

*Full Length Research Paper*

## Informal transfer of information among vegetable growers in Khartoum State, Sudan

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Received 14 April, 2015; Accepted 11 August, 2015.

**Informal transfer of information among vegetable growers in Khartoum State, Sudan was investigated through a cross-sectional survey with 120 growers from six typical vegetable production villages (20 growers from each each) in peri-urban Omdurman (2 villages) and Eastern Nile locality (4 villages). The focus was on inventor growers (72, 60%) employing their information, skills and experience exchange to improve and develop their production. Growers from each village were selected following the systematic random sampling technique on geographical basis. Field data was collected using questionnaires in face to face interviews for literacy reasons, in depth interviews and group discussions. Extension workers and researchers took part in the group discussions. The results showed that most of the growers (85%) had contacts with one or more other growers in a personal level. Most of them did not receive any extension information from the officials entrusted with this task. This led growers to develop their own system of information exchange. Vegetable production skills were learnt mostly from family members (81%) and they do not trust information delivered by extension. Growers mostly (90%) made consultation with other growers on their inventions. Cooperation between growers in minimal due to lack of time and communication. The majority of the inventor-growers did not transfer their own inventions to others.**

**Key Words:** Vegetables production in Khartoum State, technology, techniques and practices, information transfer, grower' inventions, communication and skills learning, cooperation and consultation.

### INTRODUCTION

Information in any agricultural system is one of the important components for solving problems and meeting needs of farmers. Farmers usually are in continuous search for new information from any source. This is related to confidence, long practical experience and knowledgeable farmers. The Sudanese grower proved to

be receptive and would utilize new information from research if properly presented to him. Further, he succeeded in overcoming major production problems with little or no help from research or any public services (Geneif, 1987).

This paper investigates the transfer and information

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exchange for improving vegetables' diffusion and adoption by growers and their craftsmanship. Learning is a focal issue. So this necessitates identifying and expanding the set mechanism of determinant information diffusion and adoption among farmers (Jones, 1992).

Vegetable production in Sudan has increased over the last twenty years. In 2008, vegetables were grown on more than 330,000 ha. Vegetables and fruit production comprises more than 12% of the total agricultural output compared to 21% contributed by grains, 15% by cotton and 9% by oil seeds in Sudan (Ahmed et al., 2013). Lack of introduction of more advanced agricultural technology, absence of research and extension services, marketing bottlenecks are characteristic features of this sector (Khalid, 2013).

### Problem statement

Vegetable production has received little attention by the policy makers in Sudan. The growers have not received new information, advice and technology from the public institutions entrusted with this task. The high cost and availability of inputs have negative effect on profitability of production. In such a situation the growers have had no alternative but to depend on their own efforts to improve their production systems in a profitable way.

The role growers have played in their development has been ignored (GTZ, 1986). The agricultural research and extension policy do not consider the value of the farmers own informal system of technology transfer as useful means to overcome their production problems and have not been recognized and were completely ignored. On the other hand, social scientists did not conduct an in depth study how farmers do experiments, exchange information, techniques, practices and dissemination technology.

Richards offered a concrete suggestion for new ways of establishing a connection between farmer experiments and scientific experiments (Maat, 2015). The changes in English agriculture grouped by historians under the heading the agricultural revolution was brought about by farmers not scientists. If anything, the agricultural revolution stimulated the development of agricultural science, not other way round (Richards, 1985). Agricultural systems were developed historically largely through the efforts of farmers and landowners (Garforth, 1987)

The agricultural sector in Sudan has deteriorated considerably during the last ten years'. Among the major reasons behind this deterioration were: Lack of sound programs and policies, lack of introduction of improved technological innovations, weak linkage between researchers and extension, high cost of production and low marketing prices (Ministry of Finance, 1998). Vegetable production is an important economic activity for growers in Khartoum State. It is a major source of

income and profit for many people. A dominant commercial attitude of the vegetable and fruit growers is reflected in their strongly money and profit oriented behavior (Geneif, 1987). The vegetable growers in Khartoum State achieve relatively low and falling yields which are generally very low compared to the existing potential (GTZ, 1986).

Production of vegetables in Khartoum State is faced by problems which include inadequate capital, shortage and high cost of inputs and skilled labor, weak formal research and development, fragmentation of land due to inheritance problems, lack of storage facilities, inefficient use of available resources and loss of profit to merchants and middlemen (Ministry of Agriculture, 1998; Badri, 1996; GTZ, 1986; 1987; Geneif, 1986). Further, the Sudanese grower proved to be receptive and would utilize new information from research if properly presented to him; he succeeded in overcoming major production problems with little or no help from research or any public services (Geneif, 1987). Despite this, the applied research done so far is not sufficient to formulate reliable extension recommendations for the growers.

Successful vegetable production requires a constantly changing mix of information (T Tq P) and inputs for the continuous changes facing this type of intensive commercialized production. The formal R&D services are not aware of the growers' own developed exchange of information and (T Tq P). This is the result of a weak linkage.

Very little is known about the mechanism of invention exchange and transfer of information among vegetable growers in Khartoum State. Therefore, the main objectives of this paper were to:

1. Explore the mechanisms that vegetable growers in Khartoum State follow in developing and disseminating their own invented T Tq P.
2. Explore whether the vegetable growers in Khartoum State do experiments, made useful contacts with other growers and the methods developed to exchange ideas and information to improve their production.
3. Identify the characteristics that affect growers' capacity in the exchange of information.

### MATERIALS AND METHODS

This study followed the cross-sectional survey design targeting vegetable growers in the six villages in Khartoum State (Four villages from the Eastern Nile Locality and two from Omdurman Locality). The six villages were selected purposively because they are typical and prominent vegetable production areas.

The study followed the systematic random sampling technique on geographical basis by selecting the first of each three growers along a survey line drawn on the field area until 20 growers were selected from each village.

The study opted to this procedure as it was difficult to access or creates a sampling frame. Further, the homogeneity in the targeted growers/villages encouraged using this procedure of sampling technique. Hence the study ended with a total sample of 120

growers (20 from each of the six selected villages).

Filed data was collected through interview schedules (questionnaires) in face to face interview with the respondents, observation, in depth interviews and discussions with prominent typical growers, researchers, extension agents and the director of the Department of Horticulture/State Ministry of Agriculture. Researchers, extension agents and officials of the Ministry of Agriculture were not part of the primary sample from which field data was collected. They instead took part in the in depth group discussion as to enrich the information and avail opportunities to growers to explain their point of view.

The interview schedule (questionnaire) was filled in face to face interviews technique for literacy reasons. It mainly concentrated on the major following issues:

1. Invention in vegetable production,
2. Transfer of information and T Tq P,
3. Consultation regarding vegetable production,
4. Cooperation in the inventions development process.

Field data was descriptively analyzed to produce frequency and percentage tables.

### The study limitation

The reliability of the study depends on the accuracy of the information provided by the growers, and in turn this is dependent on their memories: they kept no relevant written materials. The lack of information about the number and kinds of growers in all the villages, and their addresses, made it difficult to obtain a sampling frame. Hence the study was based on purposively selected vegetable production villages. As a result of the experience of the long time needed to accurately complete the interview schedule during the pre-test, the research was limited to 120 grower respondents.

Some of the respondents were reluctant to give information about their latest developed (T Tq P), and would only provide information about the practices developed. This is attributed to the intended benefits that would result from these inventions before they spread to the other growers. Their information was subject to a type of competition.

Although the growers' inventors (Gis) covered most aspects of vegetable production they included no post harvest technology. This may have been due to the high perishable nature of vegetables, the lack of storage facilities and the need for immediate cash acting to accelerate sales. It is also that the production phase was more amenable to invention than was marketing.

Finally, these inventions have increased the growers, exchange of basic information basic and knowledge available to develop other inventions, and so added to the stock of indigenous knowledge: as knowledge is both a product and a consumable in the process of invention and transfer of information.

## RESULTS AND DISCUSSION

From the 120 growers only 72 (60%) were inventors upon whom the results and discussion will be based (Table 1). Amongst the inventor growers, only 30 (42%) had contacts with other vegetable growers as their one source of information, 38 (53%) had two contacts, with vegetable growers and extension workers or other officials, one grower had made three such contacts. The

growers who had no contacts at all with peer growers, extension workers or other officials regarding vegetable production accounted for 3 (4%) of the 72 inventors. All the contacts were stated to be personal: in this community contacts with other growers were only personal. This was- and is an important method of communication. Informal personal communication took place at social occasions when social networks could be used to exchange knowledge.

Vegetable production is a common concern shared by the growers in the villages under study, and presumably information about the problems encountered and the results of previous seasons were shared and ideas and plans for the coming season were discussed. The relationships through which the vegetable production idea was based on interpersonal contacts of informal information with trusted and experience peer growers.

The growers did raise and discuss with extension agents only problems related to chemical fertilizers and insecticides. They seemed to distinguish between sources of information and advice on the basis of who is good at what. The reason they stated was that the extension workers perceived these inventions to be 'wrong' and 'not useful' and were 'not scientific'. The growers, however, believed in practical results, the experience and information are exchanged with peer growers more than the recommendations of science. This seemed to give them confidence to proceed, and an assurance that reduced the chance of error and risk to the minimum. Hence, the growers had a high degree of confidence in the exchange of information with a limited number of peer growers, which was the basis for help with their decisions.

As source of information is concerned, 26 (36%) of the total 72 inventors had contacts with other vegetable growers (Table 2). Contacts with extension workers were reported by 3 (4%). Contacts with both vegetable growers and extension workers were counted for 35 (49%), while 3 (4%) were conducted with researchers and 2 (3%) with academicians. Those who had made no contact with any source were 3 (4%). The 35 joint contacts made with both vegetable growers and extension workers, involved extension workers on matters only concerning the purchase of improved/ imported seeds, chemical, fertilizer and insecticides. All together 61 (85%) respondents had contacts with other vegetable growers for the purpose of exchanging experience and gaining new information and ideas.

These helped their inventing and innovating to improve their production. The growers who had been visited by extension workers represent 35 (49%), and 37 (51%) were not visited during and prior to the fieldwork. However, the 35 visited said that these visits were not useful in any way (Table 3). It was the quality of the discussion of their problems with other vegetable growers, which had mattered.

In particular, problem identification and information,

**Table 1.** Total respondents by inventors and non-inventors.

Categories	Frequency	Percentage
Inventors	72	60
Non-Inventors	48	40
Total	120	100

**Table 2.** Frequency distribution and percentage of inventor growers by number of contacts.

Categories	Frequency	Percentage
1 contact	30	42
2 contacts	41	57
3 contacts	1	1
Total	72	100

**Table 3.** Frequency distribution and percentage of inventor growers by extension visits.

Categories	Frequency	Percentage
Visited	35	49
Not visited	37	51
Total	72	100

**Table 4.** Frequency distribution and percentage of inventor growers by source of information.

Categories	Frequency	Percentage
vegetable growers	26	36
Extension workers	3	4
Extension workers+vegetable growers	35	49
Researchers and academicians	5	7
No contacts	3	4
Total	72	100

which had directly contributed to the formulation of an idea, were most valued.

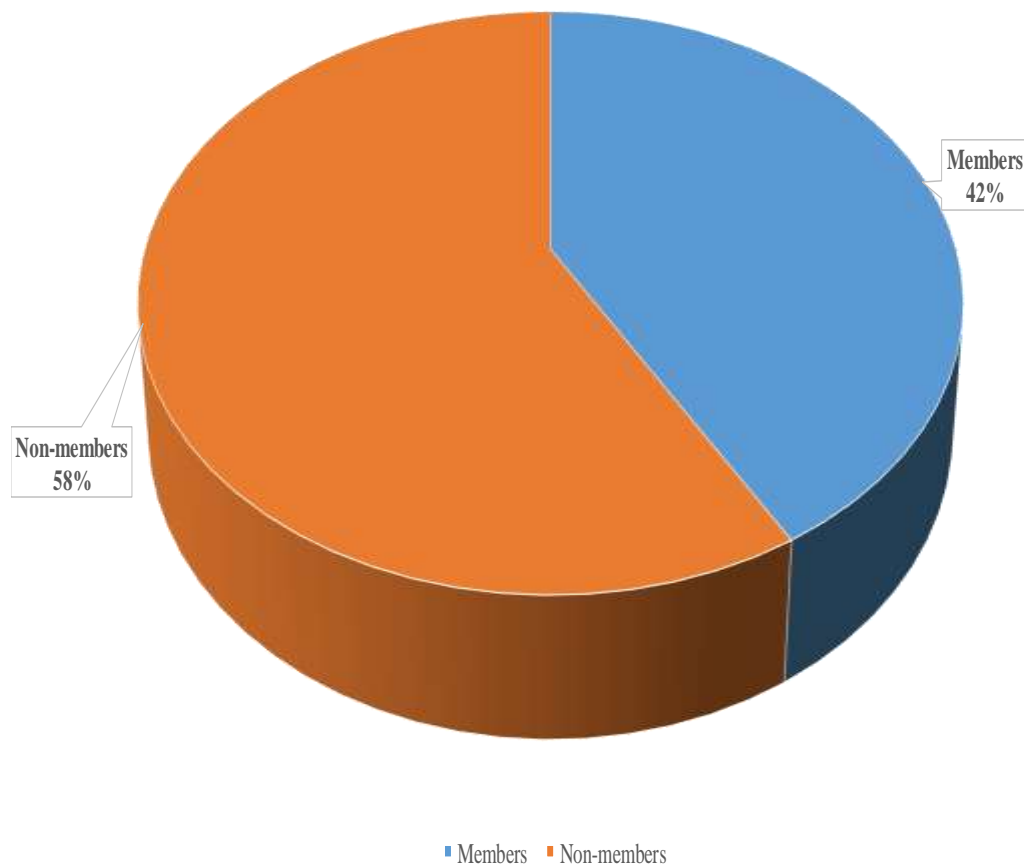
Growers mentioned that they had enough experience and were able to handle and manage their own production; they were more experienced and knowledgeable than the others; that everyone was "minding his own business"; and that their production problems and opportunities were of concern to no other person. One of the growers mentioned that he had better experience and more knowledge than the extension workers and the other educated in this field and he could teach them. The extension agent who was present did not comment. The responses indicate that the growers were proud of their knowledge, experience, exchange of

information, consultation with other peer growers which they considered superior to that of the extension agents. Only 5 (7%) growers had sought an opportunity to verify the steps they were going to follow (Table 4), or to obtain new information, 3 (4%) did so from researchers and 2 (3%) from academicians with whom they had family relations or other good relationships. The verification was for the purpose of avoiding any mistakes and risk that may occur, which leads to crop failure hence no income.

The use of local agricultural information, knowledge, experience, experimentation and husbandry skills accumulate initiatives of rural people in a specific location and over time, to develop their production systems. These initiatives cover a range of purposes, including

**Table 5.** Frequency distribution and percentage of inventor growers by source of learning vegetable production skills

Categories	Frequency	Percentage
Father and family members	63	88
Other vegetable growers	3	4
Own Observation	6	8
Total	72	100



**Figure 1.** Membership of inventor growers in local organizations.

facilitating decision-making, adding to knowledge and enabling new information (T Tq P) and better practices to be developed. For different reasons, important available advice regarding cropping practice and plant protection are not widely covered to growers by the public agricultural services (Geneif, 1987).

### Learning skills

Table 5 shows that the assumed sources of information and learnt vegetable growing skills were from father or close family members which represents most of the cases, while for marginal portions it was from other

vegetable growers, or from own observation and practical experience of work. Consultation and exchange of information with other growers contributed much to the ways decisions were taken in managing the production of their own holdings.

### Dissemination of the innovations

Members of a local farmers' union were 30 (41.7%) of the inventors (Figure 1). The rest were not involved in membership of any local organization, they were sure that these organizations were not effective. Participation in active, local organizations can help to provide the

**Table 6.** Frequency distribution and percentage of inventor growers by consultation with others.

Categories	Frequency	Percentage
Minimal consultation	65	90.3
Full consultation	7	9.7
Total	72	100

**Table 7.** Frequency distribution and percentage of inventor growers by reasons for not cooperating with others in Implementing Inventions.

Categories	Frequency	Percentage
Short season, commitments	58	80.6
Variation in problems and needs	8	11.1
Competition reasons	6	8.3
Total	72	100

grower with new information and ideas, and keep him abreast of information about the latest technology and practices in vegetable production. This includes source of inputs at affordable prices. The transfer of something new (T Tq P) or information about it, from those who possess it to those who do not constitutes a process of inventive diffusion. It is a special type of communication.

Further, a grower who provides another grower with information about a new (T Tq P) is an important agent of change. We are concerned here with information about an invention which is disseminated by the grower who invented it. When information was disseminated, it was generally accepted and adopted by other growers since it solved a problem, and was relevant and suited the grower's knowledge, skills, budget and production conditions as mentioned by the growers in all the six villages during the field survey.

Inventors who made minimal consultation were 65 (90.3%), and had not engaged in much discussion of their inventive production activities with others (Table 6). Only 7 (9.7%), were largely dependent on the consultation they had made with others. This is despite the fact that the act of consultation with others, especially peer growers, is a characteristic which may influence the growers' inventiveness. They were experimenters, enjoy high skills, confident and have been practicing vegetable production since they were at primary school.

Level of education was positively linked to the transfer of the growers' information and their own inventions. All the inventors who transferred their inventions to others had a relatively higher level of formal education. The illiterate inventors were less willing to share their information and inventions. However, the inventors who transferred their own inventions accounted for 39% of the total 72 inventors. There was obviously some reluctance

to inform peer growers about their own inventions. This seemed to be for competition reasons, and to avoid responsibility for negative outcomes if the invention was less useful to other growers.

### Cooperation in developing new inventions

Cooperation for the purpose of this section is defined as collaboration between the inventors in the processes of formulating testable ideas, experimenting and developing the invention. The simple exchange of information, or obtaining information from peer growers about production, is not considered as part of collaboration.

The vegetable growers gave no evidence of cooperating or exchange of information in developing new (T Tq P). Invention was an individual process. The growers worked alone from the stage of idea formulation to implementation. This finding is somewhat surprising. However, all the inventors responded negatively when asked if they had cooperated with any other grower in the actual development process and implementation of any of their own inventions. The reason for this, given by 58 (80.6%) inventors was because the growing season was very short and each grower was busy with his own work. They also considered that each individual knew his own holding and the conditions in which invention was practical, while 8 (11%) respondents stressed the different problems encountered and opportunities to be met, in relation to the different vegetable crops and cultural practices employed.

Only 6 (8%) respondents mentioned that they did not like the other growers to know or copy what they were doing, and emphasized the competition which exists (Table 7). It also became clear in informal group

**Table 8.** Frequency distribution and percentage of grower-inventors by reasons for not diffusing their own inventions (n=45).

Categories	Frequency	Percentage
Short season, commitments	25	56
Variation in problems and needs	14	31
Competition reasons	6	13
Total	45	100

discussions held with the growers in the six villages, that invention could become a sensitive issue if the cooperation in conducting a trial proved to be successful on the inventor's holding, but failed when implemented on the cooperator's holding. Who was going to be responsible for the failure? This question of responsibility emerged as a matter of great importance, and is a major explanation for the lack of cooperation among inventive vegetable growers.

The grower who loses his crop in a cooperative venture would blame the grower with whom he developed the invention for the failure to maintain his prestige. It would damage the reputation and relationships of the cooperating grower in the locality. The failure would also mean loss of invested capital and income and could be a catastrophe for the whole family. It could mean exposure to loss of part or all his land if a carryover loan was not secured. When the loan is secured it may take a very long time to repay, and this would expose him to live in poverty. Hence the growers wished to avoid this, and so worked alone at their inventions.

### Diffusion of the growers' inventions

Diffusion in this study is defined as the transfer of the growers' own inventions to other peer growers. The inventors who did not transfer their own inventions to other growers were 45 (62.2%), of whom 14 gave as the reason the lack of collaboration between them and other growers. The most common reason, given by 25 growers was that other growers were always aware of what they were doing because they observed each others' activities (Table 8).

If successful they copied them and asked about the details. If they were interested in the invention, the inventor was willing to give details. If not, they did not ask. These seem to be part-active and part-passive diffusion. The other 6, of the 45 mentioned the competition was the main reason for not wishing to be more than slightly active in diffusing their own inventions. Competition could work as a factor to inhibit growers' cooperation in invention and transfer of information (dissemination). The rewards of successful invention are substantial and commercially oriented. It leads to extraordinary prices in the market for short periods of

time which means high returns and extra profits. When the new information and technology spread to other growers and villages the prices fall. It seems, from the evidence of this study, that there is no complementary interaction between competition and information exchange and inventions. Competition is a relatively new attitude, and was not traditional among vegetable growers. Recently the production objectives have changed. Currently, profit maximization and lower costs are the stimuli for growing vegetable crops and these inevitably have an influence through increasing competition on sharing information and the results of inventions, as stated by the growers in the in depth discussion.

Growers who did make efforts to transfer their own inventions to other growers accounted for 27 (37%). Again, however, collaboration was said to be restricted to only a small number of growers with whom they had mutual kinship relations. In some cases, technologies and practices were transferred only after the inventor had benefited from better prices and marketing, and when the information was rather old and being replaced by new ideas. Only one grower was really positive about the benefit to him. This was because he rented part of his land to sharecroppers and so was keen that they used the most efficient techniques and practices that gave the best results.

The main way in which their inventions were transferred was said by 22 respondents to be by their personal efforts. The other 5 mentioned that they did this partly by themselves and also through other vegetable growers. The particular value of this feedback is in the information it gives about the priorities, needs and demands of the vegetable growers. It could be useful to the research and extension services. Hence many of the growers were involved in continuous information setup experimentation and feedback generated by themselves. This continuing process had contributed to the development and transfer of their inventions and in turn, had improved to some extent their vegetable production systems.

From the feedback, the growers had learnt more effective ways of conducting trials, and how to improve the inventions they had developed or helped to introduce. The situation reported by the growers is of a more-or-less represents closed system in which information of

invention approach in the process of inventing. Other sources seem to be a major reason why the growers rely on their own resources and the success they have achieved has encouraged and created enthusiasm to continue to develop their own inventions. Equally, failures push the growers to experiment and invent. The outcome is an effective means of diffusion of information and inventions, which have contributed to improving their production systems almost entirely by their own efforts.

### Limitation of growers' inventions

There is a lack of awareness and understanding by the scientists of the growers own experimentation, invention and transfer of information. This results in the isolation of the growers' inventions. All 10 extension workers in charge of the extension activities in the villages under study stated that they did not convey any of the growers' inventions to researchers or any other institution, and appeared not to understand what has been shown in this paper.

An explanation for these perceptions is, first, because inventions are rather slow and indirect in their transfer to other growers. Then it is only partial: 14 growers had introduced no new technology because they had received none from their peers or any other source. Second, and most important, the growers' inventions and information was not documented. It was kept in the memory and the only means of its spread was by word of mouth. This made it more difficult to pass the information to scientists, and so acted as a constraint. This is in accordance with Farmington and Martin (1997) who stressed that the transfer of information is constrained and error-prone since it has to be passed on orally and held in the heads of practitioners.

### Conclusion

Vegetable production is a very important economic activity in Khartoum. This actually resulted in growers being not keen in transferring/sharing their new T Tq P with their peers until they reap the economic benefits of their invention which becomes commonly spread amongst growers with time. Inventor grower represents a considerable portion of vegetable growers. The contacts between them are mostly personal and were useful in disseminating information amongst growers who received less attention from the official extension and research institutions and accordingly growers lack both confidence and reliability in any information delivered to them by these institutions. The latter was the main motive behind growers establishing their own system of T Tq P information and experience exchange. Experimentation was a very important component of the development of new T Tq P. On the other hand, extension workers did

not convey any of the growers' inventions to any other institution.

### Conflict of Interest

The authors have not declared any conflict of interest.

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