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THE ROLE OF INTENSIVE AGRICULTURAL IN ACHIEVING FOOD SECURITY IN EGYPT

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Abstract:-Egypt is still short in self-sufficiency in major food groups. Self-sufficiency in grain crops and oil crops has been estimated at 68.7% and 45%, respectively. The study concluded that production of major crops such as wheat and broad beans can be increased by expanding the areas in which the two crops are cultivated under intercropping pattern. In addition, production of vegetable crops can be increased by cultivating them under intercropping, which helps save thus allocate the areas in which they used to be cultivated as single crops for cultivating major crops in which Egypt faces production shortages. It is worth mentioning that production of wheat, broad beans, garlic, winter onions, and summer onions cultivated under intercropping amounted to 157.44, 9, 62, and 467.2 thousand tons, respectively. The amount of increase in both winter and summer vegetable crops reached 61.708 thousand tons.

Keywords:food security - agricultural intensification - agricultural intercropping.

INTRODUCTION

Despite the noticeable progress the world has been witnessing in field of industry, agriculture is receiving more attention and importance as the primary source of food in a world in which population has doubled within a period that did not exceeding three decades. From this standpoint, agricultural development is considered crucial for our country. Advancement in agricultural production is essential due to the direct and indirect impacts it has on the country's progress through providing the basic needs and required for raising the standard of living for members of the society, which in turn helps achieve social and political stability.

The limited farmland area is considered the first and most important challenge facing Egypt's agricultural sector, where it accounts for only 3.5% of Egypt's total land area. Therefore, achieving vertical and horizontal agricultural development is regarded as a national necessity for achieving national food security, and for maintaining the agricultural sector as a key supporter to the national economy. In spite of the 69.7 billion m³ of water resources, Egypt possess and uses in different purposes, the Nile River accounts for 95% of the total amount of water resources in Egypt. Egypt's annual share of the Nile River's water is estimated at 55.5 million m³. However, efficiency of water resources use in irrigation is estimated at 50%. As for the total area of agricultural land, it amounted to 8.6 million feddans, of which 6.5 million feddans fall in Old Lands areas (the valley and the Delta), whereas 2.1 million feddans fall in New Lands. The growing increase in Egyptian population, which amounted to 83 million at the beginning of 2014, is bound to create difficulties in providing food requirements despite the advancements in agricultural production methods. Therefore, adopting intensive farming is considered imperative under the prevalent changes that are

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becoming harder year-over-year (The Egyptian Society for Political Economics, 2011).

For these reasons, it is inevitable to seek different methods to achieve food security. Intensive farming is considered a key pattern for increasing food produced by the agricultural sector.

Research Problem

Despite the expansions in cultivating reclaimed lands in different Governorates, Egypt still faces shortages in the production of many strategic food crops required to meet the increasing domestic demand. In 2012, self-sufficiency in grains and oilseeds amounted to 68.7% and 46% respectively.

Objective

The research aims to find solutions for increasing the quantities produced of major food crops from the same planted area, without disrupting the current crop structure through intercropping, which helps increase self-sufficiency in the mentioned food groups.

METHODOLOGY AND SOURCES OF DATA

To achieve the research objectives, the researcher relied on published and unpublished data from official sources including: the Central Administration for Agricultural Economics affiliated to the Ministry of Agriculture and Land Reclamation (MOALR); Website of the Central Administration for Public Mobilization and Statistics (CAPMAS), in addition to the internal project report of the National Research Center titled "The Role of Intensive Farming in Achieving Food Security in Egypt". As for the methodology, the researcher applied descriptive statistics to achieve the research objectives.

RESULTS AND DISCUSSION

Definition of Food Security:

Generally speaking, food security exists when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life. However, having access to appropriate food is a necessary but not sufficient condition. There are several factors that lead to obtaining maximum benefit from the consumed food such as the availability of healthy environment, and Government's care to society members. Lack of access to adequate food needs might be attributed to low income, or low production of food (The Egyptian Society for Political Economics, 2011).

Food Security Pillars:

Achieving food security in Egypt depends on several pillars including: increasing productivity per unit of cultivated area, increasing investments allocated to the agricultural sector, and focusing on the adoption of the integration approach in achieving food security (The Egyptian Society for Political Economics, 2011).

Studying the Food Balance of Major Food Commodities in Egypt:

Table (1) shows food balance data for some food commodities, and self-sufficiency ratios during 2012. It is clear that self-sufficiency in total grains has been estimated at 68.71%, whilst reached 55.73% and 67.72% for wheat and maize, which are the two main grain crops, respectively. Self-sufficiency in total legumes reached 43.90%, whilst reached 38.84% for dry broad beans, 48.15% for dry beans, and 1.56% for lentils. Self-sufficiency in roots and tubers exceeded 100%. The same applies to sugar crops in which self-sufficiency exceeded 100%. In contrast, self-sufficiency in total oilseeds reached 45.96%, whilst self-sufficiency ratios for underlying crops have been estimated at 5.3% and 42.86% for soybeans and sunflower seeds, respectively. Self-sufficiency in onions and garlic, vegetables, and fruits exceeded 100%. As regards the group of animal protein, self-sufficiency in poultry meat and red meat reached 96.55% and 85.71%, respectively. Finally, self-sufficiency in medicinal and aromatic plants reached 77.48%.

It is clear that Egypt faces huge shortages in grains, especially wheat and maize, and in oilseeds too, which negatively affects self-sufficiency in edible oils. This situation requires exerting efforts to come up with proposals and plans for boosting production from these crops. One of the proposed options might be expanding cultivated areas, but not at the expense of areas cultivated with competing crops during the same season, which can be achieved through intensification of agricultural production.

Table 1: Food balance for some food commodities, and self-sufficiency ratios during 2012.

Crops	Production	Imports	Exports	Available for consumption	Self-sufficiency (%)
Total grains	22294	9884	160	32447	68,71
wheat	8795	6561	-	15782	55,73
Parley	108	15	-	123	87,80
Maize	6877	3284	6	10155	67,72
Total legumes	234	378	77	533	43,90
Dry broad beans	141	237	15	363	38,84
lentils	1	76	10	64	1,56
Dry beans	13	15	1	27	48,15
Sugar Crops	24891	2	1	24892	99,99
Total oilseeds	523	649	34	1138	45,96
Soybeans seeds	30	525	-	555	5,40
Sunflower seeds	19	78	2	95	20
Onions and garlic	2725	3	361	2367	115,12
Total vegetables	15405	1	183	15223	101,19
Starchy crops	5196	121	296	4789	108,50
Total fruits	6920	316	208	7026	98,49
Citrus	3980	11	1040	2951	134,87
Nuts	19	43	-	62	30,64
Poultry meat	1037	61	1	1074	96,55
Red meat	990	208	-	1155	85,71
Medicinal and aromatic plants	86	38	13	111	77,48

(Quantity: thousand tons); Source: Central Agency for Public Mobilization and Statistics, (CAPMAS), Information Center, Electronic Website (CAPMAS, 2012).

Definition of Intensive Farming:

Intensive farming or intensive agriculture is defined as the process of intensifying the return on resources used. It is an agricultural production system that is characterized by a low fallow ratio and high use of inputs such as capital and labor, or the heavy use of pesticides and chemical fertilizers relative to land area. It is well known that determinants of agricultural expansions are land and water. Therefore, intensification is achieved through maximizing output per unit of land area, or per cubic meter of water, or both. However, in some cases intensification of productivity per unit of labor and capital are also considered factors of agricultural intensification.

IMPORTANCE OF INTENSIVE FARMING:

Intensification is considered an effective way of utilizing agricultural land due to several reasons:

First: intensifying a number of plants in a relatively small area makes it easier to control.

Second: improving quality of the cultivated plants by devoting attention to providing better planting conditions such as the sorting of planted seeds, adopting improved practices, using proper fertilizers,

and conducting appropriate fungal, insect, and pests control methods.

Third: guaranteeing a sufficient and permanent source of green fodders in case grass crops are cultivated.

Fourth: all services such as hoeing, harvesting, and irrigation can be performed for more than one crop in one time.

Fifth: cultivating fodder crops beside animal production farms in case of integrated projects.

Sixth: obtaining full benefit from fertilizers added to the soil.

Intensification patterns include intercropping, planting more than one seed per hole, reducing the distance between holes, and finally crop rotations. Intensive farming is a system that aims to increase output per unit of land area through optimum use of available resources to maximize productivity. This research focuses on intercropping as one of intensive farming patterns adopted to achieve optimum use of production inputs, and to increase both production per unit of cultivated area, and return per unit of land. Intercropping is defined as the process of cultivating two or more crops in the same area and time, or that share the same time period. However, this might lead to some competition between intercropped plants during the growth season, or part of it. Hence, it is highly important to take great care when selecting the plants to be intercropped so as to avoid conflicts in environmental needs with the main crop. Moreover, compatibility between agricultural operations performed for the intercropped plants is considered of the main conditions for achieving the benefit of cropping advantage per unit of area.

Maize is considered Egypt's number one crop in terms of possibility of planting under intercropping pattern. The main reason for this top rank is its large cultivated area, where summer white maize area has been estimated at 2157 thousand feddans in 2012. In addition, it is possible to execute an integrated intercropping plan in maize planted areas. Finally, maize is planted on ridges, which is a procedure that provides a great opportunity for maximum utilization per area unit. (3)

STUDYING MAIN INTERCROPPED PLANTS IN EGYPT:

Intercropping is a cultivation system that allows obtaining maximum benefit from the prevalent environmental conditions by producing two crops that differ in the way of benefiting from the environment. In addition, it allows better investment per unit of land area thus receiving higher return per cultivated area. However, there are several conditions that must be satisfied in the intercropped plant. The first is that it should be planted on independent ridges alternately with the main crop, or each crop can be planted on one side of the ridge. The second condition is that the intercropped plant should belong to the same season during which the main crop is cultivated, and it should follow the same farming pattern as that of the main crop.

STUDYING MAIN INTERCROPPED PLANTS DURING THE PERIOD 2000-2012:

Data published by the Ministry of Agriculture and Land Reclamation showed that wheat, broad beans, garlic, onions, and some winter vegetables are the main crops planted under intercropping during the winter season, whereas onions and some summer vegetables are the main crops planted under intercropping during the summer season.

1. Wheat: data in Table (2) show that total intercropped wheat area at the country level amounted to some 9.482 thousand feddans during 2012, of which 9.119 thousand feddans representing 96.17% are located in Old Lands and 3.83% are located in New Lands. The Governorates in which wheat is cultivated under intercropping pattern are Qena and Luxor, with shares estimated at 76.9% and 23.1%, respectively. Total produced quantity of intercropped wheat at the country level amounted to 157.440 thousand Aradeb, with shares estimated at 81.38% and 18.62% for Qena and Luxor, respectively. Yield per feddan at the country level has been estimated at 16.6 Aradeb, whilst reached

16.65 and 15.50 Ardab for Old and New Lands, respectively. A comparison between yield per feddan of wheat cultivated under the single pattern and yield per feddan of intercropped wheat at the country level indicate that it amounted to an average of 18.55 Aradeb for single planted wheat compared with an average of 16.6 Aradeb for intercropped wheat.

Table 2: Total intercropped wheat area in Egypt during 2012.

Governorate	Land type	Area	Total (%)	Production	Total (%)	yield per feddan (single)	yield per feddan (intercropped)
Qena	Old Lands	7.000	76.76	123.097	81.08	19.68	17.59
	New Lands	0.292	80.44	5.020	89.24	17.26	17.19
	Total	7.292	76.90	128.117	81.38	18.82	17.57
Luxor	Old Lands	2.119	23.24	28.718	18.92	19.00	13.55
	New Lands	0.071	19.56	0.605	10.76	14.55	8.25
	Total	2.190	23.10	29.323	18.62	16.98	13.19
Total	Old Lands	9.119	96.17	151.815	96.43	19.10	16.65
	New Lands	0.363	3.83	5.625	3.57	16.22	15.50
	Total	9.482	100.00	157.440	100.00	18.55	16.60

(Quantity: thousand tons, area: thousand acres); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics and Statistics, unpublished data, 2012.

2. Broad Beans: as clear from Table (3), average country-level area of intercropped broad beans for the period 2000-2012 amounted to 11.763 thousand feddans. Governorates that occupied top ranks in terms of areas where broad bean is cultivated under intercropping pattern include Menofiya, Gharbiya, and Aswan, with shares estimated at 32.19%, 27.63%, and 16.28%, respectively. Average country-level production obtained from intercropped broad beans amounted to 9.028 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped broad beans at the country level include Menofiya (35.86%), Gharbiya (18.50%), and Aswan (13.56%). Average yield per feddan of intercropped broad beans amounted to 1.16, 1.14, and 1.02 tons in Bani Swaif, Giza, and Sohag, respectively, whilst amounted to 1.058, 1.205, and 1.394 tons in case broad bean is planted under the single-crop pattern in the same mentioned Governorates, respectively. Suez Governorate ranked first in terms of yield obtained from intercropped and single-planted broad beans, which amounted to 1.504 and 0.777 ton/feddan for the tow planting [atterns, respectively.

Table 3: Average area in Egypt of intercropped broad beans during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)	yield per feddan single	yield per feddan intercropped
Gharbiya	3.250	27.628	1.670	18.198	1.389	0.514
Menofiya,	3.786	32.185	3.238	35.861	1.371	0.626
Suez	0.130	1.105	0.101	1.119	1.504	0.777
Giza	0.518	4.658	0.629	6.967	1.205	1.140
Bani Swaif	0.358	3.044	0.386	4.275	1.058	1.157
Fayoum	0.154	1.309	0.133	1.473	1.141	0.864
Minya	0.196	1.663	0.115	1.271	1.127	0.601
Sohag	0.583	4.956	0.597	6.613	1.394	1.023
Qena	0.583	4.954	0.351	3.89	1.103	0.987
Luxor	0.261	2.219	1.224	13.556	1.307	0.885
Aswan	1.915	16.277	1.224	13.556	1.072	0.708
Total	11.763	100.00	9.028	100.00	1.396	0.845

(Quantity: thousand tons, area: thousand Feddans); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

3. Winter Onions: it is clear from Table (4) that average country-level area of intercropped onions over the period 2000-2012 amounted to 28.126 thousand feddans. Governorates that occupied the top ranks in terms of areas where onions are cultivated under intercropping include Gharbiya, Bahaira, and Bani Swaif, with shares estimated at 47.95%, 28.41%, and 9.77%, respectively. Average country-level production obtained from intercropped onions amounted to 221.086 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped onions at the country level include Gharbiya (63.33%), Bahaira (11.65%), and Bani Swaif (10.34%). Gharbiya ranked first in terms of average yield obtained from intercropped onions, which amounted to 10.46 tons/feddan, followed by Bani Swaif (10.29 tons/feddan), and Daqahliya (8.88 tons/feddan). Yield obtained from onions cultivated under the single-crop pattern amounted to 14.79, 11.89, and 14.11 tons/feddan for the same mentioned Governorates, respectively.

Table 4: Average area in Egypt of intercropped onions during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)	yield per feddan (single)	yield per feddan (intercropped)
Bahaira	7.991	28.41	25.767	11.655	13.607	8.617
Gharbiya	13.186	47.95	110.003	63.332	14.787	10.463
Damietta	0.33	0.117	0.240	0.109	1.727	6.523
Kafr El-Sheikh	1.699	6.04	11.518	5.21	10.159	6.633
Daqahliya	1.352	4.806	13.856	6.267	14.112	8.883
Bani Swaif	2.747	9.767	22.871	10.345	11.888	10.287
Minya	0.220	0.78	1.922	0.87	12.033	8.651
Luxor	0.047	0.166	342	0.154	10.636	8.120
Aswan	0.552	1.964	4.568	2.066	13.993	7.850
Total Republic	28.126	100.00	221.086	100.00	13.735	9.719

(Quantity: thousand tons, area: thousand Feddan); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

4. Winter Garlic: as clear from Table (5), average country-level area of intercropped garlic over the period 2000-2012 amounted to 7.729 thousand feddans. Governorates that occupied the top ranks in terms of areas where garlic is cultivated under intercropping include Bani Swaif, Minya, Bahaira,

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and Daqahliya, with shares estimated at 52.96%, 17.75%, 10.22%, and 10.07%, respectively. Average country-level production obtained from intercropped garlic amounted to 62.002 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped garlic at the country level include Bani Swaif (61.49%), Minya (17.49%), and Daqahliya (8.79%). Bani Swaif ranked first in terms of average yield obtained from intercropped garlic, which amounted to 9.27 tons/feddan, followed by Minya (8.21 tons/feddan), and Aswan (7.08 tons/feddan). Yields obtained from garlic cultivated in the mentioned Governorates under the single-crop pattern amounted to 11.32, 9.75, and 8.58 tons/feddan respectively.

Table 5: Average area in Egypt of intercropped garlic during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)	yield per feddan (single)	yield per feddan (intercropped)
Behaira	0.790	10.224	3.997	6.447	7.75	6.765
Gharbiya	0.156	2.019	0.559	0.949	7.077	4.283
Daqahliya	0.779	10.072	5.448	8.787	7.187	6.576
Qalyoubeyah	0.124	1.598	0.683	1.101	10.274	5.524
Bani Swaif	4.094	52.965	38.124	61.489	11.322	9.268
Minya	1.372	17.75	10.846	17.492	9.745	8.206
Qena	0.43	0.554	0.224	0.361	8.306	5.502
Luxor	0.010	0.126	0.050	0.80	8.131	5.343
Aswan	0.112	1.44	0.818	1.319	8.582	7.084
Suez	0.251	3.247	1.255	2.024	7.983	5.00
Total	7.729	100.00	62.003	100.00	9.629	7.810

(Quantity: thousand tons, area: thousand Feddan); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

5. Winter Vegetables: data in Table (6) show that average country-level area of winter vegetable crops intercropped with main crops over the period 2000-2012 amounted to 2.548 thousand feddans. Governorates that occupied the top ranks in terms of share in country-level area of winter vegetables cultivated under intercropping include Aswan (51.09%), Luxor (28.29%), and Bani Swaif (20.62%). Average country-level production obtained from intercropped winter vegetables amounted to 23.993 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped garlic at the country level include Aswan (39.11%), Minya (35.18%), Bani Swaif (25.71%).

Table 6: Average area in Egypt of winter vegetable crops intercropped during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)
Bani Swaif	0.525	20.621	6.167	25.705
Luxor	0.721	28.29	8.442	35.184
Aswan	1.302	51.092	9.384	39.111
Total	2.548	100.00	23.993	100.00

(Quantity: thousand tons, area: thousand Feddan); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

6. Summer Onions: data in Table (7) show that average country-level area of summer onions cultivated under intercropping over the period 2000-2012 amounted to 17.935 thousand feddans. Governorates that occupied the top ranks in terms of share in country-level area of intercropped

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summer onions include the 6th of October (46.96%), Behaira (17.45%), and Sharqiya (17.32%). Average country-level production obtained from intercropped summer onions amounted to 246.132 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped summer onions at the country level include the 6th of October (75.14%), Behaira (9.2%), and Sharqiya (6.76%). Top Governorates in terms of average yield obtained from intercropped summer onions include The 6th of October (21.96 tons/feddan), followed by Behaira (8.55 tons/feddan), and Qalioubiya (7.36 tons/feddan). Yields obtained from summer onions cultivated under the single-crop pattern in the mentioned Governorates amounted to 21.95, 16.30, and 12.15 tons/feddan, respectively. The 6th of October achieved the highest yield from both cultivation patterns.

Table 7: Average area in Egypt of summer onions cultivated under intercropping during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)	yield per feddan (single)	yield per feddan (intercropped)
Behaira	3.130	17.450	22.646	9.201	16.303	8.555
Menofiya,	1.032	5.755	6.221	2.528	9.761	6.116
Qalyoubeyah	624	3.481	4.231	1.719	12.148	7.363
Sharqiya	3.107	17.323	16.642	6.761	11.535	6.093
Dakahlia	0.251	1.399	1.862	0.756	9.415	7.331
October 6	8.422	46.958	184.934	75.136	21.952	21.958
North Sinai	0.290	0.162	0.101	0.041	3.741	3.183
Nubariya	1.340	7.471	9.494	3.857	6.988	7.085
Total	17.935	100.00	246.132	100.00	16.45	7.88

(Quantity: thousand tons, area: thousand Feddan); Source: Ministry of Agriculture and Land Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

7. Summer Vegetables: data in Table (8) show that average country-level area of summer vegetable crops intercropped with main crops over the period 2000-2012 amounted to 2.794 thousand feddans. Governorates that occupied the top ranks in terms of share in country-level area of intercropped summer vegetables include Bani Swaif (76.01%), Menofiya (14.86%), and Gharbiya (7.88%). Average country-level production obtained from intercropped summer vegetables amounted to 37.715 thousand tons. Governorates that occupied the top ranks in terms of share in average produced quantity of intercropped summer vegetables at the country level include Bani Swaif (86.18%), Gharbiya (8.68%), and Menofiya (4.46%).

Table 8: Average area in Egypt of summer vegetable crops intercropped during the period (2000-2012).

Governorate	Area	Total (%)	Production	Total (%)
Menofiya,	0.415	14.86	1.681	4.46
Gharbiya	0.355	7.88	3.272	8.68
Bani Swaif	2.124	76.01	32.502	86.18
Luxor	0.035	1.25	0.220	0.006
Aswan	0.012	0.004	0.340	0.674
Total	2.794	100.00	37.715	100.00

(Quantity: thousand tons, area: thousand Feddan) ; Source: Ministry of Agriculture and Land

Reclamation (MOALR); the Central Administration for Agricultural Economics, unpublished and published data, Bulletin of Plant Production Statistics (2000-2012).

Comparison between Yields Obtained From the Study Crops Planted Under Single-Crop and Intercropping Patterns:

As clear from Table (9), yields obtained from crops planted under intercropping pattern are lower compared to those obtained under the single-crop pattern. It is also clear that the amount of decline in yield varies according to the degree of competition between crops cultivated under intercropping. The competition might be low when the length of growth period of the intercropped plants is faster, and also when each crop utilizes the surrounding field conditions differently. However, total production per feddan cultivated under intercropping is higher compared with the sum of production quantities obtained when each crop is planted under the single-crop pattern. It should be noted that lower productivity of crops planted under intercropping can be overcome by applying modern methods, either by using high-yielding varieties, or applying proper fertilization rates and improved inputs. The lowest decline in yield has been observed in wheat crop (10.8%), whereas the highest decline has been observed in summer onions (52.1%). The decline in yield obtained from garlic, winter onions, and broad beans has been estimated at 18.9%, 29.2%, and 39.5%, respectively.

Table 9: Compared to the average productivity of some single pattern and intercropping patter at the level of the Republic during (2000-2012).

Crops	single-crop pattern	Intercropping Pattern	Total (%)
wheat	18.55	16.60	10.5
broad beans	1.396	0.845	39.5
winter onions	13,735	9,719	29.2
winter garlic	9,629	7,810	18.9
summer onions	16.45	7.88	52.1

(Quantity: tons); Source: Calculated from Table (2) to Table (8) of research.

Therefore, it can be concluded that wheat planted under intercropping yields slightly lower productivity (10%) compared with the productivity obtained under the single-crop pattern, which can be compensated by using high-yielding, dormancy resistant varieties recommended by the Agricultural Research Center. Based on that, the study recommends expansions in planting wheat under intercropping in order to raise self-sufficiency in wheat, currently estimated at 55.73%, which helps improve the Balance of Agricultural Trade by cutting as much as possible of the wheat imports bill that amounted to US\$ 3196.9 million in 2012. Self-sufficiency in broad beans can also be raised by 38.84% through expanding areas cultivated under intercropping pattern. Expansions in vegetable crops, onions, and garlic, in which Egypt is self-sufficient, can be of great benefit for Egypt, where surplus production can be used in agro processing industries. Establishing small processing industries in integration with plant production activities shall provide products that can be exported to earn hard currencies.

SUMMARY

Agricultural development has become a necessity for Egypt. It is crucial to boost agricultural production to benefit from the direct and indirect impacts that contribute to the country's advancement. It is a well known fact that agriculture provides the basic needs required for advancement and raising the standard of living, which helps achieve social and political stability for the society. Despite the achieved expansions in areas of reclaimed lands, Egypt is still short in self-sufficiency in major food groups. Self-sufficiency in grain crops and oil crops has been estimated at 68.7% and 45%, respectively. The study concluded that production of major crops such as wheat and broad beans can be increased by expanding the areas in which the two crops are cultivated under

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intercropping pattern. In addition, production of vegetable crops can be increased by cultivating them under intercropping, which helps save thus allocate the areas in which they used to be cultivated as single crops for cultivating major crops in which Egypt faces production shortages. It is worth mentioning that production of wheat, broad beans, garlic, winter onions, and summer onions cultivated under intercropping amounted to 157.44, 9, 62, and 467.2 thousand tons, respectively. The amount of increase in both winter and summer vegetable crops reached 61.708 thousand tons.

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