Development of Market Gardening in the Region of Poro: an Opportunity for the Empowerment of Women

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Abstract: In recent years, the development of market gardening and its commercialization has increased abundantly in the region of Poro thanks to women. However, no study has yet focused on the opportunities available to women through this activity, the difficulties they face, in order to make some recommendations. Thus, a survey and a bibliographic review were carried out, which revealed that market gardening and its commercialization constitute a real source of income and fulfillment for women.This has allowed them to become economically independent. Women are present in all the steps of the chain, from production to labor and marketing.They take care of their gardens daily during the campaign to have enough money to meet their needs and contribute adequately to household expenses. Beyond that, they participate in the development of family farms. In addition, they contribute to the development of the country in general, and of their localities in particular. However, it is important that the government, through the Ministry of Agriculture, support women by facilitating access to credit and reorganizing the market gardening sector. The government must provide women with inputs (fertilizer, good quality seeds, etc.) and train them in the manufacture and use of organic fertilizers. Women should be organized into cooperatives and sell their produce as a group. They should be present at all levels of the marketing circuit.

Keywords: *Market gardening, empowerment of women,region of Poro,Côte d'Ivoire.*

I. Introduction

Investing in women's economic empowerment is the surest path to gender equality, poverty eradication, and inclusive economic growth (ONU-Femmes, 2018).

In the region of Poro, the Ivorian population is estimated at more than 697,293 inhabitants, mostly Senoufos and Malinkés (RGPH, 2014). Among this population, women who represent 50.49% play a fundamental role in the regional economy. One of their main activities, in recent years, is the production and marketing of market garden crops. This dynamism is explained by the presence of lowlands and irrigation water in all seasons and by the relative ease of marketing vegetables in urban markets close to the production areas (ANADER, 2014). In the north of Côte d'Ivoire, the fact that women do not own land means that they cannot grow cash crops such as cotton, cashew nuts, etc. They cultivate the outskirts of the villages and therefore exploit the peripheries of the water reservoirs for short-cycle crops such as market gardens. For this reason, the installation of 13 hydro-agricultural dams in the region of Poro has been an opportunity for the women of this region to develop vegetable gardening. The objective of this study was to show how market gardening contributes to the empowerment of women in the regionof Poro. To do so, we willfirstanalyze the opportunities and economic importance of market gardening, then we will look at the constraints related to this activity in the region ofPoro and finally we will give some recommendations for a better development of this activity.

II. Methodology

2.1. Study Site

This study was conducted in the district of Poro in northern Côte d'Ivoire. The region of Poro, is situated between latitudes 9°27 and 9°41 North and longitudes 5°38 and 5°19 West and covers a surface of 13,400 km^2. The total population is about 763,852 inhabitants RGPH (2014) and mostly constituted of Sénoufos the dominant ethnic group. In these both regions, the principal activity of the population is agriculture and cattle breeding. The annual rainfall varies between 1,200 mm and 1,400 mm.

2.2. Data collection

To obtain the data for this study, we first conducted a survey in the district of Poro among women producers of vegetable crops. Then, we used a questionnaire to obtain additional information on the organization of this activity from the women vegetable producers to the authorities of the district. Finally, we did documentary research on the market gardening sector to deepen our knowledge on the opportunities of garden crops and on the involvement of women in this activity. The data obtained enabled us to assess the economic importance of market gardening, the opportunities for these crops, the constraints faced by women, and to make some recommendations.

III. Opportunities and economic importance of market gardening in the regionof Poro

Vegetables from market gardening are widely consumed in Côte d'Ivoire, with 5.5 kilograms of fresh fruit per inhabitant per year (DSDI, 2005). In the region of Poro in particular, 41% of the population prefer okra-based sauces, compared to 29% for eggplant-based sauces, 20% for tomato-based sauces, and 10% for sauces made from other vegetables (Fondio, 2005). For all of these reasons, market garden products seem to be of paramount importance to the populations of this region. Their supply is ensured mainly by market gardeners in and around the large cities, who make their living from market gardening. This activity is most often carried out by women, but also by young men seeking to become economically independent from their parents.

Generally, this market gardening craze is found in villages close to dams (1 to 3 km) and located near village markets or large towns where production can be sold. These are off-season crops with onions (often grown intensively), tomatoes, lettuce, chili peppers, tobacco, eggplants, etc. This is a real agricultural revolution for the inhabitants of northern Côte d'Ivoire, who used to have to wait for rainfall (June to October) to grow these crops. The edges of the water reservoirs located in areas with sufficient population (more than 15 inhabitants/km^2) are used for market gardening. This is the case in the densely populated area of Korhogo (more than 80 inhabitants/km^2), the sub-prefectures of Sirasso (15 to 20 inhabitants/km^2), Niofoin (15 to 20 inhabitants/km^2),M'Bengué (15 inhabitants/km^2), Niellé (15 to 20 inhabitants/km^2), Diawalla (15 inhabitants/km^2), Ouangolodougou (15 to 20 inhabitants/km^2) and Ferkessédougou (15 to 30 inhabitants/km^2). On average, a quarter of the perimeter of the reservoirs where market gardening is practiced is exploited. In some reservoirs, nearly 70% of the banks are used for market gardening. The proximity of major cities (Korhogo and Ferkessédougou) favors the sale of market garden produce from nearby villages, which are connected by the road network. In addition, women remain the driving force behind the marketing of these market garden products. The main actor in the long circuit of market garden production is the wholesale trader. This circuit is characterized by the presence of several intermediaries: the producer, the wholesaler, the retailer, and the consumer. On the various mass consumption markets (Korhogo, Ferkessédougou, Katiola, Bouaké, Abidjan....), women constitute the majority of wholesalers (FIRCA-BVP-AFD, 2018). These women wholesalers are responsible for collecting and shipping production to consumption areas. Production is sold per area cultivated by the market gardener, not per kilogram. The wholesalers supply their own distribution network made up of several retailers that they organize around them for the rapid sale of their stocks on the markets. They are the preferred choice of producers because they regulate the market and judge the quality of vegetables in the production areas. For example,they can refuse to buy any vegetables on which they observe blackish spots or yellowing leafy vegetables. Better yet, they will look for the green color of the leaves. On the other hand,

other direct buyers such as consumers and some supermarkets will be more careful about the means of production (quality of water and inputs used) or will require numerous quality tests of these products, which for illiterate producers may seem daunting. Women wholesalers maintain relationships of loyalty and trust with the producers and retailers. They reassure the producers at the time of the purchase and the retailers for the supply whatever the cultivation season. Besides this "long" circuit, there is a "short" circuit that directly involves the producer and the consumer. Consumers either buy their supplies directly from the production areas or meet the producer at the market. Some households near the production areas take advantage of this to buy market garden produce. For producers, they do not constitute a large and reliable clientele, as purchases are made according to the immediate needs of the household. However, the women are not alone in this activity. They are supported by their husbands. Thus, the development of market gardening areas is a real opportunity for women. They are helped in certain arduous tasks by their husbands, who also watch over the roaming of the animals. As a result, it promotes development and social cohesion among the population, and more specifically among women. From the home to social cohesion, the "woman and market gardening" becomes a marriage of happiness. Today, thanks to these farms, women contribute greatly to the improvement of the quality of meals. In addition, women participate in meeting household expenses through the exploitation and marketing of market garden products (Coulibali, 2016). However, this activity faces difficulties.

IV. Market gardening constraints in the Poro region

The constraints to market gardening development in the region of Poro can be grouped into agro-climatic constraints, economic and socio-organizational constraints, land constraints, and marketing constraints.

4.1. Agro-climatic constraints

The agro-climatic constraints are climatic, agro-pedological and linked to increasing phytosanitary pressure. Overall, climate change is accentuating the differences between production zones and climatic accidents: rains are more intense and violent, and periods of drought are more severe throughout the region of Poro. To remedy these problems, it is important that the areas intended for market gardening benefit from equipment capable of overcoming water deficits and excesses, i.e. with efficient irrigation and drainage systems adapted to the management and investment capacities of producers. Crops grown under soil-less cover can be considered for year-round production of tomatoes. Other crops in peri-urban areas could be produced in a more rational manner, such as lettuce, peppers, and cucumbers. Increasingly, a decline in soil fertility has been observed in all zones. This trend is linked to the practice of repeated market gardening on the same soils (decrease in chemical and physical soil fertility, high level of soil infestation by parasites). This may explain the low yields obtained in many of the production areas. Regular applications of organo-mineral fertilizers are necessary on vegetable crops before each crop. Organic matter can come from different sources depending on the area: animal manure, plant waste, urban waste compost, or in the form of crop improvement in rainfed systems. Due to a lack of knowledge, know-how and equipment (tricycle, cart with power tiller or animal traction, etc.), market gardeners do not yet place enough emphasis on maintaining the organic status of the soils they cultivate almost continuously. Phytosanitary pressure is high in almost all areas. It is due to the hot and humid climate for exogenous species (tomatoes, peppers, cabbage, onions, lettuce). The main disease of Solanaceae is bacterial wilt due to *Ralstonia solanacearum* which is very present in many production areas. This bacterium has many wild hosts and cultivates solanaceous plants (eggplants, peppers, chillies). When it has been introduced and promoted by tomato cultivation, it remains in the soil, multiplying there and increasing its destructive potential. There are many control methods to reduce its impact, but its aggressiveness increases over time. In the wet season, bacteria of the genus Xanthomonas responsible for bacterial scab and Clavibacter responsible for bacterial canker, cause significant damage to solanaceous plants (spots on the fruits for scab, slow and generalized drying of the plants which turn brown, cessation of fructification after 2 to 3 harvests for canker) The alternation of a very marked dry season and the cessation of cultivation limits the development of bacterial wilt, but root-knot nematodes, especially in sandy or sandy-loam soils, are another risk to be monitored in

irrigated areas. It is therefore important to grow species and varieties that are well adapted to hot and humid conditions: African eggplant, purple eggplant, chili, okra, tomatoes with adapted varieties, green beans. In areas with shorter dry seasons, an onion harvested fresh without a conservation objective, i.e. a marketing delay of 2 to 3 weeks at most, could be tested with productive and early varieties. In addition, rainfed onions could be developed, but with lower yields than in the dry season, adapted varieties and a cropping calendar to be developed between the rainy and dry seasons. This combination of production to supply the market with locally produced onions will have to be based on work of varieties, production calendars, types of products marketed, and the identification of integrated production zones.

4.2. Economic constraints

Constraints related to access to inputs concern fertilizers and organic materials, seeds, organic matter, seeds, and pesticides. They are common to all major agro-climatic zones. Chemical fertilizers are expensive, non-specific, and not subsidized (apart from a few one-off project actions) compared to the major export sectors. Subsidized chemical fertilizers that are better adapted to market gardening would improve yields due to better adapted crop nutrition and limit fertility losses insofar as their use is combined with that of quality organic manures. To achieve this, it is necessary to facilitate the production of these manures in synthetic fertilizer production units. In villages and towns, the creation of organic manure manufacturing companies would make it possible to offer a range of organic fertilizers from local deposits. Quality seeds are difficult to access and considered too expensive. Better use of these seeds through adapted nursery techniques (protected nurseries isolated from the soil and subsidized under certain conditions) would make it possible to reduce the quantities used and obtain better quality plants. The extension of the distribution networks of the private companies is to be encouraged by the state services. Finally, for species and varieties selected by the National Center of Agronomic Researches (CNRA), collaboration with private distributors should be developed, as their networks are well developed. Access to pesticides is often difficult. As a result, pesticides approved for other crops (especially cotton) but not authorized for use on vegetable crops are misused. Training of pesticide sellers, technical advisors and farmers is a priority. It must be targeted not only on the regulatory aspects but also on the risks for human health and the environment. At the same time, the use of organic or environmentally friendly products should be developed.

4.3. Economic and socio-organizational constraints

Economic and socio-organizational constraints include land pressure, poor organization of market gardeners for market access, and their low investment capacity at the level of producer units and groups/cooperatives. Land pressure exists in the North, particularly in the region of Poro. It is felt most when land and water are coveted by different users. Thus, on the outskirts and in the heart of cities, land dedicated to market gardening is increasingly urbanized. The increasingly high price of building land does not allow producers and even local authorities to buy this land to classify it definitively as urban market gardening land. Yet these areas would be of interest in terms of improving the living conditions of city dwellers (green spaces, opportunities to buy vegetables). However, the urban and peri-urban market gardening are most often confronted with a strong degradation of the quality of irrigation water. The promotion of agriculture in these conditions depends first and foremost on providing market gardeners with good quality water (deep wells, good wastewater management). In the region of Poro in particular, traditional land uses are sometimes in opposition to year-round market garden production in areas where irrigated crops compete with animal watering in the dry season. The establishment of shared rules for the use of space and water around water points would allow for better protection of market garden crops, which are too often destroyed by the passage of animals. More generally, the insecurity of land tenure experienced by market gardeners is linked to their origins (allochthonous, non-indigenous), and therefore to their precarious land tenure status and to their low level of collective organization. In addition to securing land managed by the new market garden development projects, it would be appropriate to secure the oldest and often most productive market garden areas, which are no longer the subject of significant support from projects and programs.

The creation of producers' organizations could allow them to have their activities better recognized and to be able to discuss with the authorities. These organizations should be built or strengthened at the local level, first in

the form of groups or cooperatives. Also, unions could be formed to facilitate exchanges at the regional level with projects/programs, public services, and local communities to manage land insecurity. Another form of regional organization to be promoted is that of the multi-actor platform, which allows for dialogue and contractualization between producers' cooperatives and traders' cooperatives, agro-providers, development programs, etc. Similarly, such organizations (cooperatives, groups, associations, or regional unions) could increase the capacity for individual and collective investment to improve the infrastructure of market gardening areas or the acquisition of motorized equipment through public subsidies, projects and facilitated access to credit. If the various forms of collective organization of market gardeners are functional and effective, it will then be possible to consider creating an umbrella organization for market gardeners in the region of Poro and an inter-professional organization.

Marketing constraints are also common to all zones when market gardeners direct their production to consumer markets. The overabundant supply of vegetables and the consequent collapse of prices at certain periods could be curbed by spreading production out over the year. Moreover, the absence of a solid producer organization puts them in a weak position with respect to buyers and transporters. Strengthening covered grouping platforms and contractualization mechanisms (producer-wholesalers) would allow producers to be brought together in truly professional and sustainable organizations and to diversify their activities: coupling input credit and group sales, technical advice with the recruitment of a specialized technician, coaching for the creation of other platforms in other regions. But for this to happen, it is necessary to reduce the asymmetries between wholesalers and market gardeners (i) by organizing more basic training (literacy, basic economic and financial management), (ii) by training producers on the interests and limits of group sales, (iii) by holding awareness-raising sessions for traders and finally (iv) by financing support mechanisms for group sales experiences, for groups of market gardeners and wholesalers who wish to collaborate. Finally, the promotion of innovative techniques of cultivation (choice of varieties, rational irrigation), harvesting (date, sorting), packaging (crates), conservation and processing of vegetables would make it possible to limit the losses observed in the various links of the chain from harvesting to consumers.

V. Recommendations

5.1. Recommendations in the field of production

Improve the fertilization of market garden crops and the maintenance of soil fertilityis necessary to significantly increase the production and use of organic manure to sustainably exploit market garden soils, particularly those in developed areas: train producers in the production of ruminant, poultry and pig manure, set up fields school focused on organo-mineral fertilization, subsidize groups to acquire adequate transport materials at low cost. When the "organic" constraint is lifted, it is necessary to work with research, extension workers and producers on mineral fertilizer inputs and to know how to combine them with organic inputs.

5.2. Recommendations for improving water management

Improving water management capacities of producers would be useful to learn from the lessons learned from the development of irrigated market gardening perimeters before launching new and very costly projects. Then, we recommend that investments be made in situations where producers have already acquired good experience by limiting the surface area of the developed perimeters and by favoring rustic irrigation systems for collective use. Improve the collective integrated management of the developed perimeters as management of pests, soils, crop rotation, drainage, etc. Technicians and producers often underestimate the other components of perimeter management (soil, pests in the soil or in the peripheral vegetation, excess water, etc.). We therefore recommend developing an integrated management method for irrigated market gardens that could be developed into a management manual accessible to producers and extension agents, a video film, and a training module for the same audience. This method will address drainage, soil fertility management, disease, and pest management, and collective activities such as protected nurseries, pump and irrigation system management, etc.

5.3. Recommendations for access to seeds

It is necessary to facilitate access to quality seeds and rationalize their use. It is possible to promote contractual relations between input suppliers recognized for their reliability and large cooperatives or, better, unions of groups/cooperatives. The development of an alternative seed sector, managed by public structures or cooperatives, does not seem desirable at present because the profession is not sufficiently organized except for onions. Given the high cost of quality seeds, we recommend that a support and advice program to produce quality seedlings in nurseries be developed.

5.4. Recommendations for improving pesticide use and preventing risks

Generally, producers are poorly informed about the uses and dangers of pesticides. It is necessary to reinforce the level of information, training and skills of shopkeepers, technicians or agricultural advisers and market gardeners in this field. Thus, it is necessary to establish (i) a list of pesticides that can be used in market gardening, updated each year and easily accessible by all actors in the sector and (ii) to publish a practical guide to the use of approved pesticides for market gardening in a language that is easily accessible to producers. The establishment of a coalition of market gardening actors involved with consumer associations should be promoted to reduce the use of chemical pesticides and better control their use.

5.5. Recommendations for improving the marketing of market garden produce

In the region of Poro, it would be possible to spread production over time by advancing the period of the first harvests. However, this requires starting the nurseries very early and identifying varieties that can withstand the rains well during the flowering and ripening periods. For this, we recommend setting up a program to spread out rainfed vegetable production.

Also, we recommend starting with information and training on marketing, followed by support for groups of market gardeners who wish to engage in group sales. The networking of cooperatives and groups that manage to market collectively (via the creation of a WhatsApp network or others) will give more scope to this action. It is also important to distinguish between support and group sales schemes for basic food crops and those for market garden produce. The grouped sale allows a cooperative to have financial capital that can then be (i) either loaned to members as a campaign loan, or (ii) considered as a guarantee for a bank to grant campaign credit to cooperative members if they so wish. In parallel, it is necessary to develop an experimental management consulting system specifically for market gardeners and cooperatives so that they can prepare their annual management plan.

5.6. Recommendations on transport conditions for vegetable products

We recommend experimenting with the transport of fragile vegetables in crates (plastic, wood) to establish a cost/benefit analysis when moving from the traditional transport system with disposable cartons to the transport system with plastic or wood crates. Segmenting the market by introducing signs of quality and origin. Consumers will be more likely to buy a vegetable at a higher price and better remunerate the producer if they are well informed about its origin and quality. To this end, we recommend (i) studying the feasibility of labeling the origin of market garden products (country and region for Côte d'Ivoire) and conducting a comparative study in similar countries of vegetable quality labels.

5.7. Recommendations on the conditions of the actors of the sector

It is necessary to provide reliable and updated information to the actors of the sector. Thus, we recommend carrying out a study with the actors in the sector to determine their information needs (prices, quality range, quantities marketed, production costs, yield). On this basis, the experimentation of a shared information system could be envisaged for a few economically important market garden products.

5.8. Recommendations for addressing non-marketing related socio-organizational constraints

Urban and peri-urban market gardening systems are very useful to city dwellers and cities (green spaces, fresh vegetables in the vicinity, recycling of organic waste). On this basis, we recommend that a study be conducted

to identify areas with a high production potential for market gardening/vegetable crops that can be secured by the purchase of land by local authorities or the State. In areas developed by projects/programs, the establishment of a land contract between the landowners and the producers' group will be systematized. In the region of Poro, it would be advisable to systematize the establishment of a management charter for the water point and peripheral land between farmers and market gardeners and to improve the quality of fences. Various approaches need to be studied and then tested, such as the joint use of power tillers and small motorized equipment and management advice for groups to improve their choices and the management of joint equipment

5.9. Recommendations in terms of capacity building of actors and professional organizations of the market gardening sector

Address the lack of technical skills in landscaping, irrigation and soilless cultivation implies the training of experts in each of these fields. These experts will already be employees of public or private structures. Develop a training program for about a hundred experts so that they can form the basis for the development of the sector. In a second phase, these experts could constitute a "Poro region market gardening" network and contribute to revising the training curricula in plant production by creating horticulture options (Technician and Engineer levels). The expert market gardeners, literate producers with communication skills would also be identified, mobilized and networked. The strengthening of the CNRA's market gardening program is also essential, as is the coordination of research on market gardening at the national level. In addition, we propose to study the feasibility of creating a resource center dedicated to market gardening, which could be called the Garden Crops Development Center of the region of Poro. Also, we recommend developing a national capacity to produce technical and economic analyses on the performance of innovations in market gardening. For these different activities, the expert market gardeners would be mobilized to give their points of view on the way to present the innovations or more simply bring their own know-how. There is a need to renew support approaches and to better organize market garden producersto strengthen the capacities of producers and their role in the sector (functional literacy, new information and communication technologies in producer training, etc.).

VI. Conclusion

In the region of Poro, women and market gardening are a true love story. For years, market gardening has been considered a typically female activity. Over time, it has become a real source of income and fulfillment for them. This has allowed them to become economically independent. Present in all the chains: from production to marketing, they take care of their gardens daily during the campaign to have enough financial means to meet their needs and contribute adequately to household expenses. Beyond that, they participate in the development of family farms. In addition, they contribute to the development of the country in general, and of their localities. Thus, market gardening being a very old activity of women, its promotion is considered today as a means ofresilience.

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