An algorithm for automated green alternative solution for farm input distribution

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An electronic-wallet carried out by an information technology company is an online system of distribution system for farmers (who are the major beneficiaries of the government subsidy programme) but this system does not allow proper accounting of subsidized inputs. This paper presents an algorithm for automated green alternative solution for farm input distribution. The FARMSUPPORT Software can be launched on the web or mobile device, it will go a long way in eliminating fake farmers and taking care of irregularities and corrupt practices in the old system. Also the issue of marginalization of certain categories of farmers has been taken care of in the algorithm of the proposed new system.

Key words: Farmers, online system, subsidized inputs, Algorithms, use-case diagram, entity relation diagram and system flowchart.

INTRODUCTION

Farmers are likely to apply inputs to the use with the greatest expected return. Fertilizers, for example, may be applied to a variety of crops. Even if subsidies are intended to expand production of the food staples consumed by poor people with inelastic demand (and benefit poor consumers with low deadweight losses), farmers may apply subsidized fertilizers to (cash) crops with more price elastic demand if these offer higher returns. Direct switching of inputs between crops or products may not be so easy for subsidized seeds, although some indirect switching may happen due to wider capital.

In a bid to revamp the agricultural sector and ensure food security, diversified economy and enhanced foreign exchange earnings, the Nigerian government implemented the Agricultural Transformation Agenda (ATA) programme (Federal Ministry of Agriculture and Rural Development, 2011, 2016). The central objectives of the programme are to boost agricultural output, encourage private sector engagement, and create 3.5 million new jobs in the farming sector.

Also, ATA aims to improve farmers' incomes through increased productivity, securing greater market access, and strengthening value chains (International Food Policy Research Institute (IFPRI, 2012). The Agricultural Transformation Agenda and the Growth Enhancement Support Scheme (GESS) were initiated by the Nigerian government to boost agricultural production through the provision of 'smart subsidies' on some farm inputs to small–scale farmers. The Scheme was able to deliver subsidised agricultural inputs to small–scale farmers with relative ease and at affordable rate which was able to boost farm output. It is recommended that, adequate synergy should be established between all collaborating agencies of the government participating in the scheme to ensure adequate release of funds, timely disbursement of farm inputs and the provision of suitable support services to farmers (Michael et al., 2018).

The objectives of the GES scheme were to; remove the usual complexities associated with

farm input (especially fertilizer) distribution by extending inputs delivery notification via mobile phones to 20 million farmers in four years by targeting 5 million persons annually; encourage critical actors in the fertilizer value chain to work together to improve productivity, provide direct support to farmers to enable them to procure agricultural inputs at affordable prices, at the right time and place, and enhance farmers' income and promote food security (Oyediran, 2014; Alabi and Adams, 2015; Nwaobiala and Ubor, 2016). GESS was introduced in May, 2012, as a pilot project in the 36 states of the country and the Federal Capital Territory. The scheme is also known as the e-wallet scheme. An e-wallet has thus been defined as an ancient and transparent electronic device system that makes use of vouchers for the purchase and distribution of agricultural inputs (Fadairo et al., 2015).

In 2008 the World Development Report made a powerful case for the importance of agriculture in poverty reduction (World Bank, 2007) and this was brought home by the 2008 global food price spike and recognition that the era of low and stable food prices was over, if it ever existed (Dorward, 2011).

The major challenge faced by the Farm Input Support Services Department of the Federal Ministry of Agriculture and Rural Development has always been the issue of continuous capturing of farmer's data, getting the right farm inputs across to the farmers at subsidized rate, ensuring accountability and at the same time making sure the whole information is properly managed for easy feedback to the stakeholders. Though there was an existing platform -the E-wallet system by Cellulant an ICT company, there's also a need for an alternative system for less cumbersome experience. There is lack of emphasis on improving programme effectiveness and efficiency and inadequate attention is paid to integration with complementary policies and programmes for improving achievement of both direct and indirect benefits of input subsidy programmes. In this paper we propose three algorithms for automated green alternative solution for farm input distribution that would aid proper farm input support services capable of providing up-to-the minute information to decision makers. The first algorithm describes how farmers will be interacting the system from check available items, to viewing collections and placing orders. The second algorithm describes how each farm dealer interact with the system, ranging from Updating the Stock, Issue Product to Farmer to issuing of stock report and stock Balances. The third algorithm describes how the ministry of Agriculture interact with the system. The activities that can be perform by the ministry are Farmers registration, Agro dealer registration, maintaining inputs, and exporting data to Excel.

MATERIALS AND METHODS

Three algorithms are used for the design of this system, that is, Figures 1, 2 and 3 as Algorithms 1, 2, and 3 respectively. The algorithms are FarmerDashboard, DealerDashboard, and StaffDashboard for the design of farmers, dealers and staff dashboards. The three algorithms described how each component of the system is working to achieve the said objectives. Algorithm 1 described how farmers will be interacting with system from the dealer parts to staff of the ministry. Whereas Algorithm 2 demonstrate how dealers will interact with the system. Also Algorithm 3 is for the ministry staff to effectively communicate to the farmers and dealers.

The farmers are expected to search through various dealers' warehouses looking for inputs and upon availability, they can place order and schedule for collection as shown in Algorithm 1. Every agro dealer belongs to a specific centre which is located in various states and local governments. The dealer is assigned a dealer code which identifies the company and used while making claims to the government for reimbursements as shown in Figure 2, Algorithm 2.

Dealers are expected to render services to the farmers. They stock the input supplements and distribute to farmers at government approved rates as shown in Figure 2. Once dealers acquire new stock, they have a provision on the dashboard to update their stock and so farmers and management can see those stock items from wherever they are. Figure 2 shows the dealers dashboard where these updates are done. The ministry is responsible for the registration of

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FarmerDashboard( )

Begin

1. if farmer not registered Then // contact the ministry admin
    a. Signup to register your data
2. elseif login details are forgotten or lost Then // reset password
    a. Contact the ministry admin for password reset
3. else // Input the user details
    a. login with username and password
4. end
5. if login is successful Then // Farmer exist
   begin
    a. Output :farmer name, email address and role
    b. Displayfarmer dashboard
   end
6. Select option (1 to 4)
    a. Case 1: 'check available items'
        i. Select a dealer to check his shop
        ii. Submit the form
        iii. View the report
    b. Case 2: 'view my collections'
        i. Complete starting and stopping dates
        ii. Submit the form
        iii. View your collections within the selected period
    c. Case 3: 'place an order'
        i. Select a dealer to place order from his shop
        ii. Select the item
        iii. Enter the quantity
        iv. The price is displayed automatically
        v. Place order
    d. Case 4: logout
End
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Figure 1. Algorithm 1 farmer dashboard.

farmers and dealers as shown in Figure 3. It controls the number of input that can be given to farmers and also generate reports.

RESULTS AND DISCUSSION

The above algorithms (Algorithm 1, 2 and 3) shown in Figures 1, 2 and 3 respectively, can be used to implement the proposed system. When implemented using suitable programming languages, the Farm Input Support Services Department of the Federal Ministry of Agriculture and Rural Development faced by major challenge of always been the issue of continuous capturing of farmer's data, getting the right farm inputs across to the farmers at

DealerDashboard()

Begin

1. ***if*** *dealer not registered* ***Then*** *// contact the ministry admin*
    a. *Signup to register your data*
2. ***elseif*** *login details are forgotten or lost* ***Then*** *// reset password*
    a. *Contact the ministry admin for password reset*
3. ***else*** *// Input the user details*
    a. *login with username and password*
4. ***end***
5. ***if*** *login is successful* ***Then*** *// Dealer exist*
   begin
    a. ***Output*** *: dealer name, email address and centre*
    b. *displaydealer dashboard*
   end
6. ***Select*** *option (1 to 5)*
    a. ***Case 1****: 'Update My Stock'*
        i. *Select a stock item to update*
        ii. *The approved cost comes up automatically*
        iii. *Enter the qty to update*
        iv. *Submit the form*
    b. ***Case 2:****'Issue Product to Farmer'*
        i. *Select the input*
        ii. *The cost and qty-in-stock appears automatically*
        iii. *Input the farmer id*
        iv. *The farmer's name appears automatically*
        v. *Input the Qty to issue*
        vi. *Submit the form*
    c. ***Case 3****: 'Stock Issue Report'*
        i. *Input a starting and stopping date (Report range)*
        ii. *Submit the form*
        iii. *The report is displayed*
    d. ***Case 4****: 'My Stock Balances'*
        i. *The balances of all the stock items in store are generated*
    e. *Case 5: Logout*

End

Figure 2. Algorithm 2 dealerdashboard.

subsidized rate, warranting responsibility and at the same time making sure the whole information is properly managed for easy response to the shareholders will be solved.

Conclusion

Quite of number of personnel of the ministry and agro-dealers are aware of the existence of an online system of distribution and evaluation of

MinistryDashboard()

Begin

1. *If* Ministry Staff not registered *Then* // contact the portal admin
   a. Signup to register your data
2. *elseif* login details are forgotten or lost **Then** // reset password
   a. Contact the portal admin for password reset
3. *else* // *Input the user details*
   a. login with *username* and *password*
4. *end*
5. *if* login is successful *Then* // Staff *exist*
   begin
   a. **Output** : staff name, email address and role
   b. Display staff dashboard
   end
6. **Select** option (1 to 5)
   a.Case 1: 'Farmer Registration'
      i. Assign ID to the farmer
      ii. Enter farmer's personal details
      iii. Enter State, LGA, Email and default password
      iv. The approved cost comes up automatically
      v. Submit the form
   b. *Case 2*:'Agro Dealer Registration'
      i. Enter dealer center code
      ii. Centre details are automatically displayed (State, LGA, Center name)
      iii. Enter a dealer code
      iv. Enter other personal details of the dealer
      v. Assign a default password
      vi. Submit the form
   c. *Case 3*:'Maintain Inputs'
      i. Enter an input code
      ii. Enter description of the input
      iii. Enter maximum qty of input that can be given to a farmer at one time
      iv. Enter the recommended unit cost per input
      v. Submit the form
   d. *Case 4*:'Export Data to Excel'
      i. Farmers, Agrodealers, Ministry Staff, Stock Issues, Warehouse tables are displayed for export
      ii. ***For each*** table
          Enter the data range of the data to be exported
          Submit the form
          Report is downloaded in an Excel format
   e. *Case 5*:Logout

End

Figure 3. Algorithm 3 MinistryDashboard.

the distribution channels but their level of proficiency in the use of the portal is this when efficiency of service delivery and effectiveness of organs of government is of considerably low. A system that will serve the organization is therefore needed at a time like

paramount importance to the present administration. These algorithms presented can easily be transform into codes using any suitable programming language.

In the future, the system can be implemented using the Code Igniter framework based on PHP as the frontend and MYSQL database at the backend to create full featured web applications. This framework being an open-source based framework was chosen to ensure easy integration of forms and pages in addition to some of the inherent built-in security and optimization facilities in the framework.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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