# Farm-Gate Price Monitoring

Lessons learned from the 2013-2014 pilot in selected impact countries

**A joint VAM/P4P study**

## WFP

## World Food Programme

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# VAM-P4P *Farm-Gate Price Monitoring in Selected Impact Countries: Lessons Learned from the 2013-2014 Pilot*

**Author: Ilaria Musumeci. Inputs and comments from Tobias Flämig, Damien Fontaine and Enrico Cristiani**

## For additional information, please contact:

**WFP Vulnerability Assessment and Mapping (VAM)**

Tobias Flämig, *Head of Economic and Market Analysis Unit*
tobias.flaemig@wfp.org

Ilaria Musumeci, *Market Analyst*
ilaria.musumeci@wfp.org

**WFP Purchase for Progress (P4P)**

Damien Fontaine, *Monitoring and Evaluation (M&E) Officer*
damien.fontaine@wfp.org

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# Summary of learnings

## Technical and implementation aspects

- The Geo-referenced Real-time Acquisition of Statistics Platform (GRASP) functioned successfully in the Purchase for Progress (P4P) impact countries. VAM constantly improved the data collection tool, which is now available in a more stable version.

- The user interface was too complex: farmers had problems with the Android Operating System (OS) and difficulties in undoing accidental selections. Some farmers could not save/send data regularly due to low memory capacity of the devices.

- Insufficient planning and lack of time during the trainings were among the reasons for poor data quality and data flows. Nevertheless, the pilot was a key learning lab for all teams who improved the format and content of the training materials based on the feedback received.

- Overall, implementation would have benefitted from greater coordination between WFP Headquarters (HQ) and Country Offices (COs), including regular communication flows and a clearer division of responsibilities.

- The communication strategy for the set-up and dissemination of data analysis would need major improvements. Clarifying the audience would allow to target data analysis to users' information needs. The scope of data analysis could be narrower as the potential of the collected data explaining farmers' marketing choices is limited without supplementary evidence.

- Data analysis could be provided only long after sending during the pilot because the reports' structure was defined over the analysis process and data cleaning took long time to complete. Nevertheless, with the analytical structure being already set up, data analysis will be timelier in case of scale-up. The new GRASP tool would help VAM manage and analyse more data on the server in a shorter time.

## Lessons learned from the analytical process

- Data quantity was below the amount expected in all countries for farmers' participation fell during the pilot. Project teams should be more active in checking reasons for drop-out and solicit participation of non-responsive farmers.

- Data quality of volumes sold and selling prices was poor, undermining consistency of data analysis. Data on prevailing market prices can be used to validate selling price series. Improving quality of sales data would require either to extend the data sample or the questionnaire.

## Potential uses of the GRASP-based data collection

- GRASP-based data collection has the potential to fill gaps of the available producer price data that is currently collected through other data collection methods. However, data quality must be improved.

- The use of GRASP can benefit COs' monitoring activities. Yet, implementation of the pilot was costly in remote areas and COs could neither prioritize data collection nor provide regular assistance to farmers.

- Participating farmers developed new skills and created networks among producers. Farmers also felt that receiving WFP price data could have helped them make more informed business decisions. More regular follow-ups with farmers will be a key incentive in case of scale-up.

# 1. Introduction

In January 2012, the P4P Stakeholders Group explored the possibility to develop a data collection tool that could cover P4P's data needs and fill some information gaps in the P4P M&E framework, as identified by the mid-term evaluation of the P4P pilot.[1] Discussion within the Group singled out the integration of farm-gate prices in the VAM online price database as a strategic way forward.

In 2013, VAM and P4P teams designed and piloted an *ad hoc* data collection system for farm-gate prices using a GRASP-based mobile technology.

GRASP allows for the flexible design of remote surveys through real-time questionnaire design, data entry and transmission using smartphones or tablets. The application works offline: respondents can enter the data in any location; they can upload the information later on when either GSM signal for SMS messaging, Wi-Fi or internet mobile connection (in the range of 2G-3G) is available.[2]

The goals of the GRASP-based pilot were to i) establish a strategy to monitor prices and sales of P4P farmers' organizations (FOs); ii) improve understanding of farmers' marketing choices in support of P4P M&E; and iii) integrate farm-gate prices into VAM's price monitoring tools.

The use of GRASP was the first opportunity for VAM to fully hand over to beneficiaries the data collection process. Therefore, the pilot also meant to assess whether this could be a viable option for future price monitoring initiatives.

The pilot involved three countries: El Salvador (July 2013-February 2014), Ghana (June 2013 - May 2014), and Tanzania (July 2013 - January 2014). In each country, lead farmers in P4P-supported FOs engaged in sending SMSs weekly to report on prices in the nearest market and provide details on their sales: commodities sold; channels for each sale; volumes delivered; and unit prices received.

This report collects main lessons learned from the implementation of the pilot. The purpose is to evaluate pros and cons of using GRASP with farmers to collect data on sales and prices in view of possible scale-up.

The document will address: the main technical aspects relating to the installation of GRASP, data collection and the analytical process (in Section 2); the quality and quantity of the obtained data (in Section 3); the potential uses of the GRASP-based data collection (in Section 4).

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[1] The report "*WFP 2008-2013 Purchase for Progress (P4P) Initiative: A Strategic Evaluation (mid-term)*" is available at the link: https://www.wfp.org/content/mid-term-evaluation-wfp-2008-2013-%E2%80%9Cpurchase-progress%E2%80%9D-pilot-project-terms-reference .

[2] For more information, see http://www.fsincop.net/resource-centre/detail/en/c/215097/ ;

## 2. Technical and implementation/process aspects

### 2.1 Programming and installation of GRASP

## Key Learning

> The use of GRASP during the pilot had several success factors. The system functioned well in the target countries and VAM constantly worked on its improvement. The GRASP tool is now available in a more stable version; it is recommended to complete the upgrade for future use and in case of scale-up.

In each target country, P4P HQ procured a server and 25 smartphones. The VAM team completed the installation and testing of the application,[3] prepared technical guidance notes and trained the VAM/P4P/IT staff on how to use the GRASP "Reporting tool" for downloading and exporting data.[4]

The use of GRASP during the pilot had several success factors:

- The GRASP System is well functioning in the target countries. Support from VAM HQ allowed to successfully troubleshoot main technical issues in those countries that connected their data server to the WFP network, El Salvador and Ghana.

- VAM and IT updated the GRASP data collection tool. VAM HQ has been constantly working on improving GRASP thanks to comments from farmers and the P4P team. Based on VAM's inputs, IT released a more stable version of the software.

- The new version of GRASP can speed up data cleaning and analysis for it allows to correct data entry issues and conduct basic analysis on the server before exporting the data. In case of scale-up, this feature would help VAM manage and analyse more data in a shorter time.

A number of issues that arose during the pilot suggest areas for improvement before scale-up:

- The network configuration should always include HQ to enabling remote technical support. In Tanzania, the data server was not connected to the WFP network because of the use of an Access Point Name (APN) System and HQ could not deliver support during the pilot.

- Ensure that the server and the mobile devices are set up before the staff/farmer training.

- Complete the transition to the up-to-date GRASP tool. The older tool has issues with the storage and cleaning of data that VAM has solved in the latest version. Yet, there was late or no upgrade of the GRASP System during the pilot.

Despite being greatly interested, the Ethiopia COs could not launch the pilot due to logistical and technical constraints. VAM remotely installed the server along with relevant software and shared data collection formats in order to get paper-based data collection started.

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[3] Installation and testing included the following activities: 1) Setting up servers were set up and installation of GRASP; 2) Installation and testing of GSM modem for SMS transmission; 3) Testing of SIM cards for SMS and Data transmission.

[4] Trainings and installation occurred during the following missions: El Salvador (6-12 July 2013); Tanzania (16-21 September 2013); Ghana (22 September - 4 October 2013).

## 2.2 Data entry, transmission, storage, and export

## Key Learning:

> Farmers had problems with the Android Operating System (OS), due to the complexity of the options available and difficulties in undoing accidental selections. Farmers should develop the capacity to maintain the mobile devices, for it may be too costly for COs to provide continued assistance.

Even though farmers learned how to use the GRASP mobile tool during the training, they still had problems in dealing with the Android OS during data collection. It seems that these difficulties were mostly related to the size and complexity of the touchscreen and the keyboard.

The mobile devices in use for the price data collection were Samsung Galaxy Young S5630, with 3 inches screen. Farmers often reported that it was hard for them to select the option that they wanted because of the small size of the touchscreen.

Android OS offers too many options and may be confusing to less experienced users. When farmers pressed a button accidentally, they required assistance to restore the previous state. In fact, the user interface makes the configuration of the phone very complex.

It is important to make sure that farmers develop the capacity to use the phones but also to maintain them and repair minor technical issues. This is vital where COs cannot ensure regular assistance to farmers due to distance or budget constraints,[5] for it may lead farmers to interrupt data transmission.

## Key Learning:

> Farmers faced several issues in saving and sending the data due to low memory capacity of the devices. This may be one of the reasons why farmers could not send their forms regularly during the pilot. The latest version of the GRASP tool is more user friendly and solved part of this issue.

As farmers in Ghana reported, the capability of the Secure Digital (SD) card installed on the devices (i.e. 1GB) was at times not sufficient to store the data they wanted to send during the pilot. The Farmers could often not open a blank form, because the 1 Gigabyte (GB) SD memory card was full.

In addition, GRASP allowed to complete data entry at a different time but finalizing uncompleted data was too complex. Farmers could exit easily – or accidentally – the questionnaire but it was hard for them to find unfinished forms from the *Saved tab* of the application.

VAM and P4P teams are on track to solve these issues in view of potential scale-up. The latest GRASP mobile tool has major improvements. A warning message pops up when the user attempts to exit the form before it is complete. It is also possible to delete submitted forms and save memory.

It is suggested to purchase SD cards of at least 2GB of memory in order to ensure that farmers can properly use the tool during data collection. At the same time, it is plausible that the large amount of videos and pictures produced by farmers during the pilot contributed to fill the memory of the devices

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[5] As reported by the Tanzanian country office, distances from farmers' organizations were far and costly to cover and this often prevented the country office to follow up with - and provide regular support to - farmers during the pilot. For more details, see Section 2.7.

more quickly. Whilst exploring other uses of smartphones should be encouraged,[6] other functions should not interfere with timeliness and success of the data uploads. Creating a partition in the memory card to ensure specific space for the GRASP tool could help manage this problem.

## 2.3 Questionnaires

## Key Learning:

> Involving COs and farmers in the review of the questionnaires before data collection is a successful strategy. Yet, clarity of some questions must be improved in case the exercise would be extended. Also, the pilot shows that collecting complex data (e.g. marketing costs) is not feasible through simple forms.

P4P and VAM HQ drafted the questionnaires and finalized them during in-country trainings based on the feedback of the P4P CO staff and lead farmers. HQ teams facilitated the discussion through examples and exercises, which showed farmers how to correctly complete the forms.

The forms in use during the pilot intended to be short, simple, and easy to fill-in through GRASP. Farmers were asked to report on the prices prevailing in the nearest market and to provide details on their weekly sales: the type of commodities sold; the channel for each sale; total volumes delivered; and unit prices received. Questions also inquired on payment modalities and marketing costs.

Issues arose in relation to the complexity or clarity of some questions (see below). This had a negative impact on the cleaning and analysis of the obtained data.

There is a contrast between the need to ask simple questions and the risk to miss out important information. The pilot showed that collecting data about transaction costs directly from farmers is too complex and not feasible, despite it would greatly improve the analysis farmers' sales. In El Salvador and Tanzania, the attempt to introduce one question about marketing costs (see Table 1) was not well-received by farmers, perhaps because it required them to sum-up too many cost components on the spot.

In addition, it seems that some questions in the final form were not clear and farmers were confused on how to answer even after the training:

- *Units of measure*. Farmers agreed with the pilot teams on common measurement units. Yet, there were still too many options in the forms and farmers often ended up selecting the total volume sold instead of the unit weight used (e.g. 100kg vs. 20kg - Question 1.4, Table 1)

- "*Total Price Value per Unit*" vs. "*Total value of this sale*". It is plausible that using the term "Total" in relation to both unit and overall prices may generate confusion. Farmers often reported the unit price equal to the total money received for that sale

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[6] In occasion of the launch of the pilot, P4P and VAM teams indicated the opportunity to let farmers explore other uses of smartphones as a possible incentive to participate in data collection. According to the country office in El Salvador, the possibility for farmers to produce and share videos related to agricultural techniques and sales could encourage networking and information sharing among participants.

**Table 1:** Questionnaire - Example from Tanzania

Date: ____ /____ /_____

Farmer ID:

1.0　Report of the weekly prices in the local market of your community (Tzs/20kg bag)?

| Maize | Beans | Pigeon peas | Sorghum (optional) | Rice (optional) |
|---|---|---|---|---|
| _____ | _____ | _____ | _____ | _____ |

1.1 Did you do any sale the last week?

- ☐　YES
- ☐　NO

**If yes**, Please provide information on quantity sold and price received for each sale:

1.3　Commodity: **Please select only one**

| ☐ Maize | ☐ Beans | ☐ Pigeon peas | ☐ Sorghum | ☐ Rice |
|---|---|---|---|---|

Where did you sell your products? **Please select only one**

| ☐ Farm Gate | ☐ Local Market | ☐ Auction Market | ☐ Through FOs |
|---|---|---|---|

1.4　Unit of Measure: **Please select only one**

| ☐ 100 kg Bag | ☐ 90 kg Bag | ☐ 20 kg Tin | ☐ 5 kg Tin | ☐ 1 kg |
|---|---|---|---|---|

1.5　Total Price Value per Unit (in Tzs):

1.6　Total Volume Sold in this sale:

1.7　Total Value of this sale:

1.8　Payment modality for this sale

| ☐ Cash of cheque | ☐ Installment - Partial payment | ☐ Full credit |
|---|---|---|

1.9　Marketing costs associated with sale (fee, transport...) (Tzs)

## 2.4 Data cleaning and analysis process

### Key Learning:

> Data cleaning can be reduced if project teams will prompt farmers to report with more precision by including regular refresher follow-ups and trial periods in the training process. More regular cleaning of records during data collection and the upgrading of the GRASP tool could also allow for time savings.

Data cleaning removed several errors in the transmission of forms and typing mistakes during data entry (Table 2). The amount of invalid records was large and caused sizeable data losses in all target countries.[7]

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[7] Data halved in Tanzania (i.e. 216 forms discarded) and reduced by 20 percent in Ghana (i.e. 322 forms) due to the cleaning process.

**Table 2:** Common data quality issues and data cleaning interventions

| Report/ Form issues: | |
|---|---|
| • **Reports sent in "*test*" version**. Farmers continued using the *test* version of the form created during the training. | Reports in *test* version were not considered during the analysis. |
| • **Duplicate reports** sent by a farmer on the reporting day. | Duplicate reports were deleted. |
| Data entry issues: | |
| • **Mistakes in reporting dates** - Difficulties in indicating the exact *week/month* of the report, especially at the turn of each month (i.e. 1st/4th/5th week). | Incorrect dates were corrected during data cleaning. |
| • **Typing errors** - Occasional mistakes (e.g. missing out "0", decimal separators). | Detectable typing mistakes were corrected by means of comparison to average prices and volumes:<br><br>• For that product across marketing channels;<br><br>• In the same point of sale of that district or region;<br><br>• By the same farmer in other channels during the same month or season. |
| • **Sales reporting:** Confusion between units of measure and the total amounts sold; Inconsistent unit prices reported.<br><br>**Example 1.** Price per 20kg = Price per 100kg: 20kg is the actual unit weight as intended by the farmer; 100 kg is the total quantity - 5 bags of 20kg.<br><br>**Example 2.** Price per 100kg often 6 times the TZS price for 20kg alert to 120kg being the actual measurement standard used by farmers in Tanzania. | Outliers due to possibly persistent data entry errors were flagged during the analysis process. |

One reason is that many farmers had no experience in using the mobile phones and still had problems in entering and/or sending the data after the initial trainings.

In order to reduce the extent of the data cleaning, P4P and VAM teams could integrate the following activities into the training process:

- *Trial periods before data collection*. In El Salvador, farmers practiced longer with the mobile phones before data collection and sent their forms with increased precision afterwards.[8]

- *Refresher trainings*. Namely, regular follow-up contacts (in person or by phone) to remind farmers on key concepts for correct data reporting. [9]

The data cleaning took long time to complete; VAM HQ could release clean data only long after sending (1-3 months). One reason is that checks on data quality were not regular in COs during data collection, despite this being expected. Data cleaning started only after the end of the pilot.

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[8] Data collection in El Salvador officially started in July 2013 but P4P and VAM excluded the records transmitted during that month (i.e. 216 forms) for farmers sent data daily to improve their confidence in the use of mobile devices. This preparatory period allowed to reduce the need of additional cleaning of the reports provided afterwards (i.e. 9 percent reduction, corresponding to 114 forms discarded).

[9] Suggested contents are: a) compliance with agreed-upon reporting days; b) use of the *final* version of the form through the most updated GRASP version; c) adequate selection of "week" & "month"; d) correct unit of measures; e) check for typing errors before sending the form.

Late or no upgrading of the GRASP tool also contributed to prolong the data cleaning process. Data cleaning had to be done manually in HQ after downloading the data from the server.

Updating the version of GRASP in use for data collection would be a key action point for VAM HQ in case of scale-up. It is vital that COs screen the incoming records regularly while the exercise is ongoing. This would lead to time savings and allow data analysis to start timelier. It would also help identify those farmers' who face major difficulties in data reporting and better target follow-up contacts or trainings.

## Key Learning:

> The informative potential of the data was too limited to allow for a comprehensive analysis. Analysis of selling prices is possible and could improve with better data quality. Explaining farmers' marketing choices requires supplementary evidence that can hardly be obtained through the GRASP-based questionnaire; this gap could lower the interest of potential users of the analysis.

In order to keep questions simple, the current GRASP-based questionnaire is focused on the weekly collection of the following three variables:

| | |
|---|---|
| **PREVAILING MARKET PRICES** | Highest prices for commodities in the data sample as recorded by lead farmers weekly at the nearest market. |
| **SELLING PRICES** | Prices received by lead farmers in the sample per unit of product sold at any point of sale. |
| **QUANTITY SOLD PER SALE** | Corresponding quantities of products sold per sale. |

If data quantity and quality were to be properly improved, the analysis of these variables would allow to keep track of main price trends and differentials between selling prices at different points of sales. Analysis of seasonality is also possible.

Nevertheless, this data covers only a minor part of P4P's monitoring needs. Evidence is insufficient to explain several aspects of farmers' marketing behaviour:

- Farmers' access to marketing channels: it is challenging to determine whether reliance on a single channel reflects farmers' preference or if high entry costs restrict the options available to them;

- Individual sale patterns: understanding farmers' trading activities (including timing of sales) would benefit from prior profiling in terms of household (HH) characteristics[10] and stocks availability, which were left out from the data sample.

- Price incentives at the farm-gate, with lower transaction costs rather than price levels, could be the main reason why farmers choose the farm gate as their main option.

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[10] This may include qualitative data related to size of land cultivated, access to inputs/credit/market information, etc.

These gaps require supplementary data, which is hard to access: attempts to introduce questions about transaction costs[11] into the GRASP-based form were not well received by participating farmers. More information about WFP procurement is also necessary to put FOs' price and sales patterns into context.[12]

P4P and VAM teams should explore how to overcome these issues before scale-up. Potential audiences may not be interested in the outputs of data analysis if these are incomplete without supplementary evidence that is hard to find. A possible solution could be to shift the focus back to the sole integration of farm-gate prices into the VAM database while developing a simple template for the description of selling prices and sale volumes.

## Key Learning:

> The communication strategy requires improvements. Project teams should narrow the objectives of data analysis to those that can be truly informed by the data collected. Clarifying the audience would enhance the efficacy and usefulness of analytical outputs for final users.

Starting in July 2014, VAM analysed the data collected through GRASP and produced three country-specific studies reporting the main findings.[13] Data analysis consisted in identifying indicators that could best describe price and sales patterns in the target areas (Table 5, Annex I).

A number of issues affected the analytical process:

- The scope was overreached. The analysis focus expanded over time to include additional goals beyond the visualization of farm-gate prices (Table 3). These goals were not fully achieved: data quality and informative potential were too low to meet all P4P M&E needs.

- Different objectives implied diverse audiences and channels for dissemination; these were unclear. The analysis was not effective for it looked at different directions without a specific target.

- Data analysis was not timely, because data cleaning took long time and the analysis structure was defined along the way. Regular updates to FOs were not possible.

- As a result of concerns regarding data quality, interest in the project decreased between the conception of the project and the time of data analysis.

P4P and VAM HQ should co-ordinate in defining a clearer communication strategy to improve the effectiveness and usefulness of data analysis for stakeholders:

- Narrow the analysis' scope to the objectives that can be achieved given the data independently of data quality. The analysis can: capture major trends in selling prices and price differentials across points of sale; identify how much farmers sold in correspondence to those

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[11] Transaction costs factor in all expenses for the transport, storage of marketable products, and investments required to meet quality standards of specific marketing options.

[12] These data comprise WFP procurement (i.e. timing, proportion of WFP purchases through P4P; FOs actually involved in WFP contracting), and FOs' market potential (e.g. total volumes channelled by smallholders through FOs; constraints to FOs' buying capacity).

[13] The reports are available on the *WFP VAM: One Stop Shop*. See: "Farm-Gate Price Monitoring in Selected Impact Countries – Ghana", February 2015; "Farm-Gate Price Monitoring in Selected Impact Countries – Tanzania", February 2015; "Farm-Gate Price Monitoring in Selected Impact Countries – El Salvador", March 2015.

selling prices. The information collected is not sufficient to fully explain the rationale behind farmers' marketing behaviour.

- Clarify the audience and dissemination channels for the different analytical products. Adapt analysis outputs to these information needs; COs can suggest how to better share price analysis with farmers.

**Table 3:** Farm-Gate Price Data collection pilot: the objectives of data analysis

| Objective of the analysis process | Expected output | Audience and use | Was the objective achieved? | Reasons for non-achieving |
|---|---|---|---|---|
| Suggest visualization for farm-gate prices in the VAM database | "Automated" reports – No narrative | Public visualization and use | **Not yet achieved** | Loss of focus on farm gate prices; data quality; future of farm gate price data collection |
| Develop a template for analysis of price trends and seasonality to be provided in short time | Country-specific reports; <br><br>Bulletins; <br><br>Graphic reports: price trends; and differentials across points of sale. | Dissemination through P4P and VAM channels (newsletter, website). <br><br>Sharing with selected FOs information on local prices. | **Partially achieved** <br><br>Country reports on the VAM *One Stop Shop* *but* Analysis not shared with FOs | • Analysis completed long after sending <br><br>• Structure of the analysis established after data collection <br><br>• Unclear use, expected frequency for dissemination, and audience <br><br>• Issues with data quality |
| Comprehensive analysis to identify the informative potential of the data collected | Country-specific reports | Internal use: stocktaking of lessons learned | **Achieved** | |
| Support to P4P Monitoring activities: <br>• Price and sale patterns in FOs. <br>• Understanding of farmers' marketing choices | Country-specific reports | P4P team – HQ/CO/RB, Programme officers. Complement the learning already produced on SHFs marketing choices. | **Partially achieved** <br><br>Price analysis was accurate *but* analysis cannot explain farmers' choices | • Data had limited informative potential; <br><br>• Need to integrate with additional quantitative/qualitative information. |

## 2.5 Selection of participating farmers

The pilot involved all P4P-supported FOs in the target countries; within FOs, the pilot teams selected lead farmers, provided them with mobile phones and trained them for data collection.

This approach has positive potential and could be easily repeated in case of scale-up. P4P-supported farmers are already familiar with WFP and more willing to receive training on data collection; COs could follow-up with them more easily. Possession of a mobile phone is not an excluding factor, as is frequently the case of phone-based surveys.

Choosing lead farmers only has side issues, which are common to all purposive sampling methods:

- Some lead farmers may not be representative of SHFs in the same or other FOs due to initial differences, e.g. greater access to inputs, market power. This could bias sales reporting.

- The fact that WFP is a potential buyer may influence the way farmers respond (*interviewer effects)*, especially regarding prices and volumes of commodities sold through FOs.

- In addition, older farmers were less experienced than younger farmers in the use of mobile phones; this may be one of the reasons for declining participation during the pilot and low precision in data reporting.

In the eventuality of scale up, these risks could be somehow mitigated (with sufficient resources) by expanding the sample of farmers, to include:

- At least two farmers in addition to lead farmers of selected FOs would increase the representativeness of the sample and help the correction of outliers.

- Non P4P-supported FOs could be useful to mitigate possible *interviewer effects* on P4P farmers and provide control groups for P4P monitoring activities.

- Other farmers in the selected FOs who could replace non-responsive farmers.

Previous reports suggested to prefer younger to elder farmers for increasing participation and data quality. Use of local languages - beside the national language - during the trainings would also facilitate the participation of those farmers who have knowledge of the local language only (see Section 2.7).

## 2.6 Implementation requirements at COs and HQ level

### Key Learning:

> The launch of the pilot suffered from delays in the arrangement of the mobile phone network and the start of trainings. Implementation would benefit from greater coordination between HQ and COs, including more regular communication flows and a clearer repartition of responsibilities.

Difficulty in getting deals with phone companies postponed the launch of the pilot. In Tanzania, WFP agreed a data plan with the *Airtel* Company only after the training, with delays against the project schedule. To avoid similar issues in case of scale up, appropriate planning on WFP's behalf should ensure all agreements and devices are active in advance.

Gaps in official communications between HQ and COs also caused inefficiencies. COs did not have an overview of how the entire process was going to develop. Nor did they know the exact extent of their participation (in terms of monitoring, troubleshooting, or analysis). Interaction among project teams was less effective due to the lack of a shared timeline.

Strengthening communication flows would be necessary for the success of a scale-up. HQ and CO teams should agree on a clearer division of tasks and a timeline before data collection begins. With this purpose, HQ could share more comprehensive guidance material[14] with the COs considering farm-gate price data collection with GRASP.

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[14] Guidance material was already developed during the pilot to train lead farmers on price reporting through the mobile technology. More comprehensive guidance will comprise *i)* a guide for lead farmers on how to trouble shoot during the reporting by smart phones; *ii)* a guide

It is also crucial that COs provide regular feedback on the progress of implementation (e.g. on the flow and quality of incoming data) and include WFP HQ within the network configuration. This would facilitate co-ordination in troubleshooting and ensure the optimal flow of activities.

## 2.7 Training and training material for participating farmers and trainers

### Key learning:

> Delays during the trainings and language barriers were reasons for the poor data quality. However, the pilot was a good learning process for all teams involved, who improved the format and content of the training materials based on the feedback received.

Trainings are crucial for the success of the exercise for they introduce participants to the touchscreen technology and data reporting, first on paper and then using GRASP.[15] The purpose is to ensure that farmers are comfortable with the data collection method; farmers with no previous exposure to a smartphone or internet deserve particular attention.

During the pilot, P4P and VAM HQ facilitated the training of 90 farmers and WFP CO staff in the target countries (Table 4). Farmers managed to get a basic understanding of smartphones and knowledge of how fill in a standard GRASP questionnaire. The exercises included in the training material were particularly useful, adding a factor of fun and raising initial interest in the pilot.

Nevertheless, a number of issues affected the training process:

- *Insufficient preparation of training activities*. No specific training agenda had been developed in advance. This enabled flexibility to adapt the training schedule to the progress achieved, but also led to some level of improvisation and sub-optimal use of time. Due to lack of time, HQ teams could not properly train COs, who could not fully support or supervise farmers.

- *Need to continuously adapt the training materials*. HQ teams tested the trainings for the first time and had to prepare some contents and exercises on the spot, as in El Salvador.

- *Some farmers had knowledge of the local language only*. In Tanzania, CO staff delivered the training in the local language – *Swahili* - by translating contents and exercises on the spot. This altered the flow of activities.

Delays or misinterpretations during the trainings could be reasons for poor data quality. In the future, trainings should build on a more structured schedule, which states in advance the skills and knowledge that participants should acquire and the criteria to assess if such goals have been adequately achieved.

In this sense, the pilot was a key learning lab. The teams updated the training materials based on the feedback. The need to revise them on the spot would not be an issue for scale-up.

In order to ensure that COs are aware of how to train and supervise farmers, VAM HQ could consider developing additional material in appropriate language(s) and send it before the trainings:

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for IT staff in COs for the installation and use of GRASP, i.e. software requirements, installation of the system, maintenance of both system and data; *iii)* a guide for P4P coordinators/M&E staff/VAM staff, how to use GRASP for farm gate price data collection (e.g. the design of a paper questionnaire in GRASP).

[15] As already mentioned in Section 2.1, training of WFP staff comprised how to download and export data from GRASP and took place before farmers' trainings.

- A presentation on how to use the smartphone;
- A live demo on how to use GRASP for data reporting (e.g. a video);
- Farmers' training manual and some of the exercises that farmers will do during the training;

Trial data collection periods could also be complementary to trainings. Lessons from El Salvador show that trainings may not be enough for farmers who had no previous experience with mobile phones; in these cases, the chance to practice longer would help them send data with increased precision.

**Table 4:** Training participants in the target countries

| | | El Salvador | Ghana | Tanzania | Total |
|---|---|---|---|---|---|
| **Farmers** | F | 9 | 1 | 16 | **26** |
| | M | 9 | 24 | 10 | **43** |
| | **Subtotal** | **18** | **25** | **26** | **69** |
| **WFP Staff** | F | | 1 | 1 | **2** |
| | M | 3 | 3 | 3 | **9** |
| | **Subtotal** | **3** | **4** | **4** | **11** |
| **Supply side Partners** | F | | 9 | | **9** |
| | M | | 1 | | **1** |
| | **Subtotal** | **0** | **10** | **0** | **10** |
| | **Total** | **21** | **39** | **30** | **90** |

# 3. Lessons learned from the analytical process

## 3.1 Quantity and quality of the obtained data

### Key learning:

> Data quantity was below the amount expected in all countries. Farmers' declining participation was the main cause, due to technical issues or decreasing interest. Project teams should be more active in understanding reasons for drop-out and solicit participation of non-responsive farmers.

Data quantity was below the amount expected in all impact countries (*Figure 1*):[16]

**Figure 1:** Data quantity vs. data expected; data gaps due to falling or inconstant reporting, or data cleaning



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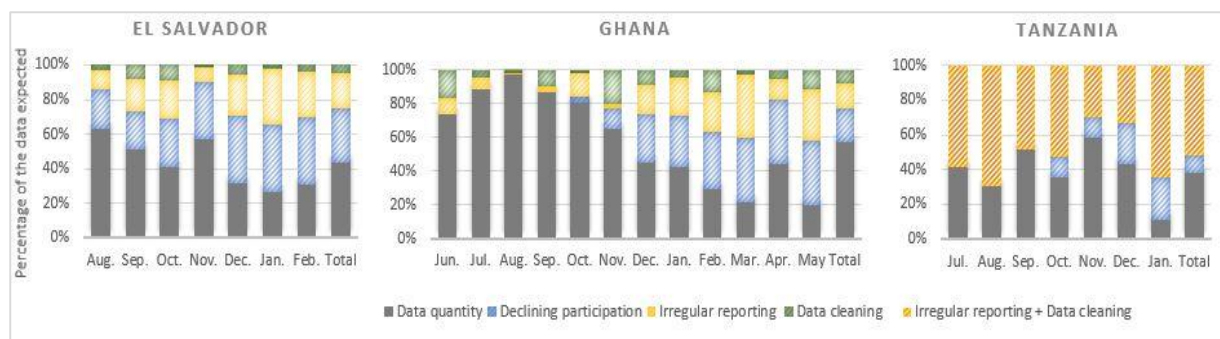
[16] The data expected is the number of records that WFP should have received given the number of farmers, the weekly frequency of reporting (4 or 5 weeks per month), and the duration of the pilot. In Ghana and El Salvador, the data available covered only 20-40 percent of the data needed from December 2013 onwards. In Tanzania, the dataset generally comprised no more than half of the weekly records expected per month and reached its lowest point in January 2014 (i.e. 11 percent).

Interruption of data transmission was the main cause: form-sending[17] farmers in Ghana and El Salvador halved from December 2013; in Tanzania, only 32 percent of farmers were active in January 2014 (*Figure 2*). Also constancy in reporting declined over time. Nearly 70 percent of farmers in El Salvador and 32 percent in Tanzania sent less than 3 records monthly against the 4/5 expected (*Table 7*, Annex III).

**Figure 2:** Number of active farmers and amount of records submitted per month
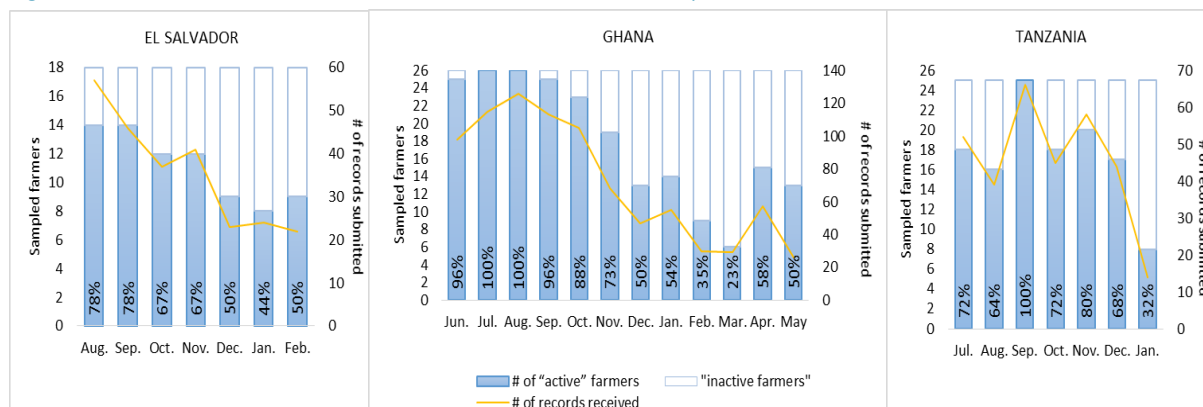


Missing values due to farmers who reported inconstantly or quitted data collection did not affect price analysis of local market prices, but significantly affected the possibility to analyse sales. A missing record could mean that a farmer simply did not report on that week (despite sales having occurred during that period) or that the farmer could not sell for some reason (e.g. no stocks, entry barriers to market, etc.). Examples are in *Figure 3*:

**Figure 3:** Data quantity and analysis of sales



Sorghum sales fell during harvest, possibly due to scarce production. This could also be due to inconstant reporting: half of farmers reduced or quitted data transmission from November; data was 55 percent only of the expectation.

Maize sales fell drastically in January 2014 at the end minor harvest season. Interpreting this result requires caution for 53 percent of farmers interrupted data sending in January.

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[17] Even in case a farmers did not record any sale on the reporting day, they were still expected to submit prevailing market prices on a regular basis. Accordingly, sampled lead farmers were considered "active" upon submission of: a) both prevailing market prices and sale records; b) at least prevailing market prices (in case no sale occurred at the time of data transmission).

Sample attrition is a common occurrence in protracted data collection efforts, and can lead to significant losses in terms of data availability.[18] This in turn affects the reliability of the analysis, especially considering the small size of the samples. However, data losses can and must be reduced for improving reliability of data analysis, especially if data samples will remain small and sales will be still in the focus of data analysis.

Possible reasons for declining participation of farmers include:

- *Technical difficulties*, such as lack of airtime or intermittent network connectivity;[19] the need of assistance to restore or reinstall the app or to repair the mobile devices.

- *Declining interest*. For instance, WFP's sporadic feedback on submitted price and sale records may have discouraged data sending.

P4P and VAM teams should monitor data reporting more regularly and strive to understand why some farmers miss rounds or drop-out of data collection. Moreover, before extending the monitoring exercise, it is necessary that teams agree on a more forward-looking strategy to keep farmers engaged with data collection and maximize data inflows. Possible responses to the abovementioned issues include:

- Soliciting active/regular participation of non-responsive farmers. Follow-ups in person or by phone would reinforce farmers' motivation and help identify reasons for leaving the project;

- If the reason is lack of airtime, follow-up contacts should discourage farmers to download videos or music from internet and save airtime for sending the data;

- Recovering the devices from inactive farmers and setting criteria for their replacement as part of the sampling frame.

- Considering two-way communication by using the phone for sharing information of interest to the farmer (prices, information on agricultural practices, etc.)

In general, it is important to clarify expectations, responsibilities and incentives for all parties involved, while also striking a balance between outcomes and available resources. Monitoring farmers' performance should also provide indications on whether there is a need to adjust any of these elements.

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[18] Several studies show that the decline of participation (i.e. sample attrition) in longitudinal data collection is unavoidable when respondents are required to provide their feedback over long periods of time; see Alderman et al. (2001) and Olsen (2005), Ganesan et al. (2013).

[19] See, *P4P-VAM Farm-Gate Price Data Collection – Issues and areas for improvement,* March 2014. In particular, this may be the case when falling participation is concentrated within specific time periods (e.g. from November 2013 to March 2014, in Ghana) or localized in hard-to-reach areas (as suggest by CO Tanzania).

## Key learning:

Quality of sales and selling price data was poor, undermining consistency of data analysis. Data on prevailing market prices was more consistent and can be used to validate selling price series. Improving quality of sales data would require either broadening the sample or expanding the questionnaire with additional questions.

Data on prevailing market prices is fairly reliable and matches quite well the market prices collected by VAM during the same period. Data quality was higher in those areas where the sample was wider and farmers participated more regularly in data reporting (*Figure 7*, Annex II).[20]

Quality of selling price data series - including farm-gate prices – was poor due to outliers that could not be removed during the data cleaning because the forms were valid, timely sent, and there were no evident typing mistakes (*Figure 4*).

**Figure 4:** Example of outliers in farm-gate price series - Tanzania



In September 2013, farmer TZ47 sold at a double price than all other farmers who sold maize at the farm gate in the same or different regions of Tanzania.

Although the farmer's records were valid and timely, this finding could still derive from an overestimation of the price per kg received.
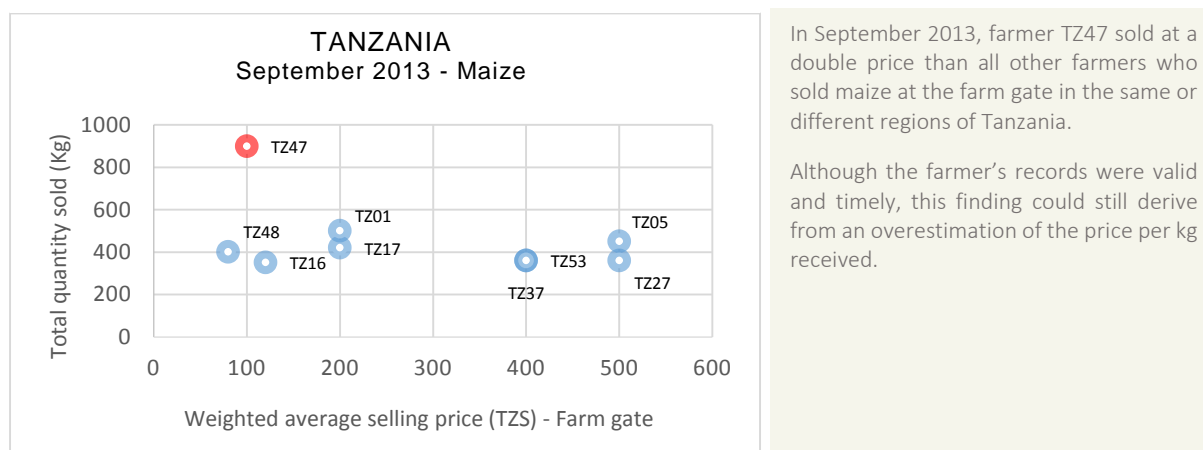
Outliers are also visible in the distribution of the income that farmers received from their sales during the pilot and flag quality issues in the data on sale volumes (*Figure 5*).

Persistence of outliers suggests that more systematic issues than data entry errors affect data quality; namely, flaws in the selection of farmers (non-representative lead farmers; inaccurate self-reporting – see Section 2.5); problems occurred during the trainings (see Section 2.7) and low participation.

P4P and VAM should address these issues before any scale-up. Poor data quality biases the reliability of data analysis, especially if the analysis is to be provided in short time or through "automated" reports. COs may decide not to use it for decision-making.

Consider the following conclusions:

- Farmers are objective in reporting prevailing market prices while the risk of inaccurate reporting is higher when they report on the prices received for their own sales.

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[20] This is the case of El Salvador and *Tamale*, in the northern region of Ghana. In *Ashanti* (Ghana), the gap between the prices reported by farmers and VAM data widened when participation was lower in the region (November 2013-March 2014). In Tanzania, GRASP-based price series were fairly reliable in *Kagera*, where sampled farmers were four; data reliability was lower in the other regions, due to discontinued reporting.

- Prevailing market prices can be used to check the reliability of selling price data and correct possible outliers: in fact, these price data series are expected to be close or at the same level.

- Sales data is vulnerable to outliers and hardly reliable. Expanding the sampling frame or adding probing questions to the form could allow to cross-check the figures provided by farmers. Project teams could also consider to remove sales from the scope of data collection.

**Figure 5:** Outliers in the income distribution - Tanzania and El Salvador
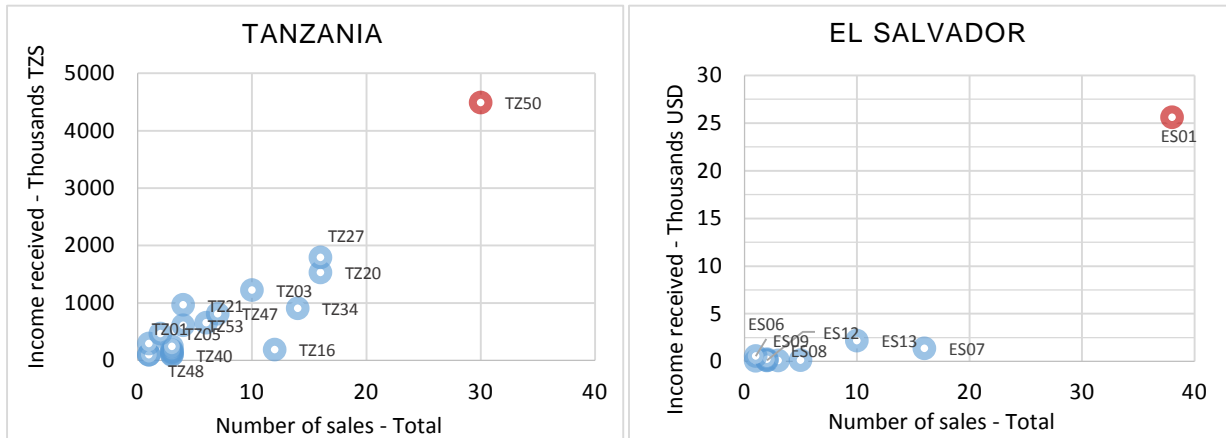


All reports sent by lead farmers TZ50 and ES01 were timely and valid (i.e. unique to sales of different products and in diverse points of sale; selling prices in line with average prices received by other farmers). Outliers may derive from inaccurate self-reporting or from the fact that these farmers were not representative of the other SHF (e.g. a greater access to inputs and marketing capacities resulted in a way larger number of sales).

## 3.2 Main analytical conclusions from pilots

### Price trends, seasonality, and differentials: the farm gate and farmers' organizations

In El Salvador, Ghana, and southern regions of Tanzania, prices at the farm gate were mostly below the prices received by sampled farmers at other points of sale; differences widened during harvest. Farm gate prices were higher than local market prices in northern regions of Tanzania.

In all impact countries, price differences between FOs and other selling points varied seasonally: FO prices were higher than prices at other channels when sales occurred during harvest while lower during the lean period.

### Limited SHF access to multiple marketing channels

In all target countries, the majority of sampled lead farmers had access to few marketing channels during data reporting (*Figure 6*): about 66 percent of farmers in Ghana and 44 percent in El Salvador relied on one or two points of sale, mostly the farm gate or local markets. In Tanzania, farm gates were the sole channel for 24 percent of farmers while additional 10 percent considered the local market or FOs as a second option. Moreover, nearly half of farmers in El Salvador and 20 percent of farmers in Tanzania reported no sale throughout the pilot.

**Figure 6:** Access to marketing channel*s*
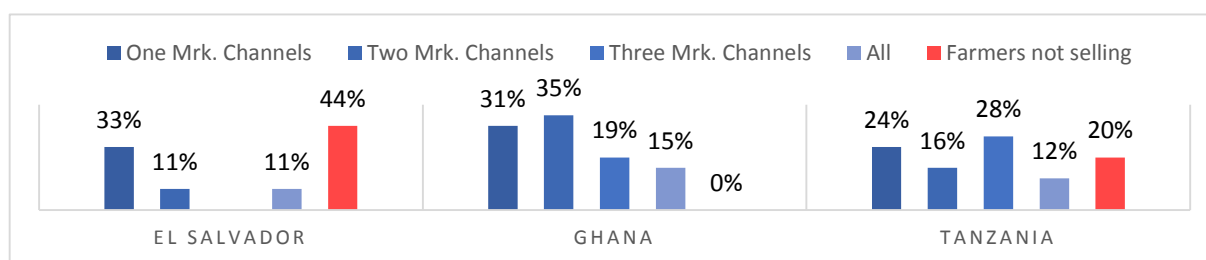


**Trends in crop sales: understanding farmers' marketing decisions**

In Ghana, the sales across marketing channels varied mostly in relation to price differentials. Farmers who had access to multiple selling points generally chose those which offered higher prices. In the other impact countries, no clear relation emerged between selling price differences and farmers' marketing choices even when more options were available to single farmers.

In El Salvador and Tanzania, farm gates were main channels for maize, even though prices were equal or lower than at other selling points. This finding is coherent with the assumption that farm gates allow to minimize transaction costs. However, evidence from obtained data was insufficient to confirm this intuition for the case under analysis.

**A relatively small share of the sampled lead farmers sold through FOs.**

In Tanzania, 40 percent of farmers channelled their products through FOs. The Ghana CO confirms that WFP procurement involved only 20 percent of the P4P-supported FOs. In El Salvador, only 22 percent of farmers sold through farmers' co-operatives due to FOs' limited buying capacity both in terms of available contracts and collective sales outside WFP contracts.

In Ghana and Tanzania farmers' decided to sell through FOs when they could receive higher prices than at other points of sale: maize sales for WFP procurement increased during harvest when FOs granted prices up to 50 percent above other channels. In El Salvador, lead farmers sold through FOs independently of price differences as a likely result of: small price differentials across marketing channels and agreements between farmers and FOs for access to private buyers or input suppliers.

## 4. Potential use of the GRASP-based FGP data collection

## 4.1 Potential use within WFP

## Key Learning:

> GRASP-based data collection has the potential to fill current gaps in the available producer price data but improving quality and continuity of the data collected is a pre-requisite.

Collecting farm-gate prices through GRASP directly from farmers is a key opportunity to fill current gaps in the producer price data that can be obtained through other collection methods.

Governments collect farm-gate prices regularly through paper-based surveys led by ministries of agriculture.[21] Since 2010, FAOSTAT[22] and CountrySTAT disseminate national farm-gate prices for public use. This data is subject to limitations: data is provided retrospectively at the end of the year; monthly series are short and discontinuous;[23] data is aggregated at national level, as an averaging of main markets, while remote areas are excluded.

The GRASP-based data collection could fill these gaps: farm-gate price data could be more frequent (i.e. weekly) and allow for analysis at disaggregated level (e.g. local market, district, or region). If properly involved in data collection, FOs are good networks to regularly reach out farmers who can hardly be reached by governments during regular surveys.

For the time being, the farm-gate prices collected through the pilot are not suitable for achieving this goal because of gaps in the data series and flaws in farmers' response accuracy. Taking advantage of this window of opportunity is still possible but improving the quality and the quantity of the data produced should be the priority before scale-up.

## Key Learning:

> GRASP-based data collection can be a benefit for COs if accompanied by relevant time and resource savings. Yet, implementation of the pilot was costly in remote areas and COs could neither prioritize data collection nor provide regular assistance to farmers.

Mainstreaming of GRASP for price monitoring can benefit COs. In the experience of El Salvador, the FGP data collection method can boost CO's monitoring capacities. Increasing attention from counterparts was also indicated as an advantage and a prompt to extend discussion with P4P partners and supported FOs. [24]

By contrast, the need to reinforce the technical platform and assist farmers *in situ* could represent a heavy opportunity cost and discourage COs from including the FGP monitoring within their activities. In Tanzania, costs and the time required to reach out distant FOs were too high, with the result that the CO could not prioritize the pilot vis-à-vis other capacity building activities.

The pilot was too short to evaluate if the data collected could support decision-making, in case of scale-up. It is unlikely that the analysis of the data obtained through GRASP will be used for P4P decision-making in the target countries due to poor potential to inform on farmers' marketing capacity and the long time lag between data sending and dissemination.

Envisioning scale-up, there is value in using GRASP as a routine source of information for price monitoring and discussion with partners. Usefulness for P4P decision-making will depend on the capacity to improve the informative potential and the timeliness of data analysis. Strengthening FOs'

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[21] In Ghana, farm-gate price data is considered as a national asset and is not publicly available; for more details, see: Ministry of Food & Agriculture (MOFA). For wholesale/producer prices collected in El Salvador see the website: Ministerio de Agricultura y Ganadería.

[22] FAO's Producer Price Data is collected annually based on the collaboration of national governments, comprising 134 countries and 216 commodities. The data is collected through questionnaires, submitted to national governments at the closing of each calendar year. Reporting governments could provide monthly price figures or their annual average. Producer prices primarily refer to farm gate prices. However, governments may choose to provide wholesale and retail price data, should prices at the farm-gate be not available. The FAOSTAT database doesn't allow to distinguish the farm-gate prices from the others.

[23] Covering the period 2010-2012 for both Ghana and El Salvador; averaging was needed to estimate missing figures. Monthly data is not available for Tanzania.

[24] The El Salvador CO is in the process of extending the use of GRASP for additional data collection purposes. Partnership with FEWSNET is currently being explored as an opportunity to establish a system for monitoring crop production across the country. This new monitoring project will involve the same farmers who participated in the FGP data collection pilot for they are already familiar with GRASP. The CO will adapt the questionnaire to capture the volumes produced and possible adverse factor that restrict farmers' production.

ability in troubleshooting main technical issues would increase time/budgetary savings and incentivize collaboration of COs.

## 4.2 Potential use for participating FOs and farmers

### Key Learning:

> The project can help farmers develop new skills and create networks among producers. Farmers also feel that receiving WFP price data could help them make more informed business decisions. More regular follow-ups with farmers will be necessary in case of scale-up.

Lead farmers reported that possession of a mobile phone and the opportunity to use the price data provided to WFP were the main incentives for participating in the pilot, with the expectation to:

- Develop and share new skills in the use of technologies. Lead farmers felt that learning how to use smartphones and GRASP was a capacity building activity that they could share with other farmers in their organization.[25]

- Improve transparency of information on market prices. Participating lead farmers felt that knowledge of how prices evolved in close regions could have helped them negotiate better prices for their own produce.

- Establish communication networks among farmers. In El Salvador, FOs used the mobile phones to connect producers and share the information provided to WFP. They perceived this as a chance to detach themselves from middlemen and ease direct access to markets.[26]

These could be key success factors for the FGP data collection project in case of scale-up. The pilot showed that the current organization of the project is already successful in developing farmers' skills in the use of smartphones and creating communication networks among FOs.

The pilot was not sufficient to assess if the data collected through GRASP could actually help farmers make better business decisions. The reason is that WFP did not follow up with farmers to share the analysis of the data provided. This was a critical gap, especially because project teams proposed the possibility to receive price information from WFP as an incentive to foster precision in data reporting.

If such beneficiary owned data collection using a smartphone technology is being pursued, WFP should look into opportunities of using the technology for other uses than data collection, including more effective communication on the programme, market opportunities, videos on agricultural practices or post-harvest handling, etc.

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[25] The farmers who participated in the trainings complained for they didn't receive a certificate to attest their new skills in touch screen technology and GRASP.

[26] Farmers' expectations in El Salvador were firstly collected in July in 2013 and posted online at: https://www.wfp.org/purchase-progress/news/blog/smallholder-farmers-report-prices-smartphones. More feedback was provided by the WFP CO in El Salvador. This reported that selected FOs in El Salvador used the mobile phones to reach out other farmers' co-operatives and get updates on how they were reporting. The information shared included which were the main marketing channels and the prices received for sales.

# 5. Concluding remarks and recommendations

The report presented key lessons from the P4P-VAM pilot collection of farm-gate prices through GRASP in Tanzania, Ghana and El Salvador. The study explored strengths and drawbacks in the set-up of the technological equipment, the pilot implementation, data collection and analysis.

Overall, the pilot offered VAM and P4P teams a valuable floor for dialogue on how to enrich the data pool at disposal of P4P M&E activities.

Most telling achievements include:

- Successfully testing and further improvement of the GRASP-based application, thanks to WFP's well-established experience in developing the tool and troubleshooting main issues.

- Lead farmers in FOs explored different uses of mobile phones and established internal or external communication networks to share information on local prices and sales;

- Increased visibility of WFP COs to P4P partners and enhanced technical resources for COs' monitoring activities.

- A key learning lab for the teams involved in pilot, who constantly sought to adapt the GRASP tool, the training materials and the analytical structure based on the feedback.

The implementation of the pilot and the analytical process encountered the below difficulties:

- The trade-off between gaining evidence for a comprehensive understanding of farmers' marketing behaviour and the need to keep questions short and simple.

- The complex interface of the GRASP app discouraged unexperienced users, especially when dealing with long questionnaires. Data entry errors were common and lowered data quality.

- Several farmers abandoned data collection as they did not receive any feedback from WFP with severe impact on data quantity.

- The weak communication strategy affected the effectiveness and timeliness of data analysis as well as its dissemination.

Based on these learnings, HQ teams are now engaged in broader discussion on possible ways forward along the lines of the below main directions:

## 1. Pursue the integration of farmers' selling prices into P4P M&E data toolkit as a priority

It is P4P's mandate to help SHFs gain knowledge and skills to engage with formal markets [27] and buffer against volatile farm-gate prices thanks to better marketing deals. Improving quality of the produce and strengthening FOs' marketing capacity are strategies to increase price premiums and farmers' incomes.

Prices are core variables to monitor progress towards these goals. P4P and VAM are recommended to pursue the integration of producer prices into P4P M&E data toolkit. As mentioned in Section 4.1, this process has also potential to fill current gaps in the availability of disaggregate producer price data within and outside WFP.

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[27] "Purchase for Progress monitoring and evaluation system design considerations: final report", prepared by the WFP and Management Systems International, December 2010. Available at: http://documents.wfp.org/stellent/groups/public/documents/reports/wfp229362.pdf

Data collection should continue to focus on core price indicators that ensure most meaningful comparison: selling prices at the farm-gate and FOs vis-à-vis prevailing market prices in local markets.

## 2. Fill information gaps in the data collected through GRASP: how to proxy transaction costs?

The report shows that the data collected during the pilot had limited potential in explaining farmers' marketing choices without supplementary evidence.

Assessing farmers' market access to different market channels would add a plus to P4P monitoring activities but requires quantitative records of transaction costs, which are hard to gather. It is advised that P4P and VAM teams address the need to access transaction cost data as part of a different project.

This process would include further literature review to proxy core components of transaction costs as measures of access to diverse marketing channels.
Transport costs are the main example: previous P4P impact studies[28] confirm that distance from FOs could influence SHF's decision to sell at the farm gate despite FOs offering higher prices: a recurrent evidence in the data analysed during the pilot. Comparison between FOs location and coordinates of respondents as provided by GRASP could set ground for testing.

## 3. Push forward the dialogue around alternative methodologies for remote data collection

The pilot showed that remote data collection has key advantages in providing high-frequency data (e.g. weekly) at disaggregated level and well matches P4P's data needs.

Nevertheless, complexity of the interface of the GRASP application was a major limit and often reason for exclusion of participants less familiar with smartphone, affecting data inflows in all impact countries during the pilot.

It is recommended that P4P and VAM push forward their dialogue to consider alternative opportunities for remote price data collection:

- **Phone surveys.** In the experience of El Salvador, farmers often felt more confident in sharing information about selling prices through phone calls to WFP and FOs rather than through the GRASP-based tool.
  Weekly phone surveys thus appear a viable option to encourage farmers' response and provide space for feedback. Existing social connections between P4P-supported farmers and WFP COs would be conducive of this approach.

- **Crowdsourcing**. The comparison between prevailing prices collected through GRASP and VAM's data in Figure 7 suggests that data accuracy was higher in those monitored areas were the number of active respondents was higher.
  Based on this evidence, crowdsourcing data collection could be the way go: the benefit of this approach would be to significantly expand the sample of interviewed farmers within and outside assisted FO and provide wider control groups to boost data quality and monitoring analyses.

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[28] Amani, S. (2014). Smallholder Farmers' Marketing Choices. Prepared by Management Systems International for the WFP, March 2014. URL: https://www.wfp.org/sites/default/files/MSI_Smallholder%20Farmers%20Marketing%20Choices.pdf

# Acronyms and Abbreviations

**APN**    Access Point Name

**CO**    Country Office

**FGP**    Farm Gate Prices

**FO**    Farmers' Organisation

**GRASP**    Geo-referenced Real-time Acquisition of Statistics Platform

**HH**    Household

**HQ**    Head Quarters

**IT**    Information Technology

**M&E**    Monitoring & Evaluation

**OS**    Operating System

**P4P**    Purchase for Progress

**SD**    Secure Digital

**SHF**    Smallholder Farmers

**VAM**    Vulnerability Analysis and Mapping

**WFP**    World Food Programme

# Annex I – Analysis Structure

**Table 5:** Analysis structure: indicator(s) used and main limitations

| Analysis' section | Indicator(s) | Limitations |
|---|---|---|
| **Data reporting** | | |
| Farmers' participation; regularity in data reporting. | • Number of *active* farmers (at least one report sent) – by month, percentage by region.<br>• Number of reports sent per month - by farmer.<br>• Number of records after data cleaning – by month. | |
| **Analysis of price trends and price differentials** | | |
| Analysis of price trends by commodity | • Average selling prices per kg (weighted by quantity) received by farmers – by month.<br>• Coefficient of variation of selling prices/kg: ratio of the standard deviation to the mean. Comparison of price volatility by product. | |
| Seasonal trends in average selling prices | • Grand Seasonal Index, the ratio of a price to its centred moving average that captures the cycle of seasonal trends over the year.[29] | |
| Monthly selling prices and price differentials | • Average selling price/kg (weighted by quantity) received at each point of sale as a % of highest prices recorded by farmers in their locality.<br>• Weighted average selling price/kg received through FOs as a % of selling prices received in other points of sale. | |
| **Sale volumes and farmers' selection of marketing channels** | | |
| Farmers' access to marketing channels | • Percentage of farmers selling through one to all points of sale during data reporting.<br>• Percentage of farmers who took sold through FOs during data collection. | The analysis could not establish if access to few channels was a deliberate choice or due to constraints |
| Sale volumes and marketing channels | • Proportion of staple commodities sold by commodity and by point of sale as a percentage of total volumes sold.<br>• Monthly distribution of sale volumes - by point of sale, by commodity. | Data needs: stocks; current production; transaction costs.<br>Gaps in the distribution of sale volumes due to irregular data sending. |
| Farmers' marketing behaviour: individual sales | • Price elasticity of supply, ratio of percentage variations in quantities supplied by farmers to percentage variations in the prices received. | Only for two farmers (Ghana), due to irregular reporting by other farmers.<br>Data needs: transaction costs; stocks. |
| **Analysis of the income received from sales** | | |
| | • Percentage of income received by commodity and channel. | |

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[29] Additional data sources include: wholesale market prices (Admin 2), from the VAM Food and Commodity Price Data Store; seasonal Calendar from EPWeb.

# Annex II – The composition of the data sample

**Table 6:** Sample size and composition of the data sample

| El Salvador | | | | | |
|---|---|---|---|---|---|
| **Data collection period** | August 2013 - February 2014 | | | | |
| **Commodities** | Beans, maize, rice, sorghum | | | | |
| **Marketing channels** | Farm gate, FOs, local market, intermediary/*coyote*, other market | | | | |
| **Sampled farmers** | | | | | |
| National | 18 | | | | |
| Regional | - | | | | |
| **Records** | | | | | |
| Submitted | 510 | | | | |
| After data cleaning | 251 | | | | |
| **Ghana** | | | | | |
| **Data collection period** | June 2013 - May 2014 | | | | |
| **Commodities** | Beans/cowpeas, groundnuts, maize, paddy and milled rice | | | | |
| **Marketing channels** | Farm gate, FOs, local market, community market | | | | |
| **Sampled farmers** | | | | | |
| National | 26 | | | | |
| Regional | | | | | |
| *Northern Region* | *10* | | | | |
| *Ashanti* | *16* | | | | |
| **Records** | | | | | |
| Total submitted | 913 | | | | |
| After data cleaning | 869 | | | | |
| **Tanzania** | | | | | |
| **Data collection period** | July 2013 - January 2014 | | | | |
| **Commodities** | Beans, maize, pigeon peas, sorghum | | | | |
| **Marketing channels** | Farm gate, FOs, local market, auction market | | | | |
| **Sampled farmers** | | | | | |
| National | 25 | | | | |
| Regional | | | | | |
| *Arusha* | 2 | Northern | | | **Geographical aggregation:** |
| *Kilimanjaro* | 2 | Northern | | | Socio-economic zones as defined by |
| *Manyara* | 3 | | Socio - economic zones[30] | | the CFSVA - (Tanzania, 2012) were |
| *Kagera* | 4 | Lake | | | used additional dimensions for the |
| *Dodoma* | 4 | Central | | | identification of price differentials |
| *Singida* | 2 | Central | | | among marketing channels and |
| *Kigoma* | 5 | Western | | | sales. |
| *Iringa* | 1 | Southern | | | |
| *Rukwa* | 1 | Southern | | | |
| *Ruvuma* | 1 | | | | |
| **Records** | | | | | |
| Submitted | 404 | | | | |
| After data cleaning | 319 | | | | |

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[30] See, *Comprehensive Food Security and Vulnerability Analysis (CFSVA),* Tanzania 2012;

# Annex III – Timeliness of data reporting by "active" farmers

**Table 7:** Frequency in data transmission

## Ghana

| | | | | | | Frequency of data reporting | | | | | | | | Total by farmer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | **2013** | | | | | | **2014** | | | |
| | | June | July | August | September | October | November | December | January | February | March | April | May | |
| | **Ghana** | | | | | | | | | | | | | |
| Region: Ashanti | GH01 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ◐ | ◐ | ◐ | ◐ | ✗ | 36 |
| | GH02 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ◐ | ✗ | ✗ | ✗ | ✗ | 24 |
| | GH03 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | 27 |
| | GH04 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ | ✓ | ◐ | 47 |
| | GH05 | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 23 |
| | GH06 | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ◐ | ✓ | ✓ | ✓ | ✓ | ◐ | 38 |
| | GH07 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ◐ | ✗ | ✓ | ✓ | ◐ | 42 |
| | GH08 | ✗ | ◐ | ✓ | ✗ | ✓ | ✓ | ◐ | ◐ | ◐ | ◐ | ✓ | ◐ | 30 |
| | GH09 | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 17 |
| | GH10 | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 20 |
| | GH11 | ◐ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✓ | ◐ | 43 |
| | GH12 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | 41 |
| | GH13 | ◐ | ✓ | ✓ | ✓ | ✓ | ◐ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | 32 |
| | GH14 | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 20 |
| | GH15 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | 52 |
| | GH16 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✓ | ◐ | 49 |
| | **Total by region** | 58 | 73 | 77 | 72 | 61 | 37 | 30 | 40 | 22 | 27 | 30 | 13 | 541 |
| Region: Tamale | GH17 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | 35 |
| | GH18 | ✓ | ◐ | ✓ | ✓ | ✓ | ◐ | ◐ | ✓ | ◐ | ✗ | ◐ | ◐ | 37 |
| | GH19 | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ✗ | ◐ | ✗ | ✗ | ◐ | ◐ | 28 |
| | GH20 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✓ | ◐ | 34 |
| | GH21 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✓ | ◐ | 45 |
| | GH22 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ◐ | ◐ | ◐ | ◐ | 42 |
| | GH23 | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | ◐ | ◐ | 25 |
| | GH24 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 23 |
| | GH25 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✓ | ◐ | 33 |
| | GH26 | ✓ | ✓ | ✓ | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | 26 |
| | **Total by region** | 40 | 42 | 49 | 41 | 44 | 31 | 17 | 15 | 8 | 2 | 27 | 13 | 329 |
| | **Grand Total** | 98 | 115 | 126 | 113 | 105 | 68 | 47 | 55 | 30 | 29 | 57 | 26 | 870 |

## Tanzania

| | | June | July | August | September | October | November | December | January | February | March | April | May | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Tanzania** | | | | | | | | | | | | | |
| Arusha | TZ13 | | ◐ | ✗ | ✓ | ◐ | ✓ | ✓ | ✗ | - | - | - | - | 15 |
| | TZ16 | | ✗ | ✗ | ◐ | ◐ | ✓ | ✓ | ◐ | - | - | - | - | 14 |
| | **Total by region** | | 1 | 0 | 6 | 4 | 8 | 8 | 2 | - | - | - | - | 29 |
| Dodoma | TZ23 | | ✗ | ✗ | ✓ | ◐ | ◐ | ◐ | ◐ | - | - | - | - | 10 |
| | TZ27 | | ✓ | ◐ | ◐ | ◐ | ✓ | ✓ | ◐ | - | - | - | - | 18 |
| | TZ25 | | ✓ | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | - | - | - | - | 18 |
| | TZ21 | | ◐ | ◐ | ✓ | ◐ | ✗ | ✓ | ◐ | - | - | - | - | 16 |
| | **Total by region** | | 11 | 6 | 12 | 7 | 10 | 11 | 5 | - | - | - | - | 62 |
| Iringa | TZ56 | | ✓ | ✓ | ◐ | ✗ | ✗ | ✗ | ✗ | - | - | - | - | 10 |
| | **Total by region** | | <u>4</u> | <u>4</u> | <u>2</u> | <u>0</u> | <u>0</u> | <u>0</u> | <u>0</u> | - | - | - | - | 10 |
| Kagera | TZ40 | | ✓ | ✓ | ◐ | ✓ | ✓ | ◐ | ✗ | - | - | - | - | 21 |
| | TZ47 | | ✓ | ✓ | ✓ | ◐ | ✓ | ✗ | ✗ | - | - | - | - | 19 |
| | TZ50 | | ◐ | ◐ | ✓ | ✓ | ✓ | ◐ | ✗ | - | - | - | - | 16 |
| | TZ37 | | ◐ | ✗ | ◐ | ◐ | ◐ | ✗ | ✗ | - | - | - | - | 7 |
| | **Total by region** | | 12 | 10 | 12 | 12 | 13 | 4 | 0 | - | - | - | - | 63 |
| Kigoma | TZ49 | | ✗ | ✗ | ◐ | ✗ | ✗ | ✗ | ✗ | - | - | - | - | 1 |
| | TZ34 | | ✓ | ◐ | ◐ | ◐ | ◐ | ◐ | ✗ | - | - | - | - | 14 |
| | TZ48 | | ✗ | ✗ | ◐ | ✓ | ✓ | ◐ | ✗ | - | - | - | - | 13 |
| | TZ31 | | ✗ | ✗ | ◐ | ✗ | ◐ | ◐ | ✗ | - | - | - | - | 3 |
| | TZ52 | | ◐ | ◐ | ◐ | ✗ | ✗ | ✗ | ✗ | - | - | - | - | 3 |
| | **Total by region** | | 5 | 2 | 8 | 7 | 7 | 5 | 0 | - | - | - | - | 34 |
| Hai | TZ03 | | ◐ | ✗ | ◐ | ◐ | ◐ | ✗ | ✗ | - | - | - | - | 8 |
| | TZ01 | | ◐ | ✓ | ◐ | ✗ | ◐ | ✓ | ◐ | - | - | - | - | 19 |
| | **Total by region** | | 4 | 4 | 6 | 2 | 5 | 4 | 2 | - | - | - | - | 27 |
| Manyara | TZ07 | | ✓ | ◐ | ◐ | ✗ | ◐ | ✓ | ◐ | - | - | - | - | 18 |
| | TZ05 | | ◐ | ◐ | ◐ | ◐ | ◐ | ◐ | ✗ | - | - | - | - | 11 |
| | TZ11 | | ✗ | ✗ | ◐ | ◐ | ◐ | ◐ | ✗ | - | - | - | - | 7 |
| | **Total by region** | | 5 | 4 | 8 | 5 | 6 | 6 | 2 | - | - | - | - | 36 |
| Rukwa | TZ53 | | ✗ | ✗ | ◐ | ✗ | ✗ | ◐ | ✗ | - | - | - | - | 2 |
| | **Total by region** | | 0 | 0 | 1 | 0 | 0 | 1 | 0 | - | - | - | - | 2 |
| Ruvuma | TZ54 | | ◐ | ◐ | ◐ | ◐ | ◐ | ✗ | ✗ | - | - | - | - | 10 |
| | **Total by region** | | <u>3</u> | <u>3</u> | <u>2</u> | <u>1</u> | <u>1</u> | <u>0</u> | <u>0</u> | - | - | - | - | 10 |
| Singida | TZ17 | | ✓ | ✓ | ✓ | ◐ | ✓ | ◐ | ◐ | - | - | - | - | 24 |
| | TZ20 | | ◐ | ◐ | ✓ | ✓ | ✓ | ◐ | ✗ | - | - | - | - | 18 |
| | **Total by region** | | 7 | 5 | 9 | 6 | 8 | 5 | 2 | - | - | - | - | 42 |
| | | | 52 | 38 | 65 | 44 | 58 | 43 | 13 | - | - | - | - | 313 |

## El Salvador

| | | | | | Frequency of data reporting | | | | | | | | Total by farmer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2013 | | | | | | 2014 | | | |
| | June | July | August | September | October | November | December | January | February | March | April | May | |
| **El Salvador** | | | | | | | | | | | | | |
| ES01 | - | - | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - | - | - | 31 |
| ES02 | - | - | ✓ | ✓ | ⚠ | ✓ | ✓ | ✓ | ⚠ | - | - | - | 29 |
| ES03 | - | - | ✓ | ✓ | ⚠ | ✓ | ✓ | ⚠ | ⚠ | - | - | - | 25 |
| ES04 | - | - | ✓ | ✓ | ✓ | ✓ | ⚠ | ⚠ | ✗ | - | - | - | 23 |
| ES05 | - | - | ✓ | ✓ | ✓ | ✓ | ⚠ | ✗ | ⚠ | - | - | - | 22 |
| ES06 | - | - | ✓ | ✓ | ⚠ | ✓ | ⚠ | ⚠ | ✗ | - | - | - | 22 |
| ES07 | - | - | ✓ | ✓ | ⚠ | ⚠ | ⚠ | ⚠ | ⚠ | - | - | - | 18 |
| ES08 | - | - | ✓ | ✓ | ⚠ | ⚠ | ⚠ | ⚠ | ⚠ | - | - | - | 18 |
| ES09 | - | - | ✓ | ⚠ | ⚠ | ⚠ | ✗ | ⚠ | ⚠ | - | - | - | 17 |
| ES10 | - | - | ✓ | ⚠ | ✓ | ✓ | ⚠ | ✗ | ✗ | - | - | - | 16 |
| ES11 | - | - | ✓ | ⚠ | ⚠ | ⚠ | ✗ | ✗ | ⚠ | - | - | - | 10 |
| ES12 | - | - | ✓ | ⚠ | ✗ | ✗ | ✗ | ✗ | ✗ | - | - | - | 8 |
| ES13 | - | - | ⚠ | ⚠ | ✗ | ⚠ | ✗ | ✗ | ✗ | - | - | - | 6 |
| ES14 | - | - | ⚠ | ⚠ | ⚠ | ✗ | ✗ | ✗ | ✗ | - | - | - | 4 |
| ES15 | - | - | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ⚠ | - | - | - | 1 |
| ES16 | - | - | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | - | - | - | 0 |
| ES17 | - | - | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | - | - | - | 0 |
| ES18 | - | - | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | - | - | - | 0 |
| **Grand Total** | - | - | 57 | 46 | 37 | 41 | 23 | 24 | 22 | - | - | - | 250 |

# Annex IV – Validation of prevailing market prices for maize

**Figure 7:** Market prices provided through GRASP vs. market prices collected by VAM[31]



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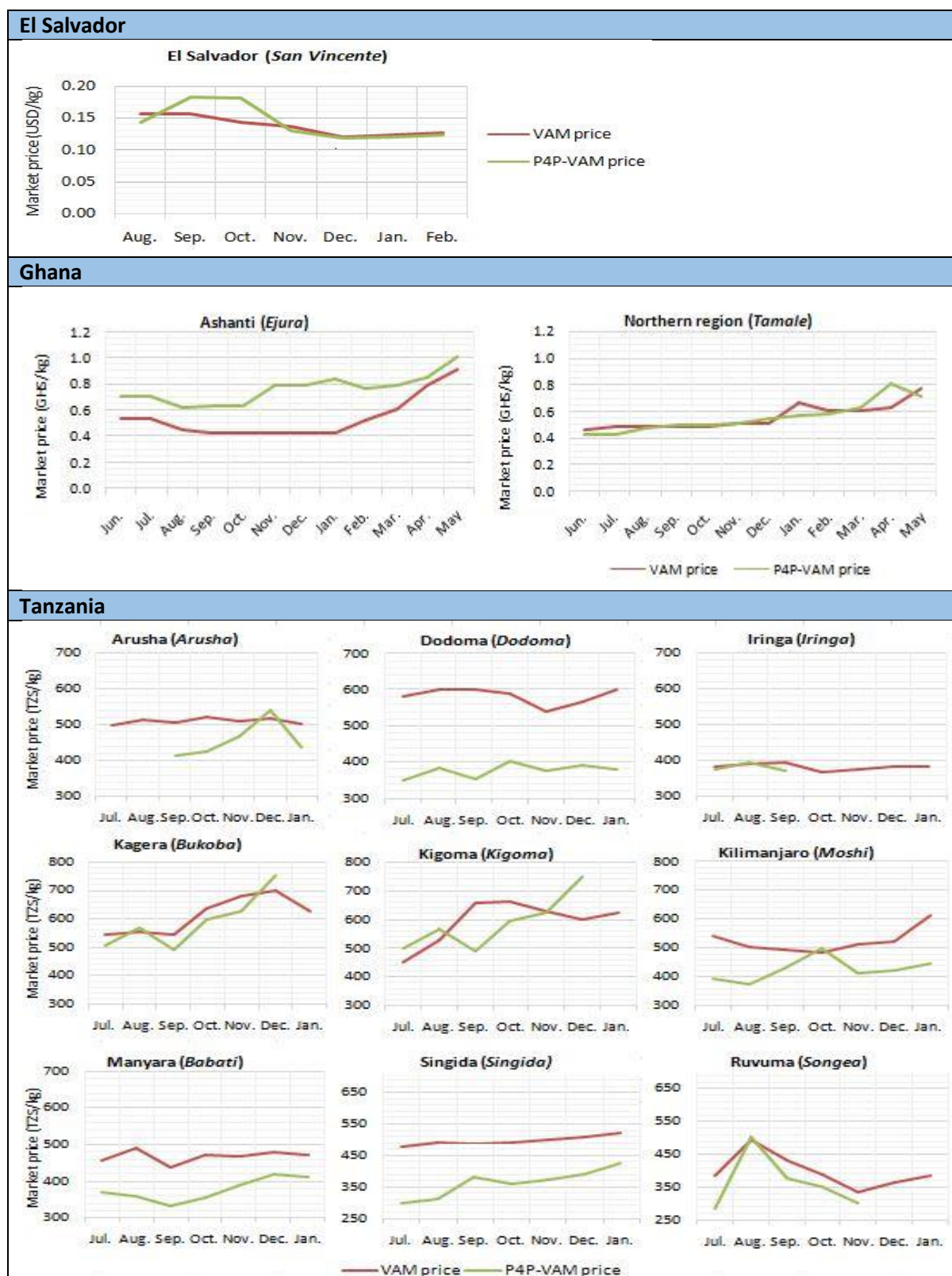
[31] VAM price data in "VAM Food and Commodity Prices Data Store", available at: http://foodprices.vam.wfp.org/;