the two permanent rivers for irrigation projects. The projects initiated aims to increase food production, high yielding livestock rearing and intensive cash crop farming among others. The County proposes to expand the three existing irrigation schemes namely Kabaa, Kayatta and Yatta (Machakos CIDP 2013-2017). The county also targets to build the capacity of farmers; the promotion of greenhouse and drip irrigation technology for mango, in Vyulia, Mwala and Makutano) locations (target of 900 households); and Matuu Ndalani, (with a target of 25,496 residents).

The Machakos County development plans indicates there are budgetary provisions for the purchase of drilling rigs which shall be used to sink boreholes across the sub-counties. The water from the proposed boreholes is hoped to be for household consumption and irrigation. (Machakos CIDP 2013-2017).

### Laikipia

The county is divided into five administrative sub-counties (formerly districts) namely: Laikipia Central, Laikipia East, Laikipia North, Laikipia West and Nyahururu sub-counties. The county is also apportioned into 3 constituencies, 15 divisions, 51 locations and 96 sub-locations respectively. According to the 2009 Kenya Population and Housing Census (KPHC) report (GOK, 2010), the total population for the county stood at 399,227 people of which 198,625 were male and 200,602 were female.

The main crops grown are maize, common bean, wheat, Irish potato, cabbage and tomato. According to the 2009 KPHC report on livestock, there were 189,685 heads of cattle in the county and 623,648 sheep and goats. Others include poultry, camels, donkeys, rabbits and bees. Livestock infrastructure is supported by 50 holding grounds, stock routes and out spans, two public and three private abattoirs, five auction yards and 33 slaughter slabs. The main livestock products include beef, mutton, milk, eggs, and pork among others. (Laikipia County Development Profile 2013).

Of the total land mass, arable land constitutes 1,984 km2, non-arable land constitutes 7,456km2, and urban areas constitute 243.3km2. The county has 580km2 of gazetted forest land. There are six distinct land use patterns heavily influenced by the climatic conditions and the ecological zones. These include: pastoralism, mixed farming, ranching, agro pastoral, marginal mixed farming and formal employment/trade/business.

Laikipia is drained by the Ewaso Nyiro River and its tributaries which originate from Mt. Kenya and the Aberdares Ranges. The six main tributaries of Ewaso Nyiro are Ngare Naro, Pesi, Suguroi, Mutara, Nanyuki, and Burguret rivers. There were 30 percent households with access to piped water in 2009 with the rest of the population accessing water from permanent rivers, wells, springs and roof catchment. Boreholes, pans and dams are also a common feature in the county for domestic and irrigation purposes. Rock catchment in the northern Laikipia is yet to be fully exploited. (Laikipia County Development Profile 2013).

The distribution of water sources is uneven across the county with the northern parts experiencing serious water shortages. A total of 41 percent households in the county access water from within their dwelling while 12.9 percent of the households take an average of one to four minutes to reach the nearest water point. Similarly 20.3 percent of households take an average of five to 14 minutes while 11.4 percent of the households take an average of 15-29 minutes. The remaining 4.6 percent of the households takes over an hour to reach the nearest water point. (Laikipia County Development Profile 2013). There are 10 irrigation schemes in the southern and western parts established through government and donor support. Irrigation along the rivers Pesi, Nanyuki and Ngobit has provided alternative means of livelihood through production of horticultural crops. These rivers support irrigation in Pesi, Mutaro, Suguroi and Likii irrigation schemes to name but a few.

### Meru County

The county has a total area of 6,936 km2 out of which 1,776 km2 is gazetted forest. The county comprises of eight administrative sub-counties which are Igembe North, Igembe South, Tigania East, Tigania West, Imenti North, Meru Central, Imenti South and Buuri. The eight administrative sub-counties are further sub-divided into 28 divisions, 133 locations and 351 sub-locations. The projected population of the county stood at 1,443,555 (713,801 male and 729,754 female), with the average density in the county being 282 persons per km2 in 2012. The major land use in the county is mainly for agricultural activities (crops farming and livestock-keeping). Other uses include cultural and forestry conservation. There is large-scale farming carried out by private companies in Timau area of Buuri Constituency. Large-scale farming is mainly for wheat production with Kisima farm being the largest in the county. Livestock farming is practised on group ranches in Tigania and Igembe. The average land holding size per household is 1.8 ha for the small-scale and 18.25 ha for the large-scale land owners. The area with potential for irrigation is 81,262 ha but only 2,131 ha is under irrigation. (Meru County Development Profile 2013).

The county has a wide range of agro-ecological zones and untapped water for irrigation which support the production of a variety of crops such as mangoes, citrus, coffee, maize, beans, Bananas, pigeon peas, cow peas and horticultural crops. The main livestock are goat, cattle, sheep, pig, rabbits and poultry which are reared in small scale since most land is used for farming of food and cash crops. The livestock are mainly used for domestic purposes; for example the bulls are used for cultivation of small farms and cows for dairy milk. The area which is potential for irrigation is 81,262 ha with only 2,131ha under irrigation. The county has 11 permanent rivers with major one being the Kathita River which is a tributary that feeds River Tana. The county also has 12 shallow wells, 30 protected springs, two water pans, 16 dams and 105 boreholes. These form the major sources of water for domestic use and irrigation. The quality of water in the county is good for domestic use as it originates from primary surface water sources like Mt. Kenya and Nyambene hills. Other small water projects have been started through community initiatives due to high demand for irrigation water especially in arid areas of the county (Meru County Development Profile 2013). The average distance to the nearest water point in 2009 was 1.5 Km. This has however been reduced following the use of Constituency Development Fund (CDF) funds to finance community water projects with the aim of bringing water closer to the people. The number of households with access to piped water stands at 21,920 while households with access to potable water are 6,744. This contrasts sharply with the abundance of water as only 2 percent of the population has access to piped water.

### Nakuru

Nakuru County is divided into the following nine administrative Sub-Counties; Naivasha, Gilgil, Nakuru, Rongai, Nakuru North, Subukia, Njoro, Molo, and Kuresoi. In terms of political units, the county has 11 constituencies and 55 Wards. The total population of Nakuru County is 1,603,325, comprising of 804,582 male and 798743 female (National Population and Housing Census, 2009). According to the 2014 Agricultural Sector Development Strategic Plan Agricultural Sector Development Support Programme (ASDSP) Baseline Survey Report, the land area in Nakuru County under food crops and cash crops is 243,711.06 (Ha) and 71,416.35 (Ha) respectively. The main food crops produced in the county include maize, beans, Irish potatoes and wheat. Fruit and vegetables grown include tomatoes, peas, carrots, onions, French beans, citrus fruits, peaches, apples, cabbages, strawberries, asparagus and leeks. Other cash crops grown include tea, flowers, wheat, barley and pyrethrum.

The main livestock kept in the county include; dairy cattle, beef cattle, pigs, goats, sheep, poultry, rabbits and bee keeping. Dairy farming under zero grazing system is emerging as an important economic activity due to diminishing land size, favourable weather patterns for dairy farming and ready market for milk. (Nakuru County Development Profile 2013). Nakuru County is endowed with natural water resources including four major lakes, Nakuru, Naivasha, Solai and Elementaita. In addition, rivers, shallow wells, springs, dams, pans and boreholes spread all over the county especially in drier parts of Naivasha, Gilgil, Molo, Njoro and Rongai provide water for irrigation. Major rivers include, Malewa, Njoro, Molo and Igwamiti. The county is also endowed with springs found in Subukia, Nakuru North, Molo and Kuresoi areas. The distance to the nearest water point in Nakuru County is from zero to six kilometres. 35 percent of the county population take between 1-4 minutes to fetch drinking water. Estimates from KPHC 2009 indicate that about 150,608 households (36.8 percent) in the county have access to piped water. About 63 percent have access to potable water. Rain water is another major source of water in the county with about 80 percent of households harvesting rain-water (Nakuru County Development Profile 2013).

According to the Nakuru County Integrated Development Plan, 2013-2017 the irrigation sub sector will facilitate small scale farmers to put more land under irrigation and ensure mitigation on changing climate and overreliance on rain fed agriculture. In Nakuru County Annual Development Plan (2015-2016) Strategic Priority II the county will investing in agricultural transformation and food security, supporting small-scale farmers, through subsidized farm inputs, technological improvements and modern farming methods, small-scale irrigation system, water reservoirs and dams in dry areas of the county. This is expected to enhance food security, raise incomes and create employment opportunities.

### Uasin Gishu

Uasin Gishu County is divided into six sub-counties: Turbo, Soy, Ainabkoi, Moiben, Kessess and Kapseret. The sub-counties are further subdivided into 51 locations and 97 sub-locations. Uasin Gishu County covers an area of 3,327Km2 with a human population of 894,179 and 202,000 households (NPC 2009). Arable land covers 2,995 Km2, 332.78 is non arable (hilly and rocky), 23.4 km2 is water mass and 196 km2 is urban. The average farm size in Uasin Gishu is 2-10 acres with a wide range of crop and livestock enterprises. The major crops grown in the county are maize, wheat, beans and horticultural crops such as passion fruits. On crop farming, 85,525 hectares is under food crops, 40,786.2 hectares under cash crops and 62 hectares is under horticulture across the county. The main livestock bred are dairy and beef cattle, goats, sheep, rabbit, pig, chicken (both hybrid and indigenous) and beekeeping (Uasin Gishu County Development Profile 2013).

The main water resources in the county include: dams, rivers, boreholes, shallow wells and springs. The county is drained by four major rivers, namely, Moiben with three tributaries, Sosiani with three tributaries, Sergoit with two tributaries, Kipkaren with nine tributaries, and River Nzoia. Good quality ground water is abundant and is a major source of water for the rural population who depends on shallow wells, hand dug wells and springs as the main source of water. The average distance to the nearest water point in the rural and urban areas of the county is approximately 500m – 1Km and 0-500m respectively. This implies that no one has to spend a disproportionate part of the day fetching water for the family’s needs. (Uasin Gishu County Development Profile 2013).

# Research Findings

## SWA SME Farmers

### Farming Households in the SWA Counties

The analysis of the total number of households in the SWA project target counties and specifically those practicing irrigated agriculture projects the potential farming households to be 62,018. The SWA project rapid assessment has within these counties identified 36,000 SME farmers.

Table 3: total number of households practicing irrigation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Indicators** | **Total** | **Laikipia** | **Machakos** | **Meru** | **Nakuru** | **Uasin Gishu** |
| Total number of households in the county (Source: KNBS 2009 Census) | 1,299,357 | 103,114 | 264,500 | 319,616 | 409,836 | 202,291 |
| [[7]](#footnote-7)Percentage of farming households | 73.6% | 85.5% | 85.3% | 87.8% | 54.6% | 54.9% |
| Total number of farming households | 929,232 | 88,162 | 225,619 | 280,623 | 223,770 | 111,058 |
| [[8]](#footnote-8)Proportion of farmers doing irrigated agriculture | 6.8% | 14.3% | 0.7% | 14.9% | 1.3% | 2.8% |
| Number of households doing irrigated agriculture *(Source: derived from ASDSP 2014 Baseline Survey Report)* | **62018** | **12607** | **1579** | **41813** | **2909** | **3110** |

### Gender-Type of Households

At least two thirds of household interviewed were male headed and managed. A third of the households in Machakos, Laikipia and Meru are female managed. Although the sample in Nakuru and Uasin Gishu is comparatively small, the counties recorded the highest proportion of male headed and managed households at 93 and 91% respectively.

Chart 1: Household type by gender

|  |
| --- |
| The SWA project aims at 20,000 farmers, male and females, effectively adopting SWS Smart Water products and services, which are supplied by the market. This baseline therefore validates this as a viable target as there in excess of 62,000 farmers in the targeted counties who already ae practising some irrigated agriculture with a potential of being upgraded into Smart Water Solutions users. Within this number, the SWA project ‘may’ still meet the target of 50% women. While women largely have access to land (the critical production resource) and are involved in decision making in irrigated agriculture, they fall far behind with regard to access to finance and market as well as representation in agricultural groups and water user associations. These challenges are further illustrated in the following sections. |

### Household access to and average land size

Overall, 69 percent of household owned or had access to at least one piece of land. This was especially the case in Machakos (77 percent) and Meru (74 percent). Almost equal proportions of farmers owned one or two pieces of land in Nakuru and Uasin Gishu.

Chart 2: number of pieces owned/accessed by household and average size

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Average size in acres | 2.48 | 2.63 | 2.96 | 2.22 | 1.91 | 2.19 |

Overall 48 percent of the households surveyed have a valid land ownership document for the main piece of land. Another 35 percent own the land but have no legal documentation while 15 percent of the households lease or rent the main piece of land. In Laikipia and Machakos, 30 percent and 24 percent of the households respectively are renting or leasing the main piece of land where agriculture is currently being practiced. Very few (2 percent) of the households in Meru county indicated that the land is under lease or being rented. In 47percent of the male headed households, the survey indicates women have access to landand are currently using the land.

It therefore means that for 83 percent the farmers who participated in this survey (48 percent with a valid land ownership document plus 35 percent who own but have no legal documentation), that are able to make long term investments on their land and therefore the smart water solutions utilized can be more permanent in nature.

### Type of Farming practiced by smallholder farmers

In almost all the targeted clusters and across all counties, horticulture farming is practiced by almost all farmers. Households reported to also grow food crops and fodder crops. It is therefore possible for the program to reach SME farmers growing horticulture and fodder crops across all the counties that are within the SWA program scope.

Chart 3: The Three Most Import Farming Activities

## Outcome 1

|  |
| --- |
| **Outcome 1: Developed Irrigation Acceleration Platforms which stimulate private sector driven, market led, innovation and business collaboration tailored for SME farmers** |

**Indicator 1: No. of SME women and men farmers and suppliers of smart water solutions (Finance, knowledge, markets, technology) engaged in irrigation platforms in every county**

## Engagement in Irrigation Platforms

Overall, 42 percent of farmers interviewed had been members of an agricultural group/association in the last one year. The survey shows high proportion of households in Meru and Nakuru counties (69 and 54 percent respectively) currently belong to an association. Machakos County had the least, reporting only 13 percent of farmers being in agricultural groups as shown in the chart below.

Chart 4: Membership to an Agricultural Group/Association

In about two thirds of the household interviewed, males above the age of 35 are member of the agricultural groups/association. This is generally the same across the five counties. The highest proportion of female membership was recorded in Machakos where 38 percent of females above 35 years are members of agricultural groups/associations.

Chart 5: Household Membership in Agricultural Groups/Association

Farmers across all the sampled clusters mentioned at least 99 agricultural groups or associations in which they are involved in. As shown in the Table 4 below, at least half of these groups are involved in water resource management.

|  |
| --- |
| The SWA Irrigation Acceleration Platform seeks to build on existing initiatives where possible. Current initiatives membership is largely male (74 percent) and at least half of the groups are involved in water resource management. There is therefore a need to include in the program a strong communication element reaching out to women with the aim of including them in the platform and ultimately, increasing uptake of irrigation technologies by women. |

## Types and prominence of groups and associations, and their activities

At least half (58 percent) of farmers interviewed claimed to have been members of a water resource users association. However, different types of platforms were more prominent than others in the different counties. For instance, Water Resource Users Association was most popular in Meru with 74 percent. This was followed by Nakuru where only a third of the farmers are members. Marketing (47 percent) and producer (41 percent) type of groups were more prominent in Laikipia than any other county.

Table 4: Type of Agricultural groups/association farmers are engaged in

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Total (236) | Laikipia (17\*[[9]](#footnote-9)) | Machakos (21\*) | Meru (175) | Nakuru (15\*) | Uasin Gishu (8\*) |
| Water Resource Users Association | 58% | - | 10% | 74% | 33% | - |
| Producer and Marketing | 14% | 6% | 38% | 7% | 53% | 38% |
| Cooperative/ Society | 12% | 6% | 14% | 12% | - | 38% |
| Producer | 8% | 41% | 24% | 2% | 7% | 13% |
| Marketing | 8% | 47% | 5% | 5% | 7% | - |
| Processing | 1% | - | - | 2% | - | - |
| Environmental management group | 1% | - | 10% | - | - | 13% |
| Labour groups | - | - | 5% | - | - | - |

Overall, the main activities of the group are water resource management (55 percent) and produce marketing or assistance to access market (29 percent). These activities are prominent in Meru at 73 percent and Nakuru at 87 percent respectively. Farmer training/extension services and promotion of modern methods of production/technology ranked very low – 4 and 3 percent. It is not clear whether this is due to a lack of capacity on the part of the group/association; or a lack of demand on the farmers for these support. The list of groups by county, sub-county and sampling area is provided in the appended document (SWS industry players).

Table 5: Main activity of Agricultural group /association

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Total (236) | Laikipia (17) | Machakos (21) | Meru (175) | Nakuru (15) | Uasin Gishu (8) |
| Water resource management | 55% | - | - | 73% | 13% | - |
| Produce marketing or assistance to access market | 29% | 65% | 33% | 20% | 87% | 38% |
| Farmer training/ extension services | 5% | 12% | 14% | 3% | - | - |
| Promotion of modern methods of production/ technology transfer | 3% | - | 14% | 1% | - | 25% |
| Facilitating savings and access to credit | 3% | - | 19% | 2% | - | - |

Note that farmers claimed that the most critical challenge they are currently facing is inadequate water flow/scare water resources (63 percent). This was the highest cited challenge across all counties.

Table 6: Most critical challenge facing farmers

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Total (557) | Laikipia (86) | Machakos (158) | Meru (253) | Nakuru (28) | Uasin Gishu (32) |
| Inadequate water flow/ scarce water resources | 63% | 56% | 62% | 64% | 64% | 69% |
| Poor market prices for produce | 47% | 56% | 43% | 47% | 54% | 44% |
| Cost of acquiring farm inputs (seeds, fertilizers, agrochemicals, animal health products etc.) | 41% | 30% | 54% | 31% | 57% | 59% |
| Emerging challenges in weeds and pest management | 36% | 24% | 56% | 26% | 18% | 56% |
| Inadequate or lack of information on farming methods | 16% | 7% | 29% | 13% | 7% | 9% |
| Lack of loans | 11% | 13% | 18% | 6% | 7% | 6% |
| Poor infrastructure to move goods | 11% | 7% | 5% | 13% | 43% | 9% |
| Other | 11% | 16% | 13% | 6% | 21% | 6% |

Some of the other major challenges farmers are facing include diseases, adverse weather effects, delayed payment for produce sold, market intermediaries, high cost of water and pumping costs, poor access to better seed varieties and crop damage by wildlife.

|  |
| --- |
| The SWA project directly responds to the most pertinent farmers’ challenge of ‘inadequate water flow/scarce water resource’. Achieving the SWA project goal of increasing water productivity calls for increased SME farmers’ knowledge, improved water management and crop production practices, improvement of water technologies which requires access to financial solutions that assist the farmer to improve water abstraction, storage, conveyance and application. SWA project market linkage initiatives need to address the issues of poor market prices (including response to the market intermediaries’ challenge) and cost of inputs. Linkage to market players providing mitigation to risk associated with SME farmer production and produce handling practices is also necessary. The SWA project will therefore need to include other stakeholders outside of irrigation stakeholders, to address these other challenges. |

## Outcome 2

|  |
| --- |
| **Improved access to and use of Smart Water technologies and services** |

**Indicator 1: Number of farmers (a) with access to SW technologies and associated services (b) using SW technologies and associated services**

## Farmers Accessing and Using Smart Water Technologies and Associated Services

Almost all farmers interviewed were using irrigation and water management systems at the time of data collection.

Chart 6: Number of farmers using irrigation and water management systems

Sprinkler irrigation was the most used method of irrigation overall. However, different methods were more popular in the different counties. For instance, in Laikipia, sprinklers (37 percent) and ordinary PVC lay-flat hoses (38 percent) were most used. In Machakos, furrow irrigation (29 percent) and use of mainly diesel or petrol powered water pumps (30 percent) were most popular. Across all counties, sprinklers were most used in Meru where 83 percent of farmers reported using them. Lay flat hoses (57 percent) and sprinkler irrigation (47 percent) were most used in Nakuru. Sprinkler irrigation (53 percent) and non-equipped crop watering (28 percent) were most used in Uasin Gishu.

Table 7: Irrigation and water management method used

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Total (529) | Laikipia (86) | Machakos (155) | Meru (228) | Nakuru (28) | Uasin Gishu (32) |
| Sprinkler irrigation | 48% | 38% | - | 83% | 46% | 53% |
| No-equipped crop watering | 18% | 9% | 15% | 24% |  | 28% |
| Lay-flat hoses | 13% | 37% | 10% | 3% | 57% |  |
| Furrow irrigation | 11% | 13% | 29% |  | 4% | 6% |
| Water pumps (fossil fuel powered) | 11% | 12% | 30% | - | - | 6% |
| Water tanks | 6% | 12% | 5% | 4% | 18% | 3% |
| Basin irrigation | 6% | 19% | 10% | 1% |  | - |
| Drip irrigation | 5% | 3% | 6% | 4% | 7% | - |
| Subsurface irrigation | 5% | 1% | 9% | 3% | 4% | 3% |
| Greenhouses | 2% | - | 5% | - | - | 3% |
| Pond liners | 2% | 6% | 1% | - | 4% | 3% |
| Manual drilling services | 2% | 1% | 6% | - | 4% | 3% |
| Water equipment/systems Installation, maintenance services | 2% | 2% | 1% | - | - | 16% |
| Methods that improve soil moisture retention capacity e.g. intercropping, mulching | 1% | 6% | - | - | - | 3% |
| Bio-degradable plastic mulch | - | - | - | - | - | 3% |
| Training and installation | - | 1% | - | - | - | - |
| Canal irrigation | - | - | 1% | - | - | 3% |
| Flooding irrigation | - | 2% | - | - | - | - |

The fact that more than 90% of the interviewed SME farmers have some knowledge and experience in various irrigation and water management systems starting from the simplest non-equipped to some of the most modern drip and sprinkler systems is essential for the SWA project to achieve its target of increasing water productivity by 20%. Interventions to improve existing systems or introduce new technologies will be relatively easier when interacting with farmers who already are engaged in irrigation and water management. Given the fact that the SWA project has only two effective years to assess the existing irrigation and water management systems and accordingly promote improved or new systems that significantly increase water productivity and income; starting from scratch is not an option.

It was beyond the scope of the baseline survey to make quantitative and qualitative analyses of the current water productivity of the various irrigation and water management systems – this need to be done through a combination of detailed field research supported by remote sensing techniques. The baseline survey has, however, made a few relevant observations

*Water storage:* Storage facilities are likely to significantly reduce the cost of pumping and also reduce the need to irrigate during day time when the sun is hot and the rate of evaporation is high. In some arears, current practice is such that the farmer *“pumps per use”* and directly to the farm-to basins or directly to a furrow where crops are planted. This is unstainable during dry spells when water levels are limited and flow of rivers during the night cannot be utilized. Raised water tanks have potential to reduce need for use of pumps as some of the water can flow through gravity.

*Rain water harvesting:* There are opportunities to improve the existing rain water storage technologies and practices. Most ponds and pans lack liners and some are dilapidated. Rehabilitating the storage capacity of the available water resources from rains can increase available water for agriculture.

*Water conveyance:* In Meru and Nakuru, where the irrigation schemes have piped systems, the infrastructure appears to be prone to damage and in some cases, is in disrepair leading to wastage from leakages. The baseline survey identified several broken pipes-these are a pointer to potential need to consider maintenance of systems to ensure minimal water wastage. In clusters using canals and furrows, the canals lack liners and water levels are low during the dry seasons.

*Water application:*. The lay flat pipes that are currently used by 37% and 57% of the interviewed farmers in Laikipia and Nakuru counties respectively, waste significant volume of water and consumes a lot of the time. The farmers cite cost of fuels as significant as well.

*Irrigation systems maintenance:* there lacks a supporting infrastructure and systems maintenance in the counties. Only 5% of the farmers surveyed indicate they get support from the current suppliers of technologies in use. Some travel long distance to even get the systems and equipment fixed, losing time and money in both travel and redundancy of the equipment.

## Smart Water Technology and Associated Services Providers

The file appended to this report titled SWS players, provides a comprehensive list of Smart Water technology and associated service providers responding to different farmer needs. This list indicates 301 technology and service providers (see appendix for a full details of providers). These include:

* Smart water providers – products and services (39)
* Agricultural Training Centres (20)
* Financial Institutions – Banks (37), SACCOs (75), MFIs (31)
* Agricultural groups (as reported by respondents - 99)

## Outcome 3

|  |
| --- |
| **Improved access to and use of financial products and services** |

**Indicator 1: Number of farmers with demand to access financial products and services to adopt SW technology**

## SME Farmers Access to Finance

### 

## SME Farmers Income

In the baseline survey, 71 percent of the households sampled received some income from horticultural crops while only 12 percent had some income made out of sale of fodder in the past year. A third of the households had received income from sale of any other farm produce.

Chart 7: SME farmers with income from farm activities

In about two thirds of male headed households the income from farm produce is received by the man while in a majority of female headed households the income is received by the woman.

Chart 8: Household members’ access and control of income from farm activities

The average annual income from farming activities among the SME farmers surveyed in the baseline is estimated at about 135,429 shillings. There is no ideal comparable national figure for agriculture income. A review of the Economic survey 2016 shows that the national average earnings is Kshs. 604,225. This includes both private and public earnings in all sectors. Private sector earning which includes agriculture, forestry and fishing is KShs. 254,274 and public sector figure for the same is Kshs.385,120. The disparity in the baseline figure and national figure could be due to the fact that the national figures includes other aspects of agriculture beyond horticulture and fodder which were our focus crops at baseline

Chart 9: SME farmers average household annual income from farm activities in Kenyan Shilling?

## SME Farmers Financial Inclusion

Overall across all the SWA program counties, 76 percent of the SME Farmers are financially included i.e. they have access to financial institutions or products. This is slightly below the average national financial inclusion figure of 80 percent. The national financial inclusion indicator is skewed upwards by urban population compared to the SWA baseline which is skewed towards farmers in rural areas. Meru County falls behind other SWA counties with a low figure of 59 percent. Female headed SME farmers households are behind the male headed ones which indicate higher access to financial institutions or products.

Chart 10: SME farmers with access to financial service providers

|  |
| --- |
| The SWA project targeted financial solutions must respond to unique position of the women and must be tailored to address women needs. Women may lack direct access to collateral and also lag behind in terms of use of mainstream financial institutions products. SWA and providers must therefore have specific initiatives tailored to create inclusion and promote use of financial products by women in SWA clusters. |

## Financial Institution used by SME Farmers

A review of national data from 2016 Financial Inclusion Survey[[10]](#footnote-10) show that formal prudential and non-prudential institutions play a major role in creating financial inclusion in the counties targeted by the SWA program.

Chart 11: SWA counties total population financial inclusion

*Source: Financial Inclusion 2016 Survey –FSD Kenya*

Mobile money services are widely used by SME farmers across most of the SWA counties. Just about 6 in every 10 households have access to commercial banks

Table 8: Main financial services providers used by SME farmers

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | *Total* | *Laikipia* | *Machakos* | *Meru* | *Nakuru* | *Uasin Gishu* |
| ***Base*** | ***422*** | ***77*** | ***141*** | ***149*** | ***25*** | ***30*** |
| Mobile Money Service e.g. Airtel Money, M-PESA, Yu Cash, *Mobikash*, Equitel | 63% | 58% | 66% | 56% | 60% | 100% |
| Commercial bank | 57% | 57% | 50% | 68% | 52% | 47% |
| Savings and Credit Coop (SACCO) | 21% | 31% | 9% | 32% | 16% | 7% |
| Merry-go-round/ Table banking/ ROSCA/ Chama/ Group savings account | 19% | 6% | 31% | 9% | 44% | 23% |
| Mobile money services from Banks (KCB Bank, Equity Bank, Cooperative Bank etc.) | 9% | 17% | 12% | 2% | 4% | 7% |
| M-Shwari | 8% | 14% | 4% | 5% | 0% | 40% |
| Micro-finance institution | 5% | 0% | 4% | 7% | 0% | 17% |
| Others | 1% | 1% | 2% | 1% | 0% | 0% |

## 

Mobile money services which is the most predominantly used financial service, is versatile and can be used across all other financial institutions. As such, financial products developed to finance irrigation products and services will be easier to use for farmers if linked to mobile money services. About half of the farmers are using commercial banks and therefore banks will be crucial members in the SWA project goals.

## SME Farmers Saving Behaviour

Seventy two percent of the SME farmers at least save some of the income generated from their farming activities. Among those who save, 59 percent said they save to manage the cost of education, while 47 percent save to purchase farming inputs. A 30 percent of them reported they save to meet the cost of buying agricultural assets.

Chart 12: SME farmers saving of income from farm activities

Chart 13: Main purposes why SME farmers save (n=305)

Perhaps we could convey the message to the county government that it is imperative to find ways of reducing the cost of education??

Most of the SME farmers who currently are saving any farming income save with commercial banks while about half (48 percent) are using mobile money services such as M-PESA or Airtel Money. Saving and Credit Cooperative Society (SACCO) and Rotating Savings and Credit Association (ROSCA) or Group Savings schemes are used by a minority of the SME farmers in the SWA program counties. However, the baseline has shown these to be important institutions in supporting farmers’ credit requirements.

Chart 14: Financial Services Providers used by SME farmers

## SME Farmers Access to Credit

Only 16 percent of the SME farmers with access to financial institutions in the clusters sampled have applied for any credit to support agricultural activity in the last year. Majority of the applications (96 percent) have been approved.

Chart 15: SME farmers’ who have applied for credit

Cooperatives, SACCOS, banks and Microfinance institutions are some of the sources of credit for the few SME farmers who have accessed agricultural loans in the past year.

Table 9: Main Source of agricultural loan

|  |  |
| --- | --- |
| *Main Source of agricultural loan* | *Base=66* |
| Cooperatives/ SACCO | 33% |
| Local banks | 23% |
| Micro-finance institution | 18% |
| Government credit schemes e.g. Youth Fund, Women Fund, County Funds | 8% |
| Group Savings/Table banking | 6% |
| NGOs, CBOs | 3% |
| Agricultural Finance Corporation | 3% |
| Social Venture Funding e.g. Juhudi Kilimo, Kiva Online, One Acre fund, etc. | 2% |
| Family and friends | 2% |
| Others | 8% |

Many (64%) of those who have accessed agricultural loans in the past year have used the loans to buy farm inputs while only a few (11%) have used the credit to invest in water solutions.

## SME Farmers access to insurance

Less than a quarter (24 percent), of the SME farmers’ population is aware of any agricultural insurance services while only 2 percent of those aware of insurance products have any agricultural insurance services.

## Barriers to Financial Access for SME Farmers

*Farmers lack records:* Generally, SME farmers do not keep consistent records and therefore a credit scoring system that assesses their suitability for credit based on such records disqualifies them for any credit. There are however opportunities to use alternatives to mainstream banking records. Sixty-three per cent of the SMEs in the SWA clusters are using mobile money services. Opportunities therefore exist to use emerging credit scoring system that based on mobile money service transaction history and behaviour.

The integration of the mobile money services to national registration data base and credit reference bureaus has been found to reduce the risk of default for customers growing from the informal sector characterising the SME farmers sector. Private sector led alternative platforms leveraging on ICT to promote farm records are also emerging. An example of such a platform- *FARMIS* that supports SME farmers with extension services, financial education, linkage to markets and farm record keeping is in use in Meru and Laikipia and has shown early stage success among users.

*Financial literacy:* SME farmers are characterised with low to average financial literacy. Limited understanding of financial services sector and poor financial discipline amongst some increase their credit default rates and therefore limit their access to financial products.

Partner with institutions and organisations working to promote financial education among farmers and other rural poor.

*Land Tenure System:* More than half the population of the SME farmers in the SWA clusters do not have formal land ownership documents. SME farmers are therefore cannot use the land as collateral or are limited in making long-term commitment in assets as the land they are investing in rented or leased. Most of the leases are not formal agreements and are based on trust. While women have access to the land, few have any documents that they can use as collateral and therefore any products developed to address women financial needs must respond to this situation.

*Limited access to Smart Water Solutions: SME* farmers have slowly adopted to climate smart agriculture. While the effects of climate change have continued to affect SME farmer enterprise, the farmer lacks access to appropriate water technologies to support crop irrigation. This is exposes farmers’ return to crop failure making them unattractive to financial providers. Incorporating smart water technologies providers in the financing is one way of addressing this problem.

*Age of the farmer:* The average of the SME farmer is past the age of fifty years. The financial institutions treat the farmer this age as a more risky client and therefore limiting access to credit, insurance and other financial products due to their perceived high risk profile.

*Low entrepreneurial skills:* The SME farmer has limited entrepreneurial skills to acquire and prudently employ financial capital obtained from both internal and external funding sources. This also limits their ability to consistently repay their debts or even manage their cash flows.

*Limited access to markets:* farmer have for various reasons have limited market participation. This creates a ripple effect in their financial and enterprise viability. Information asymmetry and skewed market relationships reduce profitability of the SME farmer venture.

*Limited products and services awareness:* the financial sector players have some financial solutions to meet the farmers’ needs. However the farmers have limited awareness about the products. There is limited interaction between the farmer and providers and the information gaps therefore have remained and bar farmers from seeking the services. For instance, crop insurance exists among several players but farmers in the baseline survey record that only about a fifth of famers are aware of any such product.

*SME farmers’ needs-product mismatch:* The products and services are designed with limited understanding of the farming as a business. Products such as crop insurance are reportedly expensive for the SME farmer while credit at times does not match the farming cash cycles. As such the products fail or achieve limited degree of success among SME farmers.

*Adoption to technology:* Slow adoption to technologies by farmers has limited their shift from traditional farming practices, water technologies and continued to hamper the commercial viability of the farmer enterprises.

*Provider lack of expertise on smart water solutions:* Financial providers report they lack understanding and knowledge to effectively support financing support to the SME farmers to accelerate adoption of SWS.

Lack of partnerships between providers of technologies and financiers to support the farmer has limited the extent to which the smart water technologies can extend their reach to farmers.

Financial sector products are not customised to respond to farmers’ needs and dynamics. For instance, repayment requirement for credit that is tied to a monthly income doesn’t help farmers to deepen their access to and use of products.

*Risk averse:* financial players treat farmers with suspicion and as earlier discussed, lack of understanding of the smallholder farming by financial sector players goes further to reduce penetration of services especially the insurance related services that are needed to mitigate the risks of smallholder agriculture constantly threated by multiple factors including climate change.

## Outcome 4

|  |
| --- |
| **Increased access to knowledge and demand created for SWS** |

**Indicator 1: Number of suppliers of SWS with access to and have gained new knowledge tailored for SME farmers**

Before the start of the SWA program, SWS providers interviewed indicated that there is no structured interventions that support them with knowledge and skills capacity building initiatives tailored for SME farmers.

**Indicator 2: Number of farmers with access to and gained new knowledge on SWS opportunities to their farming systems / working area**

## SME farmers access to information

The main source of agricultural information for SME farmers in these counties is word of mouth from other farmers, friends and information obtained from demonstrations sites. Radio and television come after word of mouth as key sources of information to farmers.

Table 10: Farmers’ source of information

|  |  |  |
| --- | --- | --- |
| **N=557** | **Agricultural Information source** | **SWS Information source** |
| Other Farmers, Friends and relatives/ demo sites | 52% | 49% |
| Radio Station | 41% | 32% |
| Television | 18% | 14% |
| Agricultural Shows, Exhibition and field days | 15% | 10% |
| Government Agricultural Officer, extension officer (SCAO etc.) | 9% | 5% |
| Other private companies in agribusiness | 9% | 7% |
| Groups/ associations | 7% | 3% |
| Farm input providers (e.g. providers-fertilizer, animal feeds, AI services, seeds, Agro-vets) | 6% | 4% |
| Cooperatives | 3% | 2% |
| Print media (Newspapers, magazines, journals) | 3% | 3% |
| Research institute/ agricultural training centre | 3% | 3% |
| Mobile phone (Short Message Service SMS, Toll free lines, calls) | 2% | 1% |

About 11 percent of the SME surveyed mentioned specifically that they access information about agriculture from *Shamba Shape Up* television program on Citizen Television. The only other significant TV program is Smart Farm on the same channel-Citizen TV.

There is wide listenership of vernacular radio stations -common ones Chamgei FM, Inooro FM, Mbaitu FM, MuugaFM, Musyi FM and Kass FM depending on the language spoken by and locality of the farmer. Main programs mentioned to be used to access information on agricultural matters include *“Mugambo wa Murimi”* on *Inooro FM, “Uthui Muundani”* on *Musyi FM, “Kajuka Murimi* on *Muuga FM,* and *“Kass Kabatik”* on *Kass FM.*

**Indicator 3: Number and capacity of existing centres providing knowledge on SWPS**

## Capacity of Existing Knowledge Centre

There are 20 Agricultural Training Centres serving the counties under study as indicated in the embedded files (SWS industry player). These centres offer both customised and non-customized courses to farmers. For the customised courses, these institutions tailor special courses to fit the needs of individuals or groups seeking advanced training of having special interests or a particular focus. Training covers various areas such as: greenhouses, horticultural production, breeding of livestock, poultry farming and liquid soap making, among others. The centre’s experts include food scientists, farm managers, crops and livestock officers.

Amiran Training Center seeks toempower farmers by changing the farming concept from subsistence farming to sustainable Agribusiness, creating better income, food security and livelihoods for families and communities in Kenya and Africa. The Amiran Farmers Kit (AFK) demo includes Seeds (outdoor and indoor), drip irrigation kit among others

## Outcome 5

|  |
| --- |
| **Investor business linkages created between Dutch and Kenya Companies in SW services and products for small and medium farmers** |

## SME farmers market and business linkage with Kenyan and Dutch companies

The SME Farmers currently have limited integration to market and linkage to market players, both locally and internationally. Only 12 percent of the sampled farming households currently belong to any association that promote market access or produce marketing. The existing associations also have limited reach and influence to champion farmers’ interests in the market. For example, existing farmer groups are poorly integrated into the value chain and lack leadership and awareness of market factors such as price determination, produce quality expectations and relative demand of various products required in the local and international markets.

There are over 40 association groups promoting farmer access to markets that were identified as working with farmers in the selected groups (see attached annex for more details). These are mainly groups that also provide other support services to SME farmers including farmer training, extension services, technology transfer, access to credit, and mobilisation of savings.

The baseline also identified about 40 Kenyan companies that have potential to work with about 20 Dutch companies that can create linkages for SME farmers targeted by SWA project.

# Conclusion and Recommendations

1. **Irrigation Acceleration Platform (IAP)**

Farmers are mobilised into groups and organisation that can easily be used to accelerate the set-up of the IAP. Among other needs the platform needs to respond to mitigate:

1. Utilization of inadequate or scarce water resources as reported by farmers as the greatest challenge
2. The gap in extension services to boost good agricultural production practices among SME farmers
3. Lack of information services on among others the smart water technologies, access to finance, providers of SWS, water and resources management, market linkages, financial literacy etc.
4. Business linkage platform between producers and market actors.

To remain sustainable, the platforms must tap on the local resources such as county government structures, existing associations and farmer groups (must include water users associations), SW technologies providers, ATCs, lead farmers, private sector market players specifically farm input providers and produce buyers among others. SWA should focus efforts to work with associations to include more women members in the current associations.

1. **Use of irrigation technologies**

The baseline survey has established that more than 90% of the target SME farmers are using various irrigation and water management systems. Some useful observations were also made: (a) lack of irrigation water storage capacity in several areas forces the famers to abstract, convey and apply the water directly to the farm, even during hot and dry period when the water resources are scarce and rate of evaporation is excessively high, and (b) a significant number of farmers are using non-equipped irrigation systems that waste water and also incur high energy costs. These findings indicate that an informed discussion could made with the SME farmers and a potential exist for adoption of improved or new systems that can increase water productivity and the income of the SME farmers. It is however imperative to undertake quantitative water productivity and income assessment for each of the different irrigation and water management technologies and practices (this was beyond the scope of the baseline survey) to exactly determine if and what improved and new systems need to be introduced.

1. **Finance**

Most SME farmers have access to one or the other of the several financial institutions present in the SWA project target counties. However, there is need to deepen the utilisation of products and services offered by the providers and SWA projects to:

* Review of products and service offering to align and match them to the needs of farmers. For instance, majority of farmers are opting to save to buy farm inputs and assets as credit products currently are not accessible to farmers. The credit profiling of the farmers by providers consider the farmer too risky (owing to seasonal cash flow, farmer age, erratic weather factors among others). SWA project needs to work with finance providers and farmers to develop and promote appropriate financing solutions.
* Agricultural insurance products have very limited reach to the SME farmers. Working with other actors including current insurance providers, other financial service providers, SW technologies providers, extension services providers etc. SWA project needs to revise the current product-from their functionality-including risk profiling and pricing, marketing and distribution to entrench their reach to the SME farmers.
* Distribution and promotion of financial products as currently is has limited reach to SME farmers. SWA project has opportunities to deepen the reach of products by working with providers to review the current opportunities to promote financial products within the IAPs, use of ICT to distribute products such as crop insurance, payment of farm inputs among others.
* SWA project should link the SWS as a potential channel for SME farmers to access financing for the SWS that are available. Amiran, Juhudi Kilimo for instance has the capacity to partner in this endeavour. Bringing together the financial institutions, SWS providers, farm input providers, produce buyers can create a low risk financing channel for the SWS required to increase water productivity with the SWA project counties.
* The SWA project targeted financial solutions must respond to unique position of the women and must be tailored to address women needs. Women lack direct access to collateral and also lag behind in terms of use of mainstream financial institutions products. SWA and providers must therefore have specific initiatives tailored to create inclusion and promote use of financial products by women in SWA clusters.
* SWA project needs to partner with providers who will promote financial literacy and entrepreneurial and life skills of the SME famers. This should include but not limited to financial literacy programs, farm record keeping, and farm management.

1. **Access to knowledge and information**

There currently is a gap in the knowledge, adoption and maintenance of SWS in the counties targeted. The SWA project must respond to this to help reduce the knowledge gap and provide sustainable solutions by working with existing and new players to create awareness about solutions, reduce funding gaps by working with financial sector providers and create a network of service providers to maintain and upgrade technologies when they break down. It is recommended that a multiplicity of information channels are used including existing network of groups, associations, radio and television, ATCs, farm demo sites and lead farmers for SWA project to grow the knowledge base of the SME farmers.

The SWA project had proposed at design stage to use *Shamba Shape Up* television program on Citizen Television as the main channel of communication. This program has a reach of 11 percent of the SME surveyed. SWA project must therefore consider other alternatives including vernacular radio programs.

To reduce information asymmetry with regard to financial services, SWA project should including systematic effort of developing a program that equips financial sector players with knowledge about a farm enterprise and farmers financial needs.

1. **SWA project sustainability and business linkage**

There are existing opportunities to transform the existing producer associations into viable contract farmer groups that can sustainably run beyond the SWA project. The baseline findings with farmer associations and groups such as Savannah Horticulture Farmer Cooperative Society in Laikipia shows that the associations can create a sustainability plan to support SME Farmers and water productivity agenda beyond the SWA project. The groups have the requisite SWS supporting structures from extension services support, water management initiatives, financial linkage and knowledge building capabilities. This groups therefore it is recommended should be transformed into contract farming models structures that addresses the needs of farmers, producer buyers, exporters, produce end-consumers, input suppliers, financial institutions among others. Turning producer into quasi-communal-private enterprises makes them sustainable vehicle to drive the SWA objectives beyond the project term.

1. **Gender and SWA Project**

The landscape within the SWA counties current has a limited participation of women. Only 35% of the SME farmers have women actively participating in decision making about farming enterprises. Membership to associations is also largely male. To achieve the 50% of 10,000 women farmers, it is recommendable for SWA project to work with associations and also women in male headed households to ensure they too benefit in much the same way like the women peers in de jure female headed and de facto female led farm holds.

# Annexes

   

1. *Statistics computed using Kenya National Bureau of Statistics 2009 Census, 2006 Integrated Budget Survey figures and ASDSP 2014 Baseline Survey data* [↑](#footnote-ref-1)
2. <http://akvo.org/products/akvoflow/#overview> [↑](#footnote-ref-2)
3. Leskovec, J., & Faloutsos, C. (2006, August). Sampling from large graphs. In Proceedings of the 12th ACM SIGKDD international conference on Knowledge discovery and data mining (pp. 631-636). ACM. [↑](#footnote-ref-3)
4. Source; Kenya Climate Smart Agriculture (SCA) Programme 2015 - 2030 [↑](#footnote-ref-4)
5. Agricultural Sector Development Strategy 2010–2020 [↑](#footnote-ref-5)
6. Food and Agricultural Organisation-FAO, 2013 [↑](#footnote-ref-6)
7. *Source: KNBS Open data, Proportion of Households Engaged in Crop Farming by Region County Estimates-KHIBS 2005/6). This is also the source for the*  [↑](#footnote-ref-7)
8. *Source: ASDSP 2014 Baseline Survey Report* [↑](#footnote-ref-8)
9. \* Caution: small base [↑](#footnote-ref-9)
10. Financial Inclusion Terms: Formal prudential – CBK, IRA, CMA, SASRA & RBA) / Formal non-prudential – MFS, Postbank, NSSF, NHIF / Formal registered – MFIs, non-deposit taking SACCOs, / Informal – ASCAS, ROSCAs, shylocks etc. / Excluded: Friends, secret hiding place, family [↑](#footnote-ref-10)